Remedial Investigation Report - Appendix E

CFAC Facility
2000 Aluminum Drive
Columbia Falls, Montana

February 21, 2020

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APPENDIX E

Baseline Ecological Risk Assessment

Baseline Ecological Risk Assessment

Columbia Falls Aluminum Company

2000 Aluminum Drive
Columbia Falls, Flathead County, Montana

Prepared for:

Columbia Falls Aluminum Company, LLC

Prepared by:

EHS Support

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Acronyms

µg	micrograms
µmol/g_{OC}	micromoles per gram organic carbon
2,3,7,8-TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
ANOVA	analysis of variance
AOC	Agreement and Order on Consent
AST	aboveground storage tank
ATP	adenosine triphosphate
AUF	area use factor
AVS	acid volatile sulfides
BAF	bioaccumulation factor
BCF	bioconcentration factor
BEHP	bis(2-ethylhexyl)phthalate
BERA	Baseline Ecological Risk Assessment
bgs	below ground surface
BLM	biotic ligand model
BSAF	biota-sediment accumulation factor
BTEX	benzene, toluene, ethylbenzene, and xylene
BTV	background threshold values
BW	body weight
CCC	criterion continuous concentration
CEC	cation exchange capacity
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFAC	Columbia Falls Aluminum Company, LLC
CMC	criteria maximum concentration
COPC	constituent of potential concern
COPEC	constituent of potential ecological concern
CSM	conceptual site model
DOC	dissolved organic carbon
DQO	data quality objective
DSR	Data Summary Report
DU	decision unit
dw	dry weight
EC_{10}	10 percent effect concentrations
Eco-SSL	ecological soil screening levels
ECSM	ecological conceptual site model
EDD	estimated daily dose
EPC	exposure point concentration
EPI	Estimation Programs Interface
EqP	equilibrium partitioning
ERA	ecological risk assessment
ERAGS	Ecological Risk Assessment Guidance for Superfund
ESB	Equilibrium Partitioning Sediment Benchmarks
ESBTU	equilibrium partitioning sediment benchmark toxic unit
ESV	ecological screening value
FCV	final chronic value

f_{oc}	fraction of organic carbon
FS	Feasibility Study
ft/ft	1 foot by 1 foot cross-sectional gradient of groundwater
ft^3/s	cubic feet per second
ft-amsl	feet above mean sea level
ft-bgs	feet below ground surface
GSD	geometric mean standard deviation
HCN	hydrogen cyanide
HHRA	Human Health Risk Assessment
HMW	high molecular weight
HQ	hazard quotient
HSD	Honest Significant Difference
IC_{10}	10 percent inhibition concentration
IC_{50}	50 percent inhibition concentration
IPaC	Information for Planning and Consultation
ISS	incremental soil sampling
ITRC	Interstate Technology and Regulatory Council
kg	kilogram
L	liter
LANL	Los Alamos National Laboratory
LC_{50}	lethal concentration in 50 percent of test organisms
LL	low level
LMW	low molecular weight
LOAEL	lowest observed adverse effects level
LOEC	lowest observed effect concentration
MATC	maximum acceptable toxicant concentration
MDEQ	Montana Department of Environmental Quality
MDL	method detection limit
mg	milligrams
mg/kg	milligrams per kilogram
mg/kg bw per day	milligrams per kilogram body weight per day
mg/L	milligrams per liter
mi^2	square miles
MPDES	Montana Pollutant Discharge Elimination System
NaCN	sodium-cyanide
NaF	sodium fluoride
NHD	National Hydrography Dataset
NOAA	National Oceanic and Atmospheric Agency
NOAEL	no observed adverse effects level
NOEC	no observed effect concentration
NRWQC	National Recommended Water Quality Criteria
ORNL	Oak Ridge National Laboratory
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-dioxin
PCDF	polychlorinated dibenzo-furan
RAIS	Risk Assessment Information System

RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RPD	relative percent difference
RSD	relative standard deviation
RSL	Regional Screening Levels
SAP	Sampling and Analysis Plan
SEDTOX	sediment toxicity
SEM	simultaneously extracted metals
SIM	selected ion monitoring
SLERA	Screening-Level Ecological Risk Assessment
SMDP	scientific management decision point
SOP	standard operating procedure
SPL	spent potliner
SQT	Sediment Quality Triad
SVOC	semi-volatile organic compound
SW	surface water
TAL	target analyte list
TCL	target compound list
TDS	total dissolved solids
TEC	Toxicity Equivalence Concentrations
TEF	toxicity equivalent factor
TEL	toxic effect level
TEQ	Toxicity Equivalency Quotient
TOC	total organic carbon
tPAH	total PAH
TRI	Toxics Release Inventory
TRV	toxicity reference value
TSS	total suspended solids
UCL	upper confidence limit
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UST	underground storage tank
UV	ultraviolet
VOC	volatile organic compound
WAD	weak acid dissociable
WET	whole effluent toxicity
WHO	World Health Organization
WQB	water quality benchmark

1 Introduction

On behalf of Roux Environmental Engineering and Geology, D.P.C. (referred to herein as Roux) and Columbia Falls Aluminum Company, LLC (CFAC), EHS Support LLC (EHS Support) has prepared this Baseline Ecological Risk Assessment (BERA) as part of the ongoing Remedial Investigation/Feasibility Study (RI/FS) of the former CFAC aluminum reduction facility (commonly referred to as an aluminum smelter) Superfund Site located in Flathead County, Montana (Site). The RI/FS is being conducted pursuant to the Administrative Settlement Agreement and Order on Consent (AOC) dated November 30, 2015, between CFAC and the United States Environmental Protection Agency (USEPA) (Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Docket No. 08-2016-0002).

As part of the RI/FS, a Site-wide ecological risk assessment (ERA) is being conducted in accordance with *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (ERAGS; USEPA, 1997). Per USEPA (1997) the functions of the ERA are to:

- Document whether actual or potential ecological risks exist at the Site;
- Identify which constituents present in exposure media at the Site pose an ecological risk; and
- Generate data to use in evaluating cleanup options

In addition to ERAGS, other relevant guidance documents that may be consulted to support the ERA process at the Site include, but may not be limited to, the following:

- *Determination of the Biologically Relevant Sampling Depth for Terrestrial and Aquatic Ecological Risk Assessments* (USEPA, 2015a)
- *Considerations for Developing Problem Formulations for Ecological Risk Assessments Conducted at Contaminated Sites Under CERCLA* (USEPA, 2004)
- *The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments* (USEPA, 2001a)
- *Guidance for the Data Quality Objective Process* (USEPA, 2000a)
- *Principles for Ecological Risk Assessment and Risk Management* (USEPA, 1999)
- *Guidelines for Ecological Risk Assessment* (USEPA, 1998)
- *Role of the Ecological Risk Assessment in the Baseline Risk Assessment* (USEPA, 1994)

ERAGS prescribes an eight-step process for the assessment of ecological risk to support risk management decision-making. The eight-step process includes several scientific management decision points (SMDPs) for the risk manager and risk assessment team to evaluate and approve or redirect the process (USEPA, 1997). The eight-step ERA process is conducted in a tiered-approach consisting of two phases of risk assessment:

- Screening-Level Ecological Risk Assessment (SLERA): The SLERA includes Steps 1 and 2 of the ERAGS process and represents a preliminary and conservative assessment of potential ecological risks to determine if additional steps in the ERAGS process are warranted.
- BERA: The BERA includes Steps 3 through 8 of the ERAGS process. A BERA is conducted to further characterize site-specific ecological risks and to support risk management and remedial decision-making for the protection of ecological receptors.

Roux prepared a SLERA (ERAGS Steps 1 and 2) for the Site based on data generated during the Phase I Site Characterization (Roux, 2017a). A Draft SLERA Report was submitted to the USEPA and Montana Department of Environmental Quality (MDEQ) on February 27, 2017, and comments on the Draft SLERA

Report were received from USEPA and MDEQ on April 14, 2017. A revised SLERA that incorporated USEPA and MDEQ comments was submitted on September 15, 2017 (Roux, 2017b). Based on conservative exposure assumptions, the SLERA identified constituents of potential ecological concern (COPECs) in surface water, sediment, or soil from exposure areas at the Site and concluded that there was insufficient information to dismiss potential ecological risk. The SLERA recommended further data gathering or analysis as part of a BERA to better understand ecological risk at the Site.

This BERA was conducted in accordance with final BERA Work Plan dated November 15, 2018 and approved by USEPA on November 30, 2018 (EHS Support, 2018).

Additionally, two interim deliverables describing major sub-components to the BERA Work Plan were submitted separately for review and approval by USEPA and MDEQ:

- *Technical Memorandum: Proposed Refined Ecological Screening Values (ESVs) to Support the Baseline Ecological Risk Assessment at the Columbia Falls Superfund Site* (EHS Support, 2019a)
- *Technical Memorandum: Proposed Wildlife Exposure Modeling Approach to Support the Baseline Ecological Risk Assessment at the Columbia Falls Superfund Site* (EHS Support, 2019b).

Comments were received and resolved on these interim deliverables prior to the completion of the BERA. The final technical memoranda are presented in **Appendix A1** and **Appendix A2**.

1.1 Purpose and Objectives

The overall purpose of the BERA is to evaluate whether environmental conditions associated with historical operations at the Site pose an unacceptable risk to ecological receptors based on the conceptual investigation framework presented in the BERA Work Plan. Specific objectives of this BERA include:

- Refine the screening-level problem formulation in the context of new information and findings of analyses conducted as part of the Phase I and Phase II Site Characterizations and the SLERA.
- Refine the ecological conceptual site model (ECSM) of the Site.
- Refine the list of COPECs identified in the SLERA to identify COPECs that are most likely to drive risk management decision-making for the Site to focus and streamline the BERA risk analysis.
- Develop screening-level and baseline ecological exposure estimates for complete exposure pathways identified in the refined ECSM for ecological exposure areas identified in the BERA Work Plan.
- Characterize risk based on baseline exposure estimates to support SMDPs for identified ecological exposure areas.
- Evaluate uncertainties in the exposure estimates and risk characterizations and the potential influence of uncertainties on risk conclusions.
- Identify potential data gaps based on the uncertainty analysis.

1.2 BERA Framework

The framework of this BERA is comprised of the following components:

- **Section 2** – Site Background, which consists of the Site and environmental settings.
- **Section 3** – Baseline Risk Assessment Problem Formulation, which includes descriptions of the nature and extent of contamination at the Site, summary of the SLERA, the ECSM, refinement of the COPECs, and assessment endpoints, risk questions, and measurement endpoints.

- **Section 4** – BERA Identification of COPECs, which includes the selection and identification of screening-level and refined COPEC lists based on the combined Phase I and Phase II Site Characterization datasets.
- **Section 5** – BERA Risk Analysis Plan, which includes key components of the effects analysis, exposure analysis, risk calculation, uncertainty analysis, and risk characterization that are investigated as part of the BERA.
- **Section 6** – Risk Characterization, which presents the results of the direct contact and wildlife ingestion evaluation of the refined COPECs.
- **Section 7** – Uncertainty Analysis, which discusses the areas of uncertainty in various components of the BERA that should be considered when interpreting the results and forming conclusions.
- **Section 8** – BERA Summary and Conclusions, which synthesizes the results of the risk characterization and uncertainty analysis to formulate a suggested strategy for further action, if warranted.
- **Section 9** – References, which lists the sources cited in this report.
- **Appendices** – Appendix files, which provide supporting information for the BERA, including:
  - Appendix A Interim Deliverables for the Baseline Ecological Risk Assessment Work Plan
  - Appendix B Screening-Level COPEC Identification Tables
  - Appendix C Calculated Dioxin Toxicity Equivalence Concentrations
  - Appendix D Calculated Ecological Screening Values for Hardness and pH Dependent Constituents
  - Appendix E Refined COPEC Identification Tables
  - Appendix F Equilibrium Partitioning Sediment Benchmark Calculations for Certain Non-ionic Organic Constituents
  - Appendix G Equilibrium Partitioning Sediment Benchmark Toxicity Units Calculations for Polycyclic Aromatic Hydrocarbons
  - Appendix H Food Chain Models for Calculating Doses to Representative Ecological Receptors
  - Appendix I ProUCL Output
  - Appendix J Incremental Soil Sampling Exposure Point Concentrations

2 Site Background

Pertinent background information for the CFAC Site is provided in this section. **Section 2.1** describes the Site setting, which includes information about the Site location and a summary of the operational history of the facility. **Section 2.2** details the environmental setting, which includes information about regional climatic conditions, localized hydrogeology, and aquatic, terrestrial, and transitional habitats identified at the Site.

2.1 Site Setting

The location and operational history of the CFAC Site is discussed in the **Sections 2.1.1** and **2.1.2**.

2.1.1 Site Location

The Site is located at 2000 Aluminum Drive in Columbia Falls, Montana (**Figure 2-1**). The Site is situated in the central portion of Flathead County, approximately 2 miles northeast of the City of Columbia Falls. The Site is accessed by Aluminum Drive via North Fork Road (County Road 486). The BERA study area consists of approximately 1,340 acres, which includes the former aluminum reduction facility and the surrounding area. The Site is generally bounded by the Cedar Creek Reservoir Overflow Ditch to the north and east, Teakettle Mountain to the east, Flathead River to the south, and Cedar Creek to the west (**Figure 2-2**).

2.1.2 Operational History

The Site was operated as a primary aluminum reduction facility (commonly referred to as an aluminum smelter) from 1955 until 2009. A detailed description of the operational history at the Site is provided in Section 2.7.2 of the RI/FS Work Plan (Roux, 2015a).

Buildings and industrial facilities remaining at the Site at the start of the Phase I Site Characterization included offices, warehouses, laboratories, mechanical shops, the Paste Plant, coal tar pitch tanks, pump houses, the Casting Garage, and the Potline Facility. The Site also includes seven closed landfills, one inactive landfill (not closed), material loading and unloading areas, two closed leachate ponds, and several wastewater percolation ponds. By January 2018, most structures on Site had been removed as part of ongoing decommissioning efforts. The structures that were removed include: West Rectifier, Rod Mill Building, Paste Plant, Quonset Hut, West Aluminum Unloader, Compressor Building, Laboratory, the Main Plant building (i.e., Pot Rooms 1 through 10), and the Change House. Several structures remain at the Site, including the administration building, the main warehouse, two ancillary warehouses, the fabrication shop, and five silos. **Figure 2-2** illustrates the locations of Site features pertinent to the BERA investigation.

2.2 Environmental Setting

The Site is situated within the Stillwater-Swan Wooded Valley ecoregion (Woods et al., 2002). Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources from a coarse (Level I) to a fine (Level IV) scale. The Stillwater-Swan Wooded Valley Level IV ecoregion is positioned west of the Canadian Rockies in the Northern Rockies area. The

valley floor sits at an elevation of approximately 3,300 feet above mean sea level (ft-amsl). This section includes descriptions of the regional climatic conditions, localized hydrogeology, and descriptions of the aquatic, terrestrial, and transitional habitats present at the Site.

2.2.1 Regional Climatic Conditions

The Site is located at a latitude of 48° 23' N. The elevation of the Site ranges from approximately 3,008 ft-amsl along the Flathead River to the south to 3,270 ft-amsl at the base of Teakettle Mountain to the east. Its mid-hemisphere latitude and intermontane setting results in wide seasonal climatic swings. Average annual precipitation in the region ranges from about 14 inches to 25 inches depending on the year. Greater precipitation at higher elevations is common; much of the precipitation is stored as snow. The regional climate is considered modified maritime (i.e., much of the precipitation regime is influenced by moist air masses from the Pacific Ocean traveling from west to east). Dry, cold air masses often move in the north to south direction from Canada. The mean annual temperature for nearby Kalispell, Montana is 43.25 degrees Fahrenheit (6.25 degrees Celsius).

2.2.2 Localized Hydrogeology

The following sections describes the regional and Site-specific features that influence surface water and groundwater flow in the region and the Site.

2.2.2.1 Surface Water Hydrology and Watershed Characteristics

The Site is located within the Flathead River watershed. As discussed above, the Site is bordered by surface water features of varying hydrology on each side, including the Flathead River to the south, Cedar Creek to the west, and intermittent Cedar Creek Reservoir Overflow Ditch to the north and east (**Figure 2-2**).

The Flathead River is a tributary to the Columbia River, which flows into the Pacific Ocean. The North Fork of the Flathead River originates in the province of British Columbia, Canada. The Middle Fork of the Flathead River originates in the Bob Marshall Wilderness located south of Glacier National Park. The confluence of the North Fork and Middle Fork of the Flathead River is approximately 10 miles upstream of the Site, north of Coram, Montana. The South Fork joins the main stem of the Flathead River at the entrance of Badrock Canyon located approximately 2 miles upstream of the Site. The Flathead River flows west through Badrock Canyon towards the City of Columbia Falls where its course is then southerly toward Flathead Lake. At the Site, the drainage area of the Flathead River is approximately 4,470 square miles (mi^2), which includes the drainage area of Cedar Creek to the west.

The United States Geological Survey (USGS) maintains three gauging stations on the Flathead River in the general vicinity of the Site. The closest station is located approximately 3 miles southwest of the Site near Columbia Falls (USGS Station #12363000). Two stations are located approximately 10 miles north-northeast of the Site, i.e., the north fork station on the Flathead River and the middle fork station immediately west of Glacier National Park (USGS Stations #12355500 and #12358500, respectively). For the October 1951 to September 2016 period of record at the Columbia Falls USGS station, , the mean monthly discharge was lowest in August across that time frame with an average flow rate of 5,340 cubic feet per second (ft^3/s). Mean monthly discharge was greatest in June across that time frame with an average flow rate of 24,900 ft^3/s. The increased discharge in June corresponds to the period when

average precipitation in the region is greatest. Meltwater from high elevation snowpack also contributes to the increased discharge in May and June (EHS Support, 2018). Variability in the flow rates of the Flathead River are discussed in more detail in the Phase II Data Summary Report (DSR) (Roux, 2019).

Cedar Creek originates north of the Site in the area contributing to the Cedar Creek Reservoir. At the outlet of the Cedar Creek Reservoir, the upgradient catchment area is 12.5 mi^2. From the reservoir outlet, Cedar Creek flows approximately 3 miles southwest towards the City of Columbia Falls. The elevation of Cedar Creek is higher than groundwater elevations within the Site, indicating that Cedar Creek is a losing stream rather than a gaining stream. According to the USGS National Hydrography Dataset (NHD), a tributary to Cedar Creek is mapped that bisects the northern area of the Site. This intermittent feature is shown to be situated along the eastern side of the Industrial Landfill and joins Cedar Creek approximately 0.5 mile to the southwest of the Industrial Landfill. This feature was not observed during Site investigation activities; however, surface water ponding and wetland vegetation were observed in the area south and southeast of the Industrial Landfill. Based on field observations, the source of the ponding was attributed to seeps in the nearby cliff. This feature was generally mapped by Roux field personnel and is identified on **Figure 2-2** as the Northern Surface Water Feature. At the western Site boundary, Cedar Creek drains an additional 1.5 mi^2, predominately from the western two-thirds of the Site.

The Cedar Creek Reservoir Overflow Ditch flows intermittently in the spring and regulates flow for Cedar Creek and the Cedar Creek Reservoir (Hydrometrics, 1985). Based upon proximity and land surface topography, some surface water runoff from the eastern side of the Site, originating from the East Landfill and the Sanitary Landfill, as well as runoff from the western flank of Teakettle Mountain, flows to the Cedar Creek Reservoir Overflow (**Figure 2-2**). Excluding potential upgradient contributions from the Cedar Creek Reservoir, the Cedar Creek Reservoir Overflow has a catchment area of approximately 2.0 mi^2. About 20 percent of this catchment area originates on-site and the remaining catchment extends to the peak of Teakettle Mountain to the east. Like Cedar Creek, the elevation of Cedar Creek Reservoir Overflow is higher than surrounding groundwater elevations within the Site, indicating that the Cedar Creek Reservoir Overflow drainage is a losing stream.

2.2.2.2 Site Hydrogeological Units

The stratigraphic units underlying the Site form a complex hydrogeologic framework that influences groundwater elevations, groundwater flow, and the migration of constituents of potential concern (COPCs) beneath the Site. Three major stratigraphic units were identified during the Phase I Site Characterization and are described in the *Phase I Site Characterization Data Summary Report* (Phase I DSR; Roux, 2017a). The three stratigraphic units consist primarily, from land surface down, of:

- Layer of glaciofluvial and alluvial coarse-grained soils, varying in vertical extent and grain size depending on the vicinity to the Site features (i.e., Teakettle Mountain, Flathead River)
- Layer of dense, poorly-sorted glacial till with interbedded deposits of glaciolacustrine clays and silts
- Bedrock

The coarse-grained glacial outwash and alluvium deposits that are found above the glacial till are collectively referred to as the “upper hydrogeologic unit” at the Site (Roux, 2017c). The coarse-grained glacial deposits that comprise the upper hydrogeologic unit account for the main water bearing unit beneath the Site. The glacial tills found below the upper hydrogeologic unit were typically characterized

as containing a higher percentage of fines that were denser and drier than the overlying outwash and alluvium deposits. The till deposits were often characterized as stiff and moist or dry. These observations indicate that the till deposits likely have a lower hydraulic conductivity than the overlying outwash and alluvium deposits in the upper hydrogeologic unit. The bedrock beneath the till has metamorphosed over time, resulting in a tightly compacted, low porosity and low permeability unit. Based upon the conceptual site model, bedrock is considered to define the bottom of the hydrogeologic system beneath the Site.

2.2.2.3 Groundwater Occurrence and Flow

Groundwater flow in the region tends to follow surface topography (USEPA, 2011). Groundwater is typically recharged from direct infiltration and surface water sources, which include reservoirs, ponds, streams, and lakes (LaFave et al., 2004). Groundwater in the region may also discharge to surface water bodies, depending on the season and localized conditions.

Groundwater occurrence and movement was evaluated during the Phase I Site Characterization described in the Phase I DSR (Roux, 2017a) and the *Groundwater and Surface Water Data Summary Report* (Roux, 2017c), and during the Phase II Site Characterization described in the Phase II DSR (Roux, 2019). During the Phase I Site Characterization, 64 monitoring wells were visited on the following dates to measure depth to groundwater across the Site: August 30, 2016; November 29, 2016; March 14-15, 2017; and June 16, 2017. During the Phase II Site Characterization, 77 monitoring wells (including 8 newly installed monitoring wells and 5 former production wells) were visited on June 4-5, 2018 and October 1-2, 2018, to measure depth to groundwater across the Site. Pressure transducers were also installed in selected wells to monitor groundwater elevations throughout the Phase I and Phase II Site Characterization. The elevation data collected from gauging and from the pressure transducers indicate that groundwater elevations fluctuate seasonally at varying magnitudes depending on the area of the Site, and the hydrogeologic unit where the well is screened. Additionally, groundwater elevations measured in monitoring well clusters, where there is a well screened within the upper hydrogeologic unit and an adjacent deep well screened below the upper hydrogeologic unit, indicates a downward vertical gradient exists. However, the differences in elevations between the glacial till and the upper hydrogeologic unit is typically greater than 25 feet, and in some cases exceeds 50 feet. This large difference is indicative of limited (if any) hydraulic connectivity between the two water bearing zones.

Groundwater flow across the Site in the upper hydrogeologic unit is generally in the south-southwest direction towards the Flathead River. While the southerly flow direction is consistent across the Site, the discussion of the hydraulic gradient can be divided into three distinct areas:

- Near Teakettle Mountain and in the landfill area of the Site, the groundwater hydraulic gradient is steep (approximately 0.059 ft/ft [1 foot by 1 foot cross-sectional gradient of groundwater, ft/ft]) and generally mirrors the steeper topography in that portion of the Site.
- Groundwater elevations in the center of the Site (near the North Percolation Ponds, former Operational Area, and northern half of the Main Plant Area) are consistent over long distances (typically within 1 foot over distances greater than 1,000 feet), indicating a relatively flat groundwater hydraulic gradient (approximately 0.0045 ft/ft) across the center of the Site.
- The gradient then increases in the southern area of the Site between the Main Plant Area and the Flathead River (approximately 0.031 ft/ft), which is also consistent with the steep drop in topography between the railroad and the Flathead River.

The gradients above and the elevations measured in the Flathead River generally indicate that the groundwater in the upper hydrogeologic unit appears to discharge to the Flathead River.

2.2.3 Description of Aquatic, Terrestrial, and Transitional Habitats

Aquatic, terrestrial, and transitional habitats are present within the Site. This section describes the general physical, hydrological, or vegetative characteristics of habitats within the Stillwater Swan Wooded Valley ecoregion where the Site is located in Montana (Woods et al., 2002). The habitat types described for the Site are used as the basis for identifying ecological exposure areas for the BERA (**Section 3.3.1**).

Aquatic habitats are characterized by perennial or near-perennial inundation with water and physical habitats that can support aquatic receptor species. In lotic aquatic habitats (flowing streams and rivers), flow conditions are suitable for the establishment of fish and invertebrate communities, as well as semi-aquatic birds or mammals that rely on aquatic flora or fauna as a food resource. Two lotic aquatic habitats exist within and around the Site, including the Flathead River and Cedar Creek. The Flathead River is considered a large river by the MDEQ. Large rivers are non-wadeable and almost always seventh-order or higher according to the Strahler stream order index (Strahler, 1964). Key physical habitat features of the Flathead River include cobble or gravel substrate; deep, fast-flowing water; and, depending on valley dimensions, multi-thread channels. In the river reach adjacent to the Site, the Flathead River provides marginal fish habitat for common species, with this section of the river being used as a migration corridor to access areas of more suitable habitat (Stagliano, 2015). Given the absence of extensive agriculture or other non-anthropogenic nutrient sources upgradient, the Flathead River is considered oligotrophic, which means that it lacks macronutrients, such as phosphorus.

Cedar Creek is a small headwater stream that discharges to the Flathead River. Small headwater stream habitats in the region can be distinguished primarily by their hydrologic regime. Montane headwater streams that originate in the high-elevation peaks have characteristically high spring and early summer flows, with the spring freshet due to snow melt. Small headwater systems are also often oligotrophic.

Terrestrial habitats are dry, upland areas that may support aboveground and/or belowground terrestrial flora and fauna. Soils that are considered terrestrial habitat are limited to the vadose, or unsaturated, zone of the soil profile. Vegetation type is another key characteristic of physical terrestrial habitats. There are four primary terrestrial habitats on the Site, which are characterized predominately by the type of vegetation present. These habitats include mixed conifer forest, riparian forest, deciduous shrubland, and open grassland. Detailed descriptions of each terrestrial habitat type and associated flora and fauna are provided in the SLERA (Roux, 2017b).

Transitional habitats are characterized by intermittent or seasonal surface water inundation. Transitional habitats can potentially support aquatic receptor species during certain life stages (e.g., benthic invertebrates, juvenile herpetofauna), as well as terrestrial species during dry periods (e.g., soil invertebrates, terrestrial plants).

Ecological exposure areas identified based on on-site habitat types are defined in **Section 3.3.1**. The evaluation of potential ecological receptors within exposure areas is distinguished based on the presence of aquatic, terrestrial, or transitional habitat characteristics.

3 Baseline Risk Assessment Problem Formulation

The purpose of the baseline problem formulation is to re-evaluate the screening-level problem formulation in the context of new information and findings of analyses conducted as part of the ongoing investigation at the Site. The baseline problem formulation establishes risk assessment goals, characterizes ecological effects of primary COPECs, and updates the preliminary ECSM. The refined ECSM is used to define assessment endpoints, risk questions, and measurement endpoints to guide the development of the conceptual BERA study design. The following sections present the preliminary baseline problem formulation that was previously presented in the SLERA (Roux , 2017b) and Phase I Site Characterization (Roux, 2017a). Any additions or modifications of the preliminary baseline problem formulation based on the review of the Phase II data are incorporated in the individual components of the problem formulation described below.

3.1 Nature and Extent of Contamination

In 2013, Weston Solutions, Inc. (Weston) completed an investigation at the Site on behalf of USEPA Region 8. The results were summarized in the April 2014 report titled *Site Reassessment for Columbia Falls Aluminum Company Aluminum Smelter Facility, Columbia Falls, Flathead County, Montana prepared for United States Environmental Protection Agency Region 8* (Weston, 2014). As part of the investigation, a total of 68 groundwater, surface water, sediment, and soil samples were collected at the Site. Results were used by the USEPA to establish if an observed release had occurred at the Site as that term is defined in the USEPA Hazardous Ranking System Guidance Manual. The data collected during the Weston investigation was considered when developing the Scope of Work for the Phase I Site Characterization that was completed by Roux, on behalf of CFAC, in 2016 and 2017.

The Phase I Site Characterization program was designed to identify and/or confirm source areas and broadly characterize the nature and extent of associated constituents of concern across the Site and around Site features. Based on the preliminary conceptual site model (CSM) presented in the RI/FS Work Plan, the nature and extent of contamination was evaluated from the following site features identified as potential source areas (**Figure 2-2**):

- Landfills (including the closed Wet Scrubber Sludge Pond and the closed leachate ponds)
- Former Drum Storage Area
- Percolation ponds
- Waste and raw materials storage and handling areas
- Plant drainage system including drywells and associated discharge points
- Underground storage tanks (USTs) and aboveground storage tanks (ASTs)

The results of the Phase I Site Characterization indicated that cyanide, fluoride, and polycyclic aromatic hydrocarbons (PAHs) are the primary COPCs identified within the potential source areas and Site features (Roux, 2017a). A summary of key findings regarding the nature and extent of constituents as it relates to the baseline problem formulation include:

- Elevated[1] cyanide and fluoride concentrations in groundwater within the upper hydrogeologic unit appear to originate immediately to the west of the Wet Scrubber Sludge Pond, with maximum concentrations immediately downgradient of the West Landfill and Wet Scrubber

[1] The term “elevated” refers to concentrations that are considered to be high relative to a benchmark value, background statistic, etc.

Sludge Pond. The Center Landfill also appears to be a source of cyanide and fluoride in groundwater. Cyanide and fluoride concentrations in groundwater to the east and northeast of these site features, and downgradient of other site landfills, are generally orders of magnitude lower.

- Soils adjacent to the West Landfill contained elevated concentrations of cyanide, fluoride, and PAHs.
- Elevated cyanide and fluoride concentrations were observed in soil and groundwater in the Former Drum Storage Area, located immediately to the west of the Wet Scrubber Sludge Pond and West Landfill.
- Concentrations of PAHs and cyanide in the percolation ponds were typically greatest in soil and sediment in the North-East Percolation Pond and its influent ditch, followed by the effluent ditch, North-West Percolation Pond, and West Percolation Pond; concentrations of COPCs decreased with increasing depth in the percolation ponds.
- COPCs detected in soil and sediment in the South Percolation Ponds were similar to the other percolation ponds, but concentrations were generally much lower than the other ponds.
- Cyanide, fluoride, and PAHs were the primary COPCs detected in soils throughout the Main Plant Area.
- Low level detections of benzene, toluene, ethylbenzene, and xylene (BTEX) were the primary volatile organic compounds (VOCs) in soils across the Site. The presence of BTEX may be related to petroleum coke and pitch materials used at the Site.
- The Phase I Site Characterization found that naturally-occurring metals were detected in soil and sediment samples across the Site. A comprehensive evaluation of Phase I and Phase II concentrations in Site data compared to background concentrations was performed in the DSR Report (Roux, 2019) and within this BERA as part of the COPEC refinement step (please see Sections 3.6.4 and 4.4.2 for additional details). This analysis was used to identify which metals (and some organic constituents with widespread anthropogenic sources) are consistent with background concentrations, as compared to constituents that may be present as a result of site operations.
- Pesticides were not detected in any soil samples collected during the Phase I Site Characterization; however, mean and median method detection limits (MDLs) for some pesticides exceeded the lowest screening criteria.
- Polychlorinated biphenyls (PCBs) were not detected in discrete samples in the site-wide soil dataset; however, PCBs were detected in four decision units (DUs) within the central portion of the Operation Area.
- Consistent with the preliminary CSM, soil and groundwater results from the Phase I Site Characterization indicate low potential for soil vapor exposure based on low VOC concentrations detected in soil and groundwater.

The findings from the Phase II Site Characterization sampling effort (Roux, 2019) were generally similar to the Phase I Site Characterization (Roux, 2017a):

- Cyanide, fluoride, and PAHs are primary COPCs in soil at the Site. The Site-wide soil quality observed during the Phase II Site Characterization is consistent with the findings of the Phase I Site Characterization. The highest concentrations of these COPCs in soil were generally found in the industrial areas of the Site including the Main Plant and Operational Area, the North Percolation Ponds, and the Central Landfill Area.
- The results of the background sampling from the Phase II Site Characterization and statistical data analysis indicate that many of the metal concentrations observed in soil samples are likely

a result of metals present at background concentrations. However, some of the areal distribution of metal detections and the magnitude of metal concentrations around certain Site features may also be a result of the former Site operations.

- Dioxin and furan compounds were detected in all soil samples collected during the Phase I Site Characterization and Phase II Site Characterization. Concentrations were highest within or adjacent to the Rectifier Yards (immediately south and northeast) but not at locations within the remainder of Main Plant Area or in the Western Undeveloped Area. Low concentrations of dioxin and furan compounds are wide-spread and are present at similar concentrations in the Western Undeveloped Area and the background reference locations.
- PCBs were detected in some soil samples, primarily in locations just south of the Wet Scrubber Sludge Pond; however, PCBs are not widespread in Site-wide soils.
- VOCs were frequently detected in soil samples across the Site. The widespread distribution of petroleum VOCs across the Site is somewhat similar to that of PAHs. The frequent detection of petroleum-related VOCs at trace levels in soil is likely attributed to the presence of these VOCs, albeit at low concentrations, in the petroleum coke and pitch materials that were used in manufacturing at the Site and were the primary sources of PAHs at the Site.
- Concentrations of cyanide and fluoride measured in Backwater Seep Sampling Area and the South Percolation Ponds were consistent with the suspected areas where groundwater is expressed from the upper hydrogeologic unit.
- Surface water sampling confirmed that many naturally occurring metals were detected frequently in surface water samples. Concentrations exceeding screening values were most commonly observed in the North and South Percolation Ponds and Flathead Riparian Area Channel.
- Semi-volatile organic compounds (SVOCs) (primarily PAHs) were detected in surface water samples, but not were not observed at elevated concentrations.
- Cyanide, fluoride, and PAHs in sediment samples were detected most frequently in the Backwater Seep Sampling Area, Flathead Riparian Area Channel, and North and South Percolation Ponds. Cyanide concentrations exceeded the USEPA Residential regional screening level (RSL) in five sediment samples, including sediment samples within and west of the Backwater Seep Sampling Area, the western most South Percolation Pond, and the North-East Percolation Pond. PAHs were most frequently detected in the North Percolation Ponds, the Backwater Seep Sampling Area, and the South Percolation Ponds.
- Similar to site-wide sediment and surface water quality data, cyanide and fluoride were detected most frequently and at the highest concentrations in sediment pore water samples in the Backwater Seep Sampling Area, Flathead Riparian Area Channel, and South Percolation Ponds. Cyanide concentrations in pore water which exceeded the DEQ-7 Acute Aquatic Life Standard occurred in the Backwater Seep Sampling Area, Flathead Riparian Area Channel, and the South Percolation Ponds. Fourteen different dissolved metals were detected in sediment pore water during the Site Characterization.
- The comparison of background and site surface water analytical data indicated that total cyanide, free cyanide, fluoride, select total and dissolved metals, and select PAHs in surface water are potentially Site-related within most or all (depending on the analyte and feature) of the surface water features.

3.2 Summary of Screening-Level Ecological Risk Assessment

The initial SLERA that was performed using the results of the Phase I Site Characterization (Roux, 2017a) provided a preliminary assessment of potential risks to ecological receptors that may be exposed to Site constituents in soil, surface water, and sediment (Roux, 2017b). It should be noted that all steps of the initial SLERA were revisited in this BERA following the collection and analysis of the Phase II data (**Section 4**). The SLERA problem formulation included a preliminary ECSM that was developed for aquatic and terrestrial exposure areas. The preliminary ECSM described potential sources of constituents, release mechanisms, exposure media, representative receptor groups, and the complete exposure pathways for each receptor/medium combination.

Based on the review of the historical processes and data collected during the SLERA, COPECs were identified in surface water, sediment, and surface soil to which ecological receptors could potentially be exposed (Roux, 2017b). COPECs were identified in the exposure analysis presented in the SLERA, which assumed maximum exposure scenarios based on comparisons of maximum exposure point concentrations to the most conservative ecological screening values (ESVs) (i.e., the minimum ESV) from a list of screening criteria sources developed in discussions with USEPA. The conservative assumptions of the SLERA exposure analysis could not be used to conclude that unacceptable risk does not exist. Rather, the findings of the exposure analysis indicated that certain COPECs and associated exposure pathways require further evaluation.

Based on these results, the SLERA concluded that there was a potential for adverse ecological effects and a more thorough assessment was warranted (USEPA, 1997). Given the uncertainties in the exposure analysis described above, it was recommended that the ecological risk assessment process proceed to ERAGS Step 3 (Baseline Risk Assessment Problem Formulation). The following section presents a refined ECSM based on the SLERA and additional information developed since the submittal of the SLERA.

3.3 Ecological Conceptual Site Model

Based on the findings of the SLERA (Roux, 2017b) and Phase I and II Site Characterizations (Roux, 2017a and 2019, respectively), the preliminary ECSM developed in the SLERA was refined to incorporate new information fundamental to the design of additional data collection activities to support the BERA. Key elements of the preliminary ECSM that were refined in the BERA problem formulation include:

- Exposure areas: Ecological exposure areas were re-defined based on the outcome of the SLERA to represent the habitat types (aquatic, transitional, and terrestrial) and receptor groups that may be present and exposed to site constituents.
- Ecological receptor categories: Additional ecological receptor categories and representative receptor species, including updated queries of special status species (e.g., rare, threatened, and endangered species), were identified in the refined ECSM.
- Exposure pathways: Potential exposure pathways were re-evaluated based on the SLERA findings to assess fate and transport properties of COPECs that may influence mobility and/or exposure routes to receptor categories.
- Bioavailability: The refined ECSM includes an evaluation of the site characteristics that may influence the bioavailability of primary COPECs in site exposure media.
- Bioaccumulation/biomagnification: The relative importance of COPECs that bioaccumulate or biomagnify were evaluated in the refined ECSM to identify potential data gaps that may be addressed in the BERA.

The following sections present the refined ECSM for the BERA problem formulation.

3.3.1 Ecological Exposure Areas

Ecological exposure areas presented in the SLERA were refined to represent primary habitat types and receptor groups that may be exposed to site constituents. Ecological exposure areas were grouped into three broad categories based on habitat types:

- Terrestrial Exposure Areas
- Transitional Exposure Areas
- Aquatic Exposure Areas

The following sections describe the categories of ecological exposure areas identified for the BERA problem formulation. The spatial extents of ecological exposure areas are illustrated in **Figure 3-1**.

3.3.1.1 Terrestrial Exposure Areas

Terrestrial exposure areas consist of upland habitats and include the following (**Figure 3-1**):

- Main Plant Area (231.9 acres)
- Central Landfills Area (91.4 acres)
- Industrial Landfill Area (12.6 acres)
- Eastern Undeveloped Area (32.1 acres)
- North-Central Undeveloped Area (114.4 acres)
- Western Undeveloped Area (439.6 acres)
- Flathead River Riparian Area (93.9 acres)

The primary habitat types within the terrestrial exposure areas include mixed conifer forest, riparian forest, deciduous shrubland, and open grassland. Conifer forests are predominantly found to the north and west of the Main Plant Area and are mostly bordered by riparian woodlands. Several areas of deciduous shrubland are located northeast and east of the Main Plant Area. Open grasslands are located immediately north and west of the Main Plant Area, between the Main Plant Area and the mixed conifer and riparian forests.

Site-related constituents from features identified as potential source areas may be present in environmental media, specifically soil, in the terrestrial exposure areas. Current primary constituent migration pathways from potential source areas to terrestrial exposure areas may include overland stormwater runoff associated with precipitation or snowmelt events. Historically, atmospheric deposition was also a potential constituent migration pathway from site emission sources. Habitats within the terrestrial exposure areas may support multiple receptor groups, including terrestrial plants, soil invertebrates, herptiles, birds, and mammals. Terrestrial exposure areas do not provide aquatic or transitional habitats, and therefore, do not support aquatic receptors. Receptors may use the terrestrial exposure areas for foraging and reproduction. The ecological relevance of these habitats may vary among the terrestrial exposure areas based on the degree of historical site operations and infrastructure, such as buildings and impervious surfaces. For example, developed areas within the Main Plant Area and Central Landfills Area provide limited habitat value for terrestrial receptors under current exposure conditions due to disturbances related to site activities.

3.3.1.2 Transitional Exposure Areas

Transitional exposure areas consist of intermittently- or seasonally-wetted habitats and include the following (**Figure 3-1**):

- North Percolation Pond Area (11.3 acres)
- South Percolation Pond Area (5.6 acres)
- Cedar Creek Reservoir Overflow Ditch (5.2 acres)
- Northern Surface Water Feature (6.1 acres)

Site-related constituents from features identified as potential source areas may be present in environmental media, including soil, surface water, sediment, and pore water in the transitional exposure areas. Primary constituent migration pathways from potential source areas to the transitional exposure areas may include overland stormwater runoff associated with precipitation or snowmelt events and direct discharges of stormwater and formerly wastewater (e.g., North and South Percolation Pond Areas). Habitats provided by transitional exposure areas range from aquatic to terrestrial depending on seasonal climatic and hydrogeologic conditions and may also range in quality depending on historical site operations. For instance, the North Percolation Ponds were constructed for wastewater management and were not designed to provide wildlife habitat. Therefore, the North Percolation Ponds may support lesser numbers of the aquatic and terrestrial receptor groups identified in **Section 3.3.5**due to the marginal habitat conditions available. Based on the intermittent nature of aquatic habitats in these transitional exposure areas, it is unlikely that permanent aquatic communities would be established. These areas may be important for the reproduction of amphibians and may also provide drinking water sources for terrestrial receptors during wet periods of the year.

3.3.1.3 Aquatic Exposure Areas

Aquatic exposure areas consist of perennially-wetted habitats and include the Flathead River Area and Cedar Creek Area (**Figure 3-1**). These exposure areas are located on the borders of the Site to the south and northwest, respectively. Site-related constituents from features identified as potential source areas may be present in environmental media, including surface water, sediment, and pore water in the aquatic exposure areas. Primary constituent migration pathways from potential source areas to the aquatic exposure areas may include groundwater discharge to surface water and overland stormwater runoff associated with precipitation or snowmelt events. Habitats within the aquatic exposure areas may support multiple aquatic receptor groups, including aquatic plants, benthic invertebrates, fish, herptiles, and semi-aquatic birds and mammals. These receptor groups may use the aquatic exposure areas for foraging and reproduction. In addition to aquatic receptors, aquatic exposure areas may also provide drinking water sources for terrestrial receptors, such as herptiles, birds, and mammals.

3.3.2 Source Areas

Based on the preliminary CSM presented in the RI/FS Work Plan (Roux, 2015a) and updated in the Phase I and Phase II DSRs, the nature and extent of contamination was evaluated from the following site features that were identified as potential source areas:

- Landfills (including the closed Wet Scrubber Sludge Pond and the closed leachate ponds)
- Former Drum Storage Area
- Percolation ponds
- Waste and raw materials storage and handling areas

- Plant drainage system including drywells and associated discharge points
- USTs and ASTs

The potential source areas associated with each ecological exposure area were identified in the refined ECSM, as presented in **Figure 3-2** for terrestrial exposure areas, **Figure 3-3** for transitional exposure areas, and **Figure 3-4** for aquatic exposure areas.

3.3.3 Fate and Transport Pathways

The fate and transport of site-related constituents released into the environment depends on the physicochemical properties of the constituent and environmental media, and the physical characteristics of the migration pathway. Constituents may partition in various environmental media, such as surface water, sediment, and soil, which affects the potential ecological risks posed to aquatic and terrestrial receptors. The primary constituent migration pathways, from the site features identified as potential source areas presented in **Section 3.3.2** to the ecological exposure areas described in **Section 3.3.1,** may include groundwater discharge to surface water, overland stormwater runoff associated with precipitation or snowmelt events, direct discharges of stormwater and formerly wastewater, and historically, atmospheric deposition from site emission sources.

Groundwater discharge to surface water occurs in the Flathead River. Groundwater from the upper hydrogeologic unit beneath the Site is not known to discharge to surface water in any other aquatic or transitional exposure areas. Groundwater elevations are lower than the elevations of Cedar Creek and the Cedar Creek Reservoir Overflow Ditch; therefore, these systems are considered to be losing systems with surface water recharging groundwater. The Northern Surface Water Feature is an intermittent feature that appears to be fed by seeps located to the north and west. Snowmelt and increased seasonal precipitation create an elevated water table, which feeds these seeps in the Northern Surface Water Feature in the spring.

Shallow groundwater from the upper hydrogeologic unit beneath the Site discharges to the Flathead River. A groundwater seep has been identified along the Flathead River in the Backwater Seep Sampling Area of the Site (**Figure 2-2**). Cyanide and fluoride are the primary constituents of concern identified in the groundwater seep. The discharge of cyanide and fluoride in groundwater to the Flathead River adjacent to the Site has been authorized by Montana Pollutant Discharge Elimination System (MPDES) permit number MT-0030066 since first issued in May 1994, and subsequently renewed in 1999 and July 2014. On January 24, 2019, MDEQ provided a Notice of Intent to terminate the permit. In the Statement of Basis that accompanied the 1999 MPDES Permit No. MT-00330066, MDEQ noted the following (MDEQ):

- Cyanide is not persistent in surface water due to photo-degradation and volatilization
- The mixing zones provided for in the permit would have no effect on fish migration in the Flathead River
- There are no spawning or nursery areas, no effects to fish migration, and no evidence of attraction to the cyanide concentration in the acute mixing zone backwater channel, and;
- There was no anticipated impact on aquatic species or other species.

Constituents in groundwater discharged to surface water may remain in dissolved form, adsorb to suspended particulates, or partition to fine-grained sediments within the receiving exposure areas. Cyanide and metal-cyanide anions, as well as dissolved metals, may adsorb to oxide minerals or clays

with high anion exchange capacities, which may influence their bioavailability and potential ecological risks posed to ecological receptors.

Overland stormwater runoff associated with precipitation or snowmelt events is another potential constituent migration pathway from site features identified as potential source areas to ecological exposure areas. Stormwater may transport constituents in dissolved form or adsorbed to suspended sediment or soil particles. Dissolved forms are subject to the processes described above, while constituents adsorbed to soil or sediment particles being transported by stormwater will eventually settle in depositional areas of the given ecological exposure area, whether aquatic, transitional, or terrestrial. The age of constituents within soils also affects the fate and transport processes described above. The likelihood of dissolved-phase transport and bioavailability often decreases with increased time since the constituent entered the soil. Smolders et al. (2009) evaluated 10 percent inhibition endpoints for plants, soil invertebrates, and microbial processes exposed to metals in aged versus freshly contaminated soils. The findings of the evaluation indicated that total soil metal concentrations resulting in 10 percent inhibition endpoints in freshly amended soils were up to 100-fold lower than total soil metal concentrations resulting in 10 percent inhibition in aged or field-contaminated soils (Smolders et al., 2009).

Several transitional exposure areas received direct wastewater and stormwater discharges from historical Site operations, including the North Percolation Pond Area and South Percolation Pond Area. Although wastewater is no longer discharged to these exposure areas, the site stormwater conveyance system still discharges to these exposure areas. Stormwater may transport site-related constituents, including aluminum, cyanide, and fluoride, as previously described.

3.3.4 Exposure Media and Exposure Pathways

The Phase I and Phase II Site Characterization Data Summary Reports indicated that site-related constituents are present in environmental media at the Site (Roux, 2017a and 2019). The type(s) of impacted environmental media varies among the different ecological exposure areas and associated habitats, and may include surface water, sediment (including pore water), and soil. Ecological receptor exposure pathways to constituents within the impacted environmental media include ingestion (direct and incidental), and to a lesser extent (based on the COPECs identified), direct contact and inhalation. The exposure media and pathways identified in the refined ECSM are presented in **Figure 3-2** for terrestrial exposure areas, **Figure 3-3** for transitional exposure areas, and **Figure 3-4** for aquatic exposure areas.

3.3.4.1 Direct Contact

Direct contact is considered a complete exposure pathway for select aquatic and terrestrial receptors (including plants, invertebrates, fish, and amphibians) that may be exposed to constituents in sediment and surface water through direct contact via absorption through plant tissue, gills, or skin. Select terrestrial receptors (including plants and soil invertebrates) may be exposed to constituents in surficial soil through direct contact via absorption through plant tissue or skin. Other semi-aquatic and terrestrial receptors may be exposed to constituents in surface water, sediment, or soil through direct contact; however, this exposure pathway is considered secondary to ingestion pathways for these receptors. Dermal contact exposure pathways to birds and mammals are not considered significant exposure pathways due to the presence of fur on mammals, feathers on birds, and scales on reptiles that mitigate

direct dermal exposure (USEPA, 2005b). Therefore, the direct contact exposure pathway was only evaluated quantitatively for plants, invertebrates, fish, and amphibians (**Figures 3-2** through **3-4**).

3.3.4.2 Ingestion – Direct and Indirect

Ingestion of impacted environmental media, including direct ingestion of dietary items and surface water and indirect ingestion of sediment and soil, is the primary exposure pathway of concern for most upper trophic aquatic and terrestrial receptors. Direct ingestion of dietary items may be an important exposure pathway if environmental media are impacted by persistent, bioaccumulative constituents. Persistent, bioaccumulative constituents in sediment, surface water, and soil may be assimilated by lower trophic level species, bioaccumulated in tissues, and transferred to higher trophic level species that consume lower trophic level species.

Exposure through ingestion pathways varies based on the foraging habits and ranges of the receptor. For instance, some receptors have small home ranges and forage within a localized area for their entire lifetime, while others, such as migratory receptors, may only forage in a specific area for a brief period before leaving to forage elsewhere. Incidental ingestion of impacted environmental media, such as soil or sediment, while grooming or foraging may also occur, but is considered secondary to the direct ingestion pathway.

3.3.4.3 Inhalation

Inhalation is a potentially complete, but secondary exposure pathway for terrestrial receptors. This exposure pathway may include the inhalation of constituents that have volatilized, or that are adsorbed to airborne particulates. Burrowing animals may be exposed to constituents through inhalation pathways while occupying burrows. Inhalation exposure pathways may be related to the inhalation of VOCs in soil vapor or soil dust particles within the burrow. Based on the SLERA and other Phase I Site Characterization data, VOCs were infrequently detected and not identified as COPCs in soils from terrestrial exposure areas where burrowing mammals may be present. Therefore, it is not likely that exposure to VOCs in subsurface soil vapor contributes significantly to the risk to potential burrowing animals at the Site. Burrowing animals may also be exposed to constituents sorbed to respirable dust particles that may be inhaled while occupying burrows. However, the inhalation of respirable dust is likely to have a minor contribution to overall risk. Based on exposure to humans, inhalation of respirable dust particles represents a relatively insignificant portion of the total exposure (i.e., less than 5 percent; USEPA, 2005b). Inhalation pathways likely result in negligible contributions to overall exposure relative to ingestion pathways; therefore, inhalation exposures were not evaluated quantitatively in the BERA.

3.3.5 *Hydrologic Variability and Spatial and Temporal Trends in Surface Water Cyanide and Fluoride*

The Phase II Sampling and Analysis Plan (SAP) (Roux, 2018a) evaluated hydrologic variability in conjunction with spatial and temporal trends of surface water cyanide and fluoride concentrations. This assessment used long-term records of stream discharge measurements from the Flathead River, precipitation data from Kalispell Airport, and analytical results from the Phase I Site Characterization (Roux, 2017a) to elucidate how temporal variations in hydrologic condition may influence subsequent investigations of cyanide and fluoride in aquatic exposure areas of the Flathead River and its adjacent riparian zone. A summary of key findings from the Phase II SAP assessment (Roux, 2018a) are discussed

below. Additional findings for the complete Phase I and Phase II Site Characterization datasets are presented in **Section 4.1.2** and in **Section 6.3.1**.

The assessment of discharge data from the Flathead River indicated that average monthly discharge patterns for 2016 and 2017 were generally consistent with the 10-year monthly discharge pattern from 2008 to 2017 (Roux, 2018a). Over the 10-year period, maximum discharges typically occurred in May and June and minimum discharges were noted between October and March. During Phase I Site Characterization sampling in 2016 and 2017, maximum and minimum discharge events occurred within a representative time frame that is consistent with historical data (**Figure 3-5**). The 2016 Phase I sampling period was characterized by a lower than average monthly discharge, except for October and November. In 2017, monthly discharge was higher than average. In addition, the 2017 discharge within the Flathead River had greater extremes in both maximum and minimum monthly discharge than the 10-year average.

Spatial and temporal trends were observed in surface water fluoride and cyanide collected during the Phase I Site Characterization (Roux, 2017a). The BERA Work Plan (EHS Support, 2018) further discussed the temporal variability and spatial gradient in surface water fluoride and total cyanide concentrations in the Backwater Seep Sampling Area and downstream stations in the Flathead River over the four Phase I sampling events. Spatial and temporal trends noted in the Phase II SAP and BERA Work Plan are discussed below.

Spatial trends observed followed the general pattern of elevated concentrations of cyanide and fluoride in the Backwater Seep Sampling Area, which exhibited attenuation in the downstream direction. Concentrations in samples collected from the downstream portion of the Flathead River, outside of the Backwater Seep Sampling Area, rapidly reached undetectable levels immediately downgradient of the seep area itself. The greatest surface water concentrations of total cyanide and fluoride were generally observed at station CFSWP-005. During all sampling rounds of the Phase I investigation, surface water concentrations of total cyanide and fluoride decreased with increasing distance downstream.

Temporal trends were associated with flow condition in the Flathead River. Wet periods of high discharge were characterized by lower concentrations of cyanide and fluoride, with the opposite observed during low water. The greatest surface water concentrations of total cyanide and fluoride were generally observed at station CFSWP-005 when discharge in the Flathead River was low (Phase I – Round 1 and Round 2). Surface water concentrations at CFSWP-005 decreased for fluoride and to a lesser extent during high-water sampling events (Phase I – Round 3 and Round 4). This evaluation suggested that potential exposure to total cyanide and fluoride in surface water in the Backwater Seep Sampling Area was greatest during low-flow sampling events in the Flathead River (September through December). Temporal patterns also seemed to influence the relative decrease in surface water concentrations moving downstream suggesting that interactions between flow magnitude and position was occurring. Rapid attenuation with distance was noted, particularly for cyanide, which was non-detect in sample stations within the Flathead River itself. These interaction effects were explored as part of this investigation and discussed in greater detail in **Section 4.1.2** and in **Section 6.3.1** for the complete Phase I and Phase II Site Characterization datasets.

The temporal evaluation of total cyanide and fluoride concentrations in Phase I surface water samples from other aquatic and transitional exposure areas of the Site indicated some seasonal variability in fluoride concentrations. However, variability in total cyanide concentrations did not indicate a clear seasonal pattern due to the low concentrations that were observed.

3.3.6 Ecological Receptors of Concern

The ecological exposure areas identified in **Section 3.3.1** may support multiple ecological receptors of concern. Aquatic receptors of concern that may use habitats within aquatic and/or transitional exposure areas include plants, invertebrates, fish, herptiles, and semi-aquatic birds and mammals. Terrestrial receptors of concern that may use habitats within aquatic, transitional, and/or terrestrial exposure areas include plants, invertebrates, herptiles, and terrestrial birds and mammals.

Several surrogate species were identified as representative species to evaluate exposure to mammalian and avian receptors based on feeding guild. Representative terrestrial species for each receptor group based on feeding guild are provided below.

Receptor Group	Scientific Name	Common Name
Mammalian Fauna		
Herbivorous Mammal	*Microtus pennsylvanicus*	Meadow Vole
Insectivorous Mammal	*Blarina brevicauda*	Northern Short-tailed Shrew
Carnivorous Mammal	*Mustela frenata*	Long-tailed Weasel
Avian Fauna		
Herbivorous Bird	*Zenaida macroura*	Mourning Dove
Invertivorous Bird	*Scolopax minor*	Woodcock
Carnivorous Bird	*Buteo jamaicensis*	Red-tailed Hawk

Representative aquatic/semi-aquatic species for each receptor group based on feeding guild are provided below.

Receptor Group	Scientific Name	Common Name
Mammalian Fauna		
Piscivorous Mammal	*Mustela vison*	Mink
Avian Fauna		
Invertivorous Bird	*Cinclus mexicanus*	American Dipper
Piscivorous Bird	*Megaceryle alcyon*	Belted Kingfisher

The focus of evaluation for each exposure area is dependent upon the habitat present and the receptors that are likely to utilize that habitat. **Table 3-1** presents a qualitative assessment of potential use of exposure areas based on the specific habitat requirements of identified receptors of concern. For terrestrial exposure areas, the risk characterization focused on organisms that have a majority of their exposure associated with terrestrial exposure pathways (i.e., all receptors except the mink, American dipper, and belted kingfisher). Similarly, the focus of aquatic exposure areas was those receptors who primarily ingest prey living in the water column or benthos. Transitional exposure areas evaluate all receptors, as both terrestrial and aquatic species may utilize the habitat during periods of inundation and dry conditions. Plant, invertebrate, and herptile communities were also evaluated, where appropriate, based on the availability of published toxicity data for organisms that occupy similar niches.

The United States Fish and Wildlife Service Information for Planning and Consultation (USFWS IPaC; https://ecos.fws.gov/ipac) indicated that six federally threatened (or proposed threatened) species may occur at the Site. No federally endangered species were identified by the USFWS IPaC search. The six federally threatened (or proposed threatened) species identified by USFWS IPaC are presented in the following table, along with general habitat requirements.

Scientific Name	Common Name	Status	Potential Exposure Area – General Habitat Requirements
Mammals			
Lynx canadensis	Canada Lynx	Threatened	Terrestrial – Moist, boreal spruce-fir forest habitat, particularly dense stands of young conifers.
Ursus arctos horribilis	Grizzly Bear	Threatened	Terrestrial – Relatively undisturbed mountainous habitat ranging from dense forest to subalpine meadows.
Gulo gulo luscus	North American Wolverine	Proposed Threatened	Terrestrial – High elevation habitat near the tree-line, typically in remote areas.
Birds			
Coccyzus americanus	Yellow-billed Cuckoo	Threatened	Terrestrial – Dense, wooded habitats with cover and water nearby, particularly cottonwood-dominated forests canopies.
Fish			
Salvelinus confluentus	Bull trout	Threatened	Aquatic – Cold-water, clean lake and stream habitats, with complex habitat features (e.g., riffles, pools, undercut, banks, structure).
Plants			
Silene spaldingii	Spalding's Catchfly	Threatened	Terrestrial – Bunchgrass grasslands and sagebrush-steppe, and occasionally in open-canopy pine stands.

The USFWS IPaC also indicated that critical habitats for the federally threatened bull trout and eight migratory USFWS Birds of Conservation Concern may occur at the Site. The migratory Birds of Conservation Concern are presented in the following table.

Scientific Name	Common Name	Breeding Season
Carpodacus cassinii	Cassin's Finch	May 15 – July 15
Aechmophorus clarkii	Clark's Grebe	All year
Tringa flavipes	Lesser Yellowlegs	Breeds Elsewhere
Numenius Americanus	Long-billed Curlew	April 1 – July 31
Limosa fedoa	Marbled Godwit	May 1 – July 31
Contopus cooperi	Olive-sided Flycatcher	May 20 – August 31
Selaphorus rufus	Rufous Hummingbird	April 15 – July 15
Tringa semipalmata	Willet	April 20 – August 5

3.3.7 Ecotoxicity of Primary Constituents of Potential Concern

The results of the Phase I and Phase II Site Characterization (Roux, 2017a and 2019) and SLERA (Roux, 2017b) indicated that cyanide, fluoride, and PAHs are the primary COPCs identified within the potential source areas and site features. Metals were also frequently detected in site media at maximum concentrations exceeding conservative ESVs in the SLERA. The following sections present a review of the ecotoxicity of these constituent groups in aquatic, transitional, and terrestrial exposure areas identified at the Site.

3.3.7.1 Cyanide

Cyanide is a general term that is used to refer to several compounds that contain a carbon-nitrogen functional group where the two atoms are bound together with a triple bond. Cyanide occurs in multiple forms in the environment. In water, cyanide can occur in strong and weak metal-cyanide complexes, as cyanate or thiocyanate, organocyanides, or as free cyanide. In solid phases, cyanides can occur in simple metal cyanide solids, complexes with alkali earth metals, or in complexes with other metals (Jaszczak et al., 2017). The toxicity of cyanide depends on its form. Free cyanide, including the liberated anion of cyanide ($^{-}$CN) as well as hydrogen cyanide (HCN), and soluble cyanide salts are the most acutely toxic forms of cyanide.

During the aluminum reduction process many chemical reactions can take place within the smelting potliner, which consists of the refractory lining, carbon cathode, and carbon sidewalls. Some of the chemical reactions that take place within pot lining materials are responsible for the production of cyanide compounds. Cyanide, along with other potentially hazardous compounds such as fluorides, can accumulate within the potliner during its operational lifespan. Once the liner has reached its operational lifespan and is removed from the pot lines, it is considered spent potliner (SPL), which is regulated as hazardous waste by the USEPA (Silveira et al., 2002). The presence of sodium-cyanide (NaCN) in SPL is of greatest concern because it is a soluble cyanide salt. Other less-soluble cyanide compounds, such as sodium ferrocyanide, are also present in large quantities within SPL (Courbariaux et al., 2004). Lisbona et al. (2012) determined the soluble cyanide fraction of SPL using a water washing approach; approximately 20 percent of the total cyanide within the studied SPL was soluble.

The primary mode of toxicity of cyanide compounds is disruption of cellular respiration. More specifically, cyanide causes histotoxic hypoxia, or the inability for cells to take up oxygen. The

mechanism that causes disruption to cellular respiration is free cyanide binding with the trivalent iron within cytochrome oxidase, an essential enzyme in the electron transport chain. Once bound, the synthesis of adenosine triphosphate (ATP) ceases and cellular function ceases due to the lack of energy (Jaszczak et al., 2017). Cyanide ions can also affect other enzymatic paths in flora and fauna (Ebbs, 2004), and react with hemoglobin (Lanno and Menzie, 2006). The ecotoxicity of cyanide is discussed for aquatic and terrestrial receptors below.

Aqueous forms of cyanide in the aquatic environment are broadly categorized into four classes: free cyanide, metal-cyanide complexes, cyanate/thiocyanate species, and organocyanide compounds (Ghosh et al., 2006). Metal-cyanide complexes may be further divided into weak metal-cyanide complexes and strong metal cyanide complexes. The dissociation of metal-cyanide complexes is dependent on pH, temperature, and reduction-oxidation potential. Weak acid dissociable (WAD) complexes with certain transition metals (Cu, Ag, Zn, Cd, Ni, and Hg) dissociate under weak acid pH (approimately 4.5); metal-cyanide complexes with other transition metals (Au, Fe, Pt, Pd, and Co) are highly resistant to dissociation and only dissociate under strong acid conditions (pH approximately 1-2) and high temperatures (100 ^{o}C). Several metal-cyanide complexes are known to be photochemically reactive. In the presence of ultraviolet (UV) light, the photolysis of ferrocyanide and ferricyanide complexes results in the formation of free cyanide, as HCN. The rate of photochemical dissociation is dependent on pH, free cyanide concentration in solution, UV intensity, temperature, turbidity, water column depth (Ghosh et al., 2006). Toxic free cyanide (HCN + $^{-}$CN) formed through photodegradation or other mechanisms does not tend to persist in aquatic environments because rapid biodegradation or volatilization occurs within the water column. Free cyanide can be oxidized to form cyanate ($^{-}$CNO) or react with sulfur to form thiocyanate ($^{-}$SCN), which are relatively nontoxic in comparison with free cyanide (Ghosh et al., 2006).

Cyanide exposure in aquatic environments occurs through direct contact with and ingestion of cyanide-containing water. This exposure occurs through ingestion or rapid gill uptake by aquatic organisms. Semi-aquatic organisms can also be exposed through drinking cyanide-containing water. Exposure to less soluble forms of cyanide in water (WAD complexes) may be problematic to mammalian and avian receptors, because cyanide can be liberated in the stomach due to the acidic and anoxic conditions. Incidental ingestion of cyanides in sediment is not a significant exposure pathway because free cyanide and weak metal–cyanide complexes tend to not accumulate in sediments unless organic carbon is abundant (Higgins and Dzombak, 2006). The reactive nature of free cyanide in water and its acute toxicity to (and rapid metabolism within) organisms limits the potential for bioaccumulation (Eisler, 1991; Lanno and Menzie, 2006). Species mean acute toxicity values for 28 freshwater species ranged from 0.046 to 10 milligrams of cyanide per liter (mg CN/L) (Lanno and Menzie, 2006). Chronic data are much more sparsely available for cyanide, and chronic toxicity values ranged between 0.008 and 0.079 mg CN/L for five freshwater and two marine species (Lanno and Menzie, 2006).

In terrestrial environments, free cyanide is typically not present. Upon entering the soil matrix via groundwater or deposition, free cyanide is rapidly complexed with metals to form cyanide-metal complexes, metabolized through microbial processes, or volatilized (Lanno and Menzie, 2006). Because cyanide compounds do not typically bioaccumulate, direct contact exposure and incidental ingestion of soils containing cyanides are the primary exposure routes for cyanides in terrestrial organisms. The mode of toxicity of cyanide to terrestrial plants is similar to that of fauna. Enzymatic binding to cytochrome oxidase results in cessation of cellular electron transport (Yu, 2015). Some plant species can assimilate or metabolize cyanide, and phytoremediation techniques as a means to cleanup terrestrial cyanide have been extensively studied (Yu, 2015).

The literature regarding cyanide bioavailability and toxicity summarized in this section was used to support the development of ecological benchmark concentrations for relevant exposure media in an interim deliverable (**Appendix A1**), as well as the Effects Analysis of this BERA.

3.3.7.2 Fluoride

Fluoride is naturally abundant in soils and contained in the minerals apatite ($Ca_5(PO_4)_3F$), fluorite (CaF_2), cryolite (Na_3AlF_6) and micaceous clay materials. Potassium fluoride (KF) and sodium fluoride (NaF) are soluble salts that contain fluoride. The fluoride-containing feedstocks used in smelting include fluorite, aluminum fluoride (AlF_3), and cryolite. Synthetic cryolite is the predominate flux compound used in aluminum smelting. Fluorite has the lowest solubility in water (16 milligrams per liter [mg/L] at 20 degrees Celsius) and cryolite is also relatively insoluble in water (420 mg/L at 20 degrees Celsius). Aluminum fluoride has an increased solubility in water of 6,700 mg/L at 20 degrees Celsius. KF and NaF represent the most soluble sources of fluoride with solubility in water at 20 degrees Celsius of 95,000 mg/L and 40,400 mg/L, respectively. NaF and KF are often used in toxicity testing of fluoride for both aqueous and solid matrices. The ecotoxicity of fluoride is discussed for aquatic and terrestrial receptors below.

Aquatic invertebrates and fish tend to take up fluoride directly from water, and, to a lesser extent, from consumption of organisms that contain fluorides. Fluorides can bioaccumulate within aquatic organisms, typically in exoskeletons for invertebrates and skeletal bones in fish. In aquatic flora, fluoride can accumulate in plant and root tissues.

The toxic action of fluoride is linked to the strong electronegative state of fluoride ions, which act as enzymatic poisons. Key enzymes, for which their activity can be compromised by the presence of fluoride ions include: phosphatase, hexokinases, enolase, succinic, dehydrogenase, pyruvic oxidase, and others (Camargo, 2003). The decreased enzymatic activity results in interruption of key metabolic processes, such as glycolysis and protein synthesis (Kessabi, 1984). The specific mechanism that causes the decoupling of metabolic processes due to enzymatic activity inhibition is not fully understood.

Increased fluoride concentration, exposure time, and water temperature increases the toxic effects of fluoride to aquatic invertebrates (Camargo, 2003). Inorganic fluorides in solution can be removed from the aquatic phase by precipitation in the presence of calcium carbonate, calcium phosphate, calcium fluoride and, magnesium fluoride (Stumm and Morgan, 1996). Therefore, harder or more saline water tends to be less toxic to aquatic invertebrates. An evaluation of available literature for freshwater acute and chronic effect endpoint data indicated that *Hyalella azteca,* an amphipod, exhibits the greatest sensitivity to fluoride among the freshwater invertebrate species used for toxicological testing. The 10 and 50 percent inhibition concentrations (IC_{10} and IC_{50}) based on growth inhibition were 1,800 and 4,100 micrograms of fluoride per liter (µg F/L), respectively at a hardness of 90 mg/L $CaCO_3$ and chloride content of 2,000 micrograms of chloride per liter (µg Cl/L) (Pearcy et al., 2015).

Increased fluoride concentration, exposure time, and water temperature also increases the toxic effects of fluoride to fish (Camargo, 2003). However, increasing intraspecific fish size and increasing calcium and chloride concentrations in water tends to decrease the toxic effects of fluoride to fish. Based on recent work by Pearcy et al. (2015), it appears that chloride concentration in surface water has a greater influence on the reduced toxicity of fluoride to freshwater organisms than calcium carbonate. Chloride concentration in water does reduce the toxic effects of fluoride to certain species; however, chloride does not mitigate toxic effects for all species. An evaluation of available literature for freshwater acute

and chronic effect endpoint data indicated that *Oncorhynchus mykiss*, the rainbow trout, exhibits the greatest sensitivity to fluoride among the freshwater fish species used for toxicological testing. The IC_{10} and IC_{50} were 6,000 and greater than 64,100 µg F/L, respectively, at a hardness of 6 mg/L $CaCO_3$ and chloride content of 2,000 µg Cl/L (Pearcy et al., 2015).

Depending upon concentration, exposure time, and species, fluoride can have inhibitory or enhancing effect on freshwater algal growth (Camargo, 2003). Like terrestrial plants, fluoride content in aquatic macrophyte tissue increases with increasing water concentration and exposure time. An evaluation of available literature for freshwater acute and chronic effect endpoint data for aquatic plants indicated that *Chlorella vulgaris,* a green algae, exhibits a sensitivity to fluoride. The non-inhibitory concentration and lethal concentration in 50 percent of the test organisms (LC_{50}) were 66,500 and 380,000 µg F/L, respectively at a pH of 6.8 (Rai et al., 1998).

In terrestrial environments, fluoride can have effects on plant roots and aboveground vegetation depending on uptake mechanisms, as well as the age and source of fluoride. Plants can take up fluorides from soil and transfer them to foliar tissues through xylematic flows (Fornasiero, 2001). When taken up by roots, some residual fluoride is accumulated into root tissue; however, much of the fluoride is transported to shoot or leaf biomass (Jha et al., 2009).

In addition to potential uptake from soil, gaseous fluorides can be absorbed through leaf stomata and be transferred to foliar tissues through xylematic flows (Zouari et al., 2014). When exposure is predominately atmospheric, accumulation of fluoride in plant roots is much less than when exposure is predominately through soil sources (Baunthiyal et al., 2014). However, the uptake of fluoride into foliar tissue has been shown to decrease, coincident with decreasing atmospheric fluoride concentrations. For example, Horntvedt (1995) found no apparent long-term effects in spruce and pine needles from fluoride accumulation into foliar tissues over a period of approximately 25 years with coincidental decreases in atmospheric fluoride emissions. This suggests that both the age and source of fluoride contamination may affect its uptake and toxicity within the terrestrial environment.

The most common visible symptom of fluoride toxicity in terrestrial plants is foliar damage (leaf necrosis). This occurs due to several morphological modifications to the upper and lower epidermis. Collapse of mesophyll results in cell distortion and sharpening (Fornasiero, 2001). Leaf necrosis can occur along the leaf margin (sides) or at the tip of the leaf (apical leaf necrosis).

High internal fluoride concentrations affect multiple physiological and metabolic plant processes (Yadu et al., 2016). Elevated fluoride can reduce growth and development, affect rates of photosynthesis, and disrupt multiple enzymatic processes. However, the effects of fluoride on growth and development of terrestrial plants vary considerably between species (Baunthiyal et al., 2014). Coniferous trees have been identified as sensitive plant species for exposure to fluoride. Zwiazek and Shay (1988) reported a lowest observed effect concentration (LOEC) for *Pinus banksiana* (jack pine) seedlings for growth of 3 mg F per kilogram (kg) dry weight (dw) of sand. Effects were observed after 29 hours. Arnesen (1997) reported a LOEC for *Lolium muliflorium* (ryegrass) growth of 400 mg F/kg dw.

The effect of fluoride on terrestrial invertebrates is not as well studied as the effects on plants and higher trophic levels. Increased fluoride concentration and exposure time has been shown to increase fluoride body burden to the terrestrial invertebrate *Eisenia fetida* (Lawson and Yu, 2003). The accumulation of fluoride by numerous other invertebrates from fluoride contaminated soils has also been studied (Buse, 1986).

The fluorination of soils by the addition of super phosphate fertilizers (e.g., monocalcium phosphate, $Ca(H_2PO_4)_2$) has resulted in many studies which focus on the effects of fluorides on grazing animals such as sheep and cows. Ingestion is the primary exposure route for fluoride in higher trophic level organisms. Fluoride compounds are absorbed in the stomach and small intestine, where acidic conditions can convert recalcitrant forms of fluoride into more bioavailable forms (Cronin et al., 2000). Threshold soil fluoride concentrations for cattle and sheep were between 326 and 1,085 mg F/kg soil dw and 372 and 1,461 mg F/kg soil dw, respectively. More recent evaluation of terrestrial exposure by Pascoe et al. (2014) found that the lowest no observed adverse effects level (NOAEL) and lowest observed adverse effects level (LOAEL) risk-based concentrations were 149 mg F/kg soil dw and 659 mg F/kg soil dw, respectively.

One key consideration to the ecotoxicity of fluoride in soils is the degree to which fluoride is adsorbed to soil particles. Fluoride adsorption is greatest in acidic non-calcareous soils containing aluminum hydroxides, where fluorides occur predominantly as aluminum fluorosilicate complexes (Pascoe et al. 2014). In slightly alkaline soils with sufficient calcium carbonate ($CaCO_3$), soluble fluoride would be most likely completely fixed as CaF_2 (Brewer, 1966) and less bioavailable. However, an increasing electrostatic potential at even higher pH decreases the retention of fluoride on the soil and increases solubility. This is partially attributed to the displacement of adsorbed fluorine by the increased concentration of hydroxide ions (Larsen & Widdowson, 1971).

The literature regarding fluoride bioavailability and toxicity summarized in this section was used to support the development of ecological benchmark concentrations for relevant exposure media in an interim deliverable to the BERA Work Plan (**Appendix A1**), as well as the Effects Analysis of the BERA Report. The derivation of ecological benchmark concentrations considers the site-specific conditions in terrestrial, transitional, and aquatic exposure areas that may influence fluoride bioavailability and toxicity to representative ecological receptors.

3.3.7.3 Polycyclic Aromatic Hydrocarbons

PAHs are a group of organic compounds that contain at least two condensed aromatic ring structures. When a PAH has three or less condensed aromatic rings, it is considered a low molecular weight PAH (LMW PAH). When it has four or more aromatic rings, it is considered a high molecular weight PAH (HMW PAH; USEPA, 2007a). During the production of aluminum using the Hall-Héroult process, carbon anodes and cathodes are used to conduct electricity through the alumina to produce molten aluminum. The coal tar pitch and coke used to create carbon anodes and cathodes contain multiple PAH compounds. The ecotoxicity of PAHs in aquatic and terrestrial environments are discussed below.

In aquatic environments, it is generally accepted that PAH compounds exert toxicity to benthic invertebrates primarily by a narcosis mode of action (USEPA, 2003a; DiToro et al., 2000; Swartz et al., 1995; Russom et al., 1997; McGrath et al., 2004). Narcosis is a nonspecific, reversible disruption of neural activity (i.e., anesthesia). Based on the similar mode of action of PAH compounds, the toxicity of multiple PAH compounds in a sediment mixture is approximately additive; therefore, exposure to the PAH mixture must be evaluated to assess potential toxicity in sediment (USEPA, 2003a). The composition of individual compounds within PAH mixtures and the relative contribution of those compounds to the additive toxicity to the benthic community vary depending on the source of PAHs.

Additional modes of ecotoxicity include phototoxicity, whereby exposure to UV light increases the toxicity of PAHs. Phototoxicity has been demonstrated in aquatic environments (van Brummelen et al.,

1998; Weinstein and Polk, 2001). However, comparisons by Swartz et al. (1995) suggest that responses of benthic communities in PAH-contaminated sites correlate well with the toxicity that is predicted based on narcosis, suggesting that phototoxicity was not a major confounding factor for those environments.

Similar to aquatic receptors, the primary mode of toxicity of PAHs to terrestrial invertebrates is through narcosis (Sverdrup et al., 2002). Soluble phases of PAH compounds found in interstitial pore waters present the greatest risk to invertebrates through ingestion or incidental ingestion. For LMW PAHs, 10 percent effect concentrations (EC_{10}) for reproduction or growth for several invertebrate species ranged from 8 to 113 milligrams per kilogram (mg/kg) dw, whereas the EC_{10} or the maximum acceptable toxicant concentration (MATC) for soil invertebrates exposed to HMW PAHs ranged from 10 to 80 mg/kg dw (USEPA, 2007a). Higher molecular weight PAH compounds generally exhibit greater toxicity to organisms, particularly mammals due to the carcinogenic and mutagenic properties. Mammalian insectivores, the most sensitive receptor group, can have a variety of physiological responses to PAH exposure (USEPA, 2007a).

The literature regarding PAH bioavailability and toxicity summarized in this section was used to support the development of ecological benchmark concentrations for relevant exposure media in an interim deliverable (**Appendix A**), as well as the Effects Analysis of the BERA Report. The derivation of ecological benchmark concentrations will consider the site-specific conditions in terrestrial, transitional, and aquatic exposure areas that may influence PAH bioavailability and toxicity to representative ecological receptors.

3.3.7.4 Metals

The availability of metals to be incorporated into biological tissues does not necessarily correspond with the total concentration of metals in soil, sediment, or surface water; bioavailability is directly related to the speciation of metals. For most divalent metals, the most bioavailable and toxic forms of metals are the metal ions or small metal-anion complexes, which are present at very low concentrations in the environment.

In sediments, most metals are not available for uptake due to strong complexation by solid phases. For example, metals precipitated as metal-sulfide ligands may be resistant to solubilization under typical geochemical conditions observed in sediment or sediment pore water (Sigg and Behra, 2005). The soluble phase of metal ions in sediment pore water is generally the most bioavailable and potentially toxic form to ecological receptors. Equilibrium partitioning theory may be used to predict the bioavailability toxicity of metals in sediment based on the partitioning of simultaneously extracted metals (SEM) between acid volatile sulfides (AVS), total organic carbon (TOC), and pore water (USEPA, 2005a). In reduced sediments, free metal ions partition to AVS and TOC to form insoluble metal sulfide complexes that have low bioavailability and are associated with low toxicity to benthic organisms in toxicity tests (USEPA, 2005a). Metals concentrations directly measured in filtered pore water samples represent the dissolved fraction of metals, which is bioavailable and can be incorporated into the tissues of benthic invertebrates (USEPA, 2005a).

Many metal compounds are essential to maintaining cellular homeostasis. However, when metal concentrations exceed what is needed to maintain normal organismal functions, toxic effects can occur (Valko et al, 2005). Metal-induced toxicity can occur by several mechanisms in organisms, including hepatotoxicity (liver toxicity), neurotoxicity (brain toxicity), and nephrotoxicity (kidney toxicity). Iron,

copper, chromium, vanadium, and cobalt can undergo redox-cycling reactions that can lead to deleterious types of oxidative stress. Mercury, cadmium, and nickel can deplete glutathione, which is an essential antioxidant in organisms. Arsenic primarily acts on organisms by binding to thiols, which can disrupt important enzymatic functions (Valko et al, 2005). The ability of metals to bioaccumulate within organisms varies depending on the receptor group and type of metal. Some metals biomagnify (e.g., mercury), or increase in concentration within receptor tissues moving up to higher trophic level.

The literature regarding the bioavailability and toxicity of metals summarized in this section was used to support the development of ecological benchmark concentrations for relevant exposure media in an interim deliverable (**Appendix A**), as well as the Effects Analysis of the BERA Report. The derivation of ecological benchmark concentrations will consider the site-specific conditions in terrestrial, transitional, and aquatic exposure areas that may influence metal bioavailability and toxicity to representative ecological receptors.

3.4 SLERA Refinement of Constituents of Potential Ecological Concern

A refinement of COPECs identified in the SLERA was conducted based on the Phase I Site Characterization data (Roux, 2017b) to identify and provide context for those constituents that are likely to be focal COPECs in the BERA process. Refinement steps included consideration of additional factors that support the removal of some screening-level COPECs from further consideration because they are highly unlikely to adversely impact ecological receptors. The results of this refinement of COPECs identified in the SLERA based on Phase I sampling results was presented in the BERA Work Plan (EHS Support, 2018). The results of that refinement were used to inform decisions regarding the collection and analysis of Phase II data. However, because this BERA investigation includes a re-analysis of all of the ecological risk assessment steps based on the combination of Phase I and Phase II Site Characterization data, the results of the SLERA COPEC refinement are not presented in this document. Screening-level and refined selections of BERA COPECs based on the combined Phase I and Phase II Site Characterization datasets are presented in **Section 4.3** through **Section 4.5**.

3.5 Data Quality Objectives

Following the initial SLERA, the Phase II Site Characterization SAP (Roux, 2018a) presented the detailed study design and supporting data quality objective (DQO) process to evaluate site-specific ecological risk based on identified assessment endpoints, risk questions, and measurement endpoints defined in the baseline problem formulation. The development of the study design in the Phase II Site Characterization SAP was guided by the USEPA DQO process, which is a seven-step planning approach to develop sampling designs for data collection activities that support decision making (USEPA, 2000a). Per USEPA (1997), the goals of the DQO process in the context of ERAGS are to:

- Clarify the study objective and the most appropriate types of data to collect.
- Determine the most appropriate field conditions under which to collect the data.
- Specify acceptable criteria that will be used as the basis for establishing the quantity and quality of data needed to support risk management decisions.

As part of the Phase II Site Characterization SAP, a DQO-based sample size evaluation was conducted to approximate the minimum sample sizes needed to estimate unknown population parameters (e.g., mean, upper confidence limits of the mean [UCL_{mean}]) of COPECs and COPCs in soil to support the BERA and Human Health Risk Assessment (HHRA), respectively (Roux, 2018a).

3.6 BERA Conceptual Study Design

The conceptual study design for the BERA was presented in the BERA Work Plan (EHS Support, 2018) and incorporated into the Phase II Site Characterization SAP (Roux, 2018a). The design identified key data objectives for the Phase II Site Characterization to support the evaluation of assessment endpoints and risk questions based on defined measurement endpoints identified in the BERA problem formulation for aquatic, transitional, and terrestrial exposure areas at the Site.

The BERA Work Plan (EHS Support, 2018) presented an analysis of data gaps identified in the SLERA and developed a conceptual plan for collecting additional data during the Phase II Site Characterization to support the BERA process. This conceptual plan outlined the strategy to collect additional data during the Phase II Site Characterization that would provide the spatial adequacy, vertical characterization of soil in ecological depths of exposure, sufficient sample size, and information related to COPEC bioavailability in a particular medium necessary for developing sound conclusions about the potential for ecological risk at the site. These objectives were obtained by:

- Collecting soil samples within the 0 to 0.5 and 0.5 to 2 feet below ground surface (ft-bgs) intervals at all exposure areas (the BERA Work Plan [EHS Support, 2018] provided justification for this soil depth as the relevant soil interval for ecological risk based on receptor exposure patterns and an evaluation of Phase I data that indicated generally decreasing concentrations with increasing soil depths for most constituents at most locations). A similar evaluation was performed after the Phase II samples were collected and analyzed. As described in the DSR, samples collected at depth intervals deeper than 2 ft-bgs for key site contaminants had average concentrations that were an order of magnitude or lower than concentrations detected within the 0 to 2 ft-bgs interval (see Section 4.2.1.11 in Roux, 2019). Thus, the assumption that exposure point concentrations based on data from the 0 to 2 ft-bgs interval provides a conservative estimate of exposure to ecological receptors was confirmed by the analysis of Phase I and Phase II Site Characterization datasets.
- Ensuring that enough samples (generally 8 to 10 samples, at a minimum) were collected in each exposure medium in each exposure area to calculate 95 percent UCL_{mean} based on the DQO-based minimum sample size evaluation.
- Collecting data to evaluate the bioavailability of constituents to ecological receptors, such as collecting both filtered and unfiltered surface water data, analyzing soil samples for parameters (e.g., pH, organic carbon) that affect the potential for binding constituents in the medium matrix in non-bioavailable forms, and analyzing sediment pore water and acid volatile sulfides-simultaneously extracted metals (AVS-SEM) in sediment.

3.6.1 Aquatic Exposure Areas

Surface water analyses in aquatic exposure areas included analyses of filtered (dissolved) and unfiltered samples for metals, cyanide, free cyanide, and fluoride. Consistent with the analyses of pore water in sediment, the freely dissolved fraction is a better indicator of potential bioavailability and toxicity of COPECs in surface water. Surface water analyses included the analysis of free cyanide, which is more representative of the bioavailable and toxic form of cyanide. Free cyanide analysis of surface water provides a 'snapshot' of the bioavailable and toxic form of cyanide in the water at any one time. Under different environmental conditions (e.g., ultraviolet light exposure, temperature, pH), different concentrations of free cyanide may be present depending on the cyanide liberated from metal cyanide complexes and the amount of hydrogen cyanide volatilized off. The sampling programs implemented as

part of the Phase I and Phase II Site Characterization in areas where elevated cyanide have been detected were designed to provide comprehensive datasets to characterize the spatial and temporal variability in free and total cyanide concentrations in surface water under varying environmental conditions.

The BERA Work Plan provided for the evaluation of the bioavailability and toxicity of COPECs in sediment within aquatic exposure areas using a tiered approach that is consistent with framework presented in USEPA guidance for evaluating ecological risk to benthic receptors from PAHs in sediment (USEPA, 2009). The tiered approach is applicable to the evaluation of PAHs and other organic and inorganic COPECs in sediment. The tiered approach includes the following components:

- Tier 1 – Assessment of COPEC bioavailability based on whole sediment analysis
- Tier 2 – Assessment of COPEC bioavailability based on pore water analysis
- Tier 3 – Assessment of COPEC bioavailability using the Sediment Quality Triad (SQT) approach and/or tissue analyses

Data to support Tier 1 and Tier 2 assessments were collected as part of the Phase I and Phase II Site Characterizations. The need for and scope of potential Tier 3 analyses may be further evaluated pending the outcome of the BERA.

Tier 1 analyses of COPEC bioavailability, including predictive models based on equilibrium partitioning (EqP) relationships, were completed for select constituent groups based on Phase I Site Characterization Data in the SLERA and COPEC Refinement (**Section 3.4**). Tier 1 analyses were also conducted in this BERA on additional data collected during the Phase II sampling as part of a weight-of-evidence evaluation for exposure. Predictive EqP models estimate the bioavailable fraction of COPECs in pore water based on the partitioning of COPECs between sediment organic carbon, pore water, and biota. EqP equilibrium partitioning sediment benchmarks (ESBs) represent concentrations of organic constituents in bulk sediment that, at equilibrium, would result in partitioning to sediment pore water at concentrations equivalent to a water quality benchmark (WQB) that may be based on no observed effect concentration (NOEC) or LOEC endpoints for survival, growth, or reproduction. Further refinement of these predictive approaches may be conducted as part of Tier 1 analyses consistent with the following USEPA guidance:

- PAHs: *Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures* (USEPA, 2003a)
- Divalent metals: *Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: Metals Mixtures (Cadmium, Copper, Lead, Nickel, Silver, and Zinc)* (USEPA, 2005a)
- Nonionic Organic Compounds: *Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: Compendium of Tier 2 Values for Nonionic Organics* (USEPA, 2008a)

For organic COPECs lacking ESB values from the above sources, site-specific ESBs may be derived using the sample-specific fraction of organic carbon (f_{oc}), constituent-specific organic carbon-water partitioning coefficient (K_{oc}), and WQB based on the following EqP relationship:

$$ESB = (f_{oc} \times K_{oc} \times WQB)$$

where:

ESB = EqP Sediment Benchmark (µg/kg dw sediment)

f_{oc} = Sample-specific fraction of organic carbon in sediment
K_{oc} = Organic carbon-water partitioning coefficient (L/kg)
WQB = Water quality benchmark (µg/L)

The use of conservative partitioning coefficients and WQB values in predictive EqP models minimizes the potential for false negatives (i.e., erroneously eliminating a constituent from further consideration) in the Tier 1 analyses.

Tier 2 analyses were conducted as part of the Phase II Site Characterization in aquatic exposure areas where Tier 1 analyses indicate the potential for adverse ecological effects based on predictive models. Tier 2 analyses consist of the direct measurement of the freely dissolved COPEC fraction in sediment pore water and direct measurements of bioavailable fractions in bulk sediment. The freely dissolved fraction better predicts COPEC bioavailability and toxicity in sediment when compared to bulk sediment analyses. Direct measurements of COPEC concentrations in pore water provide an empirical measurement to supplement the conservative theoretical estimate of COPEC concentrations in pore water derived from predictive EqP models.

In addition to pore water analyses, analyses of bioavailable fractions in sediment are considered in Tier 2 analyses. Measurements of AVS-SEM were collected during the Phase II investigation in inundated or saturated sediments where divalent metals may be elevated above sediment ESVs based on total recoverable analyses (USEPA, 2005a). Soluble fluoride was also analyzed in sediment to evaluate the potential bioavailability and toxicity of fluoride to benthic organisms.

3.6.2 Terrestrial Exposure Areas

The bioavailability of metals, cyanide, fluoride, and PAHs in soils is complex and influenced strongly by pH, cation exchange capacity (CEC), organic matter content, localized hydrology, and grain size. Soil pH is considered the primary soil variable, because it controls many soil biogeochemical processes and has a significant influence on constituent bioavailability (USEPA, 2007b). Depending on COPEC speciation, and whether it is complexed or sorbed to organic matter or clay, some portion of soil COPECs may not be bioavailable because they do not readily dissolve in water or solubilize during passage through organism intestines.

The BERA Work Plan provided for the conceptual evaluation of the bioavailability and toxicity of COPECs in soils within terrestrial exposure areas based on a tiered approach:

- Tier 1 – Assessment of potential COPEC toxicity based on bulk soil analysis
- Tier 2 – Measurement of COPEC bioavailability and toxicity based on fractional analytical methods
- Tier 3 – Measurement of COPEC bioavailability and toxicity based on *in situ* toxicity studies and/or tissue analyses

The terrestrial exposure evaluations presented in the BERA are based on Tier 1 analyses that evaluate potential soil COPEC toxicity using the available Phase I and Phase II Site Characterization Data in the preliminary COPEC screen and COPEC Refinement (**Sections 4.3** through **4.5**). Tier 1 analyses included comparisons of total COPEC concentrations to ESVs and the identification of important soil physicochemical parameters that help inform soil COPEC bioavailability, particularly soil pH and soil

organic carbon content. The need for and scope of potential Tier 2 and 3 analyses may be further evaluated pending the outcome of the BERA.

3.6.3 Transitional Exposure Areas

The evaluation of the bioavailability and toxicity of COPECs in transitional exposure areas used the approaches presented in the preceding sections for aquatic and terrestrial exposure areas. The approach for transitional exposure areas was developed based on localized exposure conditions indicating the likelihood of occurrence of aquatic or terrestrial receptors.

3.6.4 Background Characterization

The adequacy of Phase I Site Characterization data collected to represent background conditions was identified as an uncertainty in the SLERA. Additional background data was collected as part of the Phase II Site Characterization to further characterize COPEC concentrations representative of regional conditions (Roux, 2019).

A Background Investigation SAP (Background SAP) (Roux, 2018b) was developed to establish the data objectives, study design, and methodologies that were used to establish a representative background dataset. As described in the Phase II Data Summary Report, (Roux, 2019) soil background locations were distal to industrial operations at CFAC and have no known waste materials present. Background soil samples were collected from similar soil types as soils identified on the Site. Surface water and sediment sampling locations targeted areas hydraulically upgradient of the Site. Background locations for aquatic environments were located upstream of the Site in locations with similar habitats and substrate characteristics to aquatic exposure areas at the Site.

Sample sizes for soil, surface water, and sediment background datasets were sufficient to develop statistically robust measurements of UCL_{mean}, as well as background threshold values (BTVs) using ProUCL software (USEPA, 2015b). Background datasets had a minimum of 8 – 10 observations for each matrix to support statistical calculations. A full description of the background area sampling and data evaluation is presented in the Phase II DSR (Roux, 2019).

4 Identification of Baseline COPECs

Following a review of the Phase II datasets, it was determined that the components and assumptions presented in the baseline risk assessment problem formulation were still valid and accurate. Although screening-level COPECs from the Phase I data were previously identified in the SLERA (Roux, 2017b), the SLERA concluded that additional samples were required to adequately characterize some portions of the site, and additional samples were collected during a second phase of sampling following the SLERA. Because the initial steps of the risk assessment that were presented in the SLERA (Roux, 2017b) and BERA Work Plan (EHS Support, 2018) were performed only on the Phase I Site Characterization data, the screening-level steps in the risk assessment process are repeated and presented in this BERA for the combined Phase I and Phase II dataset. The results of this evaluation are presented in the following sections.

Exposure areas at the Site were previously defined based primarily on the habitat type identified during the May 2016 habitat assessment (**Section 2.2.3**). These exposure areas were refined in the BERA Problem Formulation (**Section 3.3.1**) based on additional data collection and habitat evaluations that were performed following the SLERA. A total of 13 exposure areas were defined in the BERA refinement. **Figure 3-1** shows the location and extent of each exposure area. **Figures 4-1** through **4-14** present the sample locations that comprised the dataset used for each exposure area, including the incremental sampling grid area in the Operational Area of the Site (**Figure 4-8**). The screening-level COPECs in soil, surface water, and sediment that require further evaluation in each exposure area are presented in the following sections.

4.1 Evaluated Datasets

Data from samples collected in soil, surface water, and sediment during the Phase I Site Characterization, Supplemental South Pond Assessment, and Phase II Site Characterization programs were used to perform an initial screening-level identification of COPECs. The datasets for each medium are briefly discussed below. Detailed descriptions of the sampling efforts are provided in the Phase II Site Characterization Data Summary Report (Roux, 2019). The locations where the soil, surface water, and sediment samples used in the BERA were collected for each medium in each exposure area are presented in **Table 4-1** through **Table 4-13**.

4.1.1 Soils

The Phase I Site-wide soil boring and soil sampling was conducted from May 18, 2016 to August 31, 2016. Soil samples were collected utilizing either sonic-rotary methods, direct push techniques with Geoprobe™ technology, or hand auger as detailed in the Phase I Data Summary Report (Roux, 2017a). In addition, soil samples were collected from test pits conducted within the Borrow Pit area.

Three soil samples were typically collected for laboratory analyses from each soil boring within unpaved areas:

- Surface soil sample from the top 6 inches of soil
- Shallow soil sample from the interval of 0.5 to 2 ft bgs
- Intermediate depth soil sample from a depth of 10 to 12 ft bgs

In paved areas the surficial sample was omitted (due to pavement or solid surface covering) and the shallow sample was collected from the 2-foot depth interval immediately beneath the surface covering materials. At one location (CFMW-28a) adjacent to the Northeast Percolation Pond, an opportunistic soil sample was collected from a depth of 4 to 6 ft bgs based upon the observation of stained soil at that location and depth. In addition, soil samples were collected from eight test pits conducted within the Borrow Pit area in the southeast corner of the Site, with two samples collected from each test pit at depths of 0.5 to 2 ft bgs and 2 to 4 ft bgs.

For the purposes of this BERA, only soil samples collected from less than 2 ft bgs were evaluated as soils. Soils from deeper intervals are not encountered as frequently for most terrestrial receptors, particularly those that do not regularly burrow. The bioaccumulation of constituents from soils into dietary items occurs within the biologically active zone in soil where dietary items are exposed, which is generally contained within the top 1-2 ft bgs (USEPA, 2015a). Burrowing mammals may encounter and incidentally ingest soils at depths greater than 2 ft bgs within burrows. However, the analysis of Phase I and Phase II soil datasets indicates that concentrations of key constituents of concern in site soil generally decline with increasing depth (see **Section 3.6** and Roux, 2019). As a result, ecological exposure to COPECs in soils within the 0-2 ft bgs sampling intervals is typically greater than exposure to subsurface soils (greater than 2 ft bgs). Therefore, exposure estimates for direct dietary ingestion and incidental soil ingestion based on COPEC concentrations within the 0-2 ft bgs sampling intervals provide conservative estimates of exposure to mammalian receptors that potentially burrow in site soils. Soils deeper than 10 feet are not within the biologically active zone and therefore are not part of a complete exposure pathway.

Soil samples were analyzed for the following analytical suites relevant to the BERA:

- Target Compound List (TCL) VOCs (excluding surface soil samples) via USEPA Method 8260
- TCL SVOCs (including PAHs) via USEPA Method 8270
- Target Analyte List (TAL) Metals via USEPA Method 6010
- TCL PCBs via USEPA Method 8082
- TCL Pesticides (select surface samples only) via USEPA Method 8081
- Total Cyanide via USEPA Method 9012
- Fluoride via USEPA Method 300

The Supplemental South Pond Assessment soil sampling was conducted from October 31, 2017 through November 8, 2017. A total of 18 soil borings were advanced and 43 soil samples were collected within the South Percolation Pond Area. Samples were collected in accordance with the standard operating procedures (SOPs) provided in the Phase I SAP (Roux, 2015b) and the specifications of the Expedited Risk Assessment SAP (Roux, 2017d). Soil samples were packaged and shipped under chain-of-custody to Test America Laboratories, Inc. and analyzed for the following analytical suites relevant to the BERA:

- TCL VOCs (excluding surface soil samples) via USEPA Method 8260B
- TCL SVOCs (including PAHs) via USEPA Method 8270D
- TAL metals via USEPA Method 6020A / 7471B
- Total cyanide via USEPA Method 9012B
- Free cyanide via USEPA Method 9016
- Fluoride via USEPA Method 9056A

Phase II soil samples were collected from April 28, 2018 to June 28, 2018 and from September 25, 2018 to September 28, 2018. Locations and analyses were based on information obtained from the Phase I

sampling. The Phase II soil samples were analyzed for the following analytical suites relevant to the BERA:

- TCL SVOCs (including PAHs) via USEPA Method 8270 Low Level (LL)
- TAL Metals via USEPA Method 6010
- Total Cyanide via USEPA Method 9012
- Fluoride via USEPA Method 9056A
- Dioxin and furan compounds (polychlorinated dibenzo-dioxin [PCDD] / polychlorinated dibenzo-furans [PCDF]) via USEPA Method 8290A (dioxin delineation samples only)
- TCL PCBs via USEPA Method 8082 (only locations located in the vicinity of the Rectifier Yards and delineation samples within the Operational Area)
- TAL total chromium via USEPA Method 6020A, and Cr(VI) via USEPA Method 7196A (chromium speciation samples only)
- TCL VOCs via USEPA Method 8260 (four opportunistic samples only)

Additional strategies and approaches that were used to evaluate and investigate potential contamination in the soil medium are described in the following subsections.

4.1.1.1 Incremental Soil Samples

In addition to discrete soil sampling, incremental soil sampling was conducted within an area known as the Operational Area. The Operational Area comprises approximately 43 acres within the northern portion of the Main Plant Area and southern portion of the Central Landfill Area where aerial photographs indicate historical operations may have been conducted but no known source area exists. An incremental soil sampling program was conducted within the Operational Area to assess whether any potential source areas are present in this area. The work was performed in accordance with the Scope of Work outlined in the Phase I and Phase II SAPs (Roux, 2015b and 2018a) as well as SAP Field Modification #4 (described in the Phase I Data Summary Report [Roux, 2017a]).

The Operational Area soil investigation was conducted during multiple phases in the June 14, 2016 to May 23, 2018 time frame. The Operational Area was divided into 43 grid cells, also referred to as DUs, each approximately 1 acre in size. Sampling was conducted at the frequency of one incremental surface soil sample (0 to 0.5 ft bgs) and one incremental shallow soil sample (0.5 to 2 ft bgs) per DU, for a total of 43 incremental soil samples from each interval within the 43 DUs that comprise the Operational Area. Each incremental sample consisted of a composite of 32 grab samples (or “increments”) that were processed, combined, and subsampled to develop the composite ISS result as described in the Phase II SAP (Roux, 2018a). The grid where samples were collected in the Operational Area is shown on **Figure 3-1** and **Figure 4-8**. Each sample was analyzed for the laboratory analyses noted above, with the exception of VOCs. As described in the Phase I Data Summary Report, samples from the first 15 DUs (designated CFISS-001 through CFISS-015) were collected using field processing methods which included the hand removal of coarse-grained material greater than approximately 0.5 inches in diameter, and hand mixing of the soil volumes in the field from the 32 grab samples. As documented in Field Modification #4, field processing by Roux and Hydrometrics was discontinued at the request of USEPA since the field processing method did not include drying and breaking up soil aggregates and/or sieving as specified in the Interstate Technology and Regulatory Council (ITRC) incremental sampling methodology guidance and as would be done in the lab processing of incremental soil samples (ITRC, 2012a). Three of the initial DUs were re-sampled to allow for a comparison of the results from the two

methods. After the results were considered, it was determined that the remaining 12 DUs would be re-sampled as part of the Phase II Site Characterization effort.

A single replicate was collected from most of the grid cells in the Operational Area. However, three replicates were collected from both the 0 to 0.5 ft and the 0.5 to 2 ft soil intervals from four DUs (i.e., 10 percent of the DUs; CFISS-001, -004, -011, and -015) during the Phase II investigation. Based on the results of the sampling, an estimate of variability from replicate sampling was established for the remaining DUs. An evaluation of the relative standard deviation (RSD) was performed on triplicate results where all three results were detections. The calculation indicated that most analytes had an RSD of less than 30 percent between parent and replicate samples. SVOCs, specifically PAHs, had the greatest frequency of greater than 30 percent RSD between parent and replicate samples. The parent and replicate samples from the shallow incremental soil sampling (ISS) sample CFISS-004 had the greatest range of variability, with SVOC RSD values between 58 percent and 144 percent. It should be noted that the Phase II SAP (Roux, 2018a) denotes an acceptance criterion of 50 percent relative percent difference (RPD) for parent and field duplicate soil samples. Duplicate soil samples are typically expected to be more variable than results from replicate water samples due to the physical and chemical heterogeneity of the soil matrix.

The results of triplicate ISS results were consolidated into a single concentration using the updated ITRC 95 percent UCL_{mean} calculator (ITRC, 2012b), as described in the wildlife ingestion BERA work plan interim deliverable (**Appendix A2**). An adjustment was made to detected constituents in the 39 DUs where single incremental samples were collected based on the variability observed for that constituent within the DUs where triplicate sampling was performed. The RSDs calculated and presented in the Phase II DSR (Roux, 2019) for DUs with triplicate incremental samples were used to estimate the potential variance associated with single incremental sample results. The arithmetic mean of RSDs for each constituent and sampling interval combination was used as the adjustment factor for the 39 DUs lacking replicate samples. This adjustment factor was used to calculate the potential range for each non-replicated DU in each depth interval as follows:

RSD-adjusted EPC = [single ISS result] x (1 ± (mean percent RSD/100)).

Additional information regarding how the ISS data were managed and evaluated is provided in **Section 5.3.1**.

4.1.1.2 Chromium Speciation

In an effort to reduce uncertainty in the risk assessment results with respect to chromium in soil, CFAC developed a site-specific ratio of hexavalent chromium [Cr(VI)] to trivalent chromium [Cr(III)] by collecting soil samples that were analyzed for both total chromium and Cr(VI) (Roux, 2019). Twenty soil samples within the depth of ecological exposure (0 to 2 ft-bgs) were analyzed for both Cr(VI) and total chromium. Cr(VI) was detected in only 3 of the 20 samples and comprised a maximum of 3.96 percent of the total chromium in the samples where it was detected. To determine the representative ratio of Cr(VI) to Cr(III) in soil at the Site, the Cr(III) concentration for each of the samples analyzed for Cr(VI) was calculated as the difference in concentration between total chromium concentration and the Cr(VI) concentration. For non-detect Cr(VI) concentrations at these locations, one-half of the MDL was used for the calculation. The ratio of Cr(VI) to Cr(III) was then calculated for each sample. Cr(III) and Cr(VI) results from soil sample CFSB-290-SO-0-0.5 were excluded from the dataset because both total chromium and Cr(VI) were not detected at this location. The 95 percent UCL_{mean} of all the ratios was then calculated

using ProUCL software (USEPA, 2015b). ProUCL fit the dataset to a lognormal distribution and returned a 95 percent UCL_{mean} ratio of 0.0198 based on the H-statistic method. To be conservative and to follow suggestions from the ProUCL output form, the lognormal distribution result was rejected, and instead, the nonparametric 95 percent UCL_{mean} ratio of 0.0275 was adopted as the representative ratio.

Concentrations of Cr(III) and Cr(VI) were then estimated for the remaining samples for which only total chromium was analyzed, using the above-calculated ratio of Cr(VI) to Cr(III), *r*, the Total Chromium concentration, *Cr(T)*, and the following equations. The raw dataset and calculations are provided in the Phase II DSR (Roux, 2019):

$$[Cr(III)] = \frac{1}{1+r} * Cr(T)$$

$$[Cr(VI)] = r * [Cr(III)]$$

Both the measured total chromium results as well as the estimated Cr(III) and Cr(VI) concentrations based on the above ratio are presented in the soil data tables for each exposure area.

4.1.1.3 Dioxin and Furan Compounds

Concentrations of dioxin and furan congeners were treated according to procedures provided by USEPA and the World Health Organization (WHO) (Van den Berg et al, 1998, 2006; USEPA, 2008b, 2010) and validated according to the appropriate National Functional Guidelines (USEPA, 2016). PCDDs and PCDFs consist of a family of approximately 75 and 135 congeners, respectively. For dioxin and furan congener data, results were converted to 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) toxicity equivalent quotient (TEQ) values using toxicity equivalent factors (TEFs) specific to wildlife from the World Health Organization (Van den Berg et al., 1998) and Van den Berg et al. (2006) for avian and mammalian receptor guilds, respectively. Three scenarios were calculated for non-detected congeners to bracket the range of potential concentrations present in soil. The three values assigned to results that were qualified as non-detected were 0, one-half the MDL, and the MDL. The MDL represents the lower limit of concentrations detectable by the analytical method. Therefore, any concentrations above the MDL are typically reported as estimated values and are recorded as J-qualified concentrations by the laboratory, which are considered usable results for risk assessment. Thus, the MDL represents a conservative upper limit for the potential concentration of dioxin in a sample reported as a non-detected result.

In some cases, dioxin and furan congener results that had a reported laboratory value were flagged with a laboratory qualifier “B” (indicating blank contamination) and a validation qualifier of “U” (indicating that the influence of the blank contamination compromised the confidence of determining if the constituent was present in the sample at all). In such cases, the estimated concentration reported by the laboratory was conservatively used as the surrogate value for the non-detected result rather than the MDL. All reported and surrogate values were then multiplied by the appropriate bird or mammal TEF, and the TEF-adjusted concentrations were then summed to develop the sample 2,3,7,8-TCDD TEQ concentration (USEPA, 2005c).

4.1.1.4 Soil Evaluation in Transitional Exposure Areas

As described in the BERA Work Plan (EHS Support, 2018), soil and sediment in the four transitional areas (i.e., the North Percolation Pond Area, South Percolation Pond Area, Cedar Creek Overflow Ditch, and

Northern Surface Water Feature) were combined and evaluated as both soil and sediment in order to be protective of ecological receptors that may utilize the sites during dry and wet conditions, respectively. For the soil evaluation in these areas, the soil samples (0 to 2 ft-bgs) and sediment samples were combined to form the soil dataset used to evaluate terrestrial exposure scenarios.

4.1.1.5 PAHs

As described in **Section 3.3.7**, PAHs in terrestrial and aquatic environments have similar modes of toxicity on ecological receptors. Toxicity associated with exposure to PAHs in terrestrial environments is typically considered to be additive among LMW PAHs and HMW PAHs (USEPA, 2007a). LMW PAHs are composed of fewer than four aromatic rings and HMW PAHs are composed of four or more rings. In this BERA investigation, LMW PAHs consisted of acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, and 2-mehtylnaphthalene. HMW PAHs consisted of benzo(a)anthracene), benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and pyrene. Concentrations of LMW and HMW constituents were summed in the COPEC screening steps and compared to LMW- and HMW-specific ESVs.

PAHs in some soil samples (e.g., in the North Percolation Pond Area) were analyzed using two laboratory analytical methods, 8270D and 8270D-SIM (selected ion monitoring [SIM]). The latter method includes an analysis of additional alkylated compounds that are lacking in the 8270D method, and was intended to enable the calculation of equilibrium partitioning sediment benchmark toxic units (ESBTUs) in the COPEC refinement step (**Section 4.4.1**) based on the full list of 34 PAH compounds (it is noted that these soil samples are in a transitional exposure area, and as such, are evaluated as both soil and sediment in the BERA). For these samples that were analyzed by both methods, the 8270D SIM PAH test was more sensitive (i.e., had lower reporting limits) and were used preferentially over the 8270D method for compounds detected using both methods.

4.1.2 Surface Water

Surface water datasets used in the BERA were comprised of the results of analyses of surface water samples collected over multiple events and hydrologic conditions:

- Phase I Sampling Events:
  - High-Water: June 2016 (Select surface water bodies)
  - Low-Water: September 2016 (Phase I, Round 1)
  - Low-Water: December 2016 (Phase I, Round 2)
  - High-Water: March-April 2017 (Phase I, Round 3)
  - High-Water: June 2017 (Phase I, Round 4)
  - Low-Water: October-November 2017 (Supplemental South Percolation Pond field activities)
- Phase II Sampling Events:
  - High-Water: June 2018 (Phase II, Round 1)
  - Low-Water: October 2018 (Phase II, Round 2)

A description of the phased surface water sampling program is presented below with an evaluation of the sampling events that captured the potential variability in exposure conditions due to temporal variability in surface water hydrology.

4.1.2.1 Phased Surface Water Sampling Program

Phase I surface water samples were collected from site surface water features that were observed to contain water during the Phase I Site Characterization Program. From June 6, 2016 to June 7, 2016, 10 surface water samples were collected from selected surface water bodies that were anticipated to dry-out over the summer months. These locations included the three locations in the South Percolation Ponds, the five locations in the Cedar Creek Reservoir Overflow Ditch, and the two locations in the northern area of the Site where surface water was observed (referred to as the Northern Surface Water Feature on **Figure 2-2**). Surface water was not present within the North Percolation Ponds (North-West and North-East ponds); therefore, surface water samples were not collected from these locations.

From August 29, 2016 to September 16, 2016, 12 surface water samples were collected from within the Flathead River and Cedar Creek during low water conditions. These locations were determined to be wet throughout the entire year. Similar to the June sampling event, surface water samples were not collected within the North Percolation Ponds (North-West and North-East ponds) due to an absence of surface water.

An additional Phase I round of low-water surface water sampling was conducted in December 2016. Phase I high-water sampling rounds were conducted in March-April 2017 and June 2017. In October-November 2017, additional surface water samples were collected in the South Percolation Ponds and Flathead Riparian Area Channel as part of supplemental field activities for the South Percolation Pond Area (Roux, 2017a and 2019).

Phase I surface water samples were analyzed for:

- Total recoverable and one round of dissolved TAL metals (including major cations Ca, Mg, Na, K) via USEPA Methods 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A
- Total cyanide via USEPA Method 335.4
- General chemistry including fluoride via USEPA method 300, alkalinity via method SM2023B, and hardness via USEPA method 200.7
- Nutrients including chloride and sulfate via USEPA method 300.0, nitrate and nitrite as N via USEPA method 353.2, ammonia nitrogen via USEPA method 350.1 / 350.3, and orthophosphate as P via USEPA method 365.1
- Total dissolved solids (TDS) and total suspended solids (TSS) via methods SM 2540C/D

In addition to the above analyses, biotic ligand model (BLM) parameters data, including temperature and pH, were also collected. Additional BLM parameters, including dissolved organic carbon and sulfide, were not analyzed in this evaluation but were analyzed during the fourth round of Phase I sampling completed in June 2017.

A Phase II high-water sampling event was performed in June 2018, and a low-water sampling event was performed in October 2018 to assess the temporal variability of surface water quality at the Site. Surface water samples were collected as grab samples from within the Site feature to a maximum depth of approximately 2 feet. Surface water samples were analyzed for:

- Total TAL metals via USEPA Methods 6020A / 7470A
- Dissolved TAL metals via USEPA Methods 6020A / 7470A
- Total cyanide via USEPA Method 335.4
- Free cyanide via USEPA Method 9016

- General chemistry including fluoride via USEPA Method 300, alkalinity via USEPA Method 2320B, and total hardness via USEPA Method 2340C
- Nutrients including total chloride and dissolved sulfate via USEPA Method 300.0, nitrate and nitrite as N via USEPA Method 353.2, ammonia nitrogen via USEPA Method 350.1, sulfide via USEPA Method 4500S2F, and orthophosphate as P via USEPA Method 9056A
- Total cyanide via USEPA Method 335.4, dissolved cyanide via USEPA Method 335.4, and free cyanide via USEPA Method 9016 (four opportunity samples in Cedar Creek TCL SVOCs via USEPA Method 8270 LL)
- Alkylated PAHs via USEPA Method 8270D-SIM (select samples in the Backwater Seep Sampling Area, Riparian Area, and Flathead River)

All surface water samples submitted for analysis of dissolved parameters were field filtered using a standard 0.45-micron filter.

4.1.2.2 Temporal Variability in Surface Water Hydrology

Further evaluation of the long-term discharge record for the Flathead River (USGS Gage 12363000) was conducted to determine how the daily flow conditions at the time of each sampling event compared to flow statistics computed with the entire period of daily records (June 1, 1922 to February 4, 2019). This assessment was carried out to identify how discharge conditions in the Flathead River during Phase I and Phase II surface water sampling events compared to annual flow percentiles, which were calculated for the entire population. Daily discharge of the Flathead River from January 2016 to February 2018 is illustrated in **Figure 3-5**. Sampling was conducted predominately during low flow periods representing the 20^{th} – 50^{th} percentiles of flow (Q_{20}-Q_{50}). June sampling events in 2016, 2017, and 2018 reflect periods of high discharge associated with the spring freshet. Discharge during these events was typically greater than the 85^{th} percentile. The combined evaluation of mean monthly statistics for the last 10 years and flow statistics computed from period of record for the Flathead River demonstrate that aqueous phase sampling conducted during Phase I and Phase II investigations comprise a wide range of hydrologic conditions that effectively capture the temporal variability of discharge.

4.1.3 Sediment

Phase I data collection occurred on August 29, 2016 and from September 6 to 9, 2016. Sediment samples were collected from the same locations as surface water samples immediately following the collection of surface water samples at each location. Sediment sampling also included two locations within the North-East and North-West Percolation Ponds where surface water samples were not collected due to the absence of surface water within those features. Sediment samples were collected when river stage levels were low such that the Flathead River would most likely be acting as a gaining stream. Sediment sample locations for transitional and aquatic exposure areas are shown on **Figure 4-9** through **Figure 4-14**.

Gravel and larger sized grains were removed from the sample by passing the grab sediment sample through a size 10 sieve prior to packaging and shipment for laboratory analysis. Sediment samples were analyzed with the same analytical methods as the soils described in **Section 4.1.1** , including grain size analysis and total organic carbon.

Phase II sediment samples were collected during both the high-water event in June 2018 and the low-water sampling event in October 2018. Sediment samples were collected from surface water sample locations previously sampled during Phase I and Supplemental South Pond Assessment, and additional locations added for the Phase II as described in the Phase II SAP (Roux, 2018a). Sediment samples were analyzed for:

- TCL SVOCs via USEPA Method 8270 LL
- TAL metals via USEPA Method 6020A / 7471B
- Total cyanide via USEPA Method 9014
- Fluoride via USEPA Method 9056A

In addition to the above described analyses, select sediment samples located in the Backwater Seep Sampling Area, Riparian Area, South Percolation Ponds, and the Flathead River were also analyzed for the following additional analytes:

- AVS-SEM via USEPA-821-R-100
- Alkylated PAHs via USEPA Method 8270D (CFSDP-005, 026, 027, 028, 029, and 035)

4.1.3.1 PAHs

The potential effects of PAH-induced narcosis on benthic invertebrate communities can include decreased abundance, diversity, and growth (Environment Canada, 1999). The direct contact toxicity of PAHs is additive. Total PAH (tPAH) values were established for sediment samples based on the summed concentrations of the following compounds that comprise the toxic effect level (TEL) screening value that was used in the initial COPEC screening evaluation: acenaphthene, acenaphthylene, anthracene, benzo(k)fluoranthene, benzo(b)fluorene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene.

Similar to the soil samples in the North Percolation Pond Area (**Section 4.1.1.5**), PAHs in some sediment samples in the Flathead River Riparian Area and the Flathead River Area were analyzed using two laboratory analytical methods, 8270D and 8270D-SIM, which includes an analysis of additional alkylated compounds that are lacking in the 8270D method. These data were addressed using the same approach described in **Section 4.1.1.5** for soils.

4.1.3.2 Sediment Evaluation in Transitional Exposure Areas

As described in the BERA Work Plan (EHS Support, 2018), soil and sediment in the four transitional areas (i.e., the North Percolation Pond Area, South Percolation Pond Area, Cedar Creek Reservoir Overflow Ditch, and Northern Surface Water Feature) were combined and evaluated as both soil and sediment in order to be protective of ecological receptors that may utilize the sites during dry and wet conditions, respectively. For the sediment evaluation in these areas, soil samples from the shallow soil interval (0 to 0.5 ft-bgs) and sediment samples were combined to form the sediment dataset used to evaluate aquatic or semi-aquatic exposure scenarios that may occur when the areas are inundated.

4.2 BERA Screening-Level COPEC Criteria

In this step of the screening-level evaluation, exposure to stressors and the relationship between stressor concentrations and ecological effects are evaluated. Maximum concentrations in environmental

media (soil, surface water, and sediment) are the EPCs that are compared to corresponding media-specific conservative effects benchmarks. For each exposure area, constituents were selected for further analysis as COPECs if the maximum detected concentration exceeded an ESV. Constituents that were not detected were not retained as COPECs. However, if one-half the MDL for a non-detected constituent exceeded the most conservative screening level, that constituent was retained for further evaluation in the COPEC refinement (**Section 4.4**). Constituents lacking ESVs were not removed as COPECs at the initial screening stage but were carried forward for evaluation in the COPEC refinement. Constituents that also lacked refined ESVs were discussed in the COPEC refinement uncertainty section.

Consistent with the original Site SLERA (Roux, 2017b), the ESVs for this screening-level COPEC identification step were gathered from the following sources, as detailed in the RI/FS Work Plan (Roux, 2015a) or otherwise requested by USEPA, for each media type:

- Soil
  - USEPA Ecological Soil Screening Levels (USEPA, 2005b)
  - Los Alamos National Laboratory (LANL) ECORISK Database (LANL, 2017)
  - *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates* (Efroymson et al., 1997a)
  - *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants* (Efroymson et al., 1997b)
  - Region 5 Resource Conservation and Recovery Act (RCRA) Ecological Screening Levels (USEPA, 2003b)
- Surface Water:
  - USEPA National Recommended Water Quality Criteria (USEPA, 2019)
  - Montana Department of Environmental Quality (MDEQ) Circular DEQ-7 (MDEQ, 2017)
  - *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota* (Suter and Tsao, 1996)
  - USEPA Region 3 Freshwater Screening Benchmark (USEPA, 2006a)
  - Canadian Water Quality Guidelines, Summary Table (CCME, 2008)
- Sediment:
  - Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems (MacDonald et al., 2000)
  - USEPA Region 3 Freshwater Sediment Screening Benchmarks (USEPA, 2006b)
  - *Calculation and evaluation of sediment effect concentrations for the amphipod Hyalella azteca and the midge Chironomus riparius* (Ingersoll et al., 1996)
  - Region 5 RCRA Ecological Screening Levels (USEPA, 2003b)

The minimum ESV from these sources was selected as the benchmark criterion for the selection of screening-level COPECs. A comprehensive summary of all the soil, surface water, and sediment ESVs used during this evaluation are provided in **Appendix B**. Because chromium speciation data were used to estimate relative concentrations of Cr(III) and Cr(VI) in all soil samples (**Section 4.1.1.2**), soil ESVs based on trivalent chromium were used for comparison to total and estimated Cr(III) concentrations, and soil ESVs based on hexavalent chromium were used for comparison to Cr(VI) concentrations.

Surface water ESVs are based upon chronic toxicity values and applied based on the filtered (dissolved) or unfiltered (total) fraction in accordance with the basis of the minimum ESV selected for each constituent. ESVs were based on dissolved criteria for metals with dissolved criteria promulgated as National Recommended Water Quality Criteria (NRWQC); ESVs were also evaluated based on total

criteria for metals, except for aluminum, consistent criteria promulgated in MDEQ Circular 7 (MDEQ, 2017). Hardness- or pH- dependent surface water ESVs shown in **Appendix B** for ammonia, cadmium, lead, nickel, and zinc were calculated using sample-specific hardness values, consistent with the BERA Work Plan. The resulting calculations for these sample-specific adjustments are presented in **Appendix D.**

As specified in the SLERA, when evaluating each pathway, maximum constituent concentrations measured in soil, surface water, and sediment within each exposure area were compared to the lowest identified ESV obtained from the above sources. By using maximum concentrations in the environmental media (soil, surface water, and sediment) and the lowest screening benchmarks, the initial COPEC screening evaluation is designed to minimize chances of eliminating a COPEC from further consideration when it may pose an actual ecological risk. Thus, the resulting risk calculation is expected to be an overestimate of actual risk (USEPA, 1997).

If the maximum concentration of a constituent exceeded the most conservative ESV, the COPEC was retained for further evaluation in the ecological risk assessment process. If the maximum concentration was less than the ESV, this indicates that adverse effects are not likely, and the analyte can be eliminated from further investigations.

4.3 Screening-Level Selection of COPECs

The full compilation of screening-level selection tables for all exposure areas and media are presented in **Appendix B**. A summary table of the results is presented in **Table 4-14** for soil and sediment, and **Table 4-15** for surface water. The results of the initial screening-level selection of COPECs for all exposure areas are discussed in the following subsections. Constituents were identified as screening-level COPECs if their maximum detected concentration exceeded the minimum screening ESV, or if no ESV was available.

4.3.1 Terrestrial Exposure Areas

The results of the screening-level COPEC selection process are described below for soil in the seven terrestrial exposure areas at the Site.

4.3.1.1 Main Plant Area

For the Main Plant Area, 25 inorganics (including metals, other inorganic parameters, and essential nutrients), 14 individual PAH compounds, both LMW and HMW PAH categories, 7 non-PAH SVOCs, 6 VOCs, dioxins, and 1 PCB were identified as screening-level COPECs in soil. These constituents were carried forward to the refinement COPEC selection step described in **Section 4.4**.

4.3.1.2 Central Landfills Area

For the Central Landfills Area, 25 inorganics (including metals, other inorganic parameters, and essential nutrients), 15 individual PAH compounds, both LMW and HMW PAH categories, 8 non-PAH SVOCs, 6 VOCs, dioxins, and 1 PCB were identified as screening-level COPECs in soil. These constituents were carried forward to the refinement COPEC selection step described in **Section 4.4**.

4.3.1.3 Industrial Landfill Area

For the Industrial Landfill Area, 25 inorganics (including metals, other inorganic parameters, and essential nutrients), 10 individual PAH compounds, and both LMW and HMW PAH categories were identified as screening-level COPECs in soil. These constituents were carried forward to the refinement COPEC selection step described in **Section 4.4**.

4.3.1.4 Eastern Undeveloped Area

For the Eastern Undeveloped Area, 21 inorganics (including metals, other inorganic parameters, and essential nutrients), 2 individual PAH compounds, HMW PAHs, and 4 non-PAH SVOCs were identified as screening-level COPECs in soil. These constituents were carried forward to the refinement COPEC selection step described in **Section 4.4**.

4.3.1.5 North-Central Undeveloped Area

For the North-Central Undeveloped Area, 20 inorganics (including metals, other inorganic parameters, and essential nutrients), HMW PAHs, 2 non-PAH SVOCs, and 1 VOC were identified as screening-level COPECs in soil. These constituents were carried forward to the refinement COPEC selection step described in **Section 4.4**.

4.3.1.6 Western Undeveloped Area

For the Western Undeveloped Area, 22 inorganics (including metals, other inorganic parameters, and essential nutrients), HMW PAHs, 3 non-PAH SVOCs, 4 VOCs, and dioxins were identified as screening-level COPECs in soil. These constituents were carried forward to the refinement COPEC selection step described in **Section 4.4**.

4.3.1.7 Flathead River Riparian Area

For the Flathead River Riparian Area, 17 inorganics (including metals, other inorganic parameters, and essential nutrients), 1 individual PAH compound, HMW PAHs, 3 non-PAH SVOCs, and 5 VOCs were identified as screening-level COPECs in soil. These constituents were carried forward to the refinement COPEC selection step described in **Section 4.4**.

4.3.2 Incremental Soil Sampling Area

For the Incremental Soil Sampling Area, the initial COPEC selection step was performed using Operational Area data comprised of the three scenarios described in **Section 4.1.1.1**. This data set was comprised of the UCL concentrations from the DUs with triplicate ISS samples, plus 1.) results from non-triplicate DUs adjusted high using the RSD adjustment factor, 2.) the original measured concentrations in the non-triplicate DUs, and 3.) results from non-triplicate DUs adjusted low using the RSD adjustment factor. Only the high-adjusted dataset was used to select screening-level COPECs in the ISS area soil. 26 inorganics (including metals, other inorganic parameters, and essential nutrients), 16 individual PAH compounds, LMW and HMW PAHs, 8 non-PAH SVOCs, and 2 PCBs were identified as screening-level COPECs in soil. These constituents were carried forward to the refinement COPEC selection step described in **Section 4.4**.

4.3.3 Transitional Exposure Areas

The results of the screening-level COPEC selection process are described below for soil and sediment in the four transitional exposure areas at the Site.

4.3.3.1 North Percolation Pond Area

4.3.3.1.1 Soil

For the North Percolation Pond Area, 26 inorganics (including metals, other inorganic parameters, and essential nutrients), 16 individual PAH compounds, both LMW and HMW PAH categories, 4 non-PAH SVOCs, and 6 VOCs were identified as screening-level COPECs in soil. These constituents were carried forward to the refinement COPEC selection step described in **Section 4.4**.

4.3.3.1.2 Surface Water

For the North Percolation Pond Area, 19 inorganic constituents (including both total and filtered fractions) and 9 PAHs were identified as screening-level COPECs in surface water. These constituents were carried forward for COPEC refinement, as described in **Section 4.4**.

4.3.3.1.3 Sediment

For the North Percolation Pond Area, 23 inorganics (including metals, other inorganic parameters, and essential nutrients), 17 individual PAH compounds, Total PAHs, and 3 non-PAH SVOCs were identified as screening-level COPECs in sediment. These constituents were carried forward to the refinement COPEC selection step described in **Section 4.4**.

4.3.3.2 South Percolation Pond Area

4.3.3.2.1 Soil

For the South Percolation Pond Area, 24 inorganics (including metals, other inorganic parameters, and essential nutrients), 2 individual PAH compounds, HMW PAHs, 5 non-PAH SVOCs, and 5 VOCs were identified as screening-level COPECs in soil. These constituents were carried forward to the refinement COPEC selection step described in **Section 4.4**.

4.3.3.2.2 Surface Water

For the South Percolation Pond Area, 26 inorganic constituents (including both total and filtered fractions) and 3 PAHs were identified as screening-level COPECs in surface water. These constituents were carried forward for COPEC refinement, as described in **Section 4.4**.

4.3.3.2.3 Sediment

For the South Percolation Pond Area, 19 inorganics (including metals, other inorganic parameters, and essential nutrients), 13 individual PAH compounds, Total PAHs, 5 non-PAH SVOCs, and 5 VOCs were

identified as screening-level COPECs in sediment. These constituents were carried forward to the refinement COPEC selection step described in **Section 4.4**.

4.3.3.3 Cedar Creek Overflow Ditch

4.3.3.3.1 Soil

For the Cedar Creek Reservoir Overflow Ditch Area, 18 inorganics (including metals, other inorganic parameters, and essential nutrients), 1 individual PAH compound, HMW PAHs, and 3 non-PAH SVOCs were identified as screening-level COPECs in soil. These constituents were carried forward to the refinement COPEC selection step described in **Section 4.4**.

4.3.3.3.2 Surface Water

For the Cedar Creek Reservoir Overflow Ditch Area, 10 inorganic constituents (including both total and filtered fractions) were identified as screening-level COPECs in surface water. These constituents were carried forward for COPEC refinement, as described in **Section 4.4**.

4.3.3.3.3 Sediment

For the Cedar Creek Reservoir Overflow Ditch Area, 13 inorganics (including metals, other inorganic parameters, and essential nutrients), 14 individual PAH compounds, Total PAHs, and 3 non-PAH SVOCs were identified as screening-level COPECs in sediment. These constituents were carried forward to the refinement COPEC selection step described in **Section 4.4**.

4.3.3.4 Northern Surface Water Feature

4.3.3.4.1 Soil

For the Northern Surface Water Feature Area, 18 inorganics (including metals, other inorganic parameters, and essential nutrients) and 1 non-PAH SVOC were identified as screening-level COPECs in soil. These constituents were carried forward to the refinement COPEC selection step described in **Section 4.4**.

4.3.3.4.2 Surface Water

For the Northern Surface Water Feature Area, 10 inorganic constituents (including both total and filtered fractions) were identified as screening-level COPECs in surface water. These constituents were carried forward for COPEC refinement, as described in **Section 4.4**.

4.3.3.4.3 Sediment

For the Northern Surface Water Feature Area, 14 inorganics (including metals, other inorganic parameters, and essential nutrients), 10 individual PAH compounds, Total PAHs, and 4 non-PAH SVOCs were identified as screening-level COPECs in sediment. These constituents were carried forward to the refinement COPEC selection step described in **Section 4.4**.

4.3.4 Aquatic Exposure Areas

The results of the screening-level COPEC selection process are described below for surface water and sediment in the two aquatic exposure areas at the Site.

4.3.4.1 Flathead River

4.3.4.1.1 Surface Water

For the Flathead River, 16 inorganic constituents (including both total and filtered fractions), 11 PAHs, and 2 non-PAH SVOCs were identified as screening-level COPECs in surface water. These constituents were carried forward for COPEC refinement, as described in **Section 4.4**.

4.3.4.1.2 Sediment

For the Flathead River, 8 inorganics (including metals, other inorganic parameters, and essential nutrients), 14 individual PAH compounds, Total PAHs, 4 non-PAH SVOCs, and 5 VOCs were identified as screening-level COPECs in sediment. These constituents were carried forward to the refinement COPEC selection step described in **Section 4.4**.

4.3.4.2 Cedar Creek

4.3.4.2.1 Surface Water

For Cedar Creek, 10 inorganic constituents (including both total and filtered fractions) were identified as screening-level COPECs in surface water. These constituents were carried forward for COPEC refinement, as described in **Section 4.4**.

4.3.4.2.2 Sediment

For Cedar Creek, 9 inorganics (including metals, other inorganic parameters, and essential nutrients), 12 individual PAH compounds, Total PAHs, and 2 non-PAH SVOCs were identified as screening-level COPECs in sediment. These constituents were carried forward to the refinement COPEC selection step described in **Section 4.4**.

4.4 Refined COPEC Screening Process

Following the initial selection of screening-level COPECs, a refined COPEC screening process was conducted to preliminarily identify focal COPECs that may influence the BERA. The refined COPEC screening process considers alternative ESVs and other criteria for COPECs identified in the conservative SLERA screening process. A fundamental step in the baseline problem formulation is the refinement of COPECs to identify those constituents that are most likely to drive risk management decision-making for the Site. The intent of the refinement step is to focus and streamline the overall ERAGS process. COPEC refinement in the BERA problem formulation is consistent with USEPA *The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments* (USEPA, 2001a). Specific elements of COPEC refinement include consideration of the following:

- Use of refined ESVs: Alternative ESVs that are protective of chronic exposure but represent a broader range of protective NOEC endpoints are considered to provide context for the potential ecological risk associated with COPECs identified in the initial screening step, and to focus evaluation of COPECs in the BERA.
- Background concentrations: COPECs in exposure areas at concentrations that are not significantly different from background concentrations may represent regional conditions that are not related to site activities or are not likely to drive risk in the BERA.
- Frequency of detection: COPECs that are infrequently detected (less than 5 percent) are not likely to ultimately drive risk management decisions in the BERA process. The magnitude of exceedance of ESVs and BTVs was considered as part of the refinement of infrequently detected COPECs.
- Dietary considerations: COPECs that serve as essential nutrients (e.g., calcium, iron, magnesium, sodium, and potassium) typically pose little threat to ecological receptors when present in concentrations that allow them to function as nutrients. As described in **Section 4.4.4** however, calcium received special consideration due to its potential presence at elevated concentrations due to its generation in historical waste streams at the Site.

Each of these criteria are discussed in greater detail in the following sections. Additionally, COPECs retained because they lacked ESVs, or with MDLs exceeding conservative ESVs are re-evaluated in the refined COPEC screening uncertainty section as part of the BERA Problem Formulation.

4.4.1 Refined ESVs

As discussed in **Section 3.2**, the conservative exposure scenario evaluated in the SLERA (maximum exposure concentrations and minimum ESVs) and incorporated into the screening-level COPEC selection in the BERA problem formulation minimizes the potential for COPECs to be dismissed from the screening process prematurely, but does not provide a basis for assessing the potential for adverse effects to occur. Alternative ESVs are used in the COPEC refinement process to be protective of chronic exposure to ecological receptor groups, but also represent a broader range of NOECs than the minimum ESVs used in the conservative initial screening step.

A summary of preliminary ESVs used for the initial BERA screening-level COPEC identification is presented in **Appendix B**. Additional documentation and description of the refined ESVs used for the BERA COPEC refinement is presented in **Table A-1** (soil and sediment) and **Table A-2** (surface water and ground water) in the ESV Interim Deliverable presented in **Appendix A1**. This interim deliverable was prepared for USEPA review to support the selection of revised ESVs from a range of NOECs identified in literature sources. The refined ESVs are used in the COPEC refinement step of the BERA Problem Formulation to re-screen data from each exposure area and exposure medium based on the combined Phase I and Phase II Site Characterization datasets.

For the BERA COPEC refinement, Phase I and Phase II data were grouped by exposure medium, and maximum concentrations were compared to alternative ESVs. For soil, COPEC refinement included comparison of surface (0-0.5 ft) and shallow (0.5-2 ft) soil data from terrestrial and transitional exposure areas, as well as sediment data from transitional exposure areas (as described in **Section 4**) to refined soil ESVs. For surface water, COPEC refinement included comparison of surface water data from aquatic and transitional exposure areas to refined ESVs based on USEPA NRWQC or MDEQ chronic surface water quality for the protection of aquatic life. For sediment, COPEC refinement included comparison of

sediment data from aquatic exposure areas, and a combination of surficial (0 to 0.5 ft) soil and sediment from transitional exposure areas (as described in **Section 4.1.3.2**) to refined sediment ESVs. The following sections summarize the refined COPEC screening process. A complete description of the ESVs used for the refined COPEC screen is presented in the refined ESVs interim deliverable presented in **Appendix A1**. The raw data used to perform the BERA is presented in the Phase II DSR (Roux, 2019).

4.4.1.1 Refined Soil ESVs

Refined soil ESVs were derived based on peer-reviewed, multi-trophic level soil screening criteria. The derivation of refined soil screening criteria was based on the USEPA approach for deriving ecological soil screening levels (Eco-SSLs). Eco-SSLs were derived as risk-based soil screening levels through a peer review process for the protection of multiple terrestrial receptor categories (USEPA, 2005b):

- Terrestrial plants
- Soil invertebrates
- Birds
- Mammals

Eco-SSLs are intended for use in the screening process to identify constituents that are not of potential ecological concern and do not need to be considered in the BERA (USEPA, 2005b). Eco-SSLs are considered to be protective of terrestrial ecosystems, including rare, endangered, and threatened species that may be present (USEPA, 2005b). Per Eco-SSL guidance, toxicity of aluminum and iron to terrestrial biota exhibits little correlation to detected concentrations in soil. Rather, the acidity of the soil was found to be a much more reliable indicator of toxic effects. As such, the guidance recommends replacing a numeric screening value associated with constituent toxicity with the measured soil pH. Soils with pH greater than 5.5 for aluminum and 5 for iron are considered to pose little to no risk to ecological receptors. The laboratory-measured pH from 36 soil samples collected across the Site ranged from 7.4 to 9. Therefore, aluminum and iron were excluded as COPECs in soil at all exposure areas.

To supplement established Eco-SSL criteria, endpoints from the multiple terrestrial receptor categories included in the Eco-SSL approach were compiled from the LANL ECORISK Database (Release 4.1; LANL, 2017). The LANL ECORISK Database presents benchmarks that were developed using an approach similar to the derivation of Eco-SSLs, i.e., the guidance selected geometric mean concentrations of NOEC endpoints as the screening criteria for multiple terrestrial receptor foraging guilds, or generic receptor groups, within a specific medium. The minimum of the available LANL and Eco-SSL values for multiple terrestrial receptor foraging guilds or groups was used in the BERA as the refined soil ESV for that constituent to provide for the protection of each receptor group. In the absence of sufficient data to refine soil ESVs based on the Eco-SSL approach, the conservative minimum ESV used in the SLERA was retained.

Avian and mammalian exposures to the mixture of 17 dioxin and furan compounds analyzed in surficial soil samples were evaluated relative to the toxicity of 2,3,7,8-TCDD using TEFs developed for birds and mammals by the WHO (Van den Berg et al., 2006; Van den Berg et al., 1998; USEPA, 2008b). For dioxin and furan screening, measured concentrations of the 17 dioxin and furan compounds in surface soil samples were multiplied by compound specific TEFs to calculate toxicity equivalence concentrations (TECs) for each compound. The summed TECs for each sample were compared to soil concentrations protective of avian and mammalian exposure to 2,3,7,8-TCDD. As discussed in **Section 4.1.1.4**, dioxin

and furan concentrations that were below the detection limit were estimated as 0, one-half the MDL, and the MDL. TEC calculations for dioxin and furan samples are provided in **Appendix C**.

Terrestrial plant and soil invertebrate exposures to dioxin and furan compounds were not considered in the screening evaluation since it has been demonstrated that a wide variety of invertebrates and plants are insensitive to dioxin and furan exposure relative to birds and mammals (USEPA, 2008b). However, the LANL ECORISK Ecological Screening Level of 5 mg/kg for 2,3,7,8-TCDD is included in the evaluation of soil-dwelling invertebrate direct contact exposure to dioxin and furan compounds.

In the absence of sufficient data to refine soil ESVs, the conservative minimum ESVs used in the SLERA were retained.

4.4.1.2 Refined Surface Water ESVs

Refined ESVs for surface water were preferentially based on USEPA NRWQC or MDEQ chronic surface water quality for the protection of aquatic life. Chronic aquatic life surface water criteria are derived for the protection of 95 percent of aquatic species. Therefore, these criteria are considered adequately protective to identify COPEC concentrations in surface water that have the potential to result in adverse ecological effects and warrant additional evaluation in the BERA. In the absence of NRWQC or MDEQ criteria, refined ESVs were selected from the sources listed in **Section 4.2** that are protective of chronic exposure.

Refined ESVs were applied to sample results corresponding to the aqueous toxicity data used to establish the chronic aquatic life surface water criteria. For many metals, NRWQC chronic surface water quality criteria are based on exposure to the dissolved phase. For these COPECs, refined ESVs were applied to filtered surface water sample results[2], which operationally represent the dissolved COPEC phase in the sample. MDEQ criteria for metals, except for aluminum, are based on the total result; therefore, MDEQ criteria were applied to unfiltered surface water sample results. If either phase of metal exceeded refined ESVs, the COPEC was retained for further evaluation in the BERA.

Hardness- or pH- dependent refined ESVs were derived on a sample-specific basis for ammonia, fluoride, cadmium, chromium, lead, nickel, zinc, and pentachlorophenol, consistent with the BERA Work Plan. USEPA NRWQC for copper and aluminum are based on models developed to characterize the bioavailable forms of these metals in surface water based on water quality parameters. The NRWQC for copper is based on the USEPA BLM, which accounts for organic compounds and inorganic ligands in surface water that are known to complex with copper and affect bioavailability and toxicity (USEPA, 2007b). For aluminum, the refined ESV is based on recently promulgated (December 2018) USEPA aquatic life ambient water quality criteria developed using multiple linear regression models to characterize aluminum bioavailability based on pH, hardness, and dissolved organic carbon (DOC; USEPA, 2018). The associated calculations for sample-specific adjustments for refined surface water ESVs are presented in **Appendix D.**

In the absence of sufficient data to refine surface water ESVs based on USEPA NRWQC or MDEQ surface water quality criteria, the conservative minimum ESVs used in the SLERA were retained.

[2] Filtered samples were collected in the fourth round of Phase I sampling and in all Phase II sampling rounds.

4.4.1.3 Refined Sediment ESVs

Refined ESVs for sediment were based primarily on consensus-based criteria and equilibrium partitioning-based criteria for PAHs. Consistent with the approach used for refined soil ESVs, refined sediment ESVs for metal COPECs and select organic COPECs were estimated as the geometric mean of NOEC endpoints following the consensus-based approach (MacDonald et al., 2000).

Refined ESVs for PAHs in sediment were based on USEPA *Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures* (USEPA, 2003a). ESBs derived in USEPA (2003a) were used to estimate the potential additive narcotic effects of PAH mixtures in sediment based on theoretical partitioning of PAH compounds between organic carbon and pore water. Exposure to the PAH mixture was evaluated based on the sum of equilibrium partitioning sediment benchmark toxic units (∑ESBTUs) calculated from individual PAH compounds:

$$\sum ESBTU_{FCV,Total} = \sum_{i=1}^{13} \frac{C_{oc,PAHi}}{C_{oc,PAHi,FCVi}} \times UF$$

where:

$\sum ESBTU_{FCV,Total}$ = Sum of ESBTUs for the PAH mixture based on 34 PAH compounds (unitless)

$C_{oc,PAHi}$ = Organic carbon normalized concentration of PAH *i* ($\mu g/g_{oc}$)

$C_{oc,PAHi,FCVi}$ = Organic carbon normalized critical concentration of PAH *i* based on the final chronic value (FCV; $\mu g/g_{oc}$)

UF = Uncertainty factor to estimate the toxicity of total PAHs (based on 34 PAHs – 18 parent and 16 alkylated compounds)

Sediment samples collected in the Phase I and II Site Characterization were analyzed for 13 or 34 PAH compounds included in the USEPA ESB model. For samples analyzed for 13 PAHs compounds, an uncertainty factor of 2.75 was applied to account for the potential toxicity of unmeasured PAHs in the ∑ESBTU calculation (USEPA, 2003a). Some sediment samples in the Flathead River Riparian and Northern Percolation Pond transitional areas, and the Flathead River aquatic exposure area were also analyzed during Phase II for a broader suite of PAHs using the SIM analytical method 8270D SIM. This method analyzes for 34 PAHs (18 parent and 16 alkylated compounds). For these samples, ∑ESBTU values were calculated without the use of an uncertainty factor. Method 8270D SIM data were used preferentially over the non-SIM PAH results, when available. ∑ESBTU values less than or equal to 1.0 are considered acceptable for the protection of benthic invertebrate receptors; values exceeding 1.0 indicate a potential for narcotic effects in benthic receptors (USEPA, 2003a). ∑ESBTU values greater than 10 result in more frequent adverse effects to benthic test organisms.

Several non-PAH nonionic organic constituents were identified as screening-level COPECs in sediment in transitional and aquatic exposure areas, including 3- and 4-methylphenol, 4-chloroaniline, benzaldehyde, bis(2-ethylhexyl)phthalate (BEHP), carbazole, acetophenone, dibenzofuran, and phenol. ESBs for these constituents were developed using the EqP approach described in *Procedures for the*

Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: Compendium of Tier 2 Values for Nonionic Organics (USEPA, 2008a). ESB values represent concentrations of nonionic organic constituents in bulk sediment that, at equilibrium, would result in partitioning to sediment pore water at concentrations equivalent to NOEC water quality benchmarks (WQB_{NOEC}). ESB_{NOEC} values for nonionic constituents were calculated using chronic $WQBs_{NOEC}$ and constituent-specific organic carbon-water partitioning coefficients (K_{oc}):

$$ESB_{NOEC} = (f_{oc} \times K_{oc} \times WQB_{NOEC})$$

where:

ESB_{NOEC} = Equilibrium-partitioning sediment benchmark based on NOEC aqueous toxicity data (microgram per kilogram [µg/kg] dw sediment)

f_{oc} = Fraction of organic carbon in sediment

K_{oc} = Organic carbon-water partitioning coefficient (liter per kilogram [L/kg])

WQB_{NOEC} = Water quality benchmark based on a chronic NOEC (microgram per liter [µg/L])

If available, appropriate WQB_{NOEC} values were identified from the preliminary ESVs for surface water (**Appendix B**). Constituent-specific organic carbon-water partitioning coefficient (K_{oc}) values were calculated as a function of K_{ow}. Constituent-specific values for K_{ow} were obtained from EPA Estimation Programs Interface (EPI) Suite database. K_{oc} values were estimated based on constituent-specific K_{ow} values based on the following relationship (USEPA, 2008a; Di Toro et al, 1991):

$$\log K_{oc} = 0.0028 + 0.983 \times (\log K_{ow})$$

where:

$\log K_{oc}$ = log organic carbon-normalized sediment quality benchmark (L/kg)
$\log K_{ow}$ = log octanol-water partition coefficient (unitless)

Equilibrium partitioning-based benchmark calculations for non-PAH and PAH constituents are presented in **Appendix F** and **Appendix G**, respectively. In the absence of consensus-based or equilibrium partitioning approaches, refined sediment ESVs were selected from the sources listed in **Section 4.2** that are protective of chronic exposure. If sufficient data were not available to refine sediment ESVs, the conservative minimum ESV used in the SLERA was retained.

4.4.2 Background Evaluation

As described in the *Background Investigation Sampling and Analysis Plan* (Roux, 2018b), soil background samples were collected from four nearby terrestrial areas with soil types that match those found at the Site. Surface water and sediment background samples were collected from two aquatic reference areas upgradient of the influence of any potential Site waste streams. Data from these samples were used to calculate general statistics on background constituents, including BTVs that are intended to represent upper-bound background concentrations. The methods and results of these calculations are presented in (Roux, 2019).

Following the procedures outlined in the Background SAP (Roux, 2018b), for exposure areas except the ISS grid (i.e., the Operational Area), UCL_{mean} concentrations for constituents detected in the on-site

ecological exposure areas were compared to the mean background concentration for the constituents derived from the reference area samples as an initial evaluation as to whether the constituent was background-related. The UCL_{mean} concentrations were calculated only for site data obtained from the shallow (0 to 0.5 ft-bgs) soil samples to match the depths of soils collected in the background reference area (Roux, 2018b and 2019). USEPA ProUCL software (version 5.1; USEPA, 2015b) was used to calculate the on-site statistics for comparison to background. Occasionally, ProUCL recommended a UCL_{mean} based on the H-statistic method, which often results in an impractically large UCL value. Based on general recommendations in the ProUCL User's Guide (USEPA, 2015b), an alternate calculated UCL_{mean} (usually the Chebyshev 95 percent UCL_{mean}) was selected for use for that constituent. ProUCL output and summary statistics are presented in **Appendix I.** Because the ISS grid consists of a combination of UCLs calculated for the DUs with triplicate data and single ISS sample data adjusted based on the RSD of the DUs with triplicates (see **Section 4.1.1.1**), developing an Operational Area-wide UCL value to compare against the mean background concentrations is not statistically appropriate, as the concentrations from the individual DUs have varying statistical properties and underlying assumptions. Therefore, comparisons to background concentrations were not used as a criterion for refining COPECs in the Operational Area ISS grid.

Table 4-16 presents the background reference areas that were selected for comparison to the terrestrial, transitional, and aquatic exposure areas. The selection of reference areas for the aquatic exposure areas is straightforward; constituents detected in surface water and sediment in the Flathead River and Cedar Creek aquatic exposure areas were compared with concentrations in the upgradient Flathead River and Cedar Creek reference areas, respectively. For soil, four background reference areas were established (SO#1, SO#2, SO#3, and SO#4) that reflected soil types found on-site. The background dataset for the reference area that had the most similar soil type to the exposure area being investigated was selected for the background comparison in this BERA. The Flathead Valley in the vicinity of the site is comprised of three primary soil types: 1) Glacial Till and Alluvium (soils deposited by glacial activity); 2) Fluvial Deposits and Riverwash (soils deposited by river activity); and 3) Mountainous Land with Glacial Deposits, which is expressed at the surface as Teakettle Mountain (soil interaction between the glacial outwash and bedrock) (Roux, 2018b). Although most ecological exposure areas near the facility were comprised of glacial till and alluvium, the mountainous land will glacial deposits soil type had a minor presence (e.g., less than approximately 10 percent spatial coverage) at a few of the areas. In these cases, the soil reference area that represented the dominant soil type at the exposure area was selected for the background evaluation. In all terrestrial and transitional soil areas, except for the Flathead River Riparian Area and the South Percolation Pond Area, the dominant soil type was influenced by glacial till and alluvium most similar to soil from background reference area SO#1. The Flathead River Riparian Area and the South Percolation Pond Area are both located in soil types dominated by alluvial deposits. Two background reference areas (SO#2 and SO#3) were collected in soil types similar to these two exposure areas. The lower of these two background concentrations was selected as the mean concentration for comparison to the UCL_{mean} of concentrations detected in the Flathead River Riparian Area and the South Percolation Pond Area.

As described in **Section 4.1.1**, soil and sediment samples collected from transitional exposure areas were evaluated both as soil and as sediment to account for protecting the different receptor communities that may use the areas during dry periods and during inundation. The underlying soil type guided the selection of the background soil reference area for the soil comparison, as discussed above. For the sediment comparison, the Cedar Creek Reservoir Overflow Ditch transitional area has an upgradient connection to Cedar Creek; therefore, the Cedar Creek background sediment data were used for the sediment evaluation in this exposure area. The North and South Percolation Ponds and the Northern

Surface Water Feature transitional exposure areas are hydrologically isolated from the two aquatic reference areas in the Flathead River and Cedar Creek. The transitional sediment/soil areas represent process-driven depressions where organic material and fines are likely to have been deposited. Thus, the substrates in these areas have characteristics that make a comparison to background concentrations derived from stream and river systems inappropriate. Therefore, the background soil reference area selected for the soil comparison in these three transitional exposure areas were also used for the sediment comparison.

Surface water in the transitional exposure areas was compared to background reference data from the most appropriate aquatic reference water body based on proximity, overland flow patterns, and regional drainage characteristics. Based on this evaluation, surface water from the North Percolation Pond Area, Cedar Creek Reservoir Overflow Ditch, and the Northern Surface Water Feature were compared to surface water reference data from Cedar Creek. Surface water from the South Percolation Pond Area was compared to surface water reference data from the Flathead River.

Constituents in each exposure area with 95 percent UCL_{mean} concentrations below the mean background concentration were not retained as COPECs (Roux, 2018b). However, constituents excluded as COPECs based on this comparison, with maximum detected concentrations exceeding refined ESVs, are discussed further in the COPEC selection uncertainty section (**Section 4.6**). Constituents with 95 percent UCL_{mean} concentrations exceeding the mean background concentration were subjected to a secondary background evaluation consisting of a two-sample hypothesis test to determine if the site and background populations are significantly different (Roux, 2018b). If the site concentrations are determined to be from a different population, and the mean (or median) is greater than that of the background data plus the significant difference (1.3 times the standard deviation), then the constituent was considered to be a COPEC. Otherwise, the constituent was considered to be background-related. When two reference areas were available for either soil or sediment in a given exposure area (e.g., SO#2 and SO#3 were selected as appropriate reference areas for Flathead River Riparian Area; see **Table 4-16** and Roux, 2019) a two-sample hypothesis test was separately performed for each constituent using data from both sets of reference areas. If the result of either test indicated that the populations were not significantly different between the site and reference area, then the constituent was considered to be background-related. The results of the two-sample hypothesis testing are summarized in the COPEC refinement tables and presented in full in the Phase II DSR (Roux, 2019).

4.4.3 Frequency of Detection

Constituents that are detected infrequently may be artifacts in the data that may not reflect site-related activity or disposal practices. These constituents are not evaluated further in the risk evaluation. Generally, constituents that are detected only at low concentrations in less than 5 percent of the samples (if more than 20 samples were analyzed) were initially eliminated from further consideration. Constituents detected infrequently at elevated concentrations as compared with ESVs and/or BTVs may indicate the presence of “hot spots” and may be retained in the evaluation. The maximum detected concentrations of constituents that were detected in less than 5 percent of samples were compared to a value equal to 10-times the ESV or BTV for that constituent, whichever is greater. Although no recommendation on hot spot identification was identified in MDEQ guidance, this approach is consistent with environmental guidance on identification of hot spots in other states. For example, the Land Quality Division in the state of Oregon (State of Oregon Department of Environmental Quality, 1998) defines a soil hot spot as an area where a constituent is present at 10 times the acceptable risk level (or

up to 50 times the risk level for non-threatened or endangered species). The New Jersey Site Remediation Program (New Jersey Department of Environmental Protection, 2018) lists one of its criteria for hot spots as areas where "the magnitude of the exceedance is substantial (e.g., more than 10 times the ecological screening criteria or background concentrations)". If the maximum detected concentration exceeded this value, exceedances were plotted on a map. Professional judgment was used to evaluate whether the exceedances were spatially clustered, such that regular exposure could occur in a localized, but ecologically relevant portion of the site. Infrequently detected constituents that meet these criteria were retained as refined COPECs and evaluated for risk associated with direct contact and wildlife ingestion exposure pathways.

The frequency of detection criterion was not used in the COPEC refinement step for the Operational Area. The individual DUs that comprise the ISS sampling grid represent independent exposure areas; therefore, it is not appropriate to exclude constituents as refined COPECs that occur in a low percentage of DUs because localized disposal practices could have resulted in the site-related presence of a given constituent in a single DU. Also, small range receptors could realistically receive all (or nearly all) of their exposure within one DU; thus, the elimination of a COPEC detected in a low percentage of samples because it would be infrequently encountered by a receptor is not a valid assumption for the Operational Area, where each "sample" represents an area that is approximately 1 acre in size.

4.4.4 Nutrient Status

As described in Supplemental Component 3 of *The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments* (USEPA, 2001a), physiological electrolytes (e.g., iron, magnesium, sodium, and potassium) or macro and micro-nutrients (e.g., nitrogen, phosphorus, and copper) are considered in the broader context of their essential role in performing intracellular functions in aquatic and terrestrial flora and fauna. Within the soil, surface water, and sediment matrices evaluated as part of the ecological investigation, several constituents require further discussion pertaining to dietary considerations. Anions, cationic metals, and nutrient constituent groups are discussed below for each matrix evaluated. The anion chloride is discussed, as well as the cationic metals sodium, potassium, calcium, and magnesium. Nutrients, measured in surface water, include nitrate/nitrite-nitrogen, ammonium-nitrogen, and total orthophosphate-phosphorus. Most nutrients, cationic metals, and anions lacked ESVs in the initial COPEC screening evaluation. However, these constituents were included as they provide important ancillary information that can refine exposure criteria (e.g., BLM in surface waters) or further characterize exposure to identified COPECs. The role of these constituents as essential components of specialized intracellular functions is discussed below.

Cationic metals, including calcium, magnesium, potassium, and sodium, were evaluated in sediment and soil matrices. The range of observed constituent concentrations and means across exposure areas in site surface soil (0 to 2 ft-bgs) and sediment was compared to BTVs developed for the Site and to the range of typical values for western soils described in *Element Concentrations in Soils and other Surficial Materials of the Conterminous United States* (USGS, 1984):

Cationic Metal	CFAC Site	CFAC Site, Range of Means	CFAC Background (Range of BTVs)	Western U.S. Soils (USGS, 1984)	
	Concentration Range (mg/kg)	Concentration Range (mg/kg)	Concentration Range (mg/kg)	Geomean ± GSD Concentration (mg/kg)	Concentration Range (mg/kg)
Calcium	427 to 313,000	8,152 to 125,544	16,691 to 47,061	18,000 ± 30,500	600 to 320,000
Magnesium	442 to 27,500	6,329 to 10,607	8,275 to 16,202	7,400 ± 22,100	300 to 100,000
Potassium	101 to 10,900	678 to 1,797	1,844 to 2,167	18,000 ± 7,100	1,900 to 63,000
Sodium	26.5 to 61,300	58 to 11,037	69.94 to 293.3	9,700 ± 19,500	500 to 100,000

BTV = background threshold value
CFAC = Columbia Falls Aluminum Company, LLC
GSD = geometric standard deviation
mg/kg = milligrams per kilogram
USGS = United States Geological Survey
USGS. (1984). Element Concentrations in Soils and other Surficial Materials of the Conterminous United States. USGS Professional Paper 1270.

The range of site surficial soils and sediments exceeded the range of BTVs for all nutrients, which is not unexpected given the substantial disparity in sample size between the Site (n greater than 550) and the background (n = 10 per soil background area) datasets. With such a large sample size, the opportunity for sampling naturally occurring nutrients in a highly concentrated "nugget" in the soil matrix is high. A comparison of the mean concentrations to each exposure area reveals that with the exception of calcium, all mean ranges were below site BTVs. The range of detected concentrations for these four nutrients also fell within the geometric mean ± geometric mean standard deviation (GSD) for western conterminous U.S. soils for all cationic metals except calcium and sodium. Calcium concentrations above the upper GSD of the geometric mean for western conterminous U.S. soils were noted in soils and sediments from the South Percolation Pond Exposure Area. Only two results for sodium fell outside of the geometric mean ± GSD for western conterminous U.S. soils, and both results were well within the overall concentration range of western U.S. soils.

Calcium was not eliminated outright as a nutrient in the BERA because of its association with fluoride in fluorite (CaF_2). Fluorite is a component of feedstocks used in smelting. Thus, calcium warrants special consideration before eliminating it as a potential COPEC due its presence in a process-related material. As noted in the evaluation above, calcium was detected in site soil and sediment at elevated concentrations compared to site-specific BTVs, and only marginally within the broad concentration range of western U.S. soils. The highest mean concentration of calcium within the evaluated exposure areas occurred at the South Percolation Pond Area (mean = 125,543 mg/kg). All other exposure areas were below the maximum site-specific background BTV of 47,061 mg/kg. Thus, with the exception of the South Percolation Pond Area, the average concentration of calcium that ecological receptors are exposed to does not exceed a representative background concentration from naturally occurring areas in the vicinity of the Site. Toxicity data are generally unavailable for constituents that are essential nutrients and for that reason additional characterization of toxic effects of these constituents is challenging; therefore, calcium is not carried forward as a COPEC, but elevated levels of calcium in the South Percolation Pond Area will be discussed further in the BERA uncertainty analysis (**Section 7**).

In surface water, several essential anion, cationic metals, and nutrient constituents were measured as part of the Phase I and Phase II investigation. Calcium, chloride, magnesium, potassium, and sodium were evaluated, as well as ammonium-nitrogen, nitrate/nitrite-nitrogen, and total orthophosphate nutrients. These anions, cationic metals, and nutrients are particularly important for algal growth (Ansari and Gills, 2014). With the exception of two results for total calcium and one result for dissolved calcium in the South Percolation Pond Area, no exceedances of ESVs were noted for the anion or cationic metal compounds. Anionic and cationic metals data were collected in the Phase I and II Site Characterization for the purposes of evaluating metal constituent bioavailability (e.g., copper) using the BLM, if deemed necessary.

A summary of total (T) and dissolved (D) nutrients in surface water at the Site compared with reference areas is provided in the following table. Although maximum concentrations of all nutrients were well above BTVs, the range of mean concentrations of all nutrients approximated the range of BTVs identified in reference areas, with the exception of sodium, which had means for both total and dissolved fractions that exceeded the highest BTV in four of the six exposure areas (South Percolation Pond Area, Northern Surface Water Feature, North Percolation Pond Area, and the Flathead River) where surface water data were collected.

Cationic Metal	CFAC Site	CFAC Site, Range of Means	CFAC Background (Range of BTVs)
	Concentration Range (µg/L)	Concentration Range (µg/L)	Concentration Range (µg/L)
Calcium (T)	7,860 to 506,000	28,266 to 73,042	27,776 to 55,600
Calcium (D)	7.020 to 147,000	7,020 to 55,073	23800 to 61,264
Magnesium (T)	804 to 63,900	6,510 to 17,100	7,455 to 17,601
Magnesium (D)	384 to 24,600	384 to 15,859	5,990 to 15,852
Potassium (T)	242 to 9,100	367 to 1,426	463 to 919
Potassium (D)	237 to 9,310	389 to 1,518	354 to 751
Sodium (T)	666 to 108,000	1,410 to 19,279	1,232 to 3,064
Sodium (D)	554 to 169,000	1,730 to 18,653	809 to 2,801

µg/L = micrograms per liter
BTV = background threshold value
CFAC = Columbia Falls Aluminum Company, LLC
D = dissolved
T = total

MDEQ developed phosphorus and nitrogen nutrient criteria for wadable streams (MDEQ, 2013) that have been reviewed and accepted by the USEPA. Cedar Creek, the only applicable water body for the criteria, did not have any exceedances for nitrogen or phosphorus compounds. The Flathead River is considered a large river under the numeric criteria framework developed by MDEQ. Large rivers require process-based mechanistic water quality models to determine appropriate criteria (MDEQ, 2013). No orthophosphate-phosphorus or nitrogen compounds were detected in the main stem of the Flathead River at levels that exceeded the criteria. Concentrations of nitrate/nitrite-nitrogen were greater than the criteria for wadeable streams in samples collected along the channel margin of the Flathead River within the Backwater Seep Sampling Area. However, elevated concentrations observed in these samples

are typical of mean groundwater nitrate concentrations in shallow groundwater within the Flathead Valley (McDonald and LaFave, 2004).

Based on analyses of the combined Phase I and Phase II Site Characterization datasets, essential nutrients were removed from further consideration in the COPEC refinement conducted as part of the BERA Problem Formulation. Elevated levels of calcium and sodium are discussed in the uncertainty analysis (**Section 7**).

4.4.5 Bioaccumulative Constituents and Food Chain Effects

Detected constituents that were not were not eliminated as COPECs because they were background-related, detected infrequently, or essential nutrients were retained for evaluation of food chain effects if they were classified as bioaccumulative. COPECs with the potential to bioaccumulate were identified for further evaluation in dietary exposure modeling based on satisfying one or more of the following criteria:

- Constituents identified as Persistent, Bioaccumulative, and Toxic Constituents as part of the USEPA Toxics Release Inventory (TRI) Program
- Constituents identified as important bioaccumulative constituents in *Bioaccumulation Testing and Interpretation for Sediment Quality Assessment* (USEPA, 2000b)
- Organic constituents with log octanol-water partitioning coefficient (log K_{ow}) values greater than 3.5 based on USEPA (2000b)
- Constituents with USEPA Eco-SSLs derived for birds or mammals

Thus, detected constituents that exceeded refined ESVs or that were determined to be bioaccumulative, and that were not removed as COPECs for one or more of the other refinement criteria were carried forward for additional evaluation. The results of the COPEC refinement are presented in the following sections.

4.4.6 Chromium

As described in **Section 4.1.1.2**, concentrations of Cr(VI) and Cr(III) were estimated using a ratio developed from site-specific Cr(VI) and total chromium data from a subset of soil samples collected during Phase II. Cr(VI) was detected in 3 of the 20 samples designated for this evaluation and was determined to comprise a less than 3 percent of total chromium in soil samples analyzed at the site. There is a high degree of uncertainty in the resulting estimations of Cr(VI) that were calculated at each exposure area using this ratio because over 85 percent of the samples analyzed for Cr(VI) used to develop the ratio were non-detect. The low proportion of Cr(VI) comprising total chromium was not unexpected, as chromium is present primarily in the Cr(III) oxidation state under typical soil conditions (USEPA, 2008c), and no known historical processes existed that would have introduced Cr(VI) into the environment at the CFAC facility. Cr(VI) toxicity data that may be used to estimate potential impacts to ecological receptors, particularly lower trophic-level organisms that comprise the base of the food chain, are limited because most sources of information used to characterize toxic effects are based on total chromium or Cr(III). USEPA Eco-SSL guidance presents toxicity reference values (TRVs) for Cr(III) and Cr(VI) for mammalian receptors, but only Cr(III) TRVs are available for birds. The mammalian TRV for Cr(III) from this guidance of 2.4 mg/kg-body weight (bw) per day (d) is lower (more conservative) than the TRV for Cr(VI) 9.24 mg/kg bw per day. The LANL ECORISK dataset presents TRVs for Cr(VI) for both birds (11 mg/kg-d) and mammals (9.24 mg/kg-d), both of which are less conservative than the TRVs used

to evaluate total chromium in the BERA (see Table 7 in **Appendix A2**). Thus, the evaluation of Cr(III) is protective of any Cr(VI) present in the environment for wildlife receptors. Therefore, as a simplified approach, although estimated (and measured, when available) Cr(VI) and Cr(III) concentrations are presented in the COPEC refinement tables for soil for each exposure area, these oxidation states of chromium are not carried forward separately as COPECs evaluated for ecological risk characterization. Only total chromium is carried forward as a refined COPEC for those exposure areas where it failed one or more of the refinement criteria, and subsequent evaluation of potential toxic effects of this metal are based on total chromium rather than speciated and estimated Cr(III) and Cr(VI) concentrations.

4.5 Refinement of COPECs

The full compilation of refined COPEC selection tables for all exposure areas and media are presented in **Appendix E**. A summary table of the results is presented in **Tables 4-17** (soil and sediment) and **4-18** (surface water). The results of the refined selection of COPECs for all exposure areas are discussed in the following subsections.

4.5.1 Terrestrial Exposure Areas

4.5.1.1 Main Plant Area

For the Main Plant Area, 13 inorganics (including metals and other inorganic parameters), dioxins, 14 individual PAH compounds and both LMW and HMW PAH categories, 2 SVOCs, and 5 VOCs were identified as refined COPECs in soil. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.1.2 Central Landfills Area

For the Central Landfills Area, 14 inorganics (including metals and other inorganic parameters), dioxins, 1 PCB, 15 individual PAH compounds and both LMW and HMW PAH categories, 4 SVOCs, and 4 VOCs were identified as refined COPECs in soil. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.1.3 Industrial Landfill Area

For the Industrial Landfills Area, 16 inorganics (including metals and other inorganic parameters), 9 individual PAH compounds and both LMW and HMW PAH categories were identified as refined COPECs in soil. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.1.4 Eastern Undeveloped Area

For the Eastern Undeveloped Area, 13 inorganics (including metals and other inorganic parameters), 1 individual PAH compound and the HMW PAH category, and 2 SVOCs were identified as refined COPECs in soil. These constituents were carried forward to the direct contact and (for bioaccumulative

constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.1.5 North-Central Undeveloped Area

For the North-Central Undeveloped Area, 9 inorganics (including metals and other inorganic parameters), HMW PAHs, 1 SVOC, and 1 VOC were identified as refined COPECs in soil. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.1.6 Western Undeveloped Area

For the Western Undeveloped Area, 9 inorganics (including metals and other inorganic parameters), dioxins, HMW PAHs, 1 SVOC, and 4 VOCs were identified as refined COPECs in soil. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.1.7 Flathead River Riparian Area

For the Flathead River Riparian Area, 7 inorganics (including metals and other inorganic parameters), 1 individual PAH compound and the HMW PAH category, 3 SVOCs, and 5 VOCs were identified as refined COPECs in soil. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.2 Incremental Soil Sampling Grid

As for the screening-level COPEC selection, the high-RSD adjusted dataset was used to select refined COPECs in the ISS area soil. For the Incremental Soil Sampling Grid, 18 inorganics (including metals and other inorganic parameters), 2 PCBs, 16 PAHs (and LMW and HMW PAHs), and 5 SVOCs were identified as refined COPECs in soil. These constituents were evaluated only for potential impacts associated with direct contact (plants and invertebrates), and for comparison to benchmark values protective of small range wildlife receptors.

4.5.3 Transitional Exposure Areas

4.5.3.1 North Percolation Pond Area

4.5.3.1.1 Soil

For the North Percolation Pond Area, 17 inorganics (including metals and other inorganic parameters), 16 individual PAH compounds and both LMW and HMW PAH categories, 3 SVOCs, and 6 VOCs were identified as refined COPECs in soil. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.3.1.2 Surface Water

For the North Percolation Pond Area, 17 inorganic constituents (including both total and dissolved fractions) and 8 PAHs were identified as refined COPECs in surface water. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.3.1.3 Sediment

For the North Percolation Pond Area, 15 inorganics (including metals and other inorganic parameters), 17 individual PAH compounds and Total PAHs, and 1 SVOC were identified as refined COPECs in sediment. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.3.2 South Percolation Pond Area

4.5.3.2.1 Soil

For the South Percolation Pond Area, 11 inorganics (including metals and other inorganic parameters), 2 individual PAH compounds and the HMW PAH category, 2 SVOCs, and 1 VOC were identified as refined COPECs in soil. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.3.2.2 Surface Water

For the South Percolation Pond Area, 14 inorganic constituents (including both total and dissolved fractions) and 1 PAH were identified as refined COPECs in surface water. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.3.2.3 Sediment

For the South Percolation Pond Area, 10 inorganics (including metals and other inorganic parameters), 13 individual PAH compounds and Total PAHs, 2 SVOCs, and 2 VOCs were identified as refined COPECs in sediment. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.3.3 Cedar Creek Reservoir Overflow Ditch

4.5.3.3.1 Soil

For the Cedar Creek Reservoir Overflow Ditch Area, 10 inorganics (including metals and other inorganic parameters), 1 individual PAH compound and the HMW PAH category, and 3 SVOCs were identified as refined COPECs in soil. These constituents were carried forward to the direct contact and (for

bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.3.3.2 Surface Water

For the Cedar Creek Reservoir Overflow Ditch Area, 7 inorganic constituents (including both total and dissolved fractions) were identified as refined COPECs in surface water. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.3.3.3 Sediment

For the Cedar Creek Reservoir Overflow Ditch Area, 7 inorganics (including metals and other inorganic parameters), 14 individual PAH compounds and Total PAHs, and 3 SVOCs were identified as refined COPECs in sediment. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.3.4 Northern Surface Water Feature

4.5.3.4.1 Soil

For the Northern Surface Water Feature Area, 8 inorganics (including metals and other inorganic parameters) and 1 SVOC were identified as refined COPECs in soil. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.3.4.2 Surface Water

For the Northern Surface Water Feature Area, 6 inorganic constituents (including both total and dissolved fractions) were identified as refined COPECs in surface water. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.3.4.3 Sediment

For the Northern Surface Water Feature Area, 8 inorganics (including metals and other inorganic parameters), 10 individual PAH compounds and Total PAHs, and 3 SVOCs were identified as refined COPECs in sediment. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.4 Aquatic Exposure Areas

4.5.4.1 Flathead River

4.5.4.1.1 Surface Water

For the Flathead River, 11 inorganic constituents (including both total and dissolved fractions) were identified as refined COPECs in surface water. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in Baseline Ecological Risk Analysis (**Section 5**).

4.5.4.1.2 Sediment

For the Flathead River, 4 inorganics (including metals and other inorganic parameters), 13 individual PAH compounds and Total PAHs, 2 SVOCs, and 3 VOCs were identified as refined COPECs in sediment. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.4.2 Cedar Creek

4.5.4.2.1 Surface Water

For Cedar Creek, 4 inorganic constituents (including both total and dissolved fractions) were identified as refined COPECs in surface water. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.4.2.2 Sediment

For Cedar Creek, 3 inorganics (including metals and other inorganic parameters), 12 individual PAH compounds and Total PAHs, and 2 SVOCs were identified as refined COPECs in sediment. These constituents were carried forward to the direct contact and (for bioaccumulative constituents) food ingestion risk characterization evaluation described in the Baseline Ecological Risk Analysis (**Section 5**).

4.5.5 Hot Spot Evaluation for Infrequently Detected Constituents

As described in **Section 4.4.3**, an additional evaluation was performed for constituents that were eliminated as refined COPECs because they were infrequently detected (less than 5 percent of samples) to ensure that localized areas with elevated constituent concentrations (i.e., “hot spots”) were not inappropriately dismissed at the COPEC refinement stage. Constituents eliminated due to low frequency of detection are presented in **Table 4-19** for exposure areas and media.

The maximum detected concentrations of constituents excluded due to the frequency of detection criterion were compared to a concentration equal to 10-times the greater of the BTV and ESV. Constituents with concentrations greater than this value were candidates for additional evaluation (i.e., plotting on a map to determine if localized clusters of samples with elevated concentrations are present). The only constituents that failed this initial hot spot criterion were PCBs in Main Plant Area

soil and dissolved copper in Flathead River surface water (**Table 4-19**). Total PCBs in the Main Plant Area are comprised entirely of Aroclor 1254, which was eliminated from further evaluation in the hot spot evaluation because its maximum concentration of 0.11 mg/kg did not exceed 10-times the ESV of 0.041 mg/kg. Total PCBs were not similarly eliminated because the conservative ESV for total PCBs of 0.000332 mg/kg was carried over from the screening-COPEC evaluation to the COPEC refinement step due to a lack of alternate ESVs protective of Aroclor mixtures (**Table 4-19**). Therefore, no additional hotspot evaluation is necessary for PCBs. Dissolved copper was detected in only 2 out of 49 surface water samples in the Flathead River, and only the highest detected concentration (26 µg/L) exceeded a value equal to 10-times the BTV of 1.9 µg/L. Because only one sample with concentrations exceeding the initial hot spot criterion is present, this elevated concentration of dissolved copper is considered to be isolated, and no further evaluation or visualization of areas with high concentrations is necessary to determine if a hot spot is present in the Flathead River.

Several infrequently detected constituents across multiple exposure areas and media lack both a BTV and ESV (**Table 4-19**). Because there was no basis for their retention, these constituents were not subjected to further evaluation for hot spots. The lack of BTVs and ESVs results in a minor uncertainty for these constituents. However, all of these constituents except for 3- and 4-methylphenol were detected in a single sample. Therefore, a hot spot consisting of multiple samples with elevated concentrations could not be present for these constituents. One constituent lacking both a BTV and ESV, 3- and 4-methylphenol, was detected in Main Plant Area soil in 4 out of 120 samples with a maximum detected concentration of 0.036 mg/kg (**Table 4-19**). As a VOC, this constituent is not bioaccumulative. The low concentrations detected are not likely to impact communities of organisms in soil (i.e., plants and invertebrates), even if the detections were in a small spatial area. Therefore, this constituent was also not retained for further evaluation.

Based on the information presented above, it is highly unlikely that the elimination of constituents as refined COPECs based on low frequency of detection has eliminated any site-related constituents that may represent a hot spot where localized adverse effects to ecological receptors may occur. Therefore, none of the constituents listed in **Table 4-19** are retained as refined COPECs for additional evaluation in the BERA.

4.5.6 Refined COPEC Summary

The following sections present a summary of the refined COPECs identified by exposure medium.

4.5.6.1 Soil and Sediment

Refined COPECs identified in soil and sediment are summarized below by analytical group:

- Metals – Exceedances of refined ESVs were noted in multiple exposure areas and were most prevalent in the industrial areas (Main Plant Area, Central Landfills Area, Industrial Landfill Area, and the Incremental Soil Sample Grid).
- Cyanide – Exceedances were noted in all ecological exposure areas evaluated.
- Fluoride – Exceedances were noted in the industrial areas (Main Plant Area, Central Landfills Area, Industrial Landfill Area, and the Incremental Soil Sample Grid) as well as the North Percolation Pond Area.

- Dioxin and furan compounds – TEC concentrations exceeded soil concentrations protective of avian or mammalian exposure to 2,3,7,8-TCDD within the rectifier yards in the Main Plant Area, the Central Landfills Area, and the Western Undeveloped Area.
- PCBs – Exceedances were noted for Aroclor 1254 in the Central Landfills Area and in the Incremental Soil Sampling Grid.
- PAHs – Exceedances were primarily limited to the industrial areas (Main Plant Area, Central Landfills Area, Industrial Landfill Area, and the Incremental Soil Sample Grid), and North Percolation Pond Area. Other exposure areas where sediment was collected also had high numbers of PAHs carried forward for additional evaluation.
- Other SVOCs – Exceedances were noted in multiple exposure areas for several SVOCs, most commonly BEHP, benzaldehyde, carbazole, and di-n-butyl phthalate.
- VOCs were carried forward in many exposure areas. Cyclohexane, methyl acetate, methylcyclohexane, and xylenes were the most common VOCs carried forward for further evaluation.

4.5.6.2 Surface Water

Refined COPECs identified in surface water are summarized below by analytical group:

- Metals (dissolved) – Exceedances were noted for select metals, including aluminum for three of the four transitional exposure areas (North Percolation Pond, South Percolation Pond, and Flathead River Riparian Areas), barium (all aquatic and transitional exposure areas), cadmium (North Percolation Pond Area), and copper (North and South Percolation Ponds).
- Metals (total) – Aluminum, barium, beryllium, cadmium, copper, iron, lead, manganese, nickel, vanadium, and zinc all had concentrations in unfiltered surface water samples that exceeded criteria for the refined COPEC analysis. Barium (all transitional and aquatic exposure areas) followed by vanadium and aluminum (all transitional and aquatic exposure areas except Cedar Creek) had the most frequent exceedances.
- Cyanide – Exceedances for cyanide were observed in all transitional and aquatic exposure areas except the Northern Surface Water Feature.
- Fluoride – Exceedances were noted in only the North Percolation Pond Area.
- PAHs – PAH exceedances were either not observed or only sporadically observed in all transitional and aquatic exposure areas except the North Percolation Pond Area, which exceeded refined criteria for eight PAH constituents.
- SVOCs – The Flathead River Riparian Area had four SVOCs that exceeded criteria. The only other transitional or aquatic exposure area where SVOCs were selected as refined COPECs in surface water was the Flathead River (BEHP, which is a common laboratory contaminant and unlikely related to previous site activities).

4.6 COPEC Selection Uncertainty Analysis

Constituents were identified as COPECs in the initial screening-level COPEC selection process in multiple exposure media due to uncertainties in the screening-level exposure analysis. Constituents with uncertainties that result in some ambiguity as to whether they should be retained as COPECs are re-evaluated to assess whether the uncertainty associated with exposure to these constituents is likely to influence the overall findings and conclusions of the BERA. Constituents identified as COPECs in the BERA based on the following tiers of uncertainty were re-evaluated as part of the BERA problem formulation:

- Constituents below the detection limit with one-half of the MDL exceeding an ESV
- Detected constituents lacking ESVs

4.6.1 Constituents with MDLs Exceeding ESVs

To evaluate the potential importance of non-detected constituents with MDLs exceeding ESVs in the BERA, maximum MDLs were compared to the range of ESVs considered during COPEC selection in the COPEC screening evaluation. ESVs identified in the initial COPEC screening step were based on chronic, no effect endpoints used as ecological screening criteria by various agencies. While the minimum ESV from these sources was used in the initial conservative screening process, the range of ESVs based on chronic, no effect endpoints are considered to represent concentrations that are not likely to cause adverse ecological effects. Therefore, exposure to non-detected constituents, if present, with MDLs within the range of ESVs identified in the initial screening step is not likely to result in adverse ecological effects. Based on this rationale, non-detected constituents with MDLs below the maximum ESV identified in the screening-level evaluation are not likely to influence the overall findings and conclusions in the BERA.

An evaluation of MDLs was conducted to compare the MDLs achieved by the laboratory relative to the range of ESVs. The MDL evaluation is presented in **Tables 4-20**, **4-21**, and **4-22** for soil, sediment, and surface water, respectively. Each table presents minimum and maximum MDLs for constituents not detected in any site sample compared to minimum and maximum screening-level ESVs for each constituent.

Constituents in soil with MDLs exceeding the screening ESV also had at least one occurrence where the maximum MDL exceeded the maximum ESV (**Table 4-20**). Therefore, there is some concern that concentrations could be present in the soil at levels that are undetectable, but where adverse ecological impacts are possible. These constituents include 2 pesticides and 25 SVOCs. Pesticides have been previously determined to be of low concern at the Site. The SVOCs listed in **Table 4-20** are not known to be process related, and the fact that they were not present at detectable concentrations in over 700 soil samples reduces the level of concern regarding their possible presence. Furthermore, none are bioaccumulative constituents of concern that may significantly biomagnify in the food chain at very low concentrations. Therefore, these constituents are considered to be of low concern and are not considered further.

Similar to soil, several pesticides and SVOCs analyses in sediment samples resulted in MDLs that exceeded their sediment ESVs. Pesticides often have very low ESVs owing to their potential to biomagnify in the food chain. The ESVs are often back calculated from ingestion models with conservative assumptions and result in values that are below commonly achievable detection limits. As previously stated, however, pesticides are not considered to be site-related constituents of concern at the Site. Nineteen SVOCs and two VOCs also had MDLs that exceeded their ESVs. None of these constituents were detected in a single sediment (or soil, which was treated as sediment during wet exposure conditions in transitional exposure areas) sample. None of these constituents are known to be related to previous waste streams at the Site. SVOCs and VOCs are not typically considered bioaccumulative constituents that can biomagnify in food chains and result in toxicity for higher trophic order receptors even at very low concentrations in the target medium. Therefore, these constituents are considered to be of low concern and are not considered further.

For surface water, silver, eight pesticides, seven PCBs, one SVOC, and two VOCs had maximum MDLs that exceeded maximum ESVs (**Table 4-22**). There is minor uncertainty related to silver MDLs exceeding the range of silver ESVs for surface water. The range of detection limits for total and dissolved silver (1.3 to 1.5 µg/L) is within the range of available surface water ESVs (0.067 to 3.2 µg/L) that was used for the laboratory method sensitivity analysis presented in the Phase II Site Characterization Sampling and Analysis Plan (Roux, 2018a). The DEQ-7 acute water quality standard for silver is hardness-dependent; there is no promulgated DEQ-7 chronic water quality standard for silver (MDEQ, 2017). Based on hardness values measured in surface water samples at the Site ranging from 50 mg/L as $CaCO_3$ to 1,740 mg/L as $CaCO_3$, sample-specific DEQ-7 acute water quality standards for silver range from 1.23 to 552 µg/L. The maximum silver detection limit of 1.5 µg/L would be equivalent to the sample-specific acute water quality standard at a surface water hardness of 56 mg/L as $CaCO_3$. 278 of 279 surface water samples analyzed at the Site exceeded a hardness value of 56 mg/L as $CaCO_3$, indicating that the maximum detection limit is sufficient to detect silver concentrations at the promulgated MDEQ water quality standard in 278 of 279 surface water samples. Silver was also not known to be associated with a release at the CFAC facility and was not selected as a refined COPEC in any ecological exposure medium. Silver was not detected in surface water samples at the site and was infrequently detected in other exposure media evaluated in the BERA, indicating lack of association of silver with site-related migration pathways. Silver was detected in 1.2 percent of discrete soils samples (7 of 552) collected within the 0 to 2-feet soil interval and 1.2 percent of sediment samples (1 of 84) collected in the Phase I and II Site Characterization sampling events. (MDLs for soil and sediment did not exceed minimum ESVs for silver.) Therefore, the fact that surface water MDLs for silver are slightly above the conservative screening value presented in **Table 4-22** is acknowledged as a minor uncertainty, but the level of concern is not considered sufficient to retain silver as a COPEC in surface water.

The SVOCs and VOCs listed in **Table 4-22** are not known to be process related, and the fact that they were not present at detectable concentrations in 17 to 23 surface water samples reduces the level of concern regarding their possible presence. Furthermore, none are bioaccumulative constituents of concern that may significantly biomagnify in the food chain at very low concentrations. Therefore, these constituents are considered to be of low concern and are not considered further. Pesticides have been previously determined to be of low concern at the Site, but PCBs have been detected in portions of the Site that were formerly used for industrial processes. However, both PCBs and pesticides are strongly hydrophobic, and are unlikely to partition to surface water in appreciable amounts compared to the concentrations in sediment. Furthermore, any potential risk associated with them would be more effectively handled by addressing sediment, which would represent the source for any trace amounts of these constituents in surface water. Therefore, these constituents are considered to be of low concern and are not considered further.

4.6.2 Constituents Lacking ESVs

Constituents evaluated for COPEC refinement that lacked ESVs are presented in **Tables 4-23, 4-24,** and **4-25** for soil, sediment, and surface water, respectively. The range of BTVs across all applicable reference areas is also provided in these tables for additional information. Three SVOCs and 6 VOCs in soil lacked ESVs and could not be retained or eliminated based on comparisons to benchmark values associated with acceptable levels of ecological risk (**Table 4-23**). The three SVOCs were all detected at less than 15 percent detection frequency, with concentrations at or below 1 mg/kg. Maximum detected concentrations slightly exceeded the BTV for the two constituents for which BTVs were available. The VOCs were detected more frequently in soil (22 to 57 percent detection frequency); however, detected concentrations were all below 1 mg/kg. VOCs tend to be short-lived in soil, volatilizing to the air or

naturally breaking down due to the actions of bacteria and microbes in the soil. Further, neither the SVOCs nor VOCs on this list are expected to be bioaccumulative constituents that could pose potential risks via food chain effects. Furthermore, if retained as COPECs, few if any toxicity data are available that would allow an estimation of potential effects on ecological receptors. For these reasons, the presence of these 9 constituents in Site soil is considered a minor uncertainty that is highly unlikely to affect conclusions based on constituents for which ESVs are available.

For sediment, four metals, three SVOCs, and three VOCs were detected but lacked ESVs (**Table 4-24**). Although the four metals (barium, beryllium, thallium, and vanadium) lack ESVs based on sediment exposure, ESVs are available for them based on soil exposure. Thus, they were evaluated in the terrestrial scenario for transitional exposure areas. NOEC and LOEC data are available for potential impacts to benthic invertebrates for barium. However, little additional data are available for the other three metals to evaluate their potential toxicity in aquatic sediment. Mean and maximum detected concentrations for the four metals exceeded the maximum BTV in reference areas used to establish soil background concentrations. For the three SVOCs and three VOCs that lacked ESVs, all were detected at relatively low concentrations, with the exception of carbazole, which was detected at a maximum concentration of 190 mg/kg. Carbazole is an aromatic heterocyclic compound that is strongly associated with the presence of PAHs, and it is likely that any further activities to evaluate PAHs will also address carbazole. Although the three SVOCs had maximum concentrations that exceeded BTVs (BTVs were not available for the three VOCs), the remaining organic constituents are not known or suspected to be site-related and are not expected to pose a threat to ecological receptors through food chain effects (bioaccumulation). Therefore, the presence of these constituent in site sediment is considered a minor uncertainty that is highly unlikely to affect conclusions based on constituents for which ESVs are available.

Vanadium (unfiltered) and four SVOCs were detected but lack ESVs in surface water (**Table 4-25**). Vanadium was present at concentrations greater than its BTV. Although an ESV protective of total (unfiltered) concentrations of vanadium in surface water was not identified in the sources used for obtaining benchmarks used in the refined COPEC analysis, NOEC and LOEC values for total vanadium of 19 and 190 µg/L, respectively, were identified in LANL ECORISK (2017), and were used to evaluate total vanadium effects for direct toxicity (see **Table 5-5**). Therefore, a robust evaluation of this metal was performed in the BERA in spite of the lack of an ESV for the dissolved fraction. The four SVOCs that lacked ESVs were only detected in one or two surface water samples. BTVs were available for three of the SVOCs, and two (benzaldehyde and carbazole) were detected at maximum concentrations that exceeded their BTVs. All detected concentrations were below 10 µg/L, and none are known to be site-related or are suspected to be a threat to wildlife receptors via their bioaccumulation potential. Therefore, the presence of these constituents in site surface water is considered a minor uncertainty that is highly unlikely to affect conclusions based on constituents for which ESVs are available.

5 Baseline Ecological Risk Analysis

The following sections present the framework for the baseline risk analysis developed based on data and observational information generated as part of the Phase I and Phase II Site Characterization and integrated in the BERA Problem Formulation (**Section 3**). The Problem Formulation provides the basis for the selection of assessment endpoints, risk questions, and measurement endpoints for assessment in the BERA. Exposure estimates are developed for the identified assessment and measurement endpoints based on quantitative comparisons of EPCs derived as part of the exposure analysis to effects endpoints established based on the ecological effects analysis.

5.1 Assessment Endpoints, Risk Questions, and Measurement Endpoints

Assessment endpoints are identified to explicitly express the environmental value that is to be protected (USEPA, 1997). Measurement endpoints are qualitative or quantitative observations that are measured for each receptor category in each exposure area to evaluate the assessment endpoint. Risk questions were formulated to identify specific measurable ecological characteristics that could be used to evaluate the selected assessment endpoints. These measurement endpoints represent numerical observations that will be measured in ecological exposure areas and compared to similar observations measured at reference sites or reported in the literature (e.g., effects thresholds). The selected measurement endpoints are used in a weight-of-evidence assessment of risk to each representative receptor based on the identified assessment endpoints.

Based on the problem formulation and ECSMs presented in **Section 3**, assessment endpoints, risk questions, and measurement endpoints were formulated for terrestrial, transitional, and aquatic exposure areas identified in **Section 3.3.1** (**Figures 3-2** through **3-4**, respectively). A summary of the risk questions and measurement endpoints selected for each assessment endpoint is provided in **Table 5-1** for terrestrial exposure areas, **Table 5-2** for transitional exposure areas, and **Table 5-3** for aquatic exposure areas.

Assessment endpoints include potential exposure to special status species (Threatened or proposed Threatened) that were identified by the USFWS IPaC query (**Section 3.3.5**). Consistent with ERAGS, potential exposure to Threatened species is evaluated based on the individual level of organization, as opposed to population level (**Table 5-1** to **Table 5-3**). Measurement endpoints for Threatened species is based on comparisons of estimated daily doses to NOAEL TRVs. Further evaluation of the assessment endpoints for special status species is conducted as part of the BERA Problem Formulation. Additional considerations for these assessment endpoints include an assessment of the potential for special status species to occur in site exposure areas based on documented occurrences and the potential for suitable habitat to support the special status species. The following section presents the risk analysis approach used to support the evaluation of measurement endpoints in the BERA.

5.2 Effects Analysis

As part of the risk analysis phase, the ecotoxicity review presented in the BERA Problem Formulation (**Section 3.3.7**) was used as the basis to identify receptor-specific benchmarks to estimate the potential ecotoxicological effects of primary COPECs relevant receptor groups within terrestrial, transitional, and aquatic exposure areas at the Site. The following sections describe the basis of developing receptor-specific effects endpoints for the baseline risk analysis phase.

5.2.1 Direct Contact Exposure Pathways

The effects analysis for direct contact pathways was conducted based on literature and guidance reviews to refine direct contact ESVs to represent receptor-specific exposure. Two general tiers of endpoints were identified, as available, to evaluate the potential for adverse effects related to direct contact exposure pathways:

- NOEC: Representative of the central tendency (e.g., geometric mean) of NOEC endpoints identified for relevant test organisms in literature/database studies.
- LOEC: Representative of the low end of the distribution of LOEC endpoints (e.g., 15th percentile or bounded study endpoints) identified for relevant test organisms in literature/database studies.

When available, existing estimates of NOECs and LOECs derived in the literature or guidance based on the geometric mean of no effect endpoints was used in the BERA. If insufficient data were available to establish geometric means, established NOECs and LOECs from literature or guidance were used instead. NOEC and LOEC endpoints for direct contact pathways are presented in **Tables 5-1** through **5-3**. The following sections describe the general approach for conducting effects analyses for direct contact exposure pathways from relevant exposure media.

5.2.1.1 Soil

Potential effects associated with direct contact pathways from soils were evaluated based on literature and database reviews of NOEC and LOEC endpoints from toxicological studies. Effects endpoints were established for the receptor categories identified for direct contact pathways to soil in the terrestrial and transitional ECSMs and measurement endpoints for soil (**Table 5-4**):

- Terrestrial plant community
- Soil invertebrate community

Sources of toxicological data that were used to support the development of direct contact NOEC and LOEC endpoints for soil COPECs include:

- USEPA Eco-SSLs
- Oak Ridge National Laboratory (ORNL) Risk Assessment Information System (RAIS)
- LANL ECORISK Database
- USEPA ECOTOX Database
- Targeted literature reviews for specific COPECs and receptor categories

5.2.1.2 Surface Water

Potential effects associated with direct contact pathways from surface water were evaluated based on literature/database reviews of survival, growth, and reproduction endpoints from aqueous toxicity studies. When available, USEPA and MDEQ promulgated chronic and acute surface water quality criteria were used as the basis for NOEC and LOEC endpoints, respectively for the protection of aquatic receptors that may be exposed to surface water in aquatic and transitional exposure areas at the Site. Effects endpoints were established for the receptor categories identified for direct contact pathways to surface water in aquatic and transitional ECSMs and measurement endpoints for surface water (**Table 5-5**):

- Aquatic plant community

- Benthic and pelagic invertebrate community
- Fish and herptiles (amphibians and reptiles)

Receptor-specific surface water NOEC and LOEC endpoints were derived from a review of aqueous toxicity studies and databases for relevant test organisms to support the evaluation of measurement endpoints (**Table 5-5**). Sources of aqueous toxicity studies to support the derivation of receptor-specific surface water benchmarks include:

- USEPA NRWQC (USEPA, 2019)
- MDEQ Circular DEQ-7 (MDEQ, 2017)
- USEPA ECOTOX Database
- LANL ECORISK Database
- ORNL RAIS
- Targeted literature reviews for specific COPECs and receptor categories

Where applicable, effects endpoints that consider site-specific conditions that influence COPEC bioavailability and toxicity in surface water were preferentially selected. When available, USEPA or MDEQ promulgated chronic and acute surface water quality criteria were used as the basis for NOEC and LOEC endpoints, respectively. For metals, NOECs and LOECs were based on the phase used as the basis for surface water quality criteria. USEPA NRWQC for several metals are based on exposure to the dissolved phase, with criteria for some metals (cadmium, chromium, lead, nickel, zinc) calculated as a function of surface water hardness (as mg/L $CaCO_3$). For these metals, NOECs and LOECs were based on sample-specific hardness measurements to spatially and temporally align hardness and filtered (dissolved) metals results. For copper, NOEC and LOEC concentrations were based on the BLM, consistent with the USEPA NRWQC. In addition, recently promulgated USEPA aquatic life ambient water quality criteria for aluminum that considers the influence of hardness and pH on aluminum toxicity were used to establish NOECs and LOECs for total (unfiltered) aluminum (USEPA, 2018). MDEQ water quality criteria (chronic and acute) are based on the total (unfiltered) phase for all metals, except for aluminum. In addition to differences in surface water quality criteria for metals, USEPA evaluates aqueous cyanide exposure based on analyses of free cyanide and MDEQ evaluates cyanide exposure on the basis of total cyanide. Given the differences in the basis of surface water quality criteria for metals and cyanide between USEPA and MDEQ, effects endpoints were established and evaluated based on dissolved and total phase results for metals and free and total cyanide results.

Sources of aqueous toxicity data included sources identified for surface water, but also included final chronic values (FCVs) presented in the ESB guidance for PAH exposure in pore water (USEPA, 2003a). FCVs are considered to be protective of aquatic species in the derivation of ESBs; therefore, the FCVs are considered appropriate for direct comparisons to aquatic receptors that may be exposed to surface water.

Surface water exposure pathways for COPECs and receptor categories lacking available aqueous toxicity endpoints are addressed as an uncertainty in the BERA (**Section 7**).

5.2.1.3 Sediment

Direct contact effects associated with exposure to sediment were evaluated based on benthic invertebrate effects endpoints. When available, potential effects associated with direct contact pathways from sediment to benthic invertebrates were evaluated based on predictive models derived

using EqP relationships. The approach for deriving ESBs was based on USEPA ESB guidance for multiple constituent groups relevant to sediment exposure in aquatic and transitional exposure areas at the Site:

- PAHs: *USEPA Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures* (USEPA, 2003a)
- Divalent metals: *Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: Metals Mixtures (Cadmium, Copper, Lead, Nickel, Silver, and Zinc)* (USEPA, 2005a)
- Nonionic Organic Compounds: *Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: Compendium of Tier 2 Values for Nonionic Organics* (USEPA, 2008a)

For organic COPECs lacking ESB values from the above sources, site-specific ESBs were derived using the sample-specific fraction of organic carbon (f_{oc}), constituent-specific organic carbon-water partitioning coefficient (K_{oc}), and WQB based on the EqP presented in **Section 4.4.1**.

In the absence of appropriate EqP relationships to derive site-specific ESBs for COPECs, literature and database reviews were conducted to identify NOEC and LOEC endpoints from toxicological studies. Sources of toxicological data that were used to support the development of direct contact NOEC and LOEC endpoints for sediment COPECs include (**Table 5-6**):

- National Oceanic and Atmospheric Agency (NOAA) Sediment Toxicity (SEDTOX) Database
- ORNL RAIS
- LANL ECORISK Database
- Targeted literature reviews for specific COPECs

5.2.1.4 Pore Water

Potential effects associated with direct contact pathways to pore water were evaluated based on literature and database reviews of survival, growth, and reproduction endpoints from aqueous toxicity studies. When available, pore water NOEC and LOEC benchmarks were derived for each receptor category that may be exposed to pore water in the ECSM (aquatic plants, benthic invertebrates, amphibians) using aqueous toxicity endpoints for test organisms representing each receptor category. Sources of aqueous toxicity data included sources identified for surface water, but also included FCVs presented in the ESB guidance for sediment (USEPA, 2003a). FCVs are considered to be protective of aquatic species in the derivation of ESBs; therefore, the FCVs are considered appropriate for direct comparisons to pore water to evaluate potential effects to benthic invertebrates. WQBs derived for the protection of general aquatic life are considered protective of all receptor categories that may be exposed to pore water.

Consistent with the derivation of surface water effect endpoints, the derivation of pore water effects endpoints considered site-specific conditions that influence COPEC bioavailability and toxicity. Site-specific conditions in pore water that were considered in the development of effects endpoints included:

- Pore water pH: Influences the bioavailability and toxicity of cyanide, aluminum, and other metals.
- Pore water hardness: Criteria for the dissolved phase of select metals is a function of pore water hardness (as $CaCO_3$).

- Free cyanide: Represents the bioavailable and potentially toxic form of cyanide. Toxicity studies based on free and total cyanide were included for evaluation, consistent with USEPA NRWQC (which are based on free cyanide) and DEQ-7 values (which are based on total cyanide).

In the absence of available aqueous toxicity endpoints for specific receptor categories, chronic surface water quality criteria for the protection of aquatic life promulgated by the USEPA NRWQC or MDEQ were considered default NOECs for the protection of receptors that may be exposed to pore water.

5.2.2 Ingestion Exposure Pathways

For ingestion pathways, the effects analysis included a detailed review of TRVs derived from toxicological studies to evaluate the potential for adverse ecological effects associated with the dietary doses estimated using the approaches described in **Section 5.3.3**. Two tiers of chronic TRVs representing NOAELs and LOAELs for growth, reproduction, and survival endpoints were identified to evaluate the potential for adverse effects via ingestion pathways:

- Low, NOAEL-based TRV (TRV_{NOAEL}): Represents the geometric mean NOAEL TRV identified in literature studies.
- High, LOAEL-based TRV (TRV_{LOAEL}): Represents a TRV based on chronic exposure, that estimates a geometric mean LOAEL in literature studies.

The two tiers of TRVs were used to evaluate potential wildlife exposure based on estimated daily doses (EDDs) calculated using screening-level. TRVs were obtained primarily from peer-reviewed compilations of toxicity data for ecological risk assessment from sources including, but not limited to:

- USEPA Eco-SSLs
- ORNL *Toxicological Benchmarks for Wildlife*: 1996 Revision (Sample et al., 1996)
- LANL ECORISK Database
- Targeted literature reviews for specific COPECs and receptor categories

In addition, at the request of USEPA, LOAELs provided in TechLaw (2008) and the approach for deriving TRVs presented in that document were also considered in the selection of TRVs. TRVs presented in *Development of Toxicity Reference Values for Conducting Ecological Risk Assessment at Naval Facilities in California, Interim Final* (Engineering Field Activity West, 1998) were also considered as a source for toxicity reference values. The TRVs selected for use in the BERA, and the basis for deriving TRVs from literature and database searches was presented in an interim deliverable to the BERA Work Plan, which is included in **Appendix A2**.

5.3 Exposure Analysis

Risk estimates were developed in the BERA using data and observational information generated as part of the Phase I and Phase II Site Characterization. Risk estimates were based on quantitative comparisons of EPCs to effects thresholds established based on the refined ecological effects analysis discussed in the preceding section. EPCs for mobile receptors were based initially on maximum concentrations, and refined assumptions were used to develop conservative estimates of average concentrations that receptors could be exposed to during their foraging activities. EPCs for risk estimation via direct contact and ingestion pathways were calculated based on UCL_{mean} COPEC concentrations to represent a conservative estimate of average exposure conditions over an exposure area.

5.3.1 Calculation of Exposure Point Concentrations

EPCs to evaluate exposure in the BERA were estimated for each exposure area using data collected as part of the Phase I and Phase II Site Characterizations. EPCs were calculated to represent a range of exposure scenarios:

- Maximum EPC: Represent a reasonable maximum exposure scenario based on the maximum measured concentration in each exposure area.
- Refined EPC: Represent likely exposure scenarios based on random exposure throughout each exposure area.

Refined EPCs for risk estimation via direct contact and ingestion pathways were calculated based on UCL_{mean} COPEC concentrations to represent average exposure conditions over an exposure area. UCL_{mean} concentrations were calculated using USEPA ProUCL software (version 5.1 or later) and the statistical approach described in the USEPA ProUCL Version 5.1 Technical Guidance (USEPA, 2015b). Although 95 percent UCLs were the target values to use as the refined EPCs, the term "UCL_{mean}" is used in this report because, at times, UCL values other than the 95 percent UCLs were selected as EPCs based on ProUCL outputs. In general, the 95 percent UCLs recommended in ProUCL were used as the refined EPC in the risk estimate. When the UCL recommended by the ProUCL software exceeded the maximum detected concentration, the most conservative UCL derived using the Chebyshev method that produced a result lower than the maximum was selected as the UCL_{mean} and adopted as the refined EPC. ProUCL input and output data are presented in **Appendix I**. All UCLs selected as EPCs had a confidence limit of 95 percent or greater, except for three UCL_{mean} values that had confidence limits of 90 percent. A summary of the types of UCLs selected as the refined EPCs by media is presented in the following table:

Type of Upper Confidence Limit (UCL) of the Mean	Soil/Sediment UCLs	Soil UCLs	Surface Water UCLs
90% UCLs	2	1	0
95% UCLs	483	265	77
97.5% UCLs	13	0	2
99% UCLs	4	0	2
Other (e.g., Gamma-adjusted Kaplan-Meier UCL)	28	9	8

In addition to UCL_{mean} EPCs, exposure was also evaluated on a point-by-point basis for sedentary receptors, such as plants, soil invertebrates, and benthic invertebrates, and wildlife receptors with small home ranges (e.g., meadow vole, short-tailed shrew). The evaluation of potential exposure on a point-by-point basis supports a spatial evaluation where sedentary or small home range receptors may be exposed to localized concentrations in soil that may result in adverse effects. Further discussion of the approach for evaluation exposure to small home range wildlife receptors is presented in **Section 5.3.3.2.2**.

EPCs were developed in the Operational Area for individual ISS DUs for the purpose of evaluating potential risk to sessile or small range receptors that would receive 100 percent of their exposure within a given DU; ISS data collected within the Operational Area were not evaluated for exposure to large-range receptors. The Operational Area where the ISS sample grids are located represents a sub-area that overlaps two ecological exposure areas, specifically the Central Landfill Area and the Main Plant

Area. ISS samples were only collected in a sub-area of the facility where the locations of specific source areas and migration pathways were not known. ISS results (i.e., the concentrations resulting from the single replicate adjusted for the variance within the DUs with triplicate samples or the UCL_{mean} calculation performed on these DUs with replicates) were evaluated for each grid based on point-by-point comparisons with ecological benchmarks to evaluate soil exposure to plants, soil invertebrates, and wildlife receptors with foraging ranges less than the size (approximately 1 acre) of the ISS DUs. Because the home ranges for these receptors are approximately equal to or smaller than the size of the DUs, no adjustment for spatial use (e.g., and AUF) was used to adjust the DU EPC. ISS triplicate UCL_{mean} calculations and the DU-adjusted concentrations are presented in **Appendix J**. For the four DUs with triplicate incremental samples, UCL_{mean} values were calculated for constituents that were detected in at least one of the three incremental samples using the ITRC calculator as described in **Section 4.1.1.1**. One-half the method detection limit was used as the surrogate values for non-detects (ITRC, 2012a and 2012b). $UCLs_{mean}$ calculated using only three results will always be greater than the maximum detected concentrations; therefore, the UCL generated by the ITRC UCL calculator was always selected as the EPC for the ISS triplicate sample results. EPCs for DUs where only a single incremental sample was collected were adjusted based on the variance observed for each constituent in each soil depth interval, as reflected by the average RSD for that constituent across the four DUs where triplicate samples were collected. The equation showing this adjustment is presented in **Section 4.1.1.1**.

As part of the broader, facility-wide investigation, discrete soil samples were also collected within the ISS sampling grid footprint during Phase I and Phase II Site Characterization. Data from these discrete samples were evaluated separately from the ISS evaluation; due to different underlying statistical properties, it is not appropriate to combine data derived from ISS and discrete samples to calculate statistical parameters that reflect an overall exposure to the area (e.g., UCL_{mean} EPCs for large-range receptors). Discrete samples were collected (including within the Operational Area) to fully characterize potential risk to ecological receptors across the entire Site. Therefore, data from discrete samples that were located within the ISS grids were evaluated in a manner consistent with other discrete soil samples, i.e., they were evaluated on a point-by-point basis for comparison to benchmarks protective of small-range and sessile receptors, and they were included in the larger exposure area dataset for evaluation of the protection of larger ranging receptors. A discussion of the differences in concentrations between the discrete and ISS soil samples collected within the Operational Area is presented in the Uncertainty Analysis (**Section 7.12**).

5.3.2 Direct Contact Exposure Pathways

Direct contact exposure pathways identified in the ECSM were evaluated based on comparisons of EPCs to receptor-specific effects endpoints (**Section 5.2.1**). As stated in the preceding section, direct contact exposure evaluations included a range of exposure conditions based on maximum EPC and refined EPC scenarios. Maximum and refined EPCs were compared to NOEC and LOEC endpoints to evaluate the potential for adverse effects based on a range of effects endpoints.

5.3.3 Ingestion Pathways

The evaluation of potential exposure via direct and incidental ingestion pathways was conducted based on a tiered approach in accordance with the USEPA guidance for conducting probabilistic ecological risk assessment (USEPA, 2001b). The tiered approach utilizes deterministic and then, if necessary, probabilistic exposure modeling if additional analysis is warranted (e.g., if deterministic modeling

exceeds doses associated with LOAELs). Deterministic exposure modeling is based on conventional single point estimates of EPCs and typical exposure parameters, while probabilistic exposure modeling estimates exposure based on the distributions of EPCs and exposure parameters to account for variability and/or uncertainty in model parameters. The results of the deterministic model were reviewed, and although LOAEL-based exceedances were observed, it was determined that additional information obtained through probabilistic modeling would not materially affect conclusions or provide additional insight into recommendations or conclusions. Therefore, probabilistic modeling was not performed in this BERA.

Wildlife receptors identified in **Section 3.3.6** as being representative of the foraging guilds present at the Site were evaluated for potential food chain effects resulting from ingestion of prey items exposed to contamination in Site media. Life history characteristics affecting parameters that are critical for estimating exposure (e.g., body weight, ingestion rate) are presented in the wildlife modeling interim deliverable in **Appendix A2**. Also presented in that interim deliverable are the various uptake models used to estimate concentrations in prey or food items, TRVs that reflect NOAELs and LOAELs, complete descriptions of the ingestion and dose modeling equations, and other supporting information necessary to interpret the results of the ingestion modeling.

5.3.3.1 Model Structure

Dietary exposure estimates consider the typical dietary preference and composition for each receptor, in terms of representative dietary items at the site. Exposure estimates for ingestion pathways were based on comparisons of receptor-specific EDDs calculated from simple dose rate models to TRVs. The general form of the dose rate model used to calculate EDDs in both modeling scenarios is as follows:

$$EDD = \frac{1}{BW}\sum_{i=1}^{N}\left(FIR_{dw} \times \sum_{j=1}^{M}(f_j \times C_j) + SIR \times C_{sub} + WIR \times C_{sw}\right)_i \times AUF_i$$

where:

i = Number of exposure areas
j = Receptor-specific dietary items
BW = Receptor-specific body weight
FIR_{dw} = Receptor-specific daily food ingestion rate (dry weight)
f_j = Proportion of dietary item *j* to total dietary composition
C_j = COPEC concentration in dietary item *j*
SIR = Receptor-specific incidental sediment ingestion rate
C_{sub} = COPEC concentration in substrate (sediment or soil)
WIR = Receptor-specific daily drinking-water ingestion rate
C_{sw} = COPEC concentration in unfiltered surface water
AUF_i = Area use factor

It should be noted that dietary exposure to fish was not evaluated for transitional areas, as these areas do not sustain an aquatic environment capable of supporting fish populations to provide a sufficient forage base for piscivorous wildlife.

A modified version of the model was used to evaluate the potential additive exposure to dioxin and furan compounds in surface soil sampled within the Main Plant Area and adjacent areas. The modified dietary exposure model calculated an EDD for the 17 individual dioxin and furan compounds in each sample based on measured concentrations and soil-to-biota bioaccumulation factors (BAFs). The EDD for each compound was multiplied by the compound-specific TEF for birds or mammals to estimate the TEC for each compound (Van den Berg et al., 2006; Van den Berg et al., 1998; USEPA, 2008b). TECs of the 17 dioxin and furan compounds in each sample were summed to calculate an overall TEC for the sample. Thus, the EDD was calculated for each dioxin/furan congener as described in the above equation, multiplied by the congener-specific (bird or mammal) TEF, and then summed with the other congener EDDs to calculate the TEC. The TEC for each sample was evaluated relative to avian or mammalian dietary TRVs for 2,3,7,8-TCDD.

5.3.3.2 Modeled Scenarios

A screening-level and refined food chain model was performed for the Site. The screening-level model used maximum exposure concentrations and did not use an area use factor (AUF) to estimate risk to large-range receptors. The refined food chain model used a conservative estimate of the mean (i.e., UCL_{mean} concentrations) as the exposure concentrations, and incorporated AUFs to adjust risk for receptors that have home ranges that are larger than the exposure area being evaluated.

In addition to the screening-level and refined model scenarios, additional scenarios were evaluated for: 1) large home range wildlife receptors that may forage in multiple exposure areas throughout the site and 2) small home range receptors that may forage entirely within a small portion of an exposure area. A description of the modeled scenarios for large and small home range receptors is provide below.

5.3.3.2.1 Large Home Range Receptors – Spatially Weighted Exposure Evaluation

As described in **Appendix A2**, large home range receptors that may receive exposure from adjacent (non-target) exposure areas as well as the target exposure area were evaluated using a spatially weighted approach in the refined model. Essentially, an AUF-adjusted dose for each constituent was calculated based on the percentage of the particular receptor home range that is comprised of the target exposure area as well as all adjacent exposure areas that fell within the home range (assuming the receptor was placed in the geographic center of the target exposure area). Areas outside of the Site boundary that fell within a receptor home range were included in the spatial weighting and assigned a dose of zero. Depending on the overlapping footprints of an assumed circular home range with an irregularly shaped exposure area boundary, this approach occasionally resulted in doses from adjacent exposure areas strongly influencing the exposure estimates, particularly for receptors with small to moderately sized home ranges that may forage entirely within a single exposure area. At the request of USEPA, an AUF of 1 was applied for receptors whose home range was less than the size of the exposure area; the entire dose for that receptor was assumed to originate within the target exposure area.

Area-weighted doses from exposure areas within the potential foraging range of receptors were summed to estimate the total aggregate dose for that receptor. Constituents with HQs below 1 for any given exposure area were assumed to have negligible contribution to adjacent exposure areas for that constituent. The percentages of various exposure areas that fall within large-range receptor home ranges are presented in **Table 5-7**. The "target" exposure area being evaluated is presented vertically in the second column, and the areas to which the receptor is exposed to (given a circular home range originating within the geometric centroid of each target exposure area) are presented horizontally, with the percentage of exposure for each presented in the table. For example, the American woodcock with a home range of 11.1 acres, evaluated for the South Percolation Pond Area, receives 22.4 percent of its modeled dose from the South Percolation Pond Area, 0.4 percent from the Main Plant Area, 69.6 percent from the Flathead River Riparian Area, and 7.6 percent from unimpacted areas outside the Site boundary. This spatial weighting was only performed for terrestrial receptors that may forage randomly between terrestrial and transitional exposure areas. Although many species that forage on fish and benthic invertebrates are likely to utilize multiple water bodies during their daily activities, aquatic receptors (i.e., the American dipper, belted kingfisher, and mink) were assumed to receive 100 percent of their exposure to media within the transitional or aquatic exposure area evaluated.

5.3.3.2.2 Small Home Range Receptors – Point-by-Point Exposure Evaluation

A point-by-point evaluation of soil sample results was performed to evaluate the potential for adverse effects to small range receptors that may be exposed to COPECs in foraging ranges smaller in spatial scale than the ecological exposure areas that were used to evaluate medium- and large-range receptors. The life-history characteristics of the wildlife receptors of concern were reviewed, and the meadow vole (home range = 1 acre) and the short-tailed shrew (home range = 0.13 acre) (Table 2 in the wildlife modeling interim deliverable for the BERA Work Plan presented in **Appendix A2**) were selected as the small range receptors of concern for this evaluation.

Consistent with the approach used to calculate USEPA Eco-SSL values (USEPA, 2005b), the general exposure model presented in **Section 5.3.3.1** was used to back-calculate soil benchmark concentrations from TRVs using the *Goal Seek* function in Microsoft Excel. Back-calculated soil benchmarks for each representative small home range receptor were calculated by setting the EDD equivalent to the TRV and solving for the concentration in soil or sediment (C_{soil}). Soil benchmarks were calculated based on

TRV_{NOAEL} and TRV_{LOAEL} values (**Section 5.2.2**). TRV_{NOAEL} and TRVLOAEL -based soil benchmarks were compared on a point-by-point basis to soil data from discrete samples, as well as the individual ISS DU results from the Operational Area (see **Section 5.3.1** for a description of DU EPC calculations) from the relevant exposure intervals. Comparisons of TRVNOAEL and TRVLOAEL -based benchmarks to soil data from relevant exposure intervals are presented visually within each exposure area to illustrate potential station-specific risks to small home range receptors. Soil benchmarks protective of small range-receptors are presented in **Table 5-8**. The full description of the small range receptor evaluation—including maps indicating where exceedances occurred—is presented in **Section 6**.

5.3.3.3 Exposure Point Concentrations

EPCs for soil, sediment, or surface water inputs into screening-level exposure models were initially based on the maximum measured concentration in each exposure medium to represent the most conservative exposure scenario. A refined version of the model was run using EPCs that reflected a conservative estimate of the central tendency of exposure (e.g., UCL_{mean} concentration) to estimate the average dose that a receptor may experience while foraging randomly within an exposure area.

As described in the wildlife modeling interim deliverable to the BERA Work Plan presented in **Appendix A2**, most receptors were assumed to be exposed primarily to soil in only the shallow (0 to 0.5 foot) sampling interval. For receptors whose life history patterns indicate the potential for regular exposure to deeper soil (e.g., the short-tailed shrew, meadow vole, long-tailed weasel, and North American wolverine; note that the shrew was not included as a receptor that would likely encounter deeper soil in the BERA wildlife modeling interim deliverable presented in **Appendix A2**, however, after reviewing its foraging patterns, it is included as a burrowing receptor in the BERA), dietary ingestion pathways associated with soils were based on depth-weighted average concentrations of sampling intervals collected from 0 to 0.5 ft-bgs and 0.5 to 2.0 ft-bgs to provide a representative EPC for each soil boring station. Depth-weighted average concentrations for the 0 to 2 ft-bgs sampling interval were calculated as follows:

$$C_{sub,0-2ft} = C_{sub,0-0.5ft} \times \frac{0.5ft}{2ft} + C_{sub,0.5-2ft} \times \frac{1.5ft}{2ft}$$

where:

$C_{sub,x\text{-}y\ ft}$ = Concentration in sampling interval starting from *x* to *y* ft-bgs.

In some cases, data were only available for one interval but not both. In these cases, it was assumed that the concentration present in the sampled depth interval represented the concentration present in the entire 0 to 2 feet depth range. Most commonly, a 0 to 0.5-foot sample was collected, but not a 0.5 to 2 feet sample, rather than the reverse scenario. As described in **Section 3.6** and **Section 4.1.1**, an evaluation of the Phase I and Phase II Site Characterization data indicated that COPEC concentrations are generally greater in surface and shallow intervals and decrease with increasing soil depth (EHS Support, 2018 and 2019). Therefore, the use of data from the only interval sampled when data from both soil depth intervals were not available likely results in a conservative EPC for soil.

For surface water in the screening-level food chain models, the maximum detected concentration for each COPEC across all exposure areas was selected as the EPC for the source of drinking water for terrestrial exposure areas. Thus, it was assumed that ecological receptors would drink exclusively from

the surface water bodies at the Site with greatest exposure to surface water COPECs. This is a conservative assumption; receptors with large home ranges would ingest drinking water from multiple sources, and the origin of the water body where the maximum concentration was detected may be well outside the home range for small range receptors in terrestrial exposure areas. For transitional and aquatic exposure areas, the maximum concentrations detected from the water bodies located within each exposure area was used as the exposure concentration.

For the refined version of the wildlife ingestion models, the $UCL_{mean,}$ concentration (or the average concentration, using the quantitation limit as a surrogate for non-detected results if a constituent had too few detections to calculate a UCL) from the surface water body present at transitional and aquatic exposure areas was used as the EPC. For receptors in terrestrial exposure areas, the UCL_{mean} of the sitewide surface water dataset was calculated and used as the EPC for drinking water exposure. No adjustment was included to account for the fact that different numbers of samples were collected from the various water bodies; however, the water bodies with the larger number of samples were also larger in area and/or had the greatest probability of being used as drinking water sources. Therefore, any bias in the estimation of surface water EPCs associated with the unequal sampling design between the water bodies is considered a minor uncertainty in the BERA.

The approach to estimating drinking water EPCs deviates slightly from the BERA Work Plan and *Technical Memorandum: Proposed Wildlife Exposure Modeling Approach to Support the Baseline Ecological Risk Assessment at the Columbia Falls Superfund Site* (EHS Support, 2018 and EHS Support, 2019b), which stated that the surface water EPCs for small-range receptors in terrestrial exposure areas would be calculated based on a subset of surface water features closest to the target exposure area. After an initial review of the data, it was determined that performing these extra calculations was not necessary and did not add any information to the BERA that would affect conclusions. For example, for most constituents and receptors, less than 1 percent of the total dose originated from drinking water ingestion. Furthermore, the maximum concentration and the UCL_{mean} for each water body were used as the EPCs for the transitional and aquatic food chain models. Thus, any potential impacts associated with drinking water from the individual water sources at the Site were clearly demonstrated in the modeling performed for the transitional or aquatic exposure area in which they were located. Calculating an EPC based on a combination of multiple water bodies based on proximity would be unnecessary, particularly when the results from the individual surface water bodies resulted in very low exposure resulting from drinking water ingestion. The use of the site-wide and exposure area-wide maximum concentrations in the screening-level wildlife ingestion evaluation and the site-wide and exposure area-wide UCL_{mean} values in the refined wildlife ingestion evaluation provide sufficient information to identify potential risks associated with drinking water under conservative and more representative exposure scenarios.

5.3.3.4 Model Parameters

Dietary exposure models include parameters relating to receptor-specific exposure factors, EPCs, and AUFs. Exposure factors refer to receptor-specific variables (e.g., BW, FIR_{fw}, SIR, WIR), which are typically derived from literature sources. Exposure variables refer to site-specific measurements, namely COPEC concentrations estimated in exposure media. The approach for estimating exposure factors and variables for wildlife ingestion pathways is summarized below. The receptor-specific exposure parameters for each surrogate receptor used in the dietary exposure modeling are presented in the wildlife exposure modeling interim deliverable that was submitted and approved prior to the initiation of the BERA. The interim deliverable is presented in **Appendix A2.**

The USEPA *Wildlife Exposure Factors Handbook* ("the Handbook" [USEPA, 1993]) was the primary data source of exposure factors for the wildlife receptor species used to represent the receptor categories identified in the ECSM (**Section 3.6**). Additional receptor-specific literature sources were also used to supplement exposure data compiled in the Handbook (e.g., USACHPPM, 2004). Deterministic exposure modeling uses exposure factors that are representative of typical or average (e.g., mean parameter) exposure conditions.

Based on the conceptual study design, dietary pathways were evaluated based on the estimates of the bioaccumulation of COPECs into dietary items from soil, sediment, and surface water pathways. Concentrations of COPECs in dietary items were estimated using conservative assumptions of BAFs, biota-sediment accumulation factors (BSAFs) from sediment, or bioconcentration factors (BCFs) from surface water. The wildlife exposure modeling interim deliverable in **Appendix A2** summarizes the bioaccumulation models used to support dietary modeling in the BERA.

5.4 Risk Calculation

Potential risks associated with exposure estimates presented in the BERA are expressed as HQs, and are calculated as the ratio of the EPC to ESV for the direct contact pathway and the summed EDD for ingestion pathways to the TRV for ingestion pathways, as follows:

$$HQ = \frac{EPC}{ESV} or \frac{EDD}{TRV}$$

Potential ecological risk may be characterized based on HQs for direct and ingestion pathways, as follows:

- $HQs_{NOEC/NOAEL}$ less than or equal to 1.0 indicates limited potential for adverse effects because constituent concentrations result in an exposure that has not been demonstrated to cause adverse ecological effects.
- $HQs_{NOEC/NOAEL}$ greater than 1.0 indicates that an EPC or EDD for the constituent exceeds an ecological benchmark representing a NOEC or NOAEL. The exposure may or may not constitute an actual risk; however, the potential for adverse effects cannot be dismissed and further evaluation is warranted.

HQs calculated based on LOEC ESVs or TRV_{LOAEL} were used to assess the likelihood of adverse effects based on exposure to concentrations or doses known to be associated with an adverse effect on survival, growth, or reproduction. The relative frequency and magnitude of LOEC ESVs or TRV_{LOAEL} exceedances were used to identify potential risk drivers within receptor groups and exposure areas.

6 Baseline Risk Estimates and Risk Characterization

Risk characterization in the BERA focuses on establishing causal relationships, if present, between ecological effects and site-specific exposure to COPECs. A description of potential ecological risks is documented in the BERA for each assessment endpoint based on the findings and interpretations of risk estimates from corresponding measurement endpoints. The risk description provides a weight-of-evidence evaluation of the likelihood and ecological significance of the estimated risks and may be used to support risk management decision-making (USEPA, 1997). Key elements included in the BERA risk description include:

- Identifying thresholds for ecological effects for observed exposure-response relationships;
- Estimating the likelihood of adverse ecological effects;
- Evaluating the spatial extent of ecological risk within exposure areas; and,
- Assessing the potential for identified risks to persist in the future, considering the potential for natural recovery once the sources of COPECs or migration pathways to the exposure area are mitigated.

This section presents risk estimates for direct contact and ingestion pathways and characterizes risk for individual exposure areas within the terrestrial, transitional, and aquatic habitat categories. Along with wildlife ingestion summaries and small range receptor exceedance maps, direct contact risk estimates are presented in **Table 6-1** through **Table 6-56** and **Figure 6-1** through **Figure 6-41**. **Appendix H** includes receptor- and exposure-area specific wildlife ingestion modeling calculations for the screening-level (**Appendix H1**) and refined (**Appendix H2**) model scenarios. Screening-level and refined modeling results are summarized in **Table 6-57** through **Table 6-59**. **Table 6-57** presents an overall summary of COPECs with an HQ_{NOAEL} that exceeded 1 in the screening-level evaluation. **Table 6-58** presents the numerical results of the refined evaluation, which calculated spatially weighted HQs based on exposure to exposure areas within a given receptor home range. Therefore, the HQs presented in **Table 6-58** represent exposure to the target and adjacent exposure areas within the home range for each receptor, using the weighting factors for exposure presented in **Table 5-7**. **Table 6-59** presents HQs using the refined EPCs (i.e., UCL_{mean} values), but the calculations assumed that the entire exposure for a given species was obtained within the target exposure area (i.e., the AUF was set to 1). These results provide a clearer visualization as to where potential risks are originating from between exposure areas. For example, using the spatially weighted approach presented in **Table 6-58**, a medium- or large-range receptor being evaluated for a relatively small exposure area (e.g., the Cedar Creek Reservoir Overflow Ditch) may exhibit high HQs for some constituents that are present primarily or even exclusively in adjacent exposure areas. By cross-checking against the results in **Table 6-59**, it can readily be observed whether the risk is originating at the target or adjacent exposure areas. The following subsections present the output of the exposure estimate and risk characterization, which provides the basis for the BERA conclusions and recommendations.

6.1 Terrestrial Exposure Areas

The following sections present risk estimates and risk characterizations for exposure areas within terrestrial habitats at the Site.

6.1.1 Main Plant Area

The following sections present the direct contact and ingestion risk estimates and the baseline ecological risk characterization for terrestrial exposure in the Main Plant Area.

6.1.1.1 Direct Contact Risk Estimate

The evaluation of direct contact pathways for terrestrial plants and soil invertebrates exposed to surface soil within the Main Plant Area indicates limited potential for adverse ecological effects associated with exposure to LMW and HMW PAHs. No COPECs were detected at concentrations exceeding LOECs for terrestrial plants and soil invertebrates in the Main Plant Area. The greatest exposure to soil invertebrates was associated with exposure to LMW and HMW PAH exposure in surface soil. Maximum exposure concentrations exceeded soil invertebrate NOECs for LMW PAHs (HQ_{NOEC} = 19) and HMW PAHs (HQ_{NOEC} = 35.7), with minor exceedances for arsenic (HQ_{NOEC} = 1.3), mercury (HQ_{NOEC} = 5.4), and zinc (HQ_{NOEC} = 2.0; **Table 6-1**). Based on refined EPCs, COPECs were below NOEC values for soil invertebrates, except for exposure to LMW PAHs (HQ_{NOEC} = 2.2) and HMW PAHs (HQ_{NOEC} = 4.3).

Maximum exposure concentrations resulted in minor exceedances of terrestrial plant NOECs for nickel (HQ_{NOEC} = 3.7), selenium (HQ_{NOEC} = 1.3), and zinc (HQ_{NOEC} = 1.5); however, terrestrial plant NOECs were not available for LMW and HMW PAHs (**Table 6-1**). Refined EPCs were below available NOEC values for terrestrial plants.

Figure 6-1 illustrates the spatial distribution of sampling stations within the Main Plant Area that exceed direct contact NOECs or LOECs for soil invertebrate or terrestrial plant communities. Exceedances of NOECs were primarily associated with exposure to PAHs and select metals at soil sampling stations in the north-central portion of the Main Plant Area.

6.1.1.2 Ingestion Risk Estimate

The screening-level food ingestion model that assumed 100 percent exposure to soil in the Main Plant Area and used maximum concentrations as the EPCs resulted in HQs exceeding 1 for all receptors except for the long-tailed weasel and the North American wolverine (**Table 6-57**). Exposure to PAHs, BEHP, and dioxins resulted in the highest HQs within this exposure area (**Appendix H**).

The refined food chain model using more realistic assumptions resulted in several constituents having an HQ greater than 1, but only HMW PAHs (American woodcock and yellow-billed cuckoo) had HQ_{LOAEL} values that exceeded 1 (**Table 6-2, 6-58**). The yellow-billed cuckoo, currently listed as a federally threatened species, had HQ_{NOAEL} values that equaled 1 for LMW PAHs and exceeded 1 for HMW PAHs (19.7), BEHP (4.2), and dioxins/furans (2.7; **Tables 6-2, 6-58**). All HQ_{LOAEL} values were less than 5. Approximately 99 percent of the woodcock dose and 82 percent of the yellow-billed cuckoo dose that resulted in the LOAEL exceedances were associated with ingestion of earthworms (**Appendix H**).

Because the refined evaluation considers cumulative doses across multiple exposure areas for large range receptors, it is helpful to also evaluate potential risk associated with an exposure area assuming that 100 percent of exposure originates in that area in order to understand contributions from the target area itself rather than adjacent areas. For the Main Plant Area, the dose associated with PAHs in soil associated with risk to the American woodcock and yellow-billed cuckoo originates entirely from the

Main Plant Area, assuming exclusive foraging within this exposure area (**Table 6-59**). Furthermore, PAHs were not determined to be background-related by the background hypothesis testing evaluation performed for this exposure area (Roux, 2019).

The results of the small range receptor evaluation for the Main Plant Area are presented in **Figure 6-2**. Similar to the spatial distribution of direct contact exceedances, a cluster of stations in the north-central portion of the main industrial complex near the location of the former Paste Plant had concentrations that exceeded the NOAEL-based soil benchmark and some that exceeded the LOAEL-based soil benchmark for the short-tailed shrew. A few additional sample locations (CFSB-080 and CFSB-236) to the southeast of the main industrial complex in the vicinity of the Rectifier Yards also had concentrations that exceeded the LOAEL-based benchmark for the short-tailed shrew. Most of the samples around the periphery of the Main Plant exposure area either did not exceed either benchmark, or only exceeded the NOAEL-based benchmark (but not the LOAEL-based benchmark) for small range receptors.

6.1.1.3 Risk Characterization

Risk estimates for the Main Plant Area indicate the potential for adverse effects associated with exposure to PAHs in soil within localized portions of the Main Plant Area in close proximity to former operations. Direct contact exposure to PAHs in Main Plant Area may potentially result in adverse effects to terrestrial invertebrates in these localized areas. Maximum and refined EPCs exceeded NOECs; LOEC values were not available. Risk to plants via direct contact is expected to be negligible.

Based on refined exposure modeling that assumed that the Main Plant Area was the center of the home range of each receptor, estimated doses of PAHs resulted in wildlife ingestion HQ_{NOAEL} (for the yellow-billed cuckoo) or HQ_{LOAEL} values that exceeded 1 for the American woodcock and yellow-billed cuckoo. The ingestion of terrestrial invertebrates in the diet was the critical exposure pathway for these constituents for both receptors. Most of the samples with the highest concentrations of HMW PAHs were in the north central to eastern portion of the Main Plant Area.

BEHP also had HQ_{LOAEL} values that exceeded 1, but BEHP is a common laboratory contaminant, and its presence is unlikely to be site-related. Because of its current status as a federally threatened species, the yellow-billed cuckoo is evaluated on the basis of NOAEL endpoints. The yellow-billed cuckoo had HQ_{NOAEL} values that exceeded 1 for HMW PAHs (19.7), BEHP (4.2), and dioxins/furans (2.7; **Table 6-2, Table 6-58**). However, there is a low probability that yellow-billed cuckoo would be present in the vicinity of the site and, if present, it would not likely be exposed to soil in the Main Plant Area based on the limited availability of suitable habitat. Only 38 observations of the yellow-billed cuckoo have been recorded in the Montana Natural Heritage Program Database for the state of Montana. Recorded observations occurred from May to July (MNHP, 2019). If present in the vicinity of the Site, the yellow-billed cuckoo prefers open woodlands with dense, scrubby understory that provide cover, particularly willow or cottonwood-dominated forest canopies, with water nearby (Hughes, 2015). The Western subspecies that would potentially occur at the Site requires patches of at least 10 hectares (25 acres) of dense, riparian forest with a canopy cover of at least 50 percent in both the understory and overstory (MNHP, 2019). Under current conditions, the Main Plant Area is disturbed habitat that lacks wooded habitat; therefore, suitable habitat to support the yellow-billed cuckoo is not present.

The refined exposure models may also overestimate the potential dose to the yellow-billed cuckoo based on estimates of dietary dose based on terrestrial invertebrates (e.g., earthworms). No dietary information is available specific to Montana, but in other parts of the range, the main diet of the yellow-

billed cuckoo is caterpillars. Other insects, some fruits, and sometimes small lizards, frogs, and bird eggs area also consumed. Thus, the assumption in the wildlife ingestion model that the yellow-billed cuckoo diet consists entirely of terrestrial invertebrates is likely conservative; the soil-to-earthworm pathway typically results in higher exposure doses than other pathways, and the assumption that a target receptor ingests terrestrial invertebrates exclusively rather than a mixture of invertebrates and other food items would result in an overestimation of dose for most constituents. Given that the uptake factors for terrestrial invertebrates in the wildlife ingestion model are based on uptake to earthworms, exposure estimates presented in the BERA likely overestimate exposure relative to more representative dietary items for the yellow-billed cuckoo. Because caterpillars and other documented prey items have much less direct contact with soil than earthworms, they would likely bioaccumulate lower COPEC concentrations from soil.

In summary, because of the low number of records in Montana, the lack of its preferred riparian habitat at the Main Plant Area, and its migratory status, it is highly unlikely that the yellow-billed cuckoo is regularly, if ever, present at the Site in general and in the Main Plant Area specifically. Wildlife ingestion assumptions that assume 100 percent ingestion of earthworms likely overestimate risk. These factors should be considered collectively by risk managers when judging the potential for adverse impacts to this threatened species at the Site.

Potential risks to small range receptors were also noted in the Main Plant Area, particularly in the north-central and southeastern portions of the exposure area where some samples exceeded LOAEL-based benchmarks protective of mammalian receptors with limited home ranges, particularly short-tailed shrew. PAHs were detected at concentrations that were elevated compared to background areas.

Based on these findings, there is some potential for adverse effects to ecological receptors in localized areas of the Main Plant Area under current conditions. However, concern regarding constituents in the Main Plant Area are reduced because of the low quality of habitat in the area under current exposure conditions. The Main Plant Area is located in a disturbed, industrial setting with significant portions of it covered by concrete. Thus, it has poor quality resources that most species require for regular use (i.e., foraging areas, vegetative structure used for nesting or bedding areas and protection from predators, water sources). Specifically, the Main Plant Area does not provide habitat for yellow-billed cuckoo, which requires dense, wooded cover (**Section 3.3.6 and 6.1.1.2**). Therefore, ecological exposure is likely to be reduced or incomplete compared to more natural settings with higher habitat quality. Ecological risks are likely overestimated under current conditions and exposure assumptions for the Main Plant Area due to reduced or incomplete exposure pathways; however, further evaluation of exposure to soils with elevated concentrations in the identified localized areas may be warranted if future site conditions return these areas to a more naturalized habitat condition that supports ecological receptor populations.

6.1.2 Central Landfills Area

The following sections present the direct contact and ingestion risk estimates and the baseline ecological risk characterization for terrestrial exposure in the Central Landfills Area.

6.1.2.1 Direct Contact Exposure Estimate

The evaluation of direct contact pathways for terrestrial plants and soil invertebrates exposed to soil within the Central Landfills Area indicates limited potential for adverse ecological effects associated primarily with cyanide, metals, and PAHs. In the 0-0.5-ft and 0.5-2-ft sampling intervals, maximum concentrations of soil COPECs were less than available soil invertebrate LOECs, except for copper (HQ_{LOEC} = 13.7; **Table 6-3**). Maximum concentrations exceeded soil invertebrate NOECs for several metals, with HQ_{NOEC} values ranging from 1.9 for nickel to 90.8 for copper (**Table 6-3**). Maximum concentrations of LMW PAHs (HQ_{NOEC} = 33) and HMW PAHs (HQ_{NOEC} = 27) exceeded NOECs for soil invertebrates (**Table 6-3**). Based on refined EPCs for soil invertebrates, cyanide and metal COPEC concentrations were below NOEC values, except for minor exceedances for copper (HQ_{LOEC} = 1.4). Refined risk estimates for LMW PAHs and HMW PAHs resulted in HQ_{NOEC} = 3.0 (**Table 6-3**); soil invertebrate LOECs for LMW and HMW PAHs were not identified.

For terrestrial plants, maximum concentrations of soil COPECs were less than available LOECs for COPECs, except for copper (HQ_{LOEC} = 14.8; **Table 6-3**). Maximum concentrations exceeded terrestrial plant NOECs for cyanide (HQ_{LOEC} = 2.0) and several metals, with HQ_{NOEC} values ranging from 1.9 for beryllium to 104 for copper (**Table 6-3**). Concentrations of organic COPECs exceeding terrestrial plant NOECs were limited to slight exceedances of 3- and 4-methylphenol (HQ_{NOEC} = 1.5) and dibenzofuran (HQ_{NOEC} = 2.5). Based on refined EPCs, cyanide and metal COPEC concentrations were below NOEC values, except for a minor copper exceedance for (HQ_{LOEC} = 1.5).

The spatial distribution of sampling stations within the Central Landfills Area that exceed direct contact NOECs or LOECs for soil invertebrate or terrestrial plant communities is illustrated in **Figure 6-3**[3]. Elevated HQ_{NOEC} values for copper were driven by the single result at CFSB-002, which had a concentration of 7,260 mg/kg. This concentration was an order of magnitude greater than the next highest concentration of 721 mg/kg and was nearly two orders of magnitude greater than the mean concentration of copper (81 mg/kg) detected in all Central Landfills Area soil samples. Copper concentrations at other stations within the Central Landfills Area were less than LOECs for terrestrial plants and soil invertebrates. Excluding the anomalous copper result of 7,260 mg/kg, the refined direct contact EPC was 16.74 mg/kg, which is lower than terrestrial plant and soil invertebrate NOEC values and the SO#1 BTV of 17.93 mg/kg. Therefore, this elevated detection is considered anomalous and not representative of exposure within the Central Landfills Area. Barium and manganese exceedances of LOECs for terrestrial plants and soil invertebrates were distributed throughout the Central Landfills Area; however, concentrations of these metals were determined to be comparable to background concentrations in hypothesis testing (Roux, 2019). Exceedances of LOECs for other metals were associated with landfill cover stations CFLP-009 and CFLP-012 near the center of the exposure area within the footprint of the Wet Scrubber Sludge Pond (**Figure 6-3**).

6.1.2.2 Ingestion Risk Estimate

The screening-level food ingestion model that assumed 100 percent exposure to soil in the Central Landfills Area and used maximum concentrations as the EPCs resulted in HQs exceeding 1 for all receptors except for the long-tailed weasel and the North American wolverine (**Table 6-57**). Exposure to copper, Aroclor 1254, and PAHs resulted in the highest HQs within this exposure area (**Appendix H**).

[3] Samples designated with the prefix CFLP- indicate samples represent landfill cover materials.

The refined food chain model using more realistic assumptions resulted in several constituents having an HQ greater than 1, but only copper (American woodcock, yellow-billed cuckoo), Aroclor 1254 (American woodcock, yellow-billed cuckoo), and HMW PAHs (yellow-billed cuckoo) had HQ_{LOAEL} values that exceeded 1. All HQ_{LOAEL} values were less than 5, however (**Tables 6-4 and 6-58**). For copper, over 85 percent of the dose to the woodcock, and nearly the entire dose to the cuckoo was associated with ingestion of terrestrial invertebrates in their diet. Nearly the entire dose of Aroclor 1254 for the woodcock and the cuckoo, and of HMW PAHs for the cuckoo was also attributable to ingestion of terrestrial invertebrates for these two receptors (**Appendix H**). The yellow-billed cuckoo, which is evaluated using NOAEL endpoints, also had HQ_{NOAEL} values that exceeded 1 for LMW PAHs, BEHP, and dioxins/furans.

Because the refined evaluation considers cumulative doses across multiple exposure areas for large range receptors, it is helpful to also evaluate potential risk associated with an exposure area assuming that 100 percent of exposure originates in that area in order to understand contributions from the target area itself rather than adjacent areas. For the Central Landfills Area, the dose associated with copper, Aroclor 1254, and PAHs in soil associated with risk to the American woodcock and yellow-billed cuckoo and the dose associated with LMW PAHs, BEHP, and dioxins/furans that resulted in HQ_{NOAEL} values slightly greater than 1 for the yellow-billed cuckoo, originate entirely from the Central Landfills Area (**Table 6-59**). Neither copper nor PAHs were determined to be background-related by the background hypothesis testing evaluation performed for this exposure area (Roux, 2019). The EPCs for copper in soil in this exposure area were approximately an order of magnitude greater than the SO#1 BTV of 17.93 mg/kg. However, as discussed in **Section 6.1.2.1**, the single sample with elevated copper that strongly influenced the EPC at this exposure area is considered to be anomalous. To determine the influence of the anomalous sample on the calculated risk estimates for wildlife receptors, a refined EPC for copper was calculated after excluding the elevated concentration of 7,260 mg/kg. The resulting EPC of 16.74 mg/kg was an order of magnitude lower than the EPC with the anomalous sample included, and the NOAEL- and LOAEL-based HQs for all wildlife receptors using this revised EPC were all below 1.

The results of the small range receptor evaluation for the Central Landfills Area are presented in **Figure 6-4**. Several sample locations (CFSB-004, CFLP-009, and CFLP-012) had concentrations exceeding the LOAEL-based benchmark for the short-tailed shrew in the area where the Wet Scrubber Sludge Pond was formerly located. Several other locations in the southern portion of the exposure area (CFSB-227 and CFSB-224) between the Wet Scrubber Sludge Pond and the Main Plant Area also contained concentrations, including Aroclor 1254, exceeding the LOAEL-based benchmark for the short-tailed shrew. Several samples from this portion of the exposure area also had constituents at concentrations exceeding NOAEL, but not LOAEL benchmarks (with the exception of CFSB-002, where the anomalous copper concentration exceeded the LOAEL benchmark) for one or both small range receptors.

6.1.2.3 Risk Characterization

Risk estimates for the Central Landfills Area indicate the limited potential for adverse effects associated with exposure to PAHs and select metals, including copper, in soil within localized areas near the former Wet Scrubber Sludge Pond. The direct contact risk evaluation performed at the Central Landfills exposure area indicates that potential risk to soil invertebrates and terrestrial plants is low. Refined risk estimates for soil invertebrates exceeded NOECs for copper, LMW PAHs, and HMW PAHs; refined risk estimates for terrestrial plants exceeded NOECs for beryllium, copper, manganese, and thallium (**Table 6-3**). Greatest HQ_{LOEC} values for soil invertebrates and terrestrial plants were identified for copper; however, EPCs for copper were driven by a single result at CFSB-002 (7,260 mg/kg); copper

concentrations at other stations within the Central Landfills Area were over two orders of magnitude lower and were less than LOECs for terrestrial plants and soil invertebrates. HQ_{NOEC} values for LMW and HMW PAHs differed by an order of magnitude based on whether they were calculated using the maximum or refined EPCs, indicating that localized stations with elevated PAH concentrations are driving risk estimates (**Table 6-3**).

Wildlife ingestion models indicate the potential for adverse effects associated with exposure to copper, PAHs, and Aroclor 1254 assuming conservative exposure assumptions. Copper in Central Landfills Area soil also resulted in HQ_{LOAEL} values that exceeded 1 for the American woodcock and yellow-billed cuckoo for wildlife ingestion pathways. Hypothetical exposure to Aroclor 1254 (American woodcock, yellow-billed cuckoo), and HMW PAHs (yellow-billed cuckoo), also resulted in HQ_{LOAEL} values greater than 1. The ingestion of terrestrial invertebrate prey items was the critical exposure pathway for all COPECs and receptors. Similar to the direct contact pathways, EPCs for copper and PAHs resulting in elevated doses in the wildlife ingestion models are likely driven by localized stations with elevated concentrations. The greatest concentrations of Aroclor 1254 were associated with stations CFSB-227 and CFSB-224 in the southern portion of the exposure area between the Wet Scrubber Sludge Pond and the Main Plant Area. As noted above, the copper HQ values were driven by the single anomalous high concentration at CFSB-002. The small range receptor evaluation indicated several sample locations (e.g., CFLP-009, CFSB-004, CFLP-012, CFSB-227, CFSB-224) with concentrations exceeding the LOAEL-based soil benchmarks for the short-tailed shrew in the area where the Wet Scrubber Sludge Pond was formerly located and in the southern portion of the exposure area between the Wet Scrubber Sludge Pond and the Main Plant Area.

Because of its threatened status, the yellow-billed cuckoo is evaluated on the basis of NOAEL endpoints. In addition to copper, Aroclor 1254, and Total HMW PAHs, the yellow billed cuckoo had HQ_{NOAEL} values that exceeded 1 for LMW PAHs (1.4), BEHP (2.2), and dioxins/furans (1.1; **Table 6-58**). However, as stated for the Main Plant Area (see **Section 6.1.1.3**), the probability of yellow-billed cuckoo being exposed to COPECs in soil in the Central Landfills Area is low given the infrequent observations of yellow-billed cuckoo in the region and the lack of suitable habitat in the Central Landfills Area. Similar to the Main Plant Area, the Central Landfills Area lacks the open woodlands with dense, scrubby understory that the yellow-billed cuckoo requires. Further, the estimation of dietary dose to the yellow-billed cuckoo based on uptake to earthworms likely overestimates exposure experienced through the ingestion of more representative dietary items (see **Section 6.1.1.3**). Based on the low probability of exposure in the Central Landfills Area and the conservative estimate of dietary COPEC concentrations, HQs for the yellow-billed cuckoo are likely overestimated, particularly when only HQ_{NOAEL} values are considered.

Based on these findings, there is limited potential for adverse effects to ecological receptors exposed to copper, PAHs, and Aroclor 1254 in localized areas of the Central Landfills Area under current conditions. Neither copper nor PAHs were determined to be background-related by the background hypothesis testing evaluation performed for this exposure area. Therefore, copper, PAHs, and Aroclor 1254 were considered to be site-related constituents with the potential to result in adverse effects in localized areas identified within the Central Landfills Area. However, the risk associated with copper exposure was strongly influenced by a single highly elevated concentration that is considered to be anomalous. All wildlife receptor HQs were below 1 using an EPC that was calculated with the anomalous concentration excluded. Also, the potential for adverse effects associated with COPECs in soil in the Central Landfills Area is limited because of the low quality of habitat in the area that reduces receptor use and exposure. The Central Landfills Area is located in an industrial setting that has poor quality resources that most species require for regular use (i.e., foraging areas, vegetative structure used for

nesting or bedding areas and protection from predators, water sources). Specifically, the Central Landfills Area does not provide habitat for yellow-billed cuckoo, which require dense, wooded cover (**Section 3.3.6**). Ecological risks are likely overestimated under current conditions and exposure assumptions for the Central Landfills Area due to reduced or incomplete exposure pathways; however, further evaluation of exposure to soils with elevated concentrations in the identified localized areas may be warranted if future site conditions return these areas to a more naturalized habitat condition that supports ecological receptor populations.

6.1.3 Incremental Soil Sampling Grid

The following sections present the direct contact and ingestion risk estimates and the baseline ecological risk characterization for terrestrial exposure in the ISS Grid. The ISS Grid is located primarily in the Central Landfills Area, with a portion of the DUs in the northern portion of the Main Plant Area (**Figure 4-8**).

6.1.3.1 Direct Contact Risk Estimate

The evaluation of direct contact pathways for terrestrial plants and soil invertebrates exposed to soil within the ISS Grid was performed using the upper RSD-adjusted EPCs (see **Section 4.1.1.1**). The results indicate limited potential for adverse ecological effects associated primarily with cyanide, metals, and PAHs. Maximum concentrations of soil COPECs were lower than available soil invertebrate LOEC values, except for copper (HQ_{LOEC} = 1.9) and zinc (HQ_{LOEC} = 2.1; **Table 6-5**). Maximum concentrations exceeded soil invertebrate NOECs for arsenic, copper, manganese, mercury, selenium, and zinc, with HQ_{NOEC} values ranging from 2.0 (manganese) to 16.2 (zinc; **Table 6-5**). Maximum concentrations of LMW PAHs (HQ_{NOEC} = 129.9) and HMW PAHs (HQ_{NOEC} = 112..5) exceeded NOECs for soil invertebrates (**Table 6-5**); soil invertebrate LOECs for LMW and HMW PAHs were not identified.

Maximum concentrations of soil COPECs exceeded terrestrial plant LOECs for barium (HQ_{LOEC} = 1.3), copper (HQ_{LOEC} = 2.0), lead (HQ_{LOEC} = 1.1), selenium (HQ_{LOEC} = 5.3), zinc (HQ_{LOEC} = 2.4; **Table 6-5**) and dibenzofuran (HQ_{LOEC} = 1.5). Maximum concentrations exceeded terrestrial plant NOECs for cyanide (HQ_{LOEC} = 4.0) and several metals, with HQ_{NOEC} values ranging from 1.1 for cobalt to 30.7 for selenium (**Table 6-5**). The maximum concentration of dibenzofuran (HQ_{NOEC} = 15.3) also exceeded the terrestrial plant NOEC. 2,4-Dimethyphenol exceeded its terrestrial plant NOEC (HQ_{NOEC} = 71), but a terrestrial plant LOEC was not identified for this compound, and it was only detected in two ISS samples at a maximum concentration of 0.7 mg/kg (**Table 6-5**).

Figure 6-5 illustrates the spatial distribution of sampling stations within the ISS Grid that exceed direct contact NOECs or LOECs for soil invertebrate or terrestrial plant communities. The upper, measured, and lower RSD adjusted EPCs are represented by the three rows of results in the figure (because the four ISS grid areas with triplicate samples (CFISS-01, -04, -011, and -015) have EPCs based on calculated UCL_{mean} values rather than RSD adjusted concentrations, they have identical results for the three rows). Barium concentrations are likely associated with background soil conditions. Barium concentrations that exceed terrestrial plant LOECs were lower than or approximated the BTV (299.5 mg/kg) calculated for similar background soil type (SO#1); further, barium concentrations in surface soils from the Main Plant Area and Central Landfills Area that encompasses the ISS Grid were determined to be comparable to background concentrations in hypothesis testing (Roux, 2019). Exceedances of selenium were identified

in contiguous DUs in the eastern portion of the ISS Grid, and exceedances of zinc were identified in two contiguous DUs in the southwestern corner of the ISS Grid (**Figure 6-5**).

6.1.3.2 Ingestion Risk Estimate

As discussed in **Section 4.1.1.1**, the Incremental Soil Sampling Grid was not included in the wildlife ingestion model. Potential risks to small-range receptors were evaluated using the point-by-point comparison to ESVs protective of the meadow vole and short-tailed shrew, as discussed below.

The results of the small range receptor evaluation for the Incremental Sampling Grid within the Operational Area are presented in **Figure 6-6**, which uses a similar 2-by-3 grid as **Figure 6-5** to depict exceedances for the short-tailed shrew and meadow vole across the three EPCs for each DU. Incremental samples in all DUs exceeded a NOAEL-based benchmark for at least one of the two evaluated small range receptors. Exceedances of the LOAEL-based benchmarks were limited to the southeastern (CFISS-033 and -044), north-central (CFISS-007, -011, -012, -013, and -020) and northwest-central (CFISS-003 and -004) DUs. All exceedances were associated with the short-tailed shrew receptor, except for CFISS-013, which also exceeded LOAEL-based benchmarks for the meadow vole. Exceedances of LOAEL-based benchmarks for short-tailed shrew were primarily associated with LMW and HMW PAH exposures. Several DUs located in the center of the Operational Area also had PCB-1254 concentrations that exceeded LOAEL-based benchmarks for the short-tailed shrew (**Figure 6-6**).

6.1.3.3 Risk Characterization

Risk estimates for the ISS Grid were similar to risk estimates for overlapping areas within the Main Plant Area and Central Landfills Area. Direct contact exposure to soil invertebrates was greatest for PAHs and select metals, including copper and zinc. The greatest exposure to terrestrial plants was associated with exposure to selenium, copper, and zinc. However, risk estimates based on maximum EPCs resulted in $HQ_{LOEC} < 5$ (when rounded) for terrestrial plants and soil invertebrates.

Effects associated with wildlife ingestion pathways were evaluated for the ISS Grid using comparisons of NOAEL- and LOAEL-based benchmarks for small range receptors to EPCs estimated for individual DUs. Several of the DUs, particularly in the central third of the ISS Grid within the Central Landfills Area, had concentrations of constituents that exceeded LOAEL-based benchmarks protective of small range receptors. Exceedances of LOAEL-based benchmarks in these DUs were primarily associated with LMW and HMW PAH exposure to the short-tailed shrew. Exposure to Aroclor 1254 also resulted in LOAEL-based exposure to the short-tailed shrew in five of these DUs.

Because of the exceedances of LOEC/LOAEL benchmarks, there is some potential for adverse effects associated with exposure to copper, selenium, and PAHs in soil in select DUs. However, because the exceedances were relatively low, risk is considered moderate. PAHs in soil may also represent a risk to ecological receptors, particularly soil invertebrates. However, because of the lack of LOEC values, the potential risk to these receptors is an uncertainty. PAHs were found to be elevated relative to background in the hypothesis testing evaluation performed for the Central Landfills and Main Plant exposure areas, which overlap the ISS Grid. Similar to the Main Plant Area and Central Landfills Area, concern regarding exposure to COPECs in the ISS Grid are reduced because of the low quality of habitat in the area. The ISS Grid is located in an industrial setting with poor habitat quality and limited resources that are required by most species for regular use. Ecological risks are likely overestimated under current conditions and exposure assumptions for the ISS Grid due to reduced or incomplete exposure pathways;

however, further evaluation of exposure to soils with elevated concentrations in the identified DUs may be warranted if future site conditions return these areas to a more naturalized habitat condition that supports ecological receptor populations.

As described in **Sections 5.3.1** and **6.1.3.3**, soil EPCs based on individual DUs within the Operational Area ISS sampling grid were compared to benchmark values protective of small range receptors that would be expected to obtain their entire exposure within the approximately 1-acre sized DUs. Discrete soil samples that were also collected from within the ISS grid as part of the broader Site characterization effort were pooled with other discrete samples from the Main Plant Area or Central Landfills Area, which are the two exposure areas that overlap the Operational Area. The discrete soil sample dataset was used to evaluate potential risks associated with direct contact and indirect/food chain effects for a variety of receptors selected to represent the trophic positions of ecological species likely to be present. Discrete samples across the Site were also individually compared to calculated benchmark concentrations protective of small-range receptors (i.e., the meadow vole and short-tailed shrew).

As stated in the BERA Work Plan (EHS Support, 2018) and *Technical Memorandum: Proposed Wildlife Exposure Modeling Approach to Support the Baseline Ecological Risk Assessment at the Columbia Falls Superfund Site* presented in **Appendix A2**, exposure to receptors with moderately sized home ranges that may forage within multiple, adjacent DUs within the ISS grid was not quantified. This results in some uncertainty regarding potential risk to receptors with home ranges larger than an acre but smaller than the 43-acre Operational Area, including the American woodcock (11.1 acre home range), yellow-billed cuckoo (42 acre home range), and the long-tailed weasel (12 acre home range) that may forage exclusively within the Operational Area.

The uncertainty regarding the lack of evaluation of mid-range receptors is reduced based on the evaluation of relative exposure to small range receptor exposure and habitat quality within the Operational Area. HQs for small range receptors are typically higher than larger range receptors, owing to the fact that small range receptors (such as the meadow vole and short-tailed shrew) are smaller in size and have a higher relative metabolic/ingestion rate (and, therefore, calculated constituent dose) per unit body weight than larger species within the same foraging guild (USEPA, 2005b). Thus, evaluations and conclusions protective of small home range receptors are likely also protective of larger range receptors. The analysis of concentrations present at each DU and the comparison to NOAEL-based and LOAEL-based benchmark values for the meadow vole (herbivore) and short-tailed shrew (insectivore) presented in Section 6.1.3.2 indicated that most DUs within the Operational Area had constituent concentrations that were below LOAEL-based benchmarks, but 10 ISS locations primarily within the center of the sampling grid had concentrations that exceeded LOAEL-based benchmarks. Although one of the mid-range receptors of concern (the long-tailed weasel) is a carnivore, which is a foraging guild not represented by the two species used to develop wildlife benchmarks for the point-by-point analysis, and another (the yellow-billed cuckoo) is an avian species that may have somewhat different toxicity thresholds than the mammalian small-range receptors upon which the small-range receptor benchmarks were developed, risk management decisions based upon small body weight herbivores and insectivores are likely to also be protective of these receptors with mid-sized home ranges. This is supported by the fact that the mammalian insectivore exposure pathway (represented by the short-tailed shrew) typically results in the highest dose among wildlife receptors. Also, the home ranges of two of the three mid-range receptors listed above are approximately double the size of the six 1-acre DUs where LOAEL-based benchmarks were exceeded, and the third (the yellow-billed cuckoo) approximates the size of the entire Operational Area. Therefore, some dilution of dose based on exposure to less contaminated areas would result in a lower expected likelihood of adverse effects to

the three mid-range receptors of concern compared to the 1-acre exposure areas assumed for the short-tailed shrew and meadow vole.

A second consideration that reduces the uncertainty for mid-range receptors is that the Operational Area is in an area that was highly disturbed by plant operations and lacks sufficient habitat to sustain 100 percent of the foraging requirements of mid-range receptors. Habitat qualities favored by the evaluated mid-range receptors such as forest thickets (American woodcock), seral ecotones and forests with openings (long-tailed weasel), and dense, riparian forest with canopy cover of at least 50 percent (yellow-billed cuckoo) are absent in this portion of the Site. Therefore, the potential for the occurrence of such receptors is low. Although irregular exposure may occur, it is unlikely that the habitat present in this area would support multiple individuals foraging 100 percent of the time within the Operational Area. Thus, the potential for adverse effects to populations associated with the receptor groups represented by the American woodcock and long-tailed weasel, is highly unlikely due to the absence of a sufficient forage base to sustain populations of these receptor groups. The yellow-billed cuckoo is a threatened species that is protected on the individual level. However, as stated previously for the Main Plant Area and Central Landfills Area, there is low probability of yellow-billed cuckoo to be present in the vicinity of the Site is due to its rarity in Montana in general, and an even lower probability of occurrence within the Operational Area due to the absence of basic habitat requirements (see **Section 6.1.1.3**).

Based on the information presented in the preceding paragraphs, it is unlikely that the lack of evaluation of receptors with mid-sized home ranges within the Operational Area represents a significant uncertainty in the BERA. Risk management decisions based on the sessile and small-range receptors that are currently the focus of evaluation in this area are likely to be protective of larger-ranging receptors as well.

6.1.4 Industrial Landfill Area

The following sections present the direct contact and ingestion risk estimates and the baseline ecological risk characterization for terrestrial exposure in the Industrial Landfill Area.

6.1.4.1 Direct Contact Risk Estimate

The evaluation of direct contact pathways for terrestrial plants and soil invertebrates exposed to soil within the Industrial Landfill Area indicates limited potential for adverse ecological effects associated primarily with PAHs and select metals. In the 0-0.5-ft and 0.5-2-ft sampling intervals, maximum concentrations of soil COPECs were less than available soil invertebrate LOECs; however, soil invertebrate LOECs for PAHs were not identified (**Table 6-6**). Maximum concentrations exceeded soil invertebrate NOECs for arsenic (HQ_{NOEC} = 3.5), nickel (HQ_{NOEC} = 1.7), and LMW (HQ_{NOEC} = 7.0) and HMW PAHs (HQ_{NOEC} = 13.4; **Table 6-6**). Refined risk estimates for soil invertebrates potentially exposed to arsenic, nickel, and LMW and HMW PAHs resulted in similar HQ_{NOEC} values to maximum EPCs.

For terrestrial plants, maximum concentrations of soil COPECs were less than available LOECs, except for nickel and vanadium (HQ_{LOEC} = 1.7 and HQ_{LOEC} = 2.1, respectively; **Table 6-6**). Maximum concentrations exceeded terrestrial plant NOECs for several metals, with HQ_{NOEC} values ranging from 1.3 for arsenic to 12.2 for nickel (**Table 6-6**). Refined EPCs were below terrestrial plant LOECs, except for minor exceedances for nickel (HQ_{LOEC} = 1.5) and vanadium (HQ_{LOEC} = 1.9).

Figure 6-7[4] illustrates the spatial distribution of sampling stations within the Industrial Landfill Area that exceed direct contact NOECs or LOECs for soil invertebrate or terrestrial plant communities. Direct contact LOEC exceedances were associated with maximum concentrations observed at station CFLP-005; concentrations at other Industrial Landfill Area stations were less than LOECs.

6.1.4.2 Ingestion Risk Estimate

The screening-level food ingestion model that assumed 100 percent exposure to soil in the Industrial Landfill Area and used maximum concentrations as the EPCs resulted in HQs exceeding 1 for multiple receptors (**Table 6-57**). Exposure to PAHs resulted in the highest HQs within this exposure area (**Appendix H**).

The refined food chain model using more realistic assumptions resulted in several constituents having an HQ greater than 1, but only nickel (American woodcock and short-tailed shrew) and HMW PAHs (American woodcock and yellow-billed cuckoo) had HQ_{LOAEL} values that exceeded 1 (**Tables 6-7 and 6-58**). All HQ_{LOAEL} values were less than 5, however. For nickel, approximately 90 percent of the dose to the woodcock and 99 percent of the dose to the shrew was associated with ingestion of terrestrial invertebrates. For HMW PAHs, approximately 94 percent of the dose to the woodcock and nearly the entire dose to the yellow-billed cuckoo was associated with ingestion of terrestrial invertebrates. The yellow-billed cuckoo, which is evaluated using NOAEL endpoints, also had an HQ_{NOAEL} value that exceeded 1 for nickel (2.3; **Tables 6-7** and **6-58**).

Because the refined evaluation considers cumulative doses across multiple exposure areas for large range receptors, it is helpful to also evaluate potential risk associated with an exposure area assuming that 100 percent of exposure originates in that area in order to understand contributions from the target area itself rather than adjacent areas. For the Industrial Landfill Area, the doses associated with nickel and PAHs in soil associated with risk to the American woodcock and yellow-billed cuckoo originate primarily from the Industrial Landfill Area (**Table 6-59**). Furthermore, neither nickel nor PAHs were determined to be background-related in the background hypothesis testing evaluation at this exposure area (Roux, 2019). Therefore, nickel and PAHs in soil at the Industrial Landfill Area represent a moderate risk to ecological receptors due to exposure from direct and indirect ingestion pathways.

The results of the small range receptor evaluation for the Industrial Landfill Area are presented in **Figure 6-8**. None of the four soil sample locations in the center and southwestern portion of the area had concentrations that exceeded LOAEL benchmarks. Both sample locations in the northeastern portion of the site (CFLP-005 and CFLP-006) had concentrations that exceeded NOAEL-based benchmarks for the meadow vole (HMW PAHs and nickel) and LOAEL benchmarks for the short-tailed shrew (HMW PAHs).

6.1.4.3 Risk Characterization

Risk estimates for the Industrial Landfill Area indicate the limited potential for adverse effects associated with exposure to PAHs and select metals in soil. Refined risk estimates for soil invertebrates exceeded NOECs for arsenic, nickel, LMW PAHs, and HMW PAHs; refined risk estimates for terrestrial plants exceeded NOECs for five metals (**Table 6-6**). The evaluation of direct contact pathways for soil invertebrates exposed to soil within the Industrial Landfill Area indicates the greatest potential for adverse effects is associated with exposure to LMW and HMW PAHs based on HQ_{NOEC} values; however,

[4] Samples designated with the prefix CFLP- indicate samples represent landfill cover materials.

the absence of soil invertebrate LOECs results in some uncertainty in the risk estimate. Direct contact impacts associated with soil constituents to terrestrial plants are expected to be low, due to no or very minor exceedances of terrestrial plant LOECs.

The results of the food chain model indicated that nickel (American woodcock and short-tailed shrew) and HMW PAHs (American woodcock and yellow-billed cuckoo) had HQ_{LOAEL} values that exceeded 1 in this exposure area. All HQ_{LOAEL} values were less than 5, however. Neither nickel nor PAHs were determined to be background-related. Also, two sample locations in the northeastern portion of the site exceeded LOAEL-based soil benchmarks for small range receptors. The ingestion of terrestrial invertebrate prey items was the critical exposure pathway for both nickel (American woodcock and short-tailed shrew, and the yellow-billed cuckoo when evaluated using the an HQ_{NOAEL}) and HMW PAHs (American woodcock and yellow-billed cuckoo). Therefore, nickel and PAHs in soil at the Industrial Landfill Area represent a moderate risk to ecological receptors due to exposure from direct and indirect ingestion pathways. Risk associated with nickel were driven by two highly elevated concentrations, both of which were in soil boring CFLP-005, which is in the northeastern portion of the exposure area. The concentration of nickel in the 0 to 0.5 ft sample at this location was 463 mg/kg and was 513 mg/kg in the 0.5 to 2 ft sample. Six additional soil samples exceeded the nickel BTV of 17.32 mg/kg in this exposure area as well. All other samples were below 100 mg/kg. Elevated HMW PAHs were also detected in CFLP-005 (0 to 0.5 ft) as well as CFLP-006 (0 to 0.5 ft), which is approximately 250 feet to the northwest of CFLP-005. Concentrations in these samples were over 100 mg/kg, at 166.6 mg/kg and 388 mg/kg, respectively. The deeper sample from CFLP-005 (0.5 to 2 ft) (91.2 mg/kg) and CFLP-003 (0.5-2 ft) (99 mg/kg) were also somewhat elevated (i.e., greater than 50 mg/kg). All other concentrations were below 50 mg/kg. Concern regarding COPEC exposure in the Industrial Landfill Area are reduced because of the disturbed and low quality of habitat in the area. The Industrial Landfill Area is a waste disposal area with limited resource qualities relative to more naturalized adjacent habitats. Due to the reasons stated in **Section 6.1.1.3**, the HQs for the cuckoo are likely overestimated based on the limited probability of occurrence of this species and the conservative estimate of dietary COPEC concentrations, particularly when only HQ_{NOAEL} values are considered. Specifically, the Industrial Landfill Area does not provide habitat for yellow-billed cuckoo, which require dense, wooded cover (**Section 3.3.6**). Ecological risks are likely overestimated under current conditions and exposure assumptions for the Industrial Landfill Area due to reduced or incomplete exposure pathways. It is also noted that the Industrial Landfill Area is uncapped. As such, the concentrations of COPECs may be reflective of the waste materials disposed of within the landfill.

6.1.5 Eastern Undeveloped Area

The following sections present the direct contact and ingestion risk estimates and the baseline ecological risk characterization for terrestrial exposure in the Eastern Undeveloped Area.

6.1.5.1 Direct Contact Risk Estimate

The evaluation of direct contact pathways for terrestrial plants and soil invertebrates exposed to soil within the Eastern Undeveloped Area indicates negligible potential for adverse ecological effects associated with select metals. In the 0-0.5-ft and 0.5-2-ft sampling intervals, maximum concentrations of soil COPECs were less than soil invertebrate LOECs available for COPECs (**Table 6-8**). Maximum concentrations exceeded soil invertebrate NOECs for five metals, with HQ_{NOEC} values ranging from 1.3 for

zinc to 8.8 for manganese (**Table 6-8**). Based on refined EPCs, metal COPEC concentrations were below soil invertebrate NOEC values, except for barium (HQ_{LOEC} = 1.8) and manganese (HQ_{LOEC} = 3.2).

For terrestrial plants, maximum concentrations of soil COPECs were less than available LOECs, except for barium and manganese (HQ_{LOEC} = 4.1 and HQ_{LOEC} = 3.6, respectively; **Table 6-8**). Maximum concentrations exceeded terrestrial plant NOECs for five metals, with HQ_{NOEC} values ranging from 1.2 for selenium to 18 for manganese (**Table 6-8**). Refined EPCs were below terrestrial plant LOECs, except for minor exceedances for barium (HQ_{LOEC} = 2.2) and manganese (HQ_{LOEC} = 1.3; **Table 6-8**).

Figure 6-9 illustrates the spatial distribution of sampling stations within the Eastern Undeveloped Area that exceed direct contact NOECs or LOECs for soil invertebrate or terrestrial plant communities. Exceedances of barium and manganese on the eastern boundary of the Eastern Undeveloped Area were comparable to the BTVs calculated for barium (774 mg/kg) and manganese (1,566 mg/kg) for background soil area SO#4 that is typical of the Revett Formation soil type at the base of Teakettle Mountain (Roux, 2019). Exceedances to the west of the Cedar Creek Overflow Ditch are comparable to BTVs for barium (300 mg/kg) and manganese (1,566 mg/kg) calculated for the background soil area SO#1, which is representative of most of the developed portion of the Site (**Figure 6-9**). These findings indicate that direct contact exposure to barium and manganese are consistent with background exposure in the Eastern Undeveloped Area.

6.1.5.2 Ingestion Risk Estimate

The screening-level food ingestion model that assumed 100 percent exposure to soil in the Eastern Undeveloped Area and used maximum concentrations as the EPCs resulted in HQ_{NOAEL} values exceeding 1 for four receptors (**Table 6-57**). However, all values were less than 5, and no HQ_{LOAEL} values exceeded 1 (**Appendix H**).

The refined food chain model using more realistic assumptions resulted in two constituents having an HQ_{NOAEL} greater than 1 including nickel for the short-tailed shrew and BEHP (HQ =1.2) for the yellow-billed cuckoo (**Tables 6-9 and 6-58**). Neither of these HQ_{NOAEL} values were greater than 1 when rounded, and HQ_{LOAEL} values were less than 1. BEHP is also a common laboratory contaminant and is unlikely related to previous Site activities. Therefore, nickel and BEHP in soil at the Eastern Undeveloped Area represent a minimal risk to ecological receptors due to exposure from direct and indirect ingestion pathways.

The results of the small range receptor evaluation for the Eastern Undeveloped Area indicate that COPEC concentrations are below LOAEL-based benchmarks for meadow vole and short-tailed shrew at all sampling locations (**Figure 6-10)**. Stations along the eastern boundary of the Eastern Undeveloped Area and within the Borrow Pit Area exceed NOAEL-based benchmarks for nickel for short-tailed shrew, with a maximum HQ of 1.7. All sampling locations were below NOAEL-based benchmarks for the meadow vole.

6.1.5.3 Risk Characterization

Risk estimates for the Eastern Undeveloped Area indicate minimal potential for adverse effects associated with exposure to soil. Refined risk estimate indicates minor NOEC exceedances for soil invertebrates (barium and manganese) and terrestrial plants (barium, manganese, nickel, and thallium; **Table 6-8**). However, risks to soil invertebrates and terrestrial plant communities are considered to be

negligible relative to background risk in the Eastern Undeveloped Area. Maximum concentrations for all constituents were below LOEC benchmarks for soil invertebrates, and refined EPCs for barium and manganese, which were detected at concentrations comparable to background, only marginally exceeded LOEC benchmarks for plants.

The wildlife ingestion model indicated that no HQ_{NOAEL} values exceeded 1 when rounded and all HQ_{LOAEL} values were less than 1 for all receptors. The estimated dose of BEHP for yellow-billed cuckoo slightly exceeded the NOAEL (HQ = 1.2; **Table 6-9**). Although the yellow-billed cuckoo is evaluated based on NOAEL endpoints due to its current status as a federally threatened species, the likelihood of adverse effects resulting from exposure to BEHP is low. As previously discussed, there is a low probability of occurrence of yellow-billed cuckoo at the Site and the dose that slightly exceeded the NOAEL TRV was based on the conservative estimate of dietary COPEC concentrations based on 100 percent ingestion of earthworms that likely overestimates COPEC concentrations in dietary items associated with the yellow-billed cuckoo (see **Section 6.1.1.3**). The small-range receptor evaluation did not identify any sample locations that exceeded LOAEL-based benchmarks. Therefore, the potential for ecological risk at the Eastern Undeveloped Area is expected to be minimal.

6.1.6 North-Central Undeveloped Area

The following sections present the direct contact and ingestion risk estimates and the baseline ecological risk characterization for terrestrial exposure in the North-Central Undeveloped Area.

6.1.6.1 Direct Contact Risk Estimate

The evaluation of direct contact pathways for terrestrial plants and soil invertebrates exposed to soil within the North-Central Undeveloped Area indicates negligible potential for adverse ecological effects associated with select metals. Maximum concentrations of soil COPECs were less than soil invertebrate available LOECs (**Table 6-10**). Maximum concentrations exceeded soil invertebrate NOECs for arsenic (HQ_{NOEC} = 2.3), barium (HQ_{NOEC} = 1.5), and manganese (HQ_{NOEC} = 5.8; **Table 6-10**). Based on refined EPCs, metal COPEC concentrations were below soil invertebrate NOEC values, except for barium (HQ_{LOEC} = 2.5).

For terrestrial plants, maximum concentrations of soil COPECs were lower than available LOECs, except for a minor barium exceedance (HQ_{LOEC} = 1.9; **Table 6-10**). Maximum concentrations exceeded terrestrial plant NOECs for three metals, with HQ_{NOEC} values ranging from 3.8 for thallium to 11.9 for manganese (**Table 6-10**). Refined EPCs were below terrestrial plant LOECs, except for a slight exceedance for barium (HQ_{LOEC} = 1.1 **Table 6-10**).

Figure 6-11 illustrates the spatial distribution of sampling stations within the North-Central Undeveloped Area that exceed direct contact NOECs or LOECs for soil invertebrate or terrestrial plant communities. Exceedances of soil invertebrate or terrestrial plant LOECs are limited to barium and manganese. Manganese concentrations were determined to be comparable to background concentrations in hypothesis testing between the approximate portion of the site encompassed by the North-Central Undeveloped Area and background sampling area SO#1 (Roux, 2019). Exceedances of barium on the eastern boundary of the North-Central Undeveloped Area were less than the BTV calculated for barium (774 mg/kg) for background soil area SO#4 that is typical of the Revett Formation soil type at the base of Teakettle Mountain (Roux, 2019). Barium exceedances to the west of the Cedar Creek Reservoir Overflow Ditch (**Figure 6-11**) are generally comparable to BTV for barium (300 mg/kg)

calculated for the background soil area SO#1. These findings indicate that direct contact exposure to barium and manganese are consistent with background exposure in the North-Central Undeveloped Area.

6.1.6.2 Ingestion Risk Estimate

The screening-level food ingestion model that assumed 100 percent exposure to soil in the North-Central Undeveloped Area and used maximum concentrations as the EPCs resulted in HQ_{NOAEL} values exceeding 1 for cyanide (American woodcock, mourning dove, and yellow-billed cuckoo) and BEHP (American woodcock, yellow-billed cuckoo) (**Table 6-57**). However, no HQ_{NOAEL} values exceeded 5, and no HQ_{LOAEL} values exceeded 1 (**Appendix H**).

The refined food chain model using more representative exposure assumptions resulted in HMW PAHs having an HQ greater than 1 for the mourning dove (1.5; **Tables 6-11 and 6-58**). All HQ_{LOAEL} values were less than 1. Because the refined evaluation considers cumulative doses across multiple exposure areas for large range receptors, it is helpful to also evaluate potential risk associated with an exposure area assuming that 100 percent of exposure originates in that area in order to understand contributions from the target area itself rather than adjacent areas. For the North-Central Undeveloped Area, the dose associated with PAHs in soil associated with risk to the mourning dove does not originate from the North-Central Undeveloped Area, as all HQs are below 1 for these constituents when only doses from the target exposure area are considered (**Table 6-59**). Therefore, no constituents in soil at the North-Central Undeveloped Area represent a significant risk to ecological receptors due to exposure from direct and indirect ingestion pathways.

The results of the small range receptor evaluation for the North-Central Undeveloped Area are presented in **Figure 6-12**. All soil sample locations in this exposure area were below NOAEL-based benchmarks for small range receptors. It is noted that this ecological exposure area includes the sample locations around the periphery of the Industrial Landfill exposure area, indicating that the soil surrounding the landfill does not pose a threat to small range mammalian receptors.

6.1.6.3 Risk Characterization

Risk estimates for the North-Central Undeveloped Area indicate minimal potential for adverse effects associated with exposure to soil. Negligible risks to soil invertebrates and terrestrial plant communities above background risk are expected in the North-Central Undeveloped Area. Maximum concentrations for all constituents were below LOEC benchmarks for invertebrates, and refined EPCs for barium and manganese, which were detected at concentrations comparable to background, only marginally exceeded NOEC and LOEC benchmarks for plants. The wildlife ingestion model indicated that all HQ_{NOAEL} and HQ_{LOAEL} values were less than 1 for all receptors when only contributions from the North-Central Undeveloped Area were included in the risk estimates, and the small-range receptor evaluation did not identify any sample locations that exceeded LOAEL-based benchmarks. Therefore, the potential for ecological risk at the North-Central Undeveloped Area is expected to be minimal.

6.1.7 Western Undeveloped Area

The following sections present the direct contact and ingestion risk estimates and the baseline ecological risk characterization for terrestrial exposure in the Western Undeveloped Area.

6.1.7.1 Direct Contact Risk Estimate

The evaluation of direct contact pathways for terrestrial plants and soil invertebrates exposed to soil within the Western Undeveloped Area indicates negligible potential for adverse ecological effects associated with select metals. Maximum concentrations of soil COPECs were less than available soil invertebrate LOECs available for COPECs (**Table 6-12**). Maximum concentrations exceeded soil invertebrate NOECs for four metals, with HQ_{NOEC} values ranging from 1.6 (barium) to 4.9 (manganese; **Table 6-12**). Based on refined EPCs, metal COPEC concentrations were below soil invertebrate NOEC values, except for manganese (HQ_{LOEC} = 1.4).

For terrestrial plants, maximum concentrations of soil COPECs were lower than available LOECs, except for barium (HQ_{LOEC} = 2.1) and manganese (HQ_{LOEC} = 2.0; **Table 6-12**). Maximum concentrations exceeded terrestrial plant NOECs for four metals, with HQ_{NOEC} values ranging from 1.5 for zinc to 10.0 for manganese (**Table 6-12**). Refined EPCs were below terrestrial plant LOECs, except for a slight exceedance for barium (HQ_{LOEC} = 1.2).

Figure 6-13 illustrates the spatial distribution of sampling stations within the Western Undeveloped Area that exceed direct contact NOECs or LOECs for soil invertebrate or terrestrial plant communities. Exceedances of soil invertebrate or terrestrial plant LOECs are limited to barium and manganese. Manganese concentrations were determined to be comparable to background concentrations in hypothesis testing between the approximate portion of the site encompassed by the Western Undeveloped Area and background sampling area SO#1 (Roux, 2019). Barium concentrations that exceeded LOECs ranged from below to within two times the BTV (300 mg/kg) calculated for the background soil area SO#1 (**Figure 6-13**). These findings indicate that direct contact exposure to barium and manganese do not represent a substantial incremental risk above background risk.

6.1.7.2 Ingestion Risk Estimate

The screening-level food ingestion model that assumed 100 percent exposure to soil in the Western Undeveloped Area and used maximum concentrations as the EPCs resulted in HQ_{NOAEL} values exceeding 1 for four receptors (**Table 6-57**). However, all values were less than 5, and no HQ_{LOAEL} values exceeded 1 (**Appendix H**).

The refined food chain model using more realistic assumptions resulted in two constituents having an HQ greater than 1, including HMW PAHs for the mourning dove (HQ_{NOAEL} =1.5) and dioxins/furans for the short-tailed shrew (HQ_{NOAEL} =1.1); **Tables 6-13 and 6-58**). No HQ_{LOAEL} values exceeded 1.

Because the refined evaluation considers cumulative doses across multiple exposure areas for large range receptors, it is helpful to also evaluate potential risk associated with an exposure area assuming that 100 percent of exposure originates in that area in order to understand contributions from the target area itself rather than adjacent areas. For the Western Undeveloped Area, the dose associated with PAHs in soil associated with risk to the mourning dove does not originate from the Western Undeveloped Area, as all HQs are below 1 for these constituents when only doses from the target exposure area are considered (**Table 6-59**). The risk to the shrew associated with dioxin/furans does originate from the Western Undeveloped Area. However, because the HQs are so low (equal to or below 1, when rounded, for both the HQ_{NOAEL} and HQ_{LOAEL}), the risk associated with dioxins in soil is considered

minimal. Therefore, no constituents in soil at the Western Undeveloped Area represent a significant risk to ecological receptors due to exposure from direct and indirect ingestion pathways.

The results of the small range receptor evaluation for the Western Undeveloped Area are presented in **Figure 6-14**. With the exception of one sample location (CFSB-216) that had concentrations exceeding the NOAEL-based benchmark for the short-tailed shrew for $TEC_{2,3,7,8\text{-}TCDD}$, all soil sample locations in this exposure area were below NOAEL-based benchmarks for small range receptors.

6.1.7.3 Risk Characterization

Risk estimates for the Western Undeveloped Area indicate minimal potential for adverse effects associated with exposure to soil. Negligible risks above background risks are expected for soil invertebrates and terrestrial plant communities in the Western Undeveloped Area. Refined risk estimates only slightly exceeded the NOEC for manganese for soil invertebrates (HQ = 1.4) and barium (HQ = 2.8) and manganese (HQ = 2.8) for terrestrial plants **Table 6-12**).Maximum concentrations for all constituents were below LOEC benchmarks for invertebrates, and refined EPCs for barium and manganese only marginally exceeded LOEC benchmarks for plants. Manganese and barium concentrations were generally comparable to background concentrations, indicating that incremental risk above background is not substantial. The wildlife ingestion model indicated that all HQ_{NOAEL} and HQ_{LOAEL} values attributable to the exposure area were equal to or less than 1 for all receptors when rounded and the small-range receptor evaluation did not identify any sample locations that exceeded LOAEL-based benchmarks. Therefore, the potential for ecological risk at the Western Undeveloped Area is expected to be minimal.

6.1.8 Flathead River Riparian Area

The following sections present the direct contact and ingestion risk estimates and the baseline ecological risk characterization for terrestrial exposure in the Flathead River Riparian Area.

6.1.8.1 Direct Contact Risk Estimate

The evaluation of direct contact pathways for terrestrial plants and soil invertebrates exposed to soil within the Flathead River Riparian Area indicates negligible potential for adverse ecological effects. Maximum concentrations of soil COPECs were less than soil invertebrate ESVs for all COPECs. The maximum arsenic concentration was the only COPEC concentration to exceed soil invertebrate NOECs (HQ_{NOEC} = 1.2; **Table 6-14**). Based on refined EPCs, metal COPEC concentrations were below soil invertebrate NOEC values.

For terrestrial plants, maximum concentrations of soil COPECs were less than LOECs for COPECs, except for minor exceedances of barium (HQ_{NOEC} = 1.4) and manganese (HQ_{NOEC} = 1.6). Maximum concentrations exceeded terrestrial plant NOECs for barium (HQ_{NOEC} = 2.1) and manganese (HQ_{NOEC} = 2.1). Refined EPCs exceeded terrestrial plant NOECs for barium (HQ_{NOEC} = 1.4) and manganese (HQ_{NOEC} = 1.6); refined EPCs were below terrestrial plant LOECs (**Table 6-14**).

Figure 6-15 illustrates the spatial distribution of sampling stations within the Flathead River Riparian Area that exceed direct contact NOECs for soil invertebrate or terrestrial plant communities. As described above, soil concentrations were below available LOECs for terrestrial plants and soil

invertebrates. Arsenic and manganese slightly exceeded soil invertebrate NOECs at stations CFSB-142 and CFSB-141, respectively. Exceedances at remaining stations are associated with concentrations exceeding terrestrial plant NOECs for barium or manganese, which are comparable to background soil concentrations. Manganese concentrations were determined to be comparable to background concentrations in hypothesis testing between the approximate portion of the site encompassed by the Flathead River Riparian Area and background sampling areas SO#2 and SO#3 (Roux, 2019). The maximum barium concentration in soil in the Flathead River Riparian Area (236 mg/kg) is below the BTV calculated for similar alluvial deposit background soil areas SO#2 and SO#3 (300 mg/kg; Roux, 2019). These findings indicate that direct contact exposure to barium and manganese do not represent a substantial incremental risk above background risk.

6.1.8.2 Ingestion Risk Estimate

The screening-level food ingestion model that assumed 100 percent exposure to media in the Flathead River Riparian Area and used maximum concentrations as the EPCs resulted in HQ_{NOAEL} values exceeding 1 for three receptors due to exposure to cyanide (**Table 6-57**). However, all values were less than 5, and no HQ_{LOAEL} values exceeded 1 (**Appendix H**).

The refined food chain model using more realistic assumptions resulted in one exceedance associated with the exposure of the mourning dove to HMW PAHs (HQ_{NOAEL} = 1.5; **Table 6-15 and 6-58**). However, exposure to HMW PAHs is not originating from the Flathead River Riparian Area, as the HQs for these PAHs were below 1 in the screening-level iteration of the food chain models (**Table 6-57)** and the refined exposure area-specific evaluation (**Table 6-59**) which assume 100 percent exposure to the target exposure area. Therefore, COPECs in soil at the Flathead River Riparian Area do not represent a significant risk to ecological receptors due to exposure from direct and indirect ingestion pathways.

The results of the small range receptor evaluation for the Flathead River Riparian Area are presented in **Figure 6-16**. All soil sample locations in this exposure area were below NOAEL benchmarks for small range receptors.

6.1.8.3 Risk Characterization

Risk estimates for the Flathead River Riparian Area indicate minimal potential for adverse effects associated with exposure to soil. Negligible risks to soil invertebrates and terrestrial plant communities are expected in the Flathead River Riparian Area. Refined risk estimates were below direct contact NOECs for soil invertebrates and slightly exceeded NOECs for barium (HQ = 1.4) and manganese (HQ = 1.6). Maximum concentrations for all constituents were below LOEC benchmarks for both soil invertebrates and terrestrial plants. The wildlife ingestion model indicated that all exposure area-specific HQ_{NOAEL} values were less than 1 for all receptors, and the small-range receptor evaluation did not identify any sample locations that exceeded NOAEL- or LOAEL-based benchmarks. Therefore, the potential for ecological risk at the Flathead River Riparian Area is expected to be minimal.

6.2 Transitional Exposure Areas

Risk estimates and baseline risk characterizations for direct contact and ingestion exposure pathways are presented below for transitional exposure areas. Given the seasonably variable hydrology of

transitional exposure areas, direct contact exposure is evaluated for terrestrial receptors based on exposure to soil and for aquatic receptors based on exposure to sediment and surface water.

6.2.1 North Percolation Pond Area

The following sections present the direct contact and ingestion risk estimates and the baseline ecological risk characterization for terrestrial and aquatic exposure scenarios in the North Percolation Pond Area.

6.2.1.1 Terrestrial Direct Contact Risk Estimate

The evaluation of direct contact pathways for terrestrial plants and soil invertebrates exposed to soil under dry conditions in the North Percolation Pond indicates the potential for adverse ecological effects, primarily associate with cyanide, metals, and PAHs. Maximum concentrations exceeded soil invertebrate NOECs for several metals, with HQ_{NOEC} values ranging from 2.4 (mercury) to 7.3 (zinc); maximum metal concentrations were lower than available LOECs for soil invertebrates (**Table 6-16**). Maximum concentrations of LMW PAHs (HQ_{NOEC} = 307 to 311) and HMW PAHs (HQ_{NOEC} = 763) exceeded NOECs for soil invertebrates (**Table 6-16**). Based on refined EPCs, concentrations of four metal COPECs exceeded soil invertebrate NOECs with HQ_{NOEC} values ranging from 1.3 (nickel and mercury) to 2.9 (zinc); refined EPCs were lower than soil invertebrate NOECs for metals. Refined risk estimates for LMW PAHs and HMW PAHs resulted in HQ_{NOEC} = 128 to 129 and HQ_{NOEC} = 318 to 463, respectively (**Table 6-16**); soil invertebrate LOECs for LMW and HMW PAHs were not identified.

For terrestrial plants, risk estimates indicate greatest exposure to cyanide and several metals. Maximum cyanide concentrations exceeded NOEC (HQ_{NOEC} = 21.4) and LOEC (HQ_{LOEC} = 6.4) values (**Table 6-16**). Maximum concentrations of several metals exceeded terrestrial plant NOECs, with HQ_{NOEC} values ranging from 1.2. (copper) to 92 (thallium); maximum metal concentrations exceeded terrestrial plant LOECs for six metals, with HQ_{LOEC} values ranging from 1.1 (zinc) to 9.2 (thallium; **Table 6-16**). Refined concentrations of nickel (HQ_{LOEC} = 1.3), thallium (HQ_{LOEC} = 3.8), and vanadium (HQ_{LOEC} = 1.4) exceeded terrestrial plant LOECs.

Figure 6-17 illustrates the spatial distribution of sampling stations within the North Percolation Pond that exceed direct contact NOECs or LOECs for soil invertebrate or terrestrial plant communities. Exceedances of metal LOECs are generally concentrated in the North-East Pond near the inflow and the channel; only barium exceeded a LOEC (terrestrial plants) in the North-West Pond (**Figure 6-17**). LMW and HMW PAH exceedances of soil invertebrate NOECs follow a similar spatial pattern, with greater concentrations in the North-East Pond and channel and lower concentrations in the North-West Pond.

6.2.1.2 Aquatic Direct Contact Risk Estimate

There is a potential for adverse effects to temporary aquatic communities that may be exposed primarily to cyanide, PAHs, and metals during inundated conditions in the North Percolation Pond. Maximum cyanide concentrations in sediment exceeded the benthic invertebrate LOEC (HQ_{LOEC} = 137; **Table 6-17**). Maximum metal concentrations exceeded LOECs for benthic invertebrates, with HQ_{LOEC} values ranging from 1.2 (selenium) to 26 (nickel; **Table 6-17**). Concentrations of LMW and HMW PAHs in sediment resulted in ∑ESBTU values exceeding 1, ranging from a maximum of 72.3 based on analyses of 13 PAH compounds (∑ESBTU13) and 199 based on estimated total exposure to 34 PAHs (∑ESBTU34;

Table 6-17). Based on refined EPCs, concentrations of cyanide (HQ_{LOEC} = 41.2) and nickel (HQ_{LOEC} = 7.5) exceed the benthic invertebrate LOEC; several metal COPECs exceeded benthic invertebrate NOECs based on refined concentrations with HQ_{NOEC} values ranging from 1.4 (arsenic and copper) to 16.4 (nickel).

Direct contact exposure to cyanide, fluoride, metals, and PAHs in surface water has the potential for adverse effects to temporary aquatic receptors that may be present under inundated conditions. Maximum fluoride concentrations exceeded LOECs for benthic invertebrates (HQ_{LOEC}=5.2 to 5.5) and amphibians (HQ_{LOEC}=3.6 to 3.7). Unfiltered and filtered aluminum, cadmium, and copper concentrations exceed sample-specific LOECs (**Table 6-19**). The maximum unfiltered barium concentration exceeded the LOEC (HQ_{LOEC}=6.0; **Table 6-18**). The maximum total cyanide concentration exceeded the chronic NOEC protective of invertebrates, aquatic plants, and amphibians (**Table 6-18**). Unfiltered lead and nickel concentrations exceeded NOECs but were less than sample-specific LOECs (**Table 6-19**). Concentrations of several PAH compounds exceeded benchmarks protective of invertebrates, aquatic plants, and amphibians, resulting in HQ_{NOEC} values ranging from 1.3 to 14.8 (**Table 6-18**).

Figure 6-18 illustrates the spatial distribution of sediment sampling stations within the North Percolation Pond that exceed direct contact NOECs or LOECs for benthic invertebrates; the spatial distribution of surface water sampling stations that exceed direct contact NOECs or LOECs for aquatic receptors is presented in **Figure 6-19**. Maximum concentrations of cyanide, PAHs, and several metals were observed in sediment samples from the North-East Pond and channel. Concentrations of these COPECs are lower in the North-West Pond; however, cyanide and nickel exceed benthic invertebrate LOECs at each sampling location in the North-West Pond. Only two surface water samples were collected from the North Percolation Pond. Maximum concentrations of fluoride and most metals were observed in sample CFSWP-024 collected in the North-East Pond (**Figure 6-19**).

6.2.1.3 Ingestion Risk Estimate

The screening-level food ingestion model that assumed 100 percent exposure to media in the North Percolation Pond Area and used maximum concentrations as the EPCs resulted in HQs exceeding 1 for every receptor except the mink (**Table 6-57**). Exposure to nickel, vanadium, cyanide, and especially PAHs, which had HQs exceeding 1,000 for some receptors, resulted in the highest HQs within this exposure area (**Appendix H**).

The refined food chain model using more realistic assumptions resulted in several constituents having an HQ greater than 1. Several metals had HQ_{LOAEL} values greater than 1 for multiple receptors, including nickel (American woodcock and short-tailed shrew), selenium (American dipper), and vanadium (American dipper). Ingestion of PAHs resulted in highly elevated HQs in the refined assumption, with LMW PAHs exceeding HQ_{NOAEL} values of 100 for the American dipper and 10 for the American woodcock, belted kingfisher, and yellow-billed cuckoo. HMW PAHs had HQ_{NOAEL} values greater than 1,000 for the American dipper, American woodcock, and short-tailed shrew, and greater than 100 for the belted kingfisher, yellow-billed cuckoo, and meadow vole. HQ_{LOAEL} values for HMW PAHs were also highly elevated, with the American dipper greater than 100 (HQ_{LOAEL}=284), and the American woodcock (HQ_{LOAEL}=103), belted kingfisher (HQ_{LOAEL}=27), yellow-billed cuckoo (HQ_{LOAEL}=29), and short-tailed shrew (HQ_{LOAEL}=23) all having HQ_{LOAEL} values greater than 10 (**Table 6-20**). Nearly all of the risk was associated with the ingestion of terrestrial and aquatic invertebrates for all constituent-receptor combinations, with 93 to 99 percent (depending on the receptor) of the total dose affiliated with this pathway.

Because the refined evaluation considers cumulative doses across multiple exposure areas for large range receptors, it is helpful to also evaluate potential risk associated with an exposure area assuming that 100 percent of exposure originates in that area in order to understand contributions from the target area itself rather than adjacent areas. For the North Percolation Pond, the dose associated with all constituents associated with elevated HQs as described in the previous paragraph originate primarily from the North Percolation Ponds Area (**Table 6-59**). Furthermore, none of these constituents were determined to be background-related in the background hypothesis testing evaluation at this exposure area (Roux, 2019). Therefore, nickel and vanadium, which had HQ_{LOAEL} values between 1 and 10 for at least one receptor, are considered to be of moderate concern for ecological receptors. Constituents with HQ_{LOAEL} values between 10 and 100 for at least one receptor, including LMW PAHs, are considered to be of high concern. Finally, HMW PAHs, which had HQ_{LOAEL} values greater than 100 for multiple receptors (American dipper and American woodcock) are considered to be of greatest concern in soil at the North Percolation Pond Area due to exposure via direct and indirect ingestion routes.

The results of the small range receptor evaluation for the North Percolation Pond Area are presented in **Figure 6-20**. Two of the eight sample locations in the former North-West Percolation Pond had concentrations that exceeded the LOAEL for short-tailed shrew based primarily on exceedances of LMW and HMW PAHs and nickel. Six of the eight locations in the North-East Percolation Pond had concentrations that exceeded the LOAEL-based benchmarks for one or both receptors. Additionally, all six sample locations in the overflow ditch connecting the two ponds had concentrations exceeding the LOAEL-based benchmark for at least one receptor, and two stations (CFSB-272 and CFSB-203) exceeded the LOAEL-based benchmark for both receptors. No sample location in this exposure area had soil concentrations that were below NOAEL-based benchmarks for both receptors.

6.2.1.4 Risk Characterization

Risk estimates for the North Percolation Pond Area indicate that the greatest potential for adverse direct contact effects is associated with exposure to cyanide, fluoride, metals, and PAHs during inundated conditions in the North-East Pond. Under inundated conditions, maximum concentrations of fluoride, aluminum, barium, cadmium, copper, and zinc in surface water exceeded LOEC benchmarks protective of aquatic communities, and 7 PAH compounds exceeded NOEC benchmarks (LOEC values were not available). In sediment, PAH ESBTUs were greater than 1 at 24 stations and greater than 10 at 13 stations. Several inorganics in sediment, including metals and cyanide, also exceeded their LOEC values. Under dry scenarios, exposure to PAHs in soil also resulted in very high exceedances of NOEC values protective of soil invertebrates. However, refined EPCs for other constituents did not exceed LOEC values. Seven metals did, however, exceed LOECs protective of plants when their maximum concentrations were considered, but the refined EPCs for only nickel, thallium, and vanadium exceeded plant-based LOECs, and all resulted in HQs below 5 (PAH impacts to plants are uncertain due to a lack of NOEC/LOEC values for these receptors).

Elevated risks associated with direct and indirect ingestion by wildlife receptors were also observed in North Percolation Pond based on the results of the food chain modeling. Several metals in soil/sediment had HQ_{LOAEL} values in the refined model greater than 1 for multiple receptors, including nickel (American woodcock and short-tailed shrew, and the yellow-billed cuckoo had an HQ_{NOAEL} that slightly exceeded 1 for this metal), selenium (American dipper), and vanadium (American dipper). Ingestion of PAHs resulted in highly elevated HQs even using the refined assumptions, with LMW PAHs exceeding HQ_{LOAEL} values of 10 for the American dipper and above 1 for the American woodcock and yellow-billed cuckoo. HQ_{LOAEL} values for HMW PAHS were even more highly elevated, with the American dipper greater than

100 (HQ_{LOAEL}=284), American woodcock (HQ_{LOAEL}=103), belted kingfisher (HQ_{LOAEL}=27), yellow-billed cuckoo (HQ_{LOAEL}=29), and short-tailed shrew (HQ_{LOAEL}=23) all having HQ_{LOAEL} values greater than 10. The ingestion of terrestrial and aquatic invertebrate prey items was the critical exposure pathway for all constituent/receptor combinations. The small range receptor evaluation indicated that every soil sampling point exceeded LOAEL-based benchmark values protective of these receptors.

The North Percolation Ponds represent low quality habitat for terrestrial or aquatic receptors, based on their use as a former wastewater management structure. Based on the degraded habitat function and value of the North Percolation Ponds, exposure pathways may be more limited than the exposure assumptions used in direct contact and ingestion pathway evaluations. However, based on the risk estimates presented in the BERA, exposure to waste related COPECs in multiple media in the North Percolation has the potential to adversely affect ecological receptors.

6.2.2 South Percolation Pond Area

The following sections present the direct contact and ingestion risk estimates and the baseline ecological risk characterization for terrestrial and aquatic exposure scenarios in the South Percolation Pond Area. Given the seasonably variable hydrology of the ponds, exposure is evaluated for terrestrial receptors and aquatic receptors potentially exposed in the South Percolation Pond.

6.2.2.1 Terrestrial Direct Contact Risk Estimate

The evaluation of direct contact exposure pathways to soil indicates limited potential for adverse effects to soil invertebrate and terrestrial plant communities under dry conditions in the South Percolation Pond (**Table 6-21**). Maximum concentrations of copper (HQ_{LOEC}=1.3) and mercury (HQ_{LOEC}=2.8) exceeded LOEC values for soil invertebrates; however, refined concentrations of metals were lower than available LOECs (**Table 6-21**). Maximum concentrations of refined organic COPECs were comparable to or lower than available NOECs for soil invertebrates (**Table 6-21**).

For terrestrial plants, maximum COPEC concentrations were lower than LOECs for all COPECs, except for barium (HQ_{LOEC}=3.7) and copper (HQ_{LOEC}=1.4). Only the refined EPC for barium (HQ_{LOEC}=2.5) exceeded the LOEC for terrestrial plants.

Figure 6-21 illustrates the spatial distribution of sampling stations within the South Percolation Pond that exceed direct contact NOECs or LOECs for soil invertebrate or terrestrial plant communities. Exceedances of barium, copper, mercury were isolated to station CFSB-153 near the inflow; remaining stations exceeded the terrestrial plant LOEC for barium but were below the soil invertebrate LOEC.

6.2.2.2 Aquatic Direct Contact Risk Estimate

Direct contact risk estimates for aquatic receptors potentially inhabiting the South Percolation Ponds when aquatic habitat is present indicate potential sediment exposure to metals and potential aqueous exposure to cyanide (total and free) and select metals (**Table 6-22**). Maximum concentrations of total cyanide and five metals exceeded sediment LOECs for benthic invertebrates, resulting in HQ_{LOEC} values ranging from 1.1 (nickel) to 5.0 (copper). Based on refined concentrations, total cyanide (HQ_{LOEC}=4.4), barium (HQ_{LOEC}=2.1), and copper (HQ_{LOEC}=1.4) exceeded LOECs (**Table 6-22**).

The results of AVS-SEM and pore water analyses in sediment indicate metals are not bioavailable at concentrations likely to result in adverse effects to benthic invertebrates. The maximum organic carbon normalized difference between SEM and AVS [-24.4 micromoles per gram organic carbon (µmol/g_{OC})] is less than 130 µmol/g_{OC}, indicating that divalent metals (e.g., cadmium, copper, lead, nickel, silver, and zinc) are not likely bioavailable at concentrations associated with adverse effects to benthic invertebrate receptors. Consistent with the AVS-SEM results, concentrations of divalent metals in pore water samples were below LOEC values (**Table 6-23**). Sample-specific analysis of copper concentrations in pore water indicated concentrations below sample-specific NOECs (**Table 6-24**). Maximum concentrations of barium in pore water exceeded the LOEC value (HQ_{LOEC}=10.8).

LMW and HMW PAH concentrations in sediment resulted in ∑ESBTU values less than 1 based on estimated total exposure to 34 PAHs ($∑ESBTU_{34}$; **Table 6-22**), indicating that PAH compounds are not bioavailable in sediment pore water at concentrations that would result in adverse effects to benthic invertebrate receptors. Consistent with the EqP results, the only PAHs detected in pore water were phenanthrene (5 samples) and naphthalene (1 sample). Concentrations of both compounds were below FCVs protective of benthic and aquatic receptors.

Direct contact aqueous risk estimates indicate the potential for adverse effects associated with exposure to total cyanide, aluminum (filtered and unfiltered), copper (filtered and unfiltered), and barium (**Table 6-25**). The maximum total cyanide concentration exceed the NOEC based on the criterion continuous concentration (CCC) (chronic) water quality criterion (HQ_{LOEC}=13.1 to 26.7) and the LOEC based on the criteria maximum concentration (CMC) (acute) water quality criterion (HQ_{LOEC}= 3.1 to 6.3); the refined total cyanide concentration exceeded the NOEC (HQ_{NOEC}=10.2) and LOEC (HQ_{LOEC}= 2.4). However, free cyanide concentrations were below LOECs and only slightly exceeded NOECs based on the maximum (HQ_{LOEC}= 1.9) and refined concentrations (HQ_{LOEC}= 1.1). Aluminum (unfiltered or filtered) concentrations exceeded NOECs in 6 of 26 samples, with HQ_{NOEC} values ranging from 1.2 to 37.1; aluminum (unfiltered or filtered) concentrations exceeded LOECs in 2 of 26 samples, with HQ_{LOEC} values ranging from 1.0 to 11.7 (**Table 6-26**). Copper concentrations marginally exceeded samples-specific NOECs in 1 of 17 filtered (HQ_{NOEC}=1.9) and 3 of 26 unfiltered samples (HQ_{NOEC}=1.1 to 1.5). The sample-specific LOEC was slightly exceeded in one sample in the filtered (HQ_{LOEC}=1.2) and unfiltered (HQ_{LOEC}=1.1) fractions (**Table 6-26**). Maximum and refined concentrations of barium (unfiltered and filtered) exceeded LOECs, with HQ_{LOEC} values for maximum and refined concentrations in filtered samples ranging from 13.5 to 8.0, respectively (**Table 6-25**).

Figure 6-22 illustrates the spatial distribution of sediment and pore water sampling stations within the South Percolation Pond that exceed direct contact NOECs or LOECs for benthic invertebrates; the spatial distribution of surface water sampling stations that exceed direct contact NOECs or LOECs for aquatic receptors is presented in **Figure 6-23**. Exceedances of cyanide and multiple metals, including, barium, copper, mercury, nickel, and silver were associated with station CFSB-153 near the inflow; remaining stations exceeded the LOECs, primarily for barium or cyanide in surface water or pore water (**Figure 6-22**). Surface water exceedances were generally consistent spatially within sampling events; however, exceedances were greatest during the November 2017 Supplemental South Pond Assessment sampling event.

6.2.2.3 Ingestion Risk Estimate

The screening-level food ingestion model that assumed 100 percent exposure to media in the South Percolation Pond Area and used maximum concentrations as the EPCs resulted in HQs exceeding 1 for

multiple receptors (**Table 6-57**). Exposure to copper and BEHP resulted in the highest HQs within this exposure area (**Appendix H**).

The refined food chain model using more realistic assumptions resulted in several constituents having an HQ greater than 1. Barium was the only constituent with an HQ_{LOAEL} value greater than 1 (American dipper HQ_{LOAEL}=2.3). Cadmium, copper, vanadium, HMW PAHs, and BEHP all had HQ_{NOAEL} values greater than 1 for one or more receptors, but all were relatively low, and none had HQ_{LOAEL} values greater than 1 (**Tables 6-27 and 6-58**). Also, vanadium concentrations were determined to be comparable to background concentrations in hypothesis testing between the approximate portion of the site encompassed by the South Percolation Pond Area and background sampling area SO#2 and SO#3 (Roux, 2019). The yellow-billed cuckoo, which is evaluated using NOAEL endpoints, had HQ_{NOAEL} values that exceeded 1 for HMW PAHs (HQ = 3.9) and BEHP (HQ = 2.8).

Because the refined evaluation considers cumulative doses across multiple exposure areas for large range receptors, it is helpful to also evaluate potential risk associated with an exposure area assuming that 100 percent of exposure originates in that area in order to understand contributions from the target area itself rather than adjacent areas. For the South Percolation Pond, the dose associated with barium for the American dipper is associated primarily with the target exposure area (**Table 6-59**). The refined EPC for barium of 640 mg/kg in sediment is approximately double the soil BTV for SO#2 and SO#3 (300 mg/kg; Roux, 2019). However, because of the low HQs observed under maximum and refined assumptions, barium is considered to be of low concern from direct and indirect ingestion pathways in the South Percolation Pond Area.

The results of the small range receptor evaluation for the South Percolation Pond Area are presented in **Figure 6-24**. This exposure area contained a mixture of sample locations that were below NOAEL benchmarks for both receptors, and that exceeded NOAEL (but not LOAEL) benchmarks for the short-tailed shrew. No sample location in this exposure area had concentrations that exceeded LOAEL benchmarks for small range receptors.

6.2.2.4 Risk Characterization

During periods of inundation, exposure to cyanide and select metals in surface water has the greatest potential for adverse effects to temporary aquatic communities via direct contact exposure pathways. Based on MDEQ water quality criteria, cyanide exposure has the potential to adversely affect aquatic receptors due to concentrations exceeding chronic and acute criteria for total cyanide. However, there is a lower potential for adverse effects based on analyses of free cyanide, which is the bioavailable and potentially toxic form of cyanide and the basis for USEPA NRWQC. Concentrations of free cyanide were below the LOEC (NRWQC CMC) and only slightly exceeded the NOEC (NRWQC CCC). Aluminum concentrations were temporally variable in surface water, with maximum concentrations in unfiltered and filtered samples exceeding chronic and acute sample-specific criteria.

Potential direct contact aqueous exposure in the South Percolation Ponds is likely limited to tolerant receptors that can withstand the seasonal hydrology that controls habitat conditions. Because aquatic habitat is intermittent, the South Percolation Ponds do not likely support permanent communities of fish but may support tolerant invertebrates and seasonal use of aquatic habitat by amphibians and opportunistic species. The greatest risk via aqueous exposures to these receptors is likely associated with exposure to cyanide, aluminum, barium, and copper.

Risk estimates for COPECs in sediment during inundated conditions indicate limited potential for adverse effects to benthic invertebrates. The results of AVS-SEM and pore water analyses indicate that metals are not bioavailable at concentrations likely to result in adverse effects to benthic invertebrates. Further, $\sum ESBTU_{34}$ and direct pore water analyses indicate that PAH compounds are not bioavailable in concentrations associated with adverse effects to benthic invertebrate receptors. Exposure to cyanide in sediment is likely associated with aqueous phase concentrations in surface water and pore water. During dry periods, negligible risk is expected to terrestrial invertebrate and plant communities, as maximum and refined EPCs only marginally exceeded LOEC values for a few metals (barium, copper, and mercury).

Risk associated with direct and indirect ingestion by wildlife receptors in South Percolation Pond media is minimal based on the results of the food chain modeling. Barium in soil/sediment had an HQ_{LOAEL} value that was slightly greater than 1 for the American dipper. The refined EPC for barium of 640 mg/kg in sediment is approximately double the soil BTV for SO#2 and SO#3 of 300 mg/kg. However, because of the low HQs observed under maximum and refined assumptions, barium is of low concern from direct and indirect ingestion pathways in the South Percolation Pond Area. Furthermore, no sample location in this exposure area had concentrations that exceeded LOAEL benchmarks for small range receptors.

Although the yellow-billed cuckoo is evaluated based on NOAEL endpoints due to its current status as a federally threatened species, the likelihood of adverse effects resulting from exposure to HMW PAHs or BEHP is low. The yellow-billed cuckoo had HQ_{NOAEL} values using the spatially weighted ingestion model that exceeded 1 for HMW PAHs (3.9) and BEHP (2.8; **Table 6-58**), and exposure to these constituents was associated with the South Percolation Pond exposure area (**Table 6-59**). BEHP is a common laboratory contaminant and is unlikely to be related to site operations. HMW PAHs are associated with site operations. However, as previously discussed (see **Section 6.1.1.3**), there is a low probability of occurrence of yellow-billed cuckoo at the Site and the doses exceeding NOAEL TRVs likely overestimate risk due to the conservative estimate of dietary COPEC concentrations based on 100 percent ingestion of earthworms.

6.2.3 Cedar Creek Reservoir Overflow Ditch

The following sections present the direct contact and ingestion risk estimates and the baseline ecological risk characterization for terrestrial and aquatic exposure scenarios in the Cedar Creek Reservoir Overflow Ditch. Given the seasonably variable hydrology of the ponds, exposure is evaluated for terrestrial receptors and aquatic receptors potentially exposed in the Cedar Creek Reservoir Overflow Ditch.

6.2.3.1 Terrestrial Direct Contact Risk Estimate

The evaluation of direct contact exposure pathways to soil indicates negligible potential for adverse effects to soil invertebrate and terrestrial plant communities under dry conditions in the Cedar Creek Reservoir Overflow Ditch (**Table 6-28**). Maximum concentrations of metals and HMW PAHs were below LOECs for soil invertebrates and only maximum concentrations of arsenic (HQ_{LOEC}=1.1), manganese (HQ_{LOEC}=3.6), and zinc (HQ_{LOEC}=1.1) exceeded soil invertebrate NOECs. Refined concentrations of metals were less than NOECs for all metals except manganese (HQ_{NOEC}=3.0).

For terrestrial plants, maximum concentrations of metals and di-n-butyl phthalate were below LOECs, except for slight exceedances of maximum concentrations of barium (HQ_{LOEC}=1.1) and manganese (HQ_{LOEC}=1.5). Refined concentrations of barium (HQ_{LOEC}=1.1) and manganese (HQ_{LOEC}=1.2) also slightly exceeded terrestrial plant LOECs (**Table 6-28**).

Figure 6-25 illustrates the spatial distribution of sampling stations within the Cedar Creek Reservoir Overflow Ditch that exceed direct contact NOECs or LOECs for soil invertebrate or terrestrial plant communities. Exceedances of LOECs were limited to barium and manganese. Manganese concentrations are generally consistent from upgradient (CFSDP-013) to downgradient stations, indicating that concentrations of manganese in the Cedar Creek Reservoir Overflow Ditch may be related to regional soil conditions and not site-related operations and pathways; concentrations of barium were also consistent from the most upgradient to downgradient sample, indicating limited site-related influence (**Figure 6-25**). Further, maximum concentrations of manganese (1,640 mg/kg) and barium (295 mg/kg) in the Cedar Creek Reservoir Overflow Ditch were comparable to or lower than BTV values calculated for the Revett Formation background soil type (SO#4) (1,566 mg/kg and 734 mg/kg for manganese and barium, respectively) that was sampled to reflect soil conditions near the base of Teakettle Mountain (Roux, 2019). These findings indicate that direct contact exposure to barium and manganese do not represent a substantial incremental risk above background risk.

6.2.3.2 Aquatic Direct Contact Risk Estimate

Direct contact risk estimates for aquatic receptors potentially inhabiting the Cedar Creek Overflow Ditch when aquatic habitat is present indicate limited potential for adverse effects for benthic invertebrates exposed to metals and PAHs in sediment, and aqueous exposure to free cyanide and select metals. Maximum concentrations of cyanide (HQ_{LOEC}=1.5) and manganese (HQ_{LOEC}=1.5) only slightly exceeded LOECs for benthic invertebrates; only the refined manganese concentration exceeded the LOEC (HQ_{LOEC}=1.2; **Table 6-29**). For PAHs, ∑ESBTU values were less than 1.0 for all stations except CFSB-284 ($\sum ESBTU_{13}$ = 7.7; $\sum ESBTU_{34}$ = 21.2). Elevated ∑ESBTU values at this station were attributed to low organic carbon concentrations (0.006 percent) and relatively low total PAH concentrations (7.4 mg tPAH/kg).

Direct contact aqueous risk estimates indicate negligible potential for adverse effects associated with exposure to free cyanide and select metals (**Table 6-30**). The maximum free cyanide concentration was comparable to the NOEC for aquatic receptors (HQ_{NOEC}=1.1) but was lower than the LOEC. Unfiltered aluminum concentrations exceeded sample-specific NOECs in 2 of 27 samples, with HQ_{NOEC} values ranging from 1.9 to 10.3. Unfiltered aluminum concentrations exceeded sample-specific LOECs in 1 of 27 samples (HQ_{LOEC}=6.5; **Table 6-31**). Filtered aluminum concentrations were below NOECs. Maximum and refined concentrations of barium (unfiltered and filtered) exceeded LOECs, with HQ_{LOEC} values for maximum and refined concentrations in filtered samples ranging from 5.4 to 5.6 and 2.6 to 2.7, respectively (**Table 6-30**). The maximum concentration of manganese slightly exceeded the LOEC (HQ_{LOEC}=1.6), but the refined concentration was less than the NOEC and LOEC (**Table 6-30**).

Figure 6-26 illustrates the spatial distribution of sediment and pore water sampling stations within the Cedar Creek Reservoir Overflow Ditch that exceed direct contact NOECs or LOECs for benthic invertebrates; the spatial distribution of surface water sampling stations that exceed direct contact NOECs or LOECs for aquatic receptors is presented in **Figure 6-27**. Sediment exceedances of manganese were identified at four stations; however, as stated in the previous section, manganese concentrations in the Cedar Creek Reservoir Overflow Ditch are consistent upgradient to downgradient within the ditch

and also to concentrations observed in the SO#4 background dataset. The only PAH exceedance observed at CFSB-284 was attributed to low organic carbon concentrations (0.006 percent) and relatively low total PAH concentrations (7.4 mg tPAH/kg). Barium concentrations in surface water samples were consistent upgradient to downgradient and during the June 2018 sampling event. The maximum barium concentration was observed at downgradient station (CFSWP-039) during the October 2018 sampling event; however, there are no other stations for comparison during that sampling event. These findings indicate that direct contact exposure within the Cedar Creek Reservoir Overflow Ditch are consistent with regional conditions and not associated with site-related pathways.

6.2.3.3 Ingestion Risk Estimate

The screening-level food ingestion model that assumed 100 percent exposure to media in the Cedar Creek Reservoir Overflow Ditch Area and used maximum concentrations as the EPCs resulted in HQs for arsenic, nickel, selenium, vanadium, zinc, and HMW PAHs exceeding 1 for three different receptors (**Table 6-57**). However, all HQs were below 5 (**Appendix H**).

The refined food chain model using more realistic assumptions resulted in several constituents having an HQ greater than 1, but only copper (American woodcock and yellow-billed cuckoo), Aroclor 1254 (American woodcock and yellow-billed cuckoo), and HMW PAHs (yellow-billed cuckoo) had HQ_{LOAEL} values that exceeded 1 (**Table 6-32**). All HQ_{LOAEL} values were less than 5. The yellow-billed cuckoo, which is evaluated using NOAEL endpoints, also had HQ_{NOAEL} values that slightly exceeded 1 for LMW PAHs, BEHP, and dioxins/furans.

Because the refined evaluation considers cumulative doses across multiple exposure areas for large range receptors, it is helpful to also evaluate potential risk associated with an exposure area assuming that 100 percent of exposure originates in that area in order to understand contributions from the target area itself rather than adjacent areas. For the Cedar Creek Reservoir Overflow Ditch Area, none of the constituents resulting in elevated HQs were directly related to this exposure area. Because the area being assessed is a thin, linear polygon, it is strongly influenced by adjacent exposure areas for the cumulative risk calculated for most receptors. When only exposure to the Cedar Creek Overflow Ditch exposure is considered, only HQ_{NOAEL} values for barium (American dipper = 1.8), nickel (short-tailed shrew = 2), vanadium (American dipper = 1.9), and HMW PAHs (American dipper = 2.3) slightly exceeded 1; all HQ_{LOAEL} values were below 1 (**Table 6-59**). Therefore, constituents in media associated with the Cedar Creek Reservoir Overflow Ditch Area are considered to be of low concern for ecological receptors.

The results of the small range receptor evaluation for the Cedar Creek Reservoir Overflow Ditch Area are presented in **Figure 6-28**. Seven of the eight soil sample locations along this exposure area had concentrations that exceeded the NOAEL (but not the LOAEL) for the shrew. The most downstream location in the ditch (CFSDP-009) did not have any exceedances of NOAEL benchmarks for either receptor.

6.2.3.4 Risk Characterization

During periods of inundation, direct contact risk associated with surface water and sediment is expected to be minimal. Some exceedances of NOEC and LOEC in both media were noted, but consideration of BTVs, concentration gradients, the low magnitude and frequency of exceedances, and other factors suggest that site-related toxicity related to these constituents is unlikely. For times of the year when inundation does not occur, direct contact risk to terrestrial organisms is expected to be negligible

relative to background risk. No constituents had maximum concentrations that exceeded their LOECs for terrestrial invertebrates and plants, except for barium and manganese, which both had slight exceedances of LOECs protective of invertebrates. Refined risk estimates indicate minor exceedances of manganese NOECs for soil invertebrates and barium and manganese NOECs for terrestrial plants. However, maximum concentrations of manganese and barium approximate or are lower than their respective BTVs for the SO#4 reference area that was sampled to reflect soil conditions near the base of Teakettle Mountain (Roux, 2019).

The food chain modeling results for the Cedar Creek Reservoir Overflow Ditch resulted in HQ_{LOAEL} values that exceeded 1 for copper (American woodcock and yellow-billed cuckoo), Aroclor 1254 (American woodcock and yellow-billed cuckoo), and HMW PAHs (yellow-billed cuckoo). However, all HQ_{LOAEL} values were less than 5, and further evaluation indicated that adjacent exposure areas were responsible for nearly all of the doses resulting in these exceedances. The small-range receptor evaluation revealed that a single sample in this exposure area had concentrations that exceeded only the NOAEL benchmark, but no benchmarks based on LOAELs were exceeded in this exposure area. Therefore, no constituents in media associated with the Cedar Creek Reservoir Overflow Ditch Area are considered to be of concern for direct or indirect ingestion by wildlife receptors.

6.2.4 Northern Surface Water Feature

The following sections present the direct contact and ingestion risk estimates and the baseline ecological risk characterization for terrestrial and aquatic exposure scenarios in the Northern Surface Water Feature.

6.2.4.1 Terrestrial Direct Contact Risk Estimate

Risk estimates and risk characterization for direct contact exposure pathways are presented below for the Northern Surface Water Feature. The evaluation of direct contact exposure pathways to soil indicates negligible potential for adverse effects to soil invertebrate and terrestrial plant communities under dry conditions in the Northern Surface Water Feature (**Table 6-33**). Refined risk estimates slightly exceeded NOECs for soil invertebrates for arsenic, barium, and manganese (HQ = 1.8) and terrestrial plant NOECs for barium, manganese, and selenium (HQ = 2.2 to 5.3). Maximum concentrations of metals were below LOECs for soil invertebrates, with only limited exceedances of soil invertebrate NOECs (HQ_{NOEC}=1.1 to 2.7). For terrestrial plants, maximum concentrations of barium (HQ_{LOEC}=3.5) and selenium (HQ_{LOEC}=1.5) were the only COPECs to exceed LOECs for terrestrial plants; the refined barium concentration was the only COPEC to exceed the LOEC (HQ_{LOEC}=2.3; **Table 6-33**).

Figure 6-29 illustrates the spatial distribution of sampling stations within the Northern Surface Water Feature that exceed direct contact NOECs or LOECs for soil invertebrate or terrestrial plant communities. Barium concentrations exceeded the terrestrial plant LOEC at all but two stations within the Northern Surface water Feature; observed barium concentrations were 1- to 3-times the BTV (300 mg/kg) calculated for the background soil area SO#1 (**Figure 6-29**).

6.2.4.2 Aquatic Direct Contact Risk Estimate

Direct contact risk estimates for aquatic receptors potentially inhabiting the Northern Surface Water Feature when aquatic habitat is present indicate limited potential for adverse effects for benthic

invertebrates exposed to metals in sediment and aqueous exposure to select metals. Maximum concentrations of barium (HQ_{LOEC}=3.0) and selenium (HQ_{LOEC}=1.5) were the only COPECs to exceed LOECs for benthic invertebrates; only the refined barium concentration exceeded the LOEC (HQ_{LOEC}=2.0; **Table 6-34**). For PAHs sediment, ∑ESBTU values were less than 1.0 for all stations, indicating negligible potential for adverse effects to benthic invertebrates exposed to PAHs in sediment. Sediment pore water samples collected at Northern Surface Water Feature stations indicate that barium is the only COPEC to exceed LOECs for aquatic receptors (**Table 6-35; Table 6-36**).

Direct contact aqueous risk estimates indicate limited potential for adverse effects associated with exposure to unfiltered aluminum and unfiltered and filtered barium (**Table 6-37**). Unfiltered aluminum concentrations exceeded sample-specific NOECs in 3 of 16 samples, with HQ_{NOEC} values ranging from 1.2 to 3.8. unfiltered aluminum concentrations exceeded sample-specific LOECs in 2 of 16 samples (HQ_{LOEC}=1.2 and 1.9; **Table 6-38**). Filtered aluminum concentrations were below NOECs. Maximum and refined concentrations of barium (unfiltered and filtered) exceeded LOECs, with HQ_{LOEC} values for maximum and refined concentrations in filtered samples ranging from 5.9 to 3.8, respectively (**Table 6-37**).

Figure 6-30 illustrates the spatial distribution of sediment and pore water sampling stations within the Northern Surface Water Feature that exceed direct contact NOECs or LOECs for benthic invertebrates. The spatial distribution of surface water sampling stations that exceed direct contact NOECs or LOECs for aquatic receptors is presented in **Figure 6-31**. LOECs exceedances in sediment/pore water are primarily associated with barium concentrations in pore water, which were greatest near the western edge of the feature (CFSDP-049). Surface water barium concentrations were generally consistent throughout the Northern Surface Water Feature, but similar to pore water, the greatest concentration was observed near station CFSDP-049. Except for stations near the western edge of the feature, barium concentrations in pore water and surface water are not substantially greater than the BTV calculated from upgradient filtered samples off-site in Cedar Creek (99.8 µg/L). These findings indicate that direct contact exposure to barium in pore water and surface water in the Northern Surface Water Feature does not represent a substantial incremental risk above background risk upstream of the Site in Cedar Creek.

6.2.4.3 Ingestion Risk Estimate

The screening-level food ingestion model that assumed 100 percent exposure to media in the Northern Surface Water Feature Area and used maximum concentrations as the EPCs resulted in HQs exceeding 1 for barium, copper, selenium, and vanadium for several receptors (**Table 6-57**). Exposure to barium and selenium resulted in the highest HQs within this exposure area (**Appendix H**).

The refined food chain model using more realistic assumptions resulted in several metals having an HQ greater than 1, but only barium and selenium for the American dipper had HQ_{LOAEL} values that marginally exceeded 1 (**Tables 6-39 and 6-58**). The HQ_{LOAEL} values for both metals were less than 5. The critical pathway for these two metals was ingestion of invertebrates, which accounted for 99 percent of the dose of both barium and selenium. The results of the background hypothesis testing indicate that both metals were elevated relative to background soil concentrations in this area (Roux, 2019). However, the refined EPCs for barium (586 mg/kg) and selenium (1.62 mg/kg) in soil/sediment were not highly elevated compared to the BTVs in soil for these constituents in SO#1 (300 mg/kg and 1.4 mg/kg, respectively; Roux, 2019).

Because the refined evaluation considers cumulative doses across multiple exposure areas for large range receptors, it is helpful to also evaluate potential risk associated with an exposure area assuming that 100 percent of exposure originates in that area in order to understand contributions from the target area itself rather than adjacent areas. For the Northern Surface Water Feature, the dose associated with barium and selenium are associated primarily with the target exposure area (**Table 6-59**). However, because of the low HQs observed under maximum and refined assumptions, barium and selenium in Northern Surface Water Feature are considered to be of low concern due to direct and indirect ingestion pathways in this exposure area.

The results of the small range receptor evaluation for the Northern Surface Water Feature Area are presented in **Figure 6-32**. All eight of the soil sample locations in the southwestern portion of the site were below NOAEL benchmarks for both small range receptors. The two sample locations in the northeastern portion of this exposure area (CFSDP-046 and CFSDP-047) exceeded NOAEL-based soil benchmarks for selenium.

6.2.4.4 Risk Characterization

During periods of inundation, toxicity associated with direct contact with surface water and sediment is expected to be limited relative to background exposure. Refined risk estimates indicated surface water exceedances of NOECs for aluminum, barium, and iron. Maximum surface water concentrations of aluminum and barium exceeded LOECs; however, only barium had filtered refined concentrations that exceeded LOECs. The refined EPC for barium in surface water also exceeded its LOEC. Refined sediment risk estimates for total cyanide, barium, and selenium exceeded sediment NOECs; barium was also the only constituent with a refined EPC that exceeded its sediment LOEC protective of benthic invertebrates (HQ_{LOEC} = 2). However, barium exposure in the Northern Surface Water Feature is not substantially greater than background exposure upstream of the Site in Cedar Creek.

Potential direct contact aqueous exposure during periods of inundation in the Northern Surface Water Feature is likely limited to tolerant receptors that can withstand the seasonal hydrology that controls habitat conditions. Further, inundation in the Northern Surface Water Feature varies interannually. The feature was inundated when it was identified during a field visit in May 2016; however, the feature was dry during a field visit in May 2019. Because aquatic habitat is seasonal and varies interannually, the Northern Surface Water Feature does not support permanent communities of benthic invertebrates or fish, but may support temporary communities of tolerant invertebrates and seasonal use of aquatic habitat by amphibians and opportunistic species.

During dry periods, negligible risk is expected for soil invertebrates, as the maximum EPCs for all constituents were below LOECs protective of these organisms. Barium slightly exceeded its LOEC for the protection of terrestrial plants, but this exceedance was below 5.

For the wildlife ingestion model, only barium and selenium had HQ_{LOAEL} values that were greater than 1 (American dipper), but values for both of these metals were less than 5, and refined EPCs were not highly elevated compared to relevant BTVs. Ingestion of invertebrate prey items was the critical pathway for both metals. It should be noted that the higher HQs for the American dipper compared to other receptors was the result of the American dipper hypothetically ingesting benthic invertebrates that have body burdens modeled on uptake from sediment, rather than terrestrial invertebrates that have body burdens modeled on uptake from soil. The uptake factors for sediment to benthic invertebrates used in the food chain model resulted in estimated benthic invertebrate prey item

concentrations that were 30-times and 5-times higher for barium and selenium, respectively, than for terrestrial invertebrate prey items that were assumed to be exposed to these metals in soil (**Appendix E**). The Northern Surface Water Feature is an intermittently wet area, and therefore would not support a permanent benthic invertebrate community. Therefore, risks associated with the American dipper are likely overestimated. The small-range receptor evaluation indicated that all samples were below LOAEL-based benchmarks.

Because of the low HQs observed under maximum and refined assumptions, barium and selenium risks associated with direct and indirect ingestion pathways in the Northern Surface Water Feature are considered to be of low concern in this exposure area.

6.3 Aquatic Exposure Areas

The following sections present risk estimates and risk characterizations for aquatic exposure areas evaluated at the Site.

6.3.1 Flathead River

Risk estimates and the baseline risk characterization for direct contact and ingestion exposure pathways are presented below for the Flathead River. Risk estimates are presented based on sediment and surface water data for the entire Flathead River dataset including the Backwater Seep Sampling Area that has been regulated under MPDES Permit No. MT0030066 and for Flathead River data excluding samples within the Backwater Seep Sampling Area (**Figure 2-2**).

6.3.1.1 Direct Contact Risk Estimate

Risk estimates and risk characterization for direct contact exposure pathways are presented below for the Flathead River. Risk estimates are presented based on sediment and surface water data for the entire Flathead River dataset including the Backwater Seep Sampling Area and for the Flathead River data excluding samples within the Backwater Seep Sampling Area.

Direct contact risk estimates indicate that the greatest exposure to COPECs in sediment, pore water, and surface water within the Flathead River is associated with the Backwater Seep Sampling Area. Benthic invertebrate risk estimates indicate that maximum COPEC concentrations exceed benthic invertebrate NOECs in sediment for total cyanide and $\sum ESBTU_{34}$ values (**Table 6-40; Figure 6-33**). Maximum COPEC concentrations in sediment are below benthic invertebrate LOECs for all COPECs, except total cyanide and $\sum ESBTU_{34}$ values for PAHs at three stations (**Table 6-40; Figure 6-33**). Based on refined sediment exposure concentrations, only cyanide exceeded the benthic invertebrate LOEC (HQ_{LOEC}=1.7; **Table 6-40**).

Pore water samples indicate exceedances of benthic invertebrate NOECs for free cyanide, fluoride, and barium and LOECs for barium and free cyanide. Maximum concentrations of free cyanide exceed pore water NOECs (HQ_{NOEC}=12.0) and LOECs (HQ_{LOEC}=2.8; **Table 6-41**). Maximum barium concentrations exceed NOECs and LOECs (HQ_{LOEC}=6.7); however, barium concentrations in pore water remain consistent in samples collected upstream of the site on the Flathead River (CFPWP-017) to barium concentrations in samples collected within the Backwater Seep Sampling Area (**Figure 6-33**), and barium concentrations outside of the Backwater Seep Sampling Area are consistent with background (Roux, 2019). This

indicates that barium concentrations in pore water may be associated with regional conditions and not related to pathways from the site. The results of AVS-SEM and pore water analyses in sediment indicate divalent metals are not bioavailable at concentrations likely to result in adverse effects to benthic invertebrates (less than 130 $\mu mol/g_{OC}$).

The greatest direct contact exposure to surface water in the Flathead River is also associated with samples collected in the Backwater Seep Sampling Area. Based on the entire Flathead River dataset, maximum concentrations of cyanide (total and free), unfiltered aluminum, barium (filtered and unfiltered), and iron exceeded NOECs based on chronic NRWQC and DEQ-7 criteria for the protection of aquatic life (**Table 6-42**). Maximum concentrations of cyanide (total and free), unfiltered aluminum, and barium (filtered and unfiltered) exceeded LOECs based on acute criteria for the protection of aquatic life (**Table 6-42**). Maximum total and free cyanide concentrations exceeded NOECs (total cyanide HQ_{NOEC}= 63.1 to 72.7; free cyanide HQ_{NOEC}=8.1 to 26.7) and LOECs (total cyanide HQ_{NOEC}=14.9 to 17.2; free cyanide HQ_{LOEC}=1.9 to 6.3; **Table 6-42**). Unfiltered aluminum concentrations exceeded sample-specific NOECs in 21 of 76 samples, with HQ_{NOEC} values ranging from 1.0 to 28.5 (**Table 6-43**). Unfiltered aluminum concentrations exceeded sample-specific LOECs in 8 of 76 samples (HQ_{LOEC}=1.6 to 17.7; **Table 6-43**). Filtered aluminum concentrations were below NOECs. Maximum barium concentrations exceeded NOECs (filtered HQ_{NOEC}=49.0; unfiltered HQ_{NOEC} 55.4) and LOECs (filtered HQ_{LOEC}=4.9; unfiltered HQ_{LOEC} 5.5; **Table 6-42**).

Refined exposure estimates for cyanide (total and free) and barium (filtered and unfiltered) based on the entire Flathead River dataset also exceeded chronic NOECs and acute LOECs. Refined total and free cyanide concentrations exceed NOECs (total cyanide HQ_{NOEC}=11.9 to 35.2; free cyanide HQ_{NOEC}=4.5 to 5.2) and LOECs (total cyanide HQ_{LOEC}=2.8 to 8.3; free cyanide HQ_{LOEC}=1.1 to 1.2; **Table 6-42**). Refined barium concentrations exceeded NOECs (filtered HQ_{NOEC}=26.6; unfiltered HQ_{NOEC}=30.0) and LOECs (filtered HQ_{LOEC}=2.7; unfiltered HQ_{LOEC}=3.0).

Excluding samples from the Backwater Seep Sampling Area, maximum sediment concentrations only exceeded NOECs and LOECs for PAHs; all other COPECs were less than NOECs (**Table 6-44**). For PAHs, $\sum$ESBTU values exceeded 1.0 for station CFSDP-036 ($\sum ESBTU_{13}$ = 9.8; $\sum ESBTU_{34}$ = 27). Elevated $\sum$ESBTU values at this station were attributed to low organic carbon concentrations (0.01 percent) and relatively low total PAH concentrations (1.35 mg tPAH/kg). Pore water samples indicate exceedances of benthic invertebrate LOECs for barium (**Table 6-45)**; however, as previously stated, barium concentrations in pore water remain consistent in samples collected upstream of the site to downstream of the site (**Figure 6-33**), indicating that barium concentrations in pore water may be associated with regional conditions and not related to pathways from the site.

Excluding surface water data from the Backwater Seep Sampling Area, maximum concentrations of barium and unfiltered aluminum exceeded NOECs and LOECs for aquatic organisms (**Table 6-46**). Outside of stations within the Backwater Seep Sampling Area and stations along the shoreline immediately downstream of the Backwater Seep Sampling Area (CFSWP-26 through CFSWP-28), free and total cyanide concentrations were below NOEC benchmarks based on NRWQC CCC and MDEQ chronic criteria, respectively. Unfiltered aluminum concentrations exceeded sample-specific NOECs in 3 of 40 samples, with HQ_{NOEC} values ranging from 1.0 to 28.5. Unfiltered aluminum concentrations exceeded sample-specific LOECs in 3 of 40 samples (HQ_{LOEC}=3.5 to 17.7; **Table 6-47**). Filtered aluminum concentrations were below NOECs. Maximum and refined concentrations of barium (unfiltered and filtered) exceeded NOECs and LOECs, with HQ_{LOEC} values for maximum and refined concentrations in filtered samples ranging from 3.6 to 2.1, respectively (**Table 6-46**). However, similar to pore water,

barium concentrations in surface water remain consistent in samples collected the main river channel upstream of the site (CFSWP-017) to downstream of the site (CFSWP-001; **Figure 6-34**). Further, barium concentrations in the Flathead River outside of the Backwater Seep Sampling Area are generally lower than the BTVs calculated for upgradient filtered (122 µg/L) and unfiltered (130 µg/L) datasets. These findings indicate that barium concentrations in surface water is likely associated with regional conditions and not related to pathways from the site.

6.3.1.2 Ingestion Risk Estimate

The screening-level food ingestion model that assumed 100 percent exposure to surface water and sediment in the Flathead River and used maximum concentrations as the EPCs resulted in HQs exceeding 1 for aluminum, vanadium, cyanide, and HMW PAHs for one or more of the aquatic receptors (**Table 6-57**). However, all HQ values were below 10 and no HQ_{LOAEL} values exceeded 1 based on maximum EPCs (**Appendix H**).

The screening-level exposure scenario for wildlife in the Flathead River modeled the maximum exposure scenario for the potential ingestion of total cyanide through dietary, drinking water, and incidental ingestion pathways based on maximum EPCs for surface water (378 µg/L) and sediment (8.3 mg/kg) measured in samples collected from the Backwater Seep Sampling Area (CFSWP-004 and CFSWP-003 for surface water and sediment, respectively). In addition to maximum EPCs, the screening-level wildlife ingestion model assumes an AUF of 1 and therefore, represents the maximum exposure scenario for wildlife that may be associated with a single-dose exposure to total cyanide via ingestion pathways while foraging within the Backwater Seep Sampling Area. As presented in **Appendix H1**, estimated maximum daily doses of total cyanide were calculated for American dipper (Table H12-2), belted kingfisher (Table H12-3), and mink (Table H12-4) and compared to chronic TRVs for cyanide. This maximum exposure scenario for cyanide resulted in a chronic HQ_{NOAEL} values greater than 1 for American dipper (HQ_{NOAEL} = 2.3) and belted kingfisher (HQ_{NOAEL} = 1.5); maximum estimated doses for these avian receptors were less than the chronic LOAEL TRV. The drinking water ingestion pathway accounted for 69 percent of the total dose modeled for American dipper and the entire total cyanide dose modeled for belted kingfisher. The maximum modeled mink exposure for total cyanide resulted in a chronic HQ_{NOAEL} value less than 1.

The screening-level risk estimates based on maximum exposure and chronic TRVs for total cyanide are protective of acute exposure scenarios for wildlife that may occur during single-dose exposure while foraging within the Backwater Seep Sampling Area. The chronic mammalian TRVs for cyanide were based on chronic endpoints (LANL, 2017); therefore, acute mammalian TRVs would be greater than the chronic TRVs evaluated in the model. Chronic avian TRVs for total cyanide were based on a lethal dose to 50 percent of test organisms (LD_{50}) endpoint derived from a single-dose acute study (Wiemeyer et al., 1986, as cited in LANL, 2017). The chronic avian NOAEL was derived by dividing the LD_{50} by an uncertainty factor of 100 (LANL, 2017); the chronic LOAEL was estimated by multiplying the chronic NOAEL by an uncertainty factor of 10 (LANL, 2017). Comparing the doses estimated in **Appendix H1** based on the maximum detected total cyanide EPCs in the Backwater Seep Sampling Area directly to the acute LD_{50} results in a maximum HQ_{LD50} of 0.02 for modeled avian receptors. Thus, acute wildlife risks associated with a single-dose exposure scenario of ingesting the maximum detected concentration of cyanide in surface water within the Backwater Seep Sampling Area 100 percent of the time indicates minimal acute risk for modeled wildlife receptors.

The refined food chain model using more realistic assumptions resulted in only vanadium (American dipper and belted kingfisher) and HMW PAHs (American dipper, belted kingfisher, and mink) having an HQ_{NOAEL} greater than 1 (**Table 6-48**). No HQ_{LOAEL} values exceeded 1. Risk associated to vanadium and HMW PAHs originated from sediment (rather than surface water) (**Appendix H2**). Vanadium and several PAHs were found to be higher than upgradient reference area sediment data in the hypothesis testing (Roux, 2019). However, because of the very low HQs in the refined evaluation (all HQ_{NOAEL} values were below 5, no HQ_{LOAEL} values above 1) (**Table 6-59**), ecological risk to wildlife associated with direct and indirect ingestion of media in the Flathead River is considered minimal.

6.3.1.3 Risk Characterization

The evaluation of Flathead River sediment, pore water, and surface water data indicate that the greatest potential for ecological exposure to site-related constituents is associated with aqueous exposure pathways within the Backwater Seep Sampling Area, and areas where groundwater containing cyanide and fluoride discharges to surface water. Elevated sodium concentrations in surface water samples from the Backwater Seep Sampling Area are consistent with elevated sodium concentrations observed in groundwater wells adjacent to the Backwater Seep Sampling Area that are screened within the upper hydrogeologic unit. Elevated sodium concentrations in these wells are indicative of the potential groundwater discharge pathway (Roux, 2019). The discharge of cyanide and fluoride in groundwater to the Flathead River adjacent to the Site was previously authorized by MPDES permit number MT-0030066 since first issued in May 1994, and subsequently renewed in 1999 and July 2014. On January 24, 2019, MDEQ provided a Notice of Intent to terminate the permit.

Surface water exposure was greatest to cyanide (total and free), barium, and aluminum, with greater concentrations observed in the Backwater Seep Sampling Area and adjacent stations immediately downstream of the Backwater Seep Sampling Area (CFSWP-26 through CFSWP-28). Attenuation of surface water concentrations occurs rapidly with increasing distance from the Backwater Seep Sampling Area, particularly during periods of elevated discharge within the Flathead River (**Figure 6-34; Figure 6-35**). Outside of the stations within the Backwater Seep Sampling Area and stations along the shoreline immediately downstream of the Backwater Seep Sampling Area (CFSWP-26 through CFSWP-28), free and total cyanide concentrations did not exceed chronic NRWQC- and DEQ-7-based benchmarks, respectively, in multiple rounds of surface water sampling events. At surface water sampling stations on the shoreline immediately downstream of the Backwater Seep Sampling Area (CFSWP-26 through CFSWP-28), total cyanide exceeded the chronic DEQ-7-based NOEC and acute DEQ-7-based LOEC in at least one sample at each station. Free cyanide concentrations were below the NRWQC-based NOEC at stations CFSWP-26 and CFSWP-27, but exceeded the free cyanide NOEC at CFSWP-28. None of the stations on the shoreline immediately downstream of the Backwater Seep Sampling Area (CFSWP-26 through CFSWP-28) exceeded the acute NRWQC-based LOEC for free cyanide. This finding indicates that the potential area of exposure to aquatic receptors at concentrations exceeding NOECs and LOECs based on NRWQC (free cyanide) and MDEQ (total cyanide) benchmarks is spatially-limited to a groundwater-surface water mixing zone along the shoreline within and immediately adjacent to the Backwater Seep Sampling Area.

A statistical evaluation of spatial and temporal trends was conducted to assess the effect of discharge percentile on COPEC concentrations in the Backwater Seep Sampling Area and adjacent stations in the Flathead River. Variability in surface water concentrations of fluoride, total cyanide, aluminum, and barium across sampling phases were grouped by three areas: 1) the Downstream Portion of the Flathead River – stations CFSWP-001, -034, -002, -035, -026, -027, and -028; 2) the Backwater Seep

Sampling Area of the Flathead River – stations CFSWP-003, -004, and -005); and, 3) the Flathead Riparian Area Channel (CFSWP-029 to -033) (**Figure 4-13**). The effect of discharge percentiles discussed in **Section 4.1.2** on surface water concentrations of fluoride and total cyanide as well as unfiltered and filtered aluminum and barium were evaluated for each area using a one-way analysis of variance (ANOVA). Constituent concentrations are illustrated in **Figure 6-35** by discharge percentile. In addition, the suspected interaction effects of discharge percentiles and area on concentration were evaluated to assess whether the temporal response in concentration was consistent for each area (**Figure 6-36**). The results of one- and two-way ANOVAs are summarized in **Table 6-60**.

Findings from the evaluation of the effect of discharge percentile on concentration for each area supports the observations discussed in the ECSM (**Section 3.3.5**). Significantly less fluoride was observed in the Downstream Portion of the Flathead River and the Backwater Seep Sampling Area at greater discharge percentiles (**Table 6-60**). Discharge percentile did not have a significant effect on fluoride concentration in the Flathead Riparian Area Channel. Cyanide exhibited similar patterns as fluoride in the Downstream Portion of the Flathead River and Backwater Seep Sampling Area. However, significantly greater cyanide was observed in the Flathead Riparian Area Channel at periods of elevated discharge (**Table 6-60**). Significant two-way interactions of area and discharge (Q) percentile indicate that the riparian channel does not respond in a consistent manner to the Backwater Seep Sampling Area and downstream portion of the Flathead River (**Table 6-60; Figure 6-36**). Discharge percentiles did not have a significant effect on filtered or unfiltered aluminum concentrations across all three areas. Patterns of unfiltered and filtered barium were consistent across the Downstream Portion and Backwater Seep Sampling Area, with significantly lower concentrations during elevated flow conditions (**Table 6-60**). Concentrations of barium outside of the Backwater Seep Sampling Area were also consistent with concentrations detected in the main channel of the Flathead River, as well as the background area in the Flathead River upstream of the Site.

The potential for adverse ecological effects associated with COPEC concentrations in the Backwater Seep Sampling Area was further evaluated based on biological data collected by CFAC in support of the MPDES permit for Outfall 006. CFAC has conducted 18 quarterly Whole Effluent Toxicity (WET) testing studies (Fourth Quarter 2014 to First Quarter 2019) to evaluate the potential for acute toxic effects in the Backwater Seep Sampling Area. Toxicity tests were conducted using Fathead Minnow (*Pimephales promelas*) and the daphnid (*Ceriodaphnia dubia*) and a dilution series of groundwater seep water from Outfall 006 (USEPA, 2002). Fathead minnow is a relatively sensitive fish species to cyanide exposure (Broderius et al., 1977; Doudoroff, 1956; Smith et al., 1978) and daphnids are more sensitive to cyanide exposure than aquatic insects and other macroinvertebrate test organisms (Gensemer et al., 2007; Gensemer et al., 2006).

Exposure to 100 percent effluent from the groundwater seep did not result in an LC_{50} for Flathead Minnow or daphnid test organisms in any sample (**Table 6-61**). These results indicate that cyanide or other COPECs are not likely present in a toxic form or at concentrations in surface water in the Backwater Seep Sampling Area that are sufficiently elevated to elicit acute toxicity in invertebrate or fish test organisms that are relatively sensitive to cyanide exposure.

Further analysis of the results of 18 quarterly WET testing samples indicates that aqueous exposure to the groundwater seep dilution series did not materially affect the survival of Fathead Minnow and had a relatively minor effect on the survival of daphnid test organisms in short-term exposures (48- to 96-hours; **Figure 6-37**). A one-way ANOVA was conducted to test for statistically significant differences ($p < 0.05$) in mean percent survival across the dilutions series for Fathead Minnow and daphnid test

organisms assessed in 18 quarterly sampling events. There was no significant effect of the percent effluent on the percent survival of Fathead Minnow in undiluted effluent (100 percent effluent) or the dilution series exposures ($p > 0.05$; **Figure 6-37; Table 6-62**). However, a statistically significant ($p < 0.001$) main effect of percent effluent was identified for the percent survival of daphnid test organisms. Further pairwise testing of the effect of percent effluent using Tukey's Honest Significant Difference (HSD) test indicated significant differences ($p < 0.05$) in mean percent survival in undiluted effluent (100 percent effluent) compared to the dilution series (50 - 6.25 percent effluent) and the 0 percent effluent control treatment (**Figure 6-37; Table 6-62**). However, the difference in mean survival was relatively minor, as mean survival (± standard error) of daphnid test organisms in the undiluted treatment (100 percent effluent) was 91.4 ± 1.9 percent. Mean daphnid survival in the diluted treatments (50 - 6.25 percent effluent) was not significantly different from mean survival in the control sample (0 percent effluent) or any diluted exposures (**Figure 6-37; Table 6-62**). These findings indicate that 50 percent or greater dilution of discharging groundwater by surface water from the Flathead River in the Backwater Seep Sampling Area is likely sufficient to mitigate any short-term effects on the survival of representative fish and invertebrates.

The lack of substantial mortality relative to control across the WET testing dilution series also indicates that no other COPECs were present in test samples in a form or concentrations that are acutely toxic to aquatic life during short-term exposures. Further, the lack of substantial mortality in the dilution series relative to control over 18 quarters of testing indicates that acute effects are not likely in groundwater discharge that is diluted by 50 percent or greater by surface water in the Flathead River. These findings are consistent with the MDEQ Statement of Basis that accompanied the 1999 MPDES Permit No. MT-00330066 (MDEQ, 1999), which previously authorized the discharge of groundwater to the Flathead River, including the Backwater Seep Sampling Area, from 1994 through April 17, 2019. The MDEQ Statement of Basis indicated no anticipated impacts on aquatic species or other species (**Section 3.3.3)**.

As previously stated in **Section 3.3.3**, the section of the Flathead River that includes the Backwater Seep Sampling Area has limited fish habitat for common species and is primarily used as a migration corridor to access areas of more suitable habitat (Stagliano, 2015). As a result, fish exposure to cyanide in surface water in the Backwater Seep Sampling Area is likely spatially-limited near points of groundwater discharge and temporally-limited to exposure during migration. Further, the lack of spawning or nursery habitat in the reach of the Flathead River near the Site limits exposure to early life stages that may have greater sensitivity to exposure. These findings are consistent with the MDEQ Statement of Basis that accompanied the 1999 MPDES Permit No. MT-00330066 (MDEQ, 1999), which indicated that area of exceeding acute cyanide standards would not inhibit fish migration and that there were no impacts to spawning or nursery areas or attraction to cyanide within the mixing zone (**Section 3.3.3)**. Subadult bull trout and other native fish may increasingly use channel margin habitat like that of the Backwater Seep Sampling Area during periods of increased flows (David Rouse, U.S. Fish and Wildlife Service, information received in agency comments on the Draft BERA). However, this period of increased flows is limited in duration (typically greater than the 90th percentile discharge rate from April to June; see **Figure 3-5**) and coincides with lower cyanide exposure concentrations in surface water resulting from dilution by increased surface water discharge in the Flathead River (**Figure 6-35**).

The results of toxicity testing indicate low potential for acute effects to fish and aquatic invertebrate test organisms resulting from exposure to cyanide and COPECs in surface water in the Backwater Seep Sampling Area. However, it should be noted that WET testing results represent a snapshot of exposure that may not capture the temporal variability in the toxicity of groundwater discharge in the Backwater Seep Sampling Area. Further, the dynamic environmental conditions that control the fate of toxic forms

of cyanide (see **Section 3.3.7.1**) present *in situ* within the Backwater Seep Sampling Area may not be adequately represented in *ex situ* toxicity tests conducted in a laboratory. In addition to these uncertainties regarding acute effects, there is uncertainty in potential chronic, direct contact effects to aquatic and benthic receptors exposed to cyanide in the spatially-limited area of the Backwater Seep Sampling Area that receives ongoing inputs from groundwater discharge. Free cyanide is not expected to persist in surface water due to photodegradation and volatilization (MDEQ, 1999) or in sediment based on limited partitioning (Higgins and Dzombak, 2006); however, potential input from shallow groundwater may be an ongoing pathway to pore water and *in situ* dissociation of metal-cyanide complexes may be an ongoing source of free cyanide in surface water within the Backwater Seep Sampling Area. These conditions result in exceedances of acute and chronic NRWQC for free cyanide and acute and chronic DEQ-7 criteria for total cyanide in samples collected from stations within the Backwater Seep Sampling Area (CFSWP-003 through CFSWP-005). As demonstrated by the temporal analysis presented above, the greatest exposure to cyanide in this area likely occurs during low discharge periods within the Flathead River.

As discussed in **Section 6.3.1.2**, the wildlife ingestion model indicated that HQ_{NOAEL} values for vanadium and PAHs exceeded 1, but no HQ_{LOAEL} values exceeded 1. Elevated cyanide concentrations detected in surface water within the Backwater Seep Sampling Area were evaluated in the screening-level wildlife ingestion model using a worst-case scenario in which modeled receptors were assumed to ingest drinking water with the greatest detected cyanide concentration (378 µg/L) 100 percent of the time. The results of this model indicated that the maximum HQ_{NOAEL} based on ingestion of cyanide in drinking water was 1.57 for the American Dipper based on chronic TRVs (see **Appendix H1; Table H12-2**). The maximum HQ_{NOAEL} for cyanide based on dietary, incidental sediment ingestion, and drinking water exposure pathways was slightly higher (HQ = 2.26) for the American Dipper. HQ_{LOAEL} values were well below 1 for summed pathways for each receptor based on chronic TRVs. The risk modeled using the chronic cyanide TRVs is protective of acute risk, as evidenced by the fact that the avian TRV was developed by dividing an acute LD_{50} TRV endpoint by 100 to derive the chronic TRV (LANL, 2017). Because cyanide is rapidly metabolized and does not bioaccumulate (USEPA, 1985), adverse effects to semi-aquatic wildlife potentially foraging in or ingesting surface water exclusively in the Backwater Seep Sampling Area are also not likely. Therefore, potential risks associated with direct and incidental wildlife ingestion pathways are considered to be minimal.

6.3.2 Flathead River Riparian Area Channel

Risk estimates and the baseline risk characterization for direct contact and ingestion exposure pathways are presented below for the Flathead River Riparian Channel.

6.3.2.1 Direct Contact Risk Estimate

Direct contact risk estimates for sediment indicate that the greatest exposure in the Riparian Channel is associated with sampling stations near the Backwater Seep Sampling Area. Risk estimates for benthic invertebrates indicate that maximum concentrations are below NOECs for all COPECs, except total cyanide, barium, and ∑ESBTU values (**Table 6-49**); the maximum concentration of total cyanide was the only concentration exceeding its benthic invertebrate LOEC (HQ_{LOEC}=1.7). The maximum cyanide concentration and maximum ∑ESBTU value were observed at stations CFSDP-29 and CFSDP-30, respectively (**Figure 6-38**). Refined concentrations did not exceed LOECs, except for a slight exceedance of total cyanide (HQ_{LOEC}=1.1). Pore water concentrations of free cyanide exceeded the chronic NRWQC-

based NOEC at 3 of 5 stations (maximum HQ_{NOEC}=7.4) and acute NRWQC-based LOEC at 2 of 5 stations (maximum HQ_{LOEC}= 1.8 at station CFPWP-029) (**Figure 6-38; Table 6-50**). Total cyanide concentrations exceeded the DEQ-7 chronic NOEC and acute LOEC at all five stations (maximum HQ_{NOEC} = 82.5 and maximum HQ_{LOEC}= 19.5 at station CFPWP-029). Maximum barium concentrations exceed NOECs and LOECs (HQ_{LOEC}=10.1). Maximum concentrations of PAHs in pore water were lower than NOECs, indicating limited bioavailability and exposure to PAHs in the Flathead Riparian Area Channel.

The greatest direct contact exposure to COPECs in surface water within the Flathead Riparian Area Channel was associated with stations adjacent to the Backwater Seep Sampling Area and the South Percolation Ponds. Maximum concentrations of total cyanide, free cyanide, fluoride, aluminum (unfiltered), and copper (unfiltered) exceeded NOECs and LOECs (**Table 6-51; Table 6-52**). Maximum concentrations of cyanide (total and free) were observed at Station CFSWP-029, located at the eastern edge of the Backwater Seep Sampling Area (**Figure 6-39**), resulting in HQ_{LOEC} values in unfiltered samples ranging from 28.6 (total cyanide) to 6.4 (free cyanide); refined concentrations resulted in HQ_{LOEC} values in unfiltered samples ranging from 15.6 (total cyanide) to 2.8 (free cyanide; **Table 6-51**). Unfiltered aluminum concentrations exceeded sample-specific NOECs in 6 of 15 samples, with HQ_{NOEC} values ranging from 1.2 to 41.6 (**Table 6-52**); unfiltered aluminum concentrations exceeded sample-specific LOECs in 3 of 15 samples (HQ_{LOEC}=1.8 to 10.7; **Table 6-52**). Filtered aluminum concentrations were below NOECs. Unfiltered copper samples exceeded NOEC and LOEC values in 2 of 15 samples (HQ_{LOEC} =1.0 to 2.0; **Table 6-52**). Maximum and refined concentrations of barium (unfiltered and filtered) exceeded LOECs, with HQ_{LOEC} values for maximum and refined concentrations in filtered samples of 10.3 and 6.9, respectively (**Table 6-51**).

6.3.2.2 Ingestion Risk Estimate

The samples in the Flathead River Riparian Area Channel were collected specifically to more fully characterize the impacts of seep and groundwater influence on the Flathead River. Data from these samples were not included in the food chain model used to estimate potential risk associated with direct and indirect ingestion of constituents in various media. Thus, ingestion risk estimates were not developed for the Flathead River Riparian Area Channel.

6.3.2.3 Risk Characterization

The evaluation of sediment and surface water data in the Flathead River Riparian Channel indicate the potential for adverse effects associated with exposure to cyanide (total and free), fluoride, and metals in surface water. Benthic invertebrate exposure to COPECs in sediment was limited to exposure to total and free cyanide, barium, and a $\sum ESBTU_{FCV,Total}$ value exceeding 1.0 at one of five stations. Exposure to cyanide (total and free) and barium in sediment is associated with aqueous exposure in pore water. Free cyanide is not expected to persist in sediment based on limited partitioning (Higgins and Dzombak, 2006); however, potential input from shallow groundwater appears to be an ongoing pathway to pore water in the Flathead River Riparian Channel. Free and total cyanide concentrations in pore water samples exceeded NRWQC and DEQ-7 chronic (NOECs) and acute (LOECs) criteria. Low PAH concentrations measured in pore water indicate low PAH bioavailability and minimal potential for adverse effects.

Surface water data indicate potential exposure to COPECs may be influenced by groundwater discharge associated with the Backwater Seep Sampling Area and surface discharge from the South Percolation Pond Area. As stated in **Section 6.3.1.3**, the results of surface water toxicity testing in the Backwater

Seep Sampling Area did not indicate a significant acute effect on the survival of Ceriodaphnid and Fathead Minnow test organisms exposed to cyanide and other COPECs associated with groundwater discharge that was diluted by 50 percent or greater in test chambers (**Section 6.3.1.3)**. However, there is uncertainty in potential chronic direct contact effects to aquatic and benthic receptors in the Flathead Riparian Area Channel that may be exposed to cyanide and other COPECs through ongoing inputs from groundwater discharge. As demonstrated by the temporal analysis presented in **Section 6.3.1.3**, the greatest chronic exposure to cyanide in Flathead Riparian Area Channel likely occurs during periods of elevated discharge within the Flathead River (**Figure 6-35**).

6.3.3 Cedar Creek

Risk estimates and the baseline risk characterization for direct contact and ingestion exposure pathways are presented below for the Cedar Creek.

6.3.3.1 Direct Contact Risk Estimate

Direct contact risk estimates for aquatic receptors inhabiting Cedar Creek indicate minimal potential for adverse effects for benthic invertebrates exposed to cyanide, metals, and PAHs (**Table 6-53**). Maximum concentrations of COPECs in sediment resulted in minor exceedances of NOECs for cyanide (HQ_{NOEC}=2.4), barium (HQ_{NOEC}=1.7), manganese (HQ_{NOEC}=1.2; **Table 6-53**). $\sum ESBTU_{34}$ values slightly exceeded 1.0 at one station ($\sum ESBTU_{34}$ = 1.3). Refined concentrations exceeded NOECs only for total cyanide (HQ_{NOEC}=1.6) and barium (HQ_{NOEC}=1.1). PAHs were not detected in pore water; barium and manganese were the only COPECs detected in pore water at concentrations exceeding LOECs (**Table 6-54**). Barium concentrations in pore water remain consistent in samples collected from the upstream station in Cedar Creek (CFPWP-014) to the most downstream Cedar Creek station (CFPWP-016; **Figure 6-40**). This indicates that barium concentrations in pore water may be associated with regional conditions and not related to pathways from the Site.

Direct contact aqueous risk estimates indicate negligible potential for adverse effects associated with surface water exposure to cyanide and barium (**Table 6-55**). Maximum total and free cyanide concentrations exceeded the DEQ-7 based NOEC for total cyanide and NRWQC based NOEC for free cyanide resulting in HQ_{NOEC} values of 2.9 and 1.5, respectively. However, cyanide (free and total) did not frequently exceeded chronic NOECs in surface water samples collected from Cedar Creek. Free cyanide was detected in 2 of 20 samples and exceeded the NRWQC based NOEC in 1 of 20 samples. Total cyanide was detected in 7 of 22 samples and exceeded the DEQ-7 based NOEC in 2 of 22 samples. Maximum concentrations of barium in surface water samples exceeded the NOEC and LOEC (HQ_{LOEC} 3.0 to 3.3). Barium concentrations in surface water samples were consistent upgradient to downgradient and during the multiple sampling events (**Figure 6-41**). Further, barium concentrations in surface water are comparable to the BTV calculated from upgradient filtered samples off-site in Cedar Creek (99.8 µg/L; Roux, 2019). These findings indicate that direct contact exposure within the Cedar Creek is consistent with regional conditions and not associated with site-related pathways.

6.3.3.2 Ingestion Exposure Estimate

The screening-level food ingestion model that assumed 100 percent exposure to surface water and sediment in Cedar Creek and used maximum concentrations as the EPCs resulted in HQ_{NOAEL} that slightly exceeded 1 (1.1) for the American Dipper exposed to barium (**Table 6-57**) (**Appendix H**).

The results of the refined food chain model using more realistic assumptions were similar, with the American dipper having an HQ_{NOAEL} that slightly exceeded 1 (1.06) for barium. No HQ_{LOAEL} values exceeded 1 (**Table 6-56**). Barium in Cedar Creek sediment was found to be comparable to background in the comparison of populations to upgradient reference area sediment data (Roux, 2019). Thus, ecological risk to wildlife associated with direct and indirect ingestion of media in Cedar Creek is considered minimal.

6.3.3.3 Risk Characterization

Potential risks associated with direct contact with surface water and sediment in Cedar Creek are considered to be negligible. Cyanide (free and total) did not frequently exceeded chronic NOECs in surface water samples collected from Cedar Creek over multiple sampling events. Maximum concentrations of barium in surface water exceeded NOECs and LOECs in some samples, but the magnitude of exceedance was low, and no other constituents had EPCs that exceeded LOECs. No constituents in sediment were detected at concentrations that exceeded their LOECs. Pore water concentrations exceeded their LOECs for barium and manganese, but the HQ for manganese did not exceed 1 when rounded. Barium concentrations in surface water and pore water are consistent upgradient to downgradient, suggesting that concentrations are representative of upgradient/background conditions. Also, the concentrations in surface water (mean = 99.7 µg/L, refined EPC = 105 µg/L for filtered barium) and pore water (mean = 146 µg/L, maximum = 269 µg/L for filtered barium) were comparable to the upgradient reference area concentrations in Cedar Creek (mean = 91 µg/L, BTV = 99.8 µg/L for filtered barium), which indicates that concentrations of barium within Cedar Creek is consistent with regional conditions and not associated with site-related pathways.

Barium concentrations resulted in an HQ_{NOAEL} for the American Dipper that slightly exceeded 1 (1.1) for barium, but no HQ_{LOAEL} values exceeded 1. As discussed in the previous paragraph, barium in Cedar Creek surface water was comparable to background levels. Therefore, ecological risk to wildlife associated with direct and indirect ingestion of media in Cedar Creek is considered minimal.

7 Uncertainty Analysis

A critical component of the BERA is the analysis of uncertainty that is inherent in the ERA process. A thorough uncertainty analysis is necessary to understand how potential uncertainty may affect the risk estimates and associated risk characterization that may be used to support risk management decision-making.

7.1 Adequacy, Representativeness, and Quality of Sampling Data

The BERA was performed using a dataset that was compiled during multiple investigation phases. Phase I data were collected in 2016 and 2017. Additional data was collected during the Supplemental South Pond Assessment in late 2017, and the Phase II data were collected in 2018. The use of data from samples collected during three separate field mobilizations allowed for an evaluation of the Phase I data and the development of a follow-on sampling strategy designed to address any data gaps or uncertainties revealed by earlier sampling events. The Phase II sampling effort was designed to provide (along with Phase I data) a comprehensive data base that would provide confidence in any decisions and recommendations generated by evaluations based upon it. To accomplish this goal, the objectives of the Phase II effort were to address data gaps in the Phase I data and provide additional critical information regarding the characterization, nature and extent, bioavailability, fate and transport, and toxicity of possible COPECs associated with historical source areas. The strategy for accomplishing this was provided in the Phase II SAP (Roux, 2018a), which was reviewed and approved by project stakeholders. Data quality was reviewed and determined to be acceptable in the Phase I and Phase II Data Summary Reports (Roux 2017a, 2019). Therefore, the adequacy, representativeness, and quality of the sampling data is judged to be adequate for Site decisions regarding ecological exposure at the facility.

USEPA and MDEQ review of the Phase II DSR indicated that the report was clear, detailed, and complete, and generally contains the data needed to complete the risk assessments and feasibility study. Should additional investigations or actions be necessary in areas where unacceptable ecological risk is identified, the need for additional sample collection for the purposes of further delineation characterization, or risk management will be evaluated and discussed in the Feasibility Study for specific COPECs and exposure pathways that have been identified for risk management at the Site.

7.2 Temporal (Seasonal) Variability in Exposure

Temporal variability contributes to variability in ecological exposure conditions at the Site, particularly with regards to the exposure pathway between groundwater and seep/surface water entering the Flathead River. Phase I data provided some information regarding river stage and seasonality on the variability of key COPECs such as cyanide and fluoride and their discharge rates into surface water bodies. The Phase II sampling effort provided additional data to further refine the relationships between surface water COPEC concentrations and hydrology during various times of the year. Sediment samples from the Flathead River exposure area (including the Backwater Seep Sampling Area) were collected during low flow periods exclusively, when the Flathead River would most likely be acting as a gaining stream. An approximately equal number of surface water samples were collected during low (41 samples) and high flow (36 samples) hydraulic conditions (see **Table 4-12**). Thus, sediment results for this exposure area are expected to be conservative, and surface water results are expected to reflect year-round exposure. However, it is noted that the maximum EPCs used in the screening-level wildlife exposure models represent the maximum seasonal exposure scenario. The temporal evaluation

presented in **Section 4.1.2.2** indicates that surface water sampling conducted during Phase I and Phase II investigations comprise a wide range of hydrologic conditions that effectively capture the temporal variability of exposure conditions that are influenced by surface water discharge (**Figure 3-5**). Therefore, uncertainty associated with temporal/seasonal variability in exposure has largely been addressed in the BERA.

Another seasonal influence on ecological exposure and risk involves the seasonal inundation of some low-lying or seep-influenced portions of the site. These areas were evaluated as transitional exposure areas in the BERA, and complete evaluations were performed assuming that conditions were both dry (during which terrestrial exposure scenarios were evaluated) and wet (during which semi-aquatic exposure scenarios were evaluated). By evaluating both scenarios assuming the site conditions were inundated or dry 100 percent of the time, the BERA provides a conservative evaluation of both terrestrial and semi-aquatic exposure (i.e., no temporal adjustment was used to "dilute" one scenario or the other by assuming that exposure only occurred part of the time).

7.3 Exposure to Pathways Not Included in the BERA

The pathways evaluated in the BERA are intended to capture a majority of the potential exposure to constituents in relevant media. However, constituents can enter organisms from a multitude of pathways, not all of which can be fully quantified in a risk assessment. Studies have shown that ingestion and direct contact are the most significant pathways, but other modes of exposure into a receptor are possible. Not quantifying risk associated with those pathways could result in an underestimation of total risk. Perhaps the most potentially significant pathways not evaluated in the risk assessment are dermal exposure and inhalation of COPECs. Dermal and inhalation exposure routes for wildlife are typically not addressed because they are considered minor relative to ingestion, and due to the lack of science supporting the evaluations. Dermal exposure is assumed to be negligible for birds and mammals due to the presence of fur and feathers. Dermal contact to amphibians and aquatic organisms is considered through the use of protective water quality and sediment benchmarks that are inclusive of this route of exposure. Some circumstances may exist where dermal and inhalation exposure may be significant, such as for burrowing wildlife and those species that inhabit burrows of others. However, based on COPEC fate and transport considerations, it is unlikely that risk from inhalation exposure is significant at the Site. Constituents that are most likely to volatilize to the air (i.e., VOCs) are not the primary COPECs at the site and were generally detected at trace concentrations in site media, and only six VOCs were identified as COPECs across all exposure areas. Therefore, it is unlikely that ecological risk was significantly underestimated by the absence of quantified risk associated with dermal or inhalation exposure pathways.

7.4 Potential Exposure to Constituents Not Detected in the Datasets

The sampling locations and analytical methods used to collect environmental data at the Site were described in detail in various work plans reviewed and approved by regulatory agencies. The sampling and analysis strategy was designed to target areas where known or suspected waste streams associated with plant operations may have impacted environmental media. A sensitivity analysis was performed prior to the sampling effort to ensure, to the extent possible, that the analytical methods employed were sensitive enough to detect constituent concentrations associated with potential adverse effects to ecological receptors. However, 100 percent attainment of this objective was not achieved, and some constituents that were not detected in any samples had detection limits that exceeded protective

benchmarks, resulting in some uncertainty regarding their presence at concentrations that are undetectable, yet potentially toxicologically significant. This source of uncertainty was discussed in the COPEC selection uncertainty analysis (**Section 4.6**), where it was concluded that this was a minor source of uncertainty that was highly unlikely to affect BERA conclusions.

7.5 Potential Exposure to Constituents Lacking Ecotoxicity Data

Toxicity data that allow for a quantitative assessment of risk are not available for some constituents. The COPEC selection uncertainty section (**Section 4.6**) discussed constituents that lacked ESVs and concluded that the lack of ESVs was unlikely to affect BERA conclusions, as the constituents most likely to adversely affect ecological receptors detected in site media did have ESVs that could be used to help determine if the constituent should be carried forward for further evaluation. The risk characterization portion of the BERA utilized TRVs as benchmark values to assess if modeled doses to various receptors exceeded no-observed and lowest-observed effect doses. However, several constituents identified as COPECs with the potential to bioaccumulate lacked TRVs, including antimony (birds), and dibenzofuran (birds and mammals). Antimony was identified as a COPEC in several exposure areas, but dibenzofuran was only a COPEC at the Central Landfills Area and the North Percolation Pond Area. Dibenzofuran was identified as a potentially bioaccumulative constituent because its log K_{ow} slightly exceeds the criterion of 3.5 (3.7). The presence of dibenzofuran at the North Percolation Pond Area is somewhat irrelevant due to the number of constituents identified as likely risk drivers in that exposure area. At the Central Landfills Area where estimated risk due to ingestion pathways was much less definitive, the presence of dibenzofuran represents a minor uncertainty. Dibenzofuran was detected in approximately half (52 of 110) soil samples at concentrations ranging from 0.0016 mg/kg to 15 mg/kg. Because it was detected frequently in site soil at concentrations that do not resemble a gradient consistent with pathways from site source areas, the presence of dibenzofuran in soil at the Central Landfills Area is unlikely related to a release and is a minor uncertainty in the BERA.

For the direct contact evaluation, NOEC/LOEC data were unavailable for some constituents. Perhaps the greatest uncertainty was the lack of soil and surface water LOEC for benchmarks for PAHs, which were a primary COPEC at many exposure areas. LOECs help to bound site risks and can provide a level above which the potential ecological risk becomes more likely. However, bulk concentrations in media and comparison to NOECs (including considering the magnitude of exceedance) provided sufficient information in most cases to determine whether PAHs should be candidates for additional action within a given exposure area. Therefore, the uncertainty associated with the lack of LOECs for PAHs is not substantial.

Two nutrients, calcium and sodium, were detected at elevated concentrations in site media, but additional toxicity data to assess potential impacts to ecological receptors are lacking. Calcium may be related to historical Site processes due to its association with fluorite, which is a component of feedstocks used in smelting. Calcium was detected at elevated concentrations that exceeded the range of BTVs from multiple background reference areas by an order of magnitude. However, the maximum concentration detected at the Site (313,000 mg/kg) was within the concentration range observed in Western U.S. soils (maximum = 320,000 mg/kg). Furthermore, the range of means detected within the multiple exposure areas at the Site (8,152 mg/kg to 125,544 mg/kg) were well within the range of concentrations of Western U.S. soils. Thus, the average concentration experienced at any exposure area is less than half the upper limit of naturally occurring calcium concentrations in western soil. The highest mean and maximum concentrations of calcium in soil/sediment were within the South Percolation Pond

Area (mean = 125,543 mg/kg). The Flathead River Riparian Area, which surrounds the South Percolation Pond, had mean (20,260 mg/kg) and maximum (41,600 mg/kg) concentrations of calcium approximately an order of magnitude lower than the South Percolation Pond. Therefore, although calcium is elevated in the South Percolation Pond, these elevated concentrations are relatively isolated, and are within the upper limits of naturally occurring calcium in the western U.S. Therefore, the inability to quantify risk associated with elevated calcium in soil at the Site represents a relatively minor uncertainty.

Sodium and calcium were detected at elevated concentrations compared with background in unfiltered and filtered surface water samples. The greatest sodium and calcium concentrations in surface water were associated with sampling stations in exposure areas where groundwater discharge is a potential migration pathway: the Flathead River within the Backwater Seep Sampling Area, Flathead Riparian Area Channel, South Percolation Pond Area, and the Northern Surface Water Feature. Elevated sodium and calcium concentrations in surface water samples from these features is consistent with elevated sodium concentrations observed in groundwater wells screened within the upper hydrogeologic unit at the Site, which are indicative of the potential groundwater discharge pathway (Roux, 2019). Sodium is a possible constituent of historical waste streams due to its presence as sodium cyanide (NaCN). This cyanide salt is highly soluble, which is consistent with the presence of much more highly elevated concentrations of sodium in groundwater and surface water than in soil at the Site.

7.6 Selection of Substitution Value for Non-Detected Results

HMW/LMW/Total PAHs and TEC calculations for dioxins were performed using multiple substitution strategies for non-detected results to bracket the range of potential concentrations that might be present in the sample. For both PAHs and dioxins, values of zero, one-half the MDL, and the full MDL were used as surrogate values for non-detects. In no situation did the selection of the substitution method affect whether or not the constituent grouping was selected as a screening or refined COPEC (**Appendix B** and **Appendix E**). Therefore, the selection of the substitution value for non-detect resulted in little to no uncertainty for this BERA.

7.7 Background Evaluation Methods

The approaches used in the BERA to determine what constituents were related to natural or ambient environmental conditions imparted a highly conservative bias to the evaluation. The comparison of the exposure area UCL to the mean concentration in background samples at the COPEC refinement stage (**Section 4.4.2**) resulted in very few constituents being eliminated from further consideration, even in areas that are unlikely to be impacted by previous site activities. For example, in the Eastern Undeveloped Area, North-Central Undeveloped Area, and Western Undeveloped Area, only two metals were eliminated from further consideration due to this comparison to background. The second phase of the background evaluation consisted of a hypothesis test that statistically compared the site and background datasets to determine whether they were from the same or different populations. The Background Test Form 2 was used for this evaluation, which states as its null hypothesis that the mean COPEC concentration in samples from the exposure area is greater than the sum of the mean concentration in the respective background area and the substantial difference (Roux, 2018b). Test Form 2 requires a stricter burden of proof because instead of using a null hypothesis that the mean or median concentration of the potentially impacted site area does not exceed the mean or median of background, the null hypothesis that must be “disproven” is that the mean or median of the site exceeds the mean or median of background by a specified amount. Therefore, the use of the Test Form

2 is more protective of the environment by requiring that the data contain evidence of no substantial contamination (EPA, 2015b). However, the use of this test form also increases the chance of a Type II error, or failing to reject the null hypothesis, which in this case is that site concentrations are present above background concentrations. Thus, the use of the Test Form 2 likely resulted in identifying some constituents at the various exposure areas as being significantly greater than background when no statistically significant difference in populations actually exists.

7.8 Appropriateness of Variables Used in the Dose Rate Models

The variables used in the dose rate models that estimated risks associated with direct and indirect ingestion of COPECs to wildlife, including exposure parameters, TRVs, and AUFs, were documented and submitted for regulatory review in the *Technical Memorandum: Proposed Wildlife Exposure Modeling Approach to Support the Baseline Ecological Risk Assessment at the Columbia Falls Superfund Site* (presented in **Appendix A2**) prior to the initiation of the BERA. Selected variables were obtained from general literature sources and compilations of exposure factors developed to support dietary exposure modeling and were intended to reflect a conservative, but not worst-case estimate of exposure and toxicity. For example, mean body weights were used in the food chain modeling, but maximum and UCL_{mean} concentrations were used as initial and refined EPCs, respectively. AUFs used to adjust exposure based on the portion of the affected area that occurs within the home range of the receptor was not considered during the screening evaluation but was incorporated into the refined version of the model. When AUFs were used, contributions of risk from areas outside of the target exposure area were not assumed to be zero; rather, the spatially weighted contributions of COPECs from adjacent exposure areas within the receptor home range were added to estimate the aggregate risk. Finally, both NOAEL and LOAEL TRVs were used to provide context for the potential toxicity of doses incurred by the various receptors.

The use of conservative assumptions (i.e., the use of the maximum EPC and an AUF of 1) in the screening-level wildlife ingestion model combined with the more representative exposure assumptions utilized in the refined models provides sufficient information for decision making at the Site. Because of overall conservativeness of the assumptions and variables used throughout the BERA process, the likelihood of underestimating risk is low. Rather, risk estimates are likely to be overestimated at this stage of the BERA. If additional studies are performed (e.g., site-specific toxicity or uptake studies), the uncertainty associated with this (likely) overestimation may be reduced.

7.9 Uncertainty Associated with the HQ Method of Estimating Risk

Risk estimation was performed through a series of quantitative HQ calculations that compare receptor-specific exposure values with TRVs. HQs are compared to HQ guidelines for assessing the risk posed from COPECs. It should be noted that HQs are not measures of risk, are not population-based statistics, and are not linearly scaled statistics. Therefore, an HQ above 1, even exceedingly so, does not definitively indicate that there is a single organism adversely impacted by the toxicological effect associated with a given constituent to which it was exposed currently or in the future (Tannenbaum, 2005; Bartell, 1996). HQs exceeding 1 only suggest that the potential for adverse hazard may exist, and the probability of adverse effects occurring may increase with increasing HQ magnitude.

7.10 Uncertainty Associated with AVS-SEM Results

As described throughout the BERA (e.g., Sections 3.6 and 4.1.3, etc.) and in the Phase II Sampling and Analysis Plan (Roux, 2018a), AVS-SEM data were collected as part of the Phase II site characterization effort in sediments where divalent metals were suspected or known to be present at concentrations above ESVs based on total recoverable metal analyses. As stated in **Section 3.3.7.4**, the soluble phase of metal ions in sediment pore water is generally the most bioavailable and potentially toxic form to ecological receptors. Equilibrium partitioning theory may be used to predict the bioavailability toxicity of metals in sediment based on the partitioning of SEM between AVS, TOC, and pore water (USEPA, 2005a). In reduced sediments, free metal ions partition to AVS and TOC to form insoluble metal sulfide complexes that have low bioavailability and are associated with low toxicity to benthic organisms in toxicity tests (USEPA, 2005a). Based on this principle, AVS-SEM and TOC data were used in the BERA in conjunction with pore water data to provide multiple lines of evidence to evaluate the bioavailability of divalent metals in sediments in select exposure areas at the Site.

A study performed by Hammerschmidt and Burton (2010) identified potential issues with the reproducibility of AVS-SEM results between laboratories, indicating some uncertainty with AVS-SEM results as the basis for decision-making. The study examined AVS-SEM results for sediment subsamples that were distributed to seven independent laboratories and found varied results (ranging from 70 to 3,500-times for AVS and 17 to 60-times for SEM) owing to varying laboratory preparations, detection limits, and other factors. The information presented in Hammerschmidt and Burton (2010) indicates some uncertainty regarding the accuracy and replicability of AVS-SEM data between laboratories. However, the additional pore water line of evidence collected as part of the Phase II site characterization limits the uncertainty associated with AVS-SEM results. Given that multiple lines of evidence were evaluated in the assessment of metal bioavailability in sediment, the uncertainty associated with AVS-SEM analyses is not likely to affect overall conclusions regarding potential metal toxicity to benthic organisms at the Site

7.11 Calculation of HQs for Large Home Range Receptors

As discussed in **Section 5.3.3.2.1**, low-level contributions from adjacent exposure areas that resulted in an HQ_{NOAEL} of less than 1 for that exposure area were not included in the spatially weighted HQ calculations for large range receptors. This results in a slight underestimation of the aggregate dose for receptors foraging in multiple exposure areas. However, because contributions from adjacent exposure areas are spatially weighted, their impacts on the target exposure area are reduced proportionally by the percent of the receptor home range they occupy. For example, if target Exposure Area A had an HQ for lead of 2 and comprised 60 percent of the receptor home range, and Exposure Areas B, C, and D each had HQs for lead of 0.9 and comprised 10 percent of the receptor home range, the spatially weighted HQ would be (2 x 0.6) + (0.9 x 0.1) + (0.9 x 0.1) +(0.9 x 0.1) + (0.9 x 0.1) = 1.56, compared to an HQ of 1.2 if Exposure Areas B, C, and D were assumed to contribute HQs of 0. Therefore, the spatially weighted HQs for large range receptors are recognized as having some uncertainty due to a slight non-conservative bias associated with this approach, but the uncertainty is not considered significant enough to warrant recalculation of HQs or affect the conclusions presented in this BERA.

Furthermore, any area within the foraging range of a large-range receptor that was outside of the Site boundary was not included in the spatially- weighted HQ calculation, effectively adding a dose of zero for that percentage of the home range outside the Site. This approach assumes that background levels contribute de minimus risk, which is consistent with the practice of excluding constituents detected on-

site that are naturally occurring in the COPEC refinement step. In other words, if copper in soil within the exposure area was found to be background-related, it was not included in the wildlife ingestion model, which would essentially result in a dose of zero for copper in that exposure area. Therefore, both on- and off-site background-related risk was assumed to be negligible in this BERA and was not included in the wildlife ingestion modeling. The practice of assuming a dose of zero (rather than background) may slightly underestimate risk by not accounting for contributions from non-site related sources.

7.12 Incremental and Discrete Soil Sample Results in the Operational Area

As described in **Section 5.3.1**, both ISS and discrete soil samples were collected within the Operational Area, which overlaps portions of both the Main Plant and Central Landfills ecological exposure areas. The ISS samples were evaluated on an individual DU basis and used to evaluate potential impacts to sessile and small-range receptors, while the discrete samples were used in the exposure area-wide ingestion dose-response model that was used to evaluate receptors with a variety of home range sizes. Four DUs within the Operational Area grid were sampled in triplicate. RSDs calculated for each chemical and depth interval from these triplicate results were used to adjust the concentrations in the non-triplicate DUs to account for potential variability associated with the ISS samples (**Section 4.1.1.1)**. The high-adjusted concentrations were used in the screening-level and refined COPEC selection process (**Sections 4.3.2** and **4.5.2**), as well as the risk characterization for the Operational Area (**Section 6.3.1**). The range of mean RSDs used to adjust the non-triplicate DUs was 2.8 percent to 139 percent for the 0 to 0.5-ft bgs interval, and 1.9 to 98.2 percent for the 0.5 to 2 ft bgs interval. 20 of 60 mean RSDs used to adjust the concentrations in the 0 to 0.5-ft bgs interval exceeded 35 percent, and 31 of 62 in the 0.5 to 2 ft bgs interval exceeded 35 percent. Consistent with ITRC guidance (ITRC, 2012a), a criterion of 30 to 35 percent RSD in field replicates within the triplicate ISM DUs may indicate substantial heterogeneity in constituent concentrations within the DU. However, the fact that this criterion was exceeded for several individual and averaged RSD estimations did not materially affect risk conclusions in the BERA. Only one additional non-PAH SVOC was identified as a screening-level and refined COPEC using the high-adjusted dataset compared to the measured and low-adjusted datasets (**Appendices B** and **E**). The results of the risk characterization for the Incremental Sampling Grid (**Section 6.1.3**) were reviewed, and, although HQs were somewhat greater than if they had been based on the measured EPC dataset, the use of the high-adjusted values also did not materially affect results for the direct contact or small home range receptor evaluation (e.g., identification of additional site-related constituents with HQs > 1). Therefore, the variation within the triplicate results is noted as an uncertainty in the BERA, but the impacts on the BERA conclusions are minimal. Any impacts associated with this noted variation are conservative, as the high variance resulted in higher UCLs for the DUs with triplicate results, and in higher EPCs for the non-triplicate DUs, which collectively were used as the basis for COPEC selection and risk characterization.

A comparison was performed between the concentrations detected in ISS samples collected in the Main Plant Area and Central Landfills Area and the discrete soil samples that were collected within the ISS grid in these two ecological exposure areas to determine whether the discrete samples collected from these portions of the areas were appropriately representative of exposure to large-range receptors evaluated in the wildlife ingestion model.

The comparison between ISS and discrete sample concentrations was performed on constituents that were identified as refined COPECs for the Main Plant Area and Central Landfills Area (see COPEC refinement tables in **Appendix E**). Summary statistics, including detection frequency and the minimum,

mean, and maximum detected concentrations, were compiled for the ISS samples (including both the 0-0.5 bgs and the 0.5-2 ft bgs sampling depths) and the discrete samples (0-2 feet bgs) that were nested within the ISS grid footprint in both exposure areas. The ISS results used for this comparison were the calculated 95 percent UCLs for DUs with triplicate results and the measured (i.e., unadjusted) concentrations from the DUs lacking triplicate results. The results are presented in **Table 7-2**. Box and whisker plots for select metals, other inorganic constituents (i.e., cyanide and fluoride), and PAHs are presented in **Figures 7-1, 7-2**, and **7-3**, respectively.

Most metals and both LMW and HMW PAHs had higher average concentrations in the ISS samples compared to the discrete samples that were collected within the ISS grid footprint compared to the discrete samples (**Table 7-2**; **Figures 7-1** and **7-3**). Cyanide and fluoride in the Main Plant Area, and fluoride in the Central Landfills Area also had higher mean concentrations in the ISS compared to discrete soil samples; although the mean concentration of cyanide in ISS samples was slightly lower than discrete samples, the median and overall distribution of cyanide concentrations was greater in the Central Landfills Area (**Table 7-2**; **Figure 7-2**) . Some of the differences were substantial; for example, copper, selenium, and zinc in the Main Plant Area, the mean concentration among the ISS samples was 4.8-, 5.5-, and 3.7-times the mean of the discrete samples. Copper, lead, and selenium in the Central Landfills Area had mean ISS concentrations more than twice as high as the discrete samples from the ISS grid footprint. Mean LMW and HMW PAHs ranged from 1.3 to 2-times higher in the ISS samples compared to the discrete samples across both exposure areas (**Table 7-2**).

The results of this evaluation indicate that the estimated doses for larger range receptors that were calculated using discrete samples may be somewhat underestimated in the portions of the Main Plant Area and Central Landfills Area that overlap the ISS grid. However, because this area comprises only a portion of most receptor home ranges, the impacts of this underestimation would be ameliorated by the remainder of the exposure area. A summary of the percentage of the home range of each terrestrial receptor that falls within the ISS grid for the Main Plant Area and Central Landfill Area is provided in the following table (note that the meadow vole and short-tailed shrew are small range receptors that are evaluated on a sample-by-sample basis for both ISS and discrete soil samples, and are not shown in the table):

Terrestrial receptor	Home Range (acres)	# of Approx. 1-acre grids in Main Plant Area	% of Home Range	# of Approx. 1-acre grids in Central Landfill Area	% of Home Range
American Woodcock	11.1	14	126%	29	261%
Mourning Dove	1986	14	1%	29	1%
Red-tailed Hawk	551	14	3%	29	5%
Yellow-billed Cuckoo	42	14	33%	29	69%
Canada Lynx	10625	14	0%	29	0%
Grizzly Bear	32000	14	0%	29	0%
Long-tailed Weasel	12	14	117%	29	242%
Wolverine	26000	14	0%	29	0%

Thus, the concern for underestimation of exposure to higher concentrations reflected by the ISS results compared to the discrete samples is minor for the mourning dove, red-tailed hawk, Canada lynx, grizzly

bear, and wolverine, as the portion of their home range that is comprised of the ISS grid for their particular exposure areas is negligible. Concern is greater for the American woodcock and long-tailed weasel, both of which have home range sizes smaller than the area covered by the ISS grid in both exposure areas. The home range of the yellow-billed cuckoo substantially overlaps (33 and 69 percent) the ISS sampling grid in both exposure areas, as well.

This evaluation assumes that medium- and large-ranged receptors utilize a foraging area equal to the size of their home range and centered in the Main Plant or Central Landfills Area. The underestimation of risk may be greater for any receptors whose home ranges are centered on the Operational Area (rather than centered on the Main Plant Area or Central Landfills Area, for example). However, the Operational Area is one of the most industrially developed and disturbed areas of the Site, and the infrastructure and associated habitat degradation attributable to historical activities in this portion of the Site have resulted in low quality ecological resources that would likely be avoided by wildlife foraging in the area. The American woodcock represents avian insectivores, and some members of this foraging guild (e.g., the American robin) are tolerant of human presence and development, but a vast majority of the species represented by the American woodcock (avian insectivore) and long-tailed weasel (mammalian carnivore) are unlikely to regularly occur in the Operational Area. The yellow-billed cuckoo is a threatened species that is evaluated for individual protection rather as a representative of a specific foraging guild, but the presence of yellow-billed cuckoo is unlikely due to its rarity in Montana and, even if present in the vicinity of the Site, the usable habitat for the yellow-billed cuckoo is lacking in the Operational Area (see **Section 6.1.1.3** for additional discussion on the habitat requirements for this sensitive species). Therefore, the low likelihood for populations of larger ranging receptors to forage exclusively within the Operational Area is a moderating consideration for this portion of the Site.

The evaluation of the ISS samples on a point-by-point basis for small range receptors (i.e., the meadow vole and short-tailed shrew) reduces concern that ecological risks associated with exposure to the Operational Area are being underestimated, as these receptors typically are protective of larger ranging receptors owing to their small body size (toxicity and body size are generally inversely related because smaller sized animals need to consume more food relative to their body weight than larger animals) and localized exposure ranges. Larger range receptors typically occupy higher trophic order niches in the food chain and are therefore important to consider with regards to potential effects associated with bioaccumulation in the food chain. However, most metals and PAHs in terrestrial systems have relatively low bioaccumulation potential. Therefore, although risk associated with the constituents exhibiting higher concentrations in the ISS samples may be underestimated for larger-range receptors that incorporate part or all of the Operational Area into their home range, it is unlikely that the BERA conclusions are affected by this finding, and the list of constituents that potentially result in unacceptable risk using the point-by-point evaluation for small range receptors are most likely protective of larger-ranging receptors as well.

8 BERA Summary and Conclusions

The findings of the BERA are summarized to clearly identify the assessment procedures used, the potential risks identified, and the uncertainties associated with the conclusions. The BERA findings are evaluated for each ecological exposure area to support area-specific recommendations to guide risk management decision-making for the Site.

8.1 Terrestrial Exposure Areas

The overall results of the BERA for the terrestrial exposure areas are presented in **Table 8-1** and are summarized in this section.

8.1.1 Main Plant Area

Risk estimates for the Main Plant Area—particularly in the north-central portion of this exposure area--indicate the potential for adverse effects associated with exposure to PAHs in soil within localized portions of the Main Plant Area that are proximal to former operations. Direct contact exposure to PAHs in the Main Plant Area may potentially result in adverse effects to terrestrial invertebrates in these localized areas. PAHs were also responsible for two avian receptors (the American woodcock and yellow-billed cuckoo) having wildlife ingestion HQ_{LOAEL} values that exceeded 1, primarily due to the modeled ingestion of terrestrial invertebrates.

Based on these findings, the potential for ecological receptors to be adversely affected by constituents in soil in the Main Plant Area cannot be entirely dismissed under current conditions. However, concern regarding COPECs in the Main Plant Area is reduced because of the poor habitat available under current, developed conditions. Further evaluation of exposure to soils with elevated concentrations in the identified localized areas may be warranted if future site conditions return these areas to a more naturalized habitat condition that supports ecological receptor populations.

8.1.2 Central Landfills Area

Risk estimates for the Central Landfills Area indicate the limited potential for adverse effects associated with direct contact to soil constituents. The direct contact risk evaluation performed at the Central Landfills exposure area indicates that potential risk to soil invertebrates and terrestrial plants is low, although localized areas of PAHs and one elevated copper result at CFSB-002 (7,260 mg/kg) resulted in some NOEC and LOEC exceedances. This sample had concentrations of copper that were an order of magnitude greater than the next highest detected concentration and two orders of magnitude greater than the mean in this exposure area. Therefore, this sample is considered anomalous, and the EPCs that were highly influenced by this anomalous sample resulted in risk estimates that far exceed what would be considered representative for the site as a whole. Wildlife ingestion models indicate the potential for adverse effects associated with exposure to copper, PAHs, and Aroclor 1254 assuming conservative exposure assumptions. The modeled ingestion of terrestrial invertebrate prey items was the critical exposure pathway for all COPECs and receptors. Similar to the direct contact pathways, EPCs for copper are driven by an anomalously high concentration at a single station. An EPC for copper calculated with the anomalous concentration excluded resulted in negligible risks for wildlife receptors. EPCs for PAHs were also influenced by localized stations with elevated concentrations. The small range receptor evaluation indicated several sample locations (e.g., CFLP-009, CFSB-004, CFLP-012, CFSB-227, CFSB-224)

with concentrations exceeding the LOAEL-based soil benchmarks for the short-tailed shrew in the area where the Wet Scrubber Sludge Pond was formerly located and in the southern portion of the exposure area between the Wet Scrubber Sludge Pond and the Main Plant Area.

Based on these findings, the potential for ecological receptors to be adversely affected by constituents in soil in the Central Landfills Area cannot be entirely dismissed under current conditions. However, concern regarding COPECs in the Central Landfills Area is reduced because of the poor habitat available under current, developed conditions. Further evaluation of exposure to soils with elevated concentrations in the identified localized areas may be warranted if future site conditions return these areas to a more naturalized habitat condition that supports ecological receptor populations.

8.1.3 Incremental Soil Sampling Grid

Risk estimates for the ISS Grid were similar to risk estimates for overlapping areas within the Main Plant Area and Central Landfills Area. Direct contact resulted in moderate risk to soil invertebrates and plants based on contact with PAHs and select metals, including copper, selenium (plants only) and zinc. Several of the DUs, particularly in the central third of the ISS Grid within the Central Landfills Area, had concentrations of constituents that exceeded LOAEL-based benchmarks protective of small range receptors. Exceedances of LOAEL-based benchmarks in these DUs were primarily associated with LMW and HMW PAH exposure to short-tailed shrew.

Based on these findings, the potential for ecological receptors to be adversely affected by constituents in soil in some ISS grids cannot be entirely dismissed under current conditions. However, concern regarding COPECs in the Operational Area where the ISS grids were located is reduced because of the poor habitat available under current, developed conditions. Further evaluation of exposure to soils with elevated concentrations in the identified localized areas may be warranted if future site conditions return these areas to a more naturalized habitat condition that supports ecological receptor populations.

8.1.4 Industrial Landfill Area

Risk estimates for the Industrial Landfill Area indicate minimal potential for adverse effects associated with exposure to constituents in soil. The results of the food chain model indicated that nickel (American woodcock and short-tailed shrew) and HMW PAHs (American woodcock and yellow-billed cuckoo) had HQ_{LOAEL} values that exceeded 1 in this exposure area, primarily due to the modeled ingestion of terrestrial invertebrate prey items. All HQ_{LOAEL} values were less than 5, however. Therefore, nickel and PAHs in soil at the Industrial Landfills Area represent a moderate risk to ecological receptors due to exposure from direct and indirect ingestion pathways.

Based on these findings, the potential for ecological receptors to be adversely affected by constituents in soil in the Industrial Landfill Area cannot be entirely dismissed under current conditions. However, concern regarding COPECs in the Industrial Landfill Area is reduced because of the poor habitat available under current, developed conditions. Further evaluation of exposure to soils with elevated concentrations in the identified localized areas may be warranted if future site conditions return these areas to a more naturalized habitat condition that supports ecological receptor populations.

8.1.5 Eastern Undeveloped Area

Risk estimates for the Eastern Undeveloped Area indicate negligible potential for adverse effects associated with exposure to soil. No further evaluation to assess the potential for ecological risk is warranted in this exposure area.

8.1.6 North-Central Undeveloped Area

Risk estimates for the North-Central Undeveloped Area indicate negligible potential for adverse effects associated with exposure to soil. No further evaluation to assess the potential for ecological risk is warranted in this exposure area.

8.1.7 Western Undeveloped Area

Risk estimates for the Western Undeveloped Area indicate negligible potential for adverse effects associated with exposure to soil. No further evaluation to assess the potential for ecological risk is warranted in this exposure area.

8.1.8 Flathead River Riparian Area

Risk estimates for the Flathead River Riparian Area indicate negligible potential for adverse effects associated with exposure to soil. No further evaluation to assess the potential for ecological risk is warranted in this exposure area.

8.2 Transitional Exposure Areas

The overall results of the BERA for the transitional exposure areas are presented in **Table 8-2** (terrestrial evaluation) and **Table 8-3** (aquatic evaluation) and are summarized in this section.

8.2.1 North Percolation Pond Area

Elevated risks associated with direct contact to aquatic and terrestrial plants and invertebrates, and to multiple wildlife receptors foraging on benthic and terrestrial invertebrates were present in the North Percolation Ponds. Concentrations were present in every soil sample that exceeded the LOAEL benchmark protective of small-range receptors. Cyanide and several metals (e.g., barium, nickel, selenium, and vanadium) and PAHs were responsible for this elevated risk. The greatest potential for adverse effects was attributable to the North-East Percolation Pond.

Further actions should be considered to reduce or further study the elevated ecological risk at this exposure area. Further risk assessment may not be beneficial, particularly in the North-East Pond until the future uses of the North Percolation Pond are determined.

8.2.2 South Percolation Pond Area

The potential for adverse effects associated with constituents in media at the South Percolation Pond Area is considered minimal under dry scenarios, but moderate under inundated scenarios due to

potential adverse effects associated with direct contact with cyanide, metals, and PAHs in surface water. One potential action that could address this elevated risk is to evaluate the potential for minimizing stormwater discharge with elevated concentrations of cyanide, aluminum, and other COPECs to the South Percolation Ponds.

8.2.3 Cedar Creek Reservoir Overflow Ditch

The potential for adverse effects associated with constituents in media at the Cedar Creek Reservoir Overflow Ditch Area is considered minimal under both dry and inundated scenarios. No further evaluation to assess the potential for ecological risk is warranted in this exposure area.

8.2.4 Northern Surface Water Feature

The potential for adverse effects associated with constituents in media at the Northern Surface Water Feature Area is considered minimal under both dry and inundated scenarios. No further evaluation to assess the potential for ecological risk is warranted in this exposure area.

8.3 Aquatic Exposure Areas

The overall results of the BERA for the aquatic exposure areas are presented in **Table 8-4** and are summarized in this section.

8.3.1 Flathead River

Elevated risk associated with direct contact to aquatic receptors was noted within the Backwater Seep Sampling Area/Flathead River Riparian Channel, and was greatest for cyanide, barium, and aluminum in surface water and pore water. Ecological risk associated with direct contact within this limited area was considered moderate. However, rapid attenuation with increasing distance from the seep area was noted, and the potential for ecological risk in the main channel of the Flathead River for both direct contact and wildlife ingestion pathways was considered minimal and negligible, respectively. Further evaluation of chronic, direct contact exposure to cyanide in surface water and pore water in the Backwater Seep Sampling Area/Flathead River Riparian Channel may be warranted.

8.3.2 Cedar Creek

Potential risks associated with direct contact with surface water and sediment in Cedar Creek are negligible. No further evaluation to assess the potential for ecological risk is warranted in this exposure area.

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Tables

Table 3-1
Qualitative Assessment of Habitat Use by Representative Receptors
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Exposure Area	Habitat Description[1]	Habitat Use Ranks[2,3]								
		American Dipper	American Woodcock	Belted Kingfisher	Mourning Dove	Yellow-Billed Cuckoo	Canada Lynx	Grizzly Bear	Meadow Vole	Short-tailed Shrew
Terrestrial Exposure Areas										
Main Plant Area (231.9 acres)	Limited habitat quality due to former plant operations; characterized by early successional, non-woody vegetation and compacted soil; infrastructure related to former operations.	NA	1*	NA	3	1	1	1	4	3
Central Landfills Area (44.4 acres)	Limited habitat quality due to former plant operations; characterized by early successional, non-woody vegetation and compacted soil. Highest quality habitat at eastern boundary of exposure area.	NA	1*	NA	3	1	1	1	4	3
Industrial Landfill Area (12.6 acres)	Inactive, uncapped landfill. Reduced habitat quality due to landfill maintenance; characterized by early successional, non-woody vegetation.	NA	2*	NA	4	1	2	2	4	3
Eastern Undeveloped Area (64.9 acres)	Mix montane mixed conifer forest and lower montane grassland; montane-foothill deciduous shrubland located to the northeast and east of the Main Plant Area. Used by multiple avian and mammalian terrestrial receptor guilds.	NA	3	NA	4	2	2	3	5	4
North-Central Undeveloped Area (114.4 acres)	Mix montane mixed conifer forest and lower montane grassland; used by multiple avian and mammalian terrestrial receptor guilds.	NA	3	NA	4	2	2	3	5	4
Western Undeveloped Area (439.6 acres)	Mix montane mixed conifer forest and lower montane grassland; riparian woodland habitat dominated by cottonwood (*Populus spp.*) borders Cedar Creek. Used by multiple avian and mammalian receptor guilds.	NA	3	NA	4	2	2	3	5	4
Flathead River Riparian Area (93.9 acres)	Riparian woodland habitat dominated by cottonwood (*Populus spp.*), boxelder (*Acer negundo*), quaking aspen (*Populus tremloides*), and paper birch (*Betula papyrifera*). Maintained utility corridor. Used by multiple terrestrial and semi-aquatic avian and mammalian receptor guilds.	NA	4	NA	4	2	2	3	5	5
Transitional Exposure Areas										
Cedar Creek Reservoir Overflow Ditch (5.2 acres)	Intermittent surface water conveyance controlled by surface water discharge from the Cedar Creek Reservoir.	1	1*	1	2	1	1	1	1	1
South Percolation Pond Area (5.6 acres)	Three interconnected former process ponds located adjacent to the Flathead River; currently only stormwater discharges to the ponds. Variable hydrology from complete inundation during wet season to limited inundation during the dry season. Potential seasonal habitat for amphibians and tolerant invertebrates.	1*	2*	3	3	1	1	2	2	2
Northern Surface Water Feature (6.1 acres)	Seasonally and interannually variable surface water feature fed by groundwater discharge; potential temporary habitat for amphibians and tolerant invertebrates.	1*	3	2	3	2	2	3	4	4
North Percolation Pond Area (11.3 acres)	Two interconnected former process ponds; currently receives stormwater discharge. Variable hydrology related to stormwater discharge; not inundated during the dry season. Potential seasonal habitat for amphibians and tolerant invertebrates.	1*	1*	1	2	1	1	1	2	2
Aquatic Exposure Areas										
Flathead River	Coldwater river that supports the growth and propagation of salmonid fishes and associate aquatic life; fisheries near the Site are fairly limited by sub-optimal stream channel habitat.	3	NA	4	NA	NA	NA	NA	NA	NA
Cedar Creek	Second order tributary to the Flathead River; coldwater habitat that likely supports fish, however, small channel size limits biomass of edible sized fish.	4	NA	5	NA	NA	NA	NA	NA	NA

Notes:

1, Habitat descriptions summarized based on the habitat assessment reported in the *Screening Level Ecological Risk Assessment* (Roux, 2017b).

2, Habitat Use Ranks:

1. Little to no habitat available at the exposure area for the receptor or surrogates; regular exposure to populations (or individual organisms, for sensitive species) highly unlikely.
2. Low quality habitat for the species is available in portions of the site, but regular exposure to populations (or individual organisms, for sensitive species) is not be expected. Low probability for receptor to be present regionally.
3. Habitat quality is moderate for receptor. Regular exposure to receptor at the site is possible, but risk estimates based on 100 percent exposure are likely overestimated.
4. Significant portions of the exposure area have habitat qualities favored by the receptor; the assumption that the receptor could be exposed to a majority of the site area is reasonable.
5. Habitat is ideal (or nearly ideal) for the species.

NA, Habitat is not applicable for the listed receptor.

3, An asterisk (*) indicates that although it is highly unlikely that the receptor species in question would use the site, other species in its foraging guild that it represents may utilize the area to some extent.

Receptor	Habitat Requirements
American Dipper:	Prefers fast-moving, clear streams along with waterfalls. Species prefers sand, pebble, or rocky stream bottoms, which provide sufficient aquatic invertebrates. Shorelines with large boulders, fallen trees, and rubble provide shelter and protection from predators (1.).
American Woodcock:	The woodcock is primarily found in the eastern U.S. There has only been a single record in the Montana in the past 10 years (1.). Hides in forest thickets by day, where it uses its long bill to probe in damp soil for earthworms (2.).
Belted Kingfisher:	Inhabits streams, rivers, ponds, lakes, and estuaries or calm marine waters in which prey are clearly visible. Availability of suitable nesting sites - earthen banks where nesting burrows can be excavated - appears critical for the distribution and local abundance of this species (1.).
Mourning Dove:	Species has tremendous adaptability. Generally shuns deep woods or extensive forest and selects more open woodlands and edges between forest and prairie biomes for nesting. Human alteration of original vegetations is generally beneficial for this species (1.).
Yellow-Billed Cuckoo:	Rarely observed in Montana. Requires dense, wooded habitats with cover and water nearby, particularly cottonwood-dominated forests canopies (Hughes, 2015; MNHP, 2019). Western subspecies require patches of at least 10 hectares (25 acres) of dense, riparian forest with a canopy cover of at least 50 percent in both the understory and overstory. The Yellow-billed Cuckoo is known in Montana only in June and July. All of these observations indicate no behavioral evidence to suggest breeding (1.).
Canada Lynx:	Moist, boreal spruce-fir forest habitat, particularly dense stands of young conifers. In northwestern Montana, primary vegetation may include cedar-hemlock habitat types (1.).
Grizzly Bear:	Relatively undisturbed mountainous habitat ranging from dense forest to subalpine meadows. In Montana, primarily meadows, seeps, riparian zones, mixed shrub fields, open timber, closed timber. Habitat use is highly variable between areas and seasons (1.).
Meadow Vole:	Wet grassland habitat but not above timberline in grassy alpine tundra. *M. pennsylvanicus* may inhabit drier grasslands than *M. montanus* (1.).
Short-tailed Shrew:	Most common in hardwood forests with deep leaf litter and in brushy sites adjacent to ponds and streams, less common in conifer forest and grassland (1.).

Sources:

1. Montana Field Guides online, http://fieldguide.mt.gov/speciesDetail.aspx?elcode=ABPBH01010
2. Audubon Guide to North American Birds online, https://www.audubon.org/bird-guide

Table 4-1
Samples Used in the Baseline Ecological Risk Assessment - Main Plant Area
Main Plant Terrestrial Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
Soil Samples (Incremental Samples)				
CFISS-030	CFISS-030-SO-0-0.5	25-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-030	CFISS-030-SO-0.5-2	25-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-031	CFISS-031-S0-0-0.5	13-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-031	CFISS-031-S0-0.5-2	13-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-032	CFISS-032-SO-0-0.5	12-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-032	CFISS-032-SO-0.5-2	12-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-033	CFISS-033-SO-0-0.5	12-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-033	CFISS-033-SO-0.5-2	12-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-034	CFISS-034-SO-0-0.5	11-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-034	CFISS-034-SO-0.5-2	11-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-035	CFISS-035-SO-0-0.5	11-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-035	CFISS-035-SO-0.5-2	11-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-036	CFISS-036-SO-0-0.5	15-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-036	CFISS-036-SO-0.5-2	15-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-037	CFISS-037-SO-0-0.5	15-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-037	CFISS-037-SO-0.5-2	15-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-038	CFISS-038-S0-0-0.5	14-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-038	CFISS-038-S0-0.5-2	14-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-039	CFISS-039-S0-0-0.5	14-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-039	CFISS-039-S0-0.5-2	14-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-040	CFISS-040-S0-0-0.5	13-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-040	CFISS-040-S0-0.5-2	13-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-041	CFISS-41-SO-0-0.5	16-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-041	CFISS-41-SO-0.5-2	16-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-042	CFISS-042-SO-0-0.5	18-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-042	CFISS-042-SO-0.5-2	18-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-043	CFISS-043-SO-0-0.5	18-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-043	CFISS-043-SO-0.5-2	18-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
Soil Samples (Grab Samples)				
CFMW-028A	CFMW-028a-SO-0-0.5	30-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-028A	CFMW-028a-SO-0.5-2	30-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-032A	CFMW-032a-SO-0-0.5	8-Aug-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-032A	CFMW-032a-SO-0.5-2	8-Aug-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-033	CFMW-033-SO-0-0.5	1-Jul-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFMW-033	CFMW-033-SO-0.5-2	1-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-034	CFMW-034-SO-0-0.5	31-May-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-034	CFMW-034-SO-0.5-2	31-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-035	CFMW-035-SO-0-0.5	1-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-035	CFMW-035-SO-0.5-2	1-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-037	CFMW-037-SO-0-0.5	24-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-037	CFMW-037-SO-0.5-2	24-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-038	CFMW-038-SO-0-0.5	25-Jun-16	0 - 0.5	Dioxins, Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-038	CFMW-038-SO-0.5-2	25-Jun-16	0.5 - 2	Dioxins, Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-040	CFMW-040-SO-0-0.5	28-Jun-16	0 - 0.5	Dioxins, Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-040	CFMW-040-SO-0.5-2	28-Jun-16	0.5 - 2	Dioxins, Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-042	CFMW-042-SO-0-0.5	16-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-042	CFMW-042-SO-0.5-2	16-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-043	CFMW-043-SO-0-0.5	15-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-043	CFMW-043-SO-0.5-2	15-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-044A	CFMW-044a-SO-0-0.5	20-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs

Table 4-1
Samples Used in the Baseline Ecological Risk Assessment - Main Plant Area
Main Plant Terrestrial Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
CFMW-044A	CFMW-044a-SO-0.5-2	20-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-045A	CFMW-045a-SO-0-0.5	12-Aug-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-045A	CFMW-045a-SO-0.5-2	12-Aug-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-047	CFMW-047-SO-0-0.5	21-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-047	CFMW-047-SO-0.5-2	21-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-049	CFMW-049-SO-0-0.5	20-Aug-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-049A	CFMW-049a-SO-0.5-2	20-Aug-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-050	CFMW-050-SO-0-0.5	22-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-050	CFMW-050-SO-0.5-2	22-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-053A	CFMW-053a-SO-0-0.5	17-Aug-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-053A	CFMW-053a-SO-0.5-2	17-Aug-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-054	CFMW-054-SO-0-0.5	20-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-054	CFMW-054-SO-0.5-2	20-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-070	CFMW-070-SO-0-0.5	16-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFMW-070	CFMW-070-SO-0.5-2	16-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-010	CFSB-010-SO-0.5-2	21-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-012	CFSB-012-SO-0.5-2	28-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-038	CFSB-038-SO-0-0.5	21-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-038	CFSB-038-SO-0.5-2	21-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-040	CFSB-040-SO-0-0.5	20-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-040	CFSB-040-SO-0.5-2	20-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-042	CFSB-042-SO-0-0.5	20-May-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-042	CFSB-042-SO-0.5-2	20-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-044	CFSB-044-SO-0-0.5	20-May-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-044	CFSB-044-SO-0.5-2.0	20-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-045	CFSB-045-SO-0-0.5	21-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-045	CFSB-045-SO-0.5-2	21-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-046	CFSB-046-SO-0-0.5	20-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-046	CFSB-046-SO-0.5-2.0	20-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-048	CFSB-048-SO-0-0.5	20-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-048	CFSB-048-SO-0.5-2.0	20-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-049	CFSB-049-SO-0.5-2	28-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-050	CFSB-050-SO-0-0.5	21-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-050	CFSB-050-SO-0.5-2	21-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-051	CFSB-051-SO-0-0.5	21-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-051	CFSB-051-SO-0.5-2	21-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-052	CFSB-052-SO-0.5-2	20-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-053	CFSB-053-SO-0.5-2	31-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-054	CFSB-054-SO-0-0.5	28-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-054	CFSB-054-SO-0.5-2	28-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-055	CFSB-055-SO-0-0.5	28-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-055	CFSB-055-SO-0.5-2	28-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-057	CFSB-057-SO-0-0.5	28-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-057	CFSB-057-SO-0.5-2	28-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-059	CFSB-059-SO-0-0.5	28-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-059	CFSB-059-SO-0.5-2	28-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-060	CFSB-060-SO-0-0.5	27-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-060	CFSB-060-SO-0.5-2	27-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-062	CFSB-062-SO-0-0.5	2-Jun-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-062	CFSB-062-SO-0.5-2	2-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-064	CFSB-064-SO-0-0.5	3-Jun-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs

Table 4-1
Samples Used in the Baseline Ecological Risk Assessment - Main Plant Area
Main Plant Terrestrial Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
CFSB-064	CFSB-064-SO-0.5-2	3-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-065	CFSB-065-SO-0-0.5	2-Jun-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-065	CFSB-065-SO-0.5-2	2-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-066	CFSB-066-SO-0-0.5	27-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-066	CFSB-066-SO-0.5-2	27-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-068	CFSB-068-SO-0.5-2	27-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-069	CFSB-069-SO-0-0.5	27-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-069	CFSB-069-SO-0.5-2	27-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-071	CFSB-071-SO-0-0.5	27-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-071	CFSB-071-SO-0.5-2	27-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-073	CFSB-073-SO-0-0.5	1-Jun-16	0 - 0.5	Dioxins, Gen Chem, Metals, PCBs, SVOCs
CFSB-073	CFSB-073-SO-0.5-2	1-Jun-16	0.5 - 2	Dioxins, Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-074	CFSB-074-SO-0-0.5	1-Jun-16	0 - 0.5	Dioxins, Gen Chem, Metals, PCBs, SVOCs
CFSB-074	CFSB-074-SO-0.5-2	1-Jun-16	0.5 - 2	Dioxins, Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-075	CFSB-075-SO-0-0.5	1-Jun-16	0 - 0.5	Dioxins, Gen Chem, Metals, PCBs, SVOCs
CFSB-075	CFSB-075-SO-0.5-2	1-Jun-16	0.5 - 2	Dioxins, Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-079	CFSB-079-SO-0-0.5	1-Jun-16	0 - 0.5	Dioxins, Gen Chem, Metals, PCBs, SVOCs
CFSB-079	CFSB-079-SO-0.5-2	1-Jun-16	0.5 - 2	Dioxins, Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-080	CFSB-080-SO-0-0.5	1-Jun-16	0 - 0.5	Dioxins, Gen Chem, Metals, PCBs, SVOCs
CFSB-080	CFSB-080-SO-0.5-2	1-Jun-16	0.5 - 2	Dioxins, Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-082	CFSB-082-SO-0-0.5	1-Jun-16	0 - 0.5	Dioxins, Gen Chem, Metals, PCBs, SVOCs
CFSB-082	CFSB-082-SO-0.5-2	1-Jun-16	0.5 - 2	Dioxins, Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-084	CFSB-084-SO-0-0.5	27-May-16	0 - 0.5	Dioxins, Gen Chem, Metals, PCBs, SVOCs
CFSB-084	CFSB-084-SO-0.5-2	27-May-16	0.5 - 2	Dioxins, Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-086	CFSB-086-SO-0-0.5	26-May-16	0 - 0.5	Dioxins, Gen Chem, Metals, PCBs, SVOCs
CFSB-086	CFSB-086-SO-0.5-2	26-May-16	0.5 - 2	Dioxins, Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-087	CFSB-087-SO-0-0.5	26-May-16	0 - 0.5	Dioxins, Gen Chem, Metals, PCBs, SVOCs
CFSB-087	CFSB-087-SO-0.5-2	26-May-16	0.5 - 2	Dioxins, Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-088	CFSB-088-SO-0-0.5	26-May-16	0 - 0.5	Dioxins, Gen Chem, Metals, PCBs, SVOCs
CFSB-088	CFSB-088-SO-0.5-2	26-May-16	0.5 - 2	Dioxins, Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-092	CFSB-092-SO-0-0.5	26-May-16	0 - 0.5	Dioxins, Gen Chem, Metals, PCBs, SVOCs
CFSB-092	CFSB-092-SO-0.5-2	26-May-16	0.5 - 2	Dioxins, Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-094	CFSB-094-SO-0-0.5	24-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-094	CFSB-094-SO-0.5-2.0	24-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-095	CFSB-095-SO-0-0.5	24-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-095	CFSB-095-SO-0.5-2.0	24-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-097	CFSB-097-SO-0-0.5	24-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-097	CFSB-097-SO-0.5-2	24-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-098	CFSB-098-SO-0-0.5	24-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-098	CFSB-098-SO-0.5-2	24-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-099	CFSB-099-SO-0-0.5	24-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-099	CFSB-099-SO-0.5-2	24-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-100	CFSB-100-SO-0-0.5	24-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-100	CFSB-100-SO-0.5-2	24-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-128	CFSB-128-SO-0-0.5	24-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-128	CFSB-128-SO-0.5-2.0	24-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-129	CFSB-129-SO-0-0.5	24-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-129	CFSB-129-SO-0.5-2.0	24-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-130	CFSB-130-SO-0.5-2	17-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-131	CFSB-131-SO-0.5-2	17-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-154	CFSB-154-SO-0.5-2.5	15-May-18	0.5 - 2.5	Gen Chem, Metals, SVOCs, VOCs

Table 4-1
Samples Used in the Baseline Ecological Risk Assessment - Main Plant Area
Main Plant Terrestrial Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
CFSB-155	CFSB-155-SO-0.5-2.5	15-May-18	0.5 - 2.5	Gen Chem, Metals, SVOCs, VOCs
CFSB-156	CFSB-156-SO-0.5-2.5	15-May-18	0.5 - 2.5	Gen Chem, Metals, SVOCs, VOCs
CFSB-157	CFSB-157-SO-0.5-2.5	12-May-18	0.5 - 2.5	Gen Chem, Metals, SVOCs, VOCs
CFSB-158	CFSB-158-SO-0.5-2.5	12-May-18	1.5 - 2.5	Gen Chem, Metals, SVOCs, VOCs
CFSB-161	CFSB-161-SO-0.5-2.5	12-May-18	0.5 - 2.5	Gen Chem, Metals, SVOCs, VOCs
CFSB-162	CFSB-162-SO-0.5-2.5	12-May-18	0.5 - 2.5	Gen Chem, Metals, SVOCs, VOCs
CFSB-167	CFSB-167-SO-1-3	15-May-18	1 - 3	Gen Chem, Metals, SVOCs, VOCs
CFSB-189	CFSB-189-SO-0-0.5	27-Jun-18	0 - 0.5	Gen Chem, Metals, Hex Chrom, SVOCs
CFSB-189	CFSB-189-SO-0-0.5	27-Sep-18	0 - 0.5	Dioxins
CFSB-189	CFSB-189-SO-0.5-2	27-Jun-18	0.5 - 2	Gen Chem, Metals, Hex Chrom, SVOCs
CFSB-189	CFSB-189-SO-0.5-2	27-Sep-18	0.5 - 2	Dioxins
CFSB-190	CFSB-190-SO-0-0.5	27-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-190	CFSB-190-SO-0-0.5	27-Sep-18	0 - 0.5	Dioxins
CFSB-190	CFSB-190-SO-0.5-2	27-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-190	CFSB-190-SO-0.5-2	27-Sep-18	0.5 - 2	Dioxins
CFSB-205	CFSB-205-SO-0-0.5	27-Jun-18	0 - 0.5	Gen Chem, Metals, Hex Chrom, SVOCs
CFSB-205	CFSB-205-SO-0-0.5	26-Sep-18	0 - 0.5	Dioxins
CFSB-205	CFSB-205-SO-0.5-2	27-Jun-18	0.5 - 2	Gen Chem, Metals, Hex Chrom, SVOCs
CFSB-205	CFSB-205-SO-0.5-2	26-Sep-18	0.5 - 2	Dioxins
CFSB-206	CFSB-206-SO-0-0.5	22-Jun-18	0 - 0.5	Dioxins, Gen Chem, Metals, SVOCs
CFSB-206	CFSB-206-SO-0.5-2	22-Jun-18	0.5 - 2	Dioxins, Gen Chem, Metals, SVOCs
CFSB-207	CFSB-207-SO-0-0.5	28-Apr-18	0 - 0.5	Dioxins, Gen Chem, Metals, PCBs, SVOCs
CFSB-207	CFSB-207-SO-0.5-2	28-Apr-18	0.5 - 2	Dioxins, Gen Chem, Metals, PCBs, SVOCs
CFSB-208	CFSB-208-SO-0-0.5	28-Apr-18	0 - 0.5	Dioxins, Gen Chem, Metals, PCBs, SVOCs
CFSB-208	CFSB-208-SO-0.5-2	28-Apr-18	0.5 - 2	Dioxins, Gen Chem, Metals, PCBs, SVOCs
CFSB-213	CFSB-213-SO-0-0.5	22-Jun-18	0 - 0.5	Dioxins, Gen Chem, Metals, SVOCs
CFSB-213	CFSB-213-SO-0.5-2	22-Jun-18	0.5 - 2	Dioxins, Gen Chem, Metals, SVOCs
CFSB-231	CFSB-231-SO-0-0.5	28-Apr-18	0 - 0.5	Dioxins, PCBs
CFSB-231	CFSB-231-SO-0.5-2	28-Apr-18	0.5 - 2	Dioxins, PCBs
CFSB-232	CFSB-232-SO-0-0.5	28-Apr-18	0 - 0.5	Dioxins, PCBs
CFSB-232	CFSB-232-SO-0.5-2	28-Apr-18	0.5 - 2	Dioxins, PCBs
CFSB-233	CFSB-233-SO-0-0.5	28-Apr-18	0 - 0.5	Dioxins, PCBs
CFSB-233	CFSB-233-SO-0.5-2	28-Apr-18	0.5 - 2	Dioxins, PCBs
CFSB-234	CFSB-234-SO-0-0.5	28-Apr-18	0 - 0.5	Dioxins, PCBs
CFSB-234	CFSB-234-SO-0.5-2	28-Apr-18	0.5 - 2	Dioxins, PCBs
CFSB-235	CFSB-235-SO-0-0.5	28-Apr-18	0 - 0.5	Dioxins, PCBs
CFSB-235	CFSB-235-SO-0.5-2	28-Apr-18	0.5 - 2	Dioxins, PCBs
CFSB-236	CFSB-236-SO-0-0.5	28-Apr-18	0 - 0.5	Dioxins, PCBs
CFSB-236	CFSB-236-SO-0.5-2	28-Apr-18	0.5 - 2	Dioxins, PCBs
CFSB-240	CFSB-240-SO-0-0.5	10-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-240	CFSB-240-SO-0.5-2	10-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-242	CFSB-242-SO-0-0.5	10-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-242	CFSB-242-SO-0.5-2	10-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-243	CFSB-243-SO-0-0.5	10-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-243	CFSB-243-SO-0.5-2	10-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-266	CFSB-266-SO-0-0.5	10-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-266	CFSB-266-SO-0.5-2	10-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-274	CFSB-274-SO-0-0.5	11-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-274	CFSB-274-SO-0-0.5	28-Sep-18	0 - 0.5	Gen Chem
CFSB-274	CFSB-274-SO-0.5-2	11-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-274	CFSB-274-SO-0.5-2	28-Sep-18	0.5 - 2	Gen Chem

Table 4-1
Samples Used in the Baseline Ecological Risk Assessment - Main Plant Area
Main Plant Terrestrial Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
CFSB-275	CFSB-275-SO-0-0.5	11-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-275	CFSB-275-SO-0-0.5	28-Sep-18	0 - 0.5	Gen Chem
CFSB-275	CFSB-275-SO-0.5-2	11-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-275	CFSB-275-SO-0.5-2	28-Sep-18	0.5 - 2	Gen Chem
CFSB-276	CFSB-276-SO-0-0.5	11-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-276	CFSB-276-SO-0-0.5	28-Sep-18	0 - 0.5	Gen Chem
CFSB-276	CFSB-276-SO-0.5-2	11-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-276	CFSB-276-SO-0.5-2	28-Sep-18	0.5 - 2	Gen Chem
CFSB-278	CFSB-278-SO-0-0.5	11-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-278	CFSB-278-SO-0-0.5	28-Sep-18	0 - 0.5	Gen Chem
CFSB-278	CFSB-278-SO-0.5-2	11-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-278	CFSB-278-SO-0.5-2	28-Sep-18	0.5 - 2	Gen Chem
CFSB-288	CFSB-288-SO-0-0.5	28-Jun-18	0 - 0.5	Metals, Hex Chrom
CFSB-288	CFSB-288-SO-0-0.5	27-Sep-18	0 - 0.5	Dioxins
CFSB-288	CFSB-288-SO-0.5-2	28-Jun-18	0.5 - 2	Metals, Hex Chrom
CFSB-288	CFSB-288-SO-0.5-2	27-Sep-18	0.5 - 2	Dioxins
CFSB-293	CFSB-293-SO-0-0.5	27-Sep-18	0 - 0.5	Dioxins
CFSB-293	CFSB-293-SO-0.5-2	27-Sep-18	0.5 - 2	Dioxins
CFSB-294	CFSB-294-SO-0-0.5	27-Sep-18	0 - 0.5	Dioxins
CFSB-294	CFSB-294-SO-0.5-2	27-Sep-18	0.5 - 2	Dioxins

Notes:

Gen Chem: general chemistry parameters

Hex Chrom: hexavalent chromium

PCBs: polychlorinated biphenyls

SVOCs: semivolatile organic compounds

VOCs: volatile organic compounds

Table 4-2
Samples Used in the Baseline Ecological Risk Assessment - Central Landfills Area
Central Landfills Area Terrestrial Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
Soil Samples (Incremental Soil Samples)				
CFISS-001[a]	CFISS-01-S0-0-0.5	23-May-18	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-001[a]	CFISS-01-S0-0.5-2	23-May-18	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-002	CFISS-002-SO-0-0.5	19-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-002	CFISS-002-SO-0.5-2	19-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-003	CFISS-03-SO-0-0.5	22-May-18	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-003	CFISS-03-SO-0.5-2	22-May-18	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-004[a]	CFISS-04-SO-0-0.5	19-May-18	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-004[a]	CFISS-04-SO-0.5-2	19-May-18	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-005	CFISS-05-SO-0-0.5	22-May-18	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-005	CFISS-05-SO-0.5-2	22-May-18	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-006	CFISS-006-SO-0-0.5	19-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-006	CFISS-006-SO-0.5-2	19-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-007	CFISS-07-SO-0-0.5	17-May-18	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-007	CFISS-07-SO-0.5-2	17-May-18	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-008	CFISS-008-SO-0-0.5	26-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-008	CFISS-008-SO-0.5-2	26-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-009	CFISS-09-SO-0-0.5	21-May-18	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-009	CFISS-09-SO-0.5-2	21-May-18	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-010	CFISS-010-SO-0-0.5	21-May-18	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-010	CFISS-010-SO-0.5-2	21-May-18	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-011[a]	CFISS-011-SO-0.0-0.5	19-May-18	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-011[a]	CFISS-011-SO-0.5-2	19-May-18	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-012	CFISS-012-0.0-0.5	18-May-18	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-012	CFISS-012-0.5-2	18-May-18	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-013	CFISS-013-SO-0-0.5	17-May-18	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-013	CFISS-013-SO-0.5-2	17-May-18	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-014	CFISS-014-SO-0-0.5	16-May-18	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-014	CFISS-014-SO-0.5-2	16-May-18	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-015[a]	CFISS-015-SO-0-0.5	15-May-18	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-015[a]	CFISS-015-SO-0.5-2	15-May-18	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-016	CFISS-016-SO-0-0.5	23-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-016	CFISS-016-SO-0.5-2	28-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-017	CFISS-017-SO-0-0.5	29-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-017	CFISS-017-SO-0.5-2	23-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-018	CFISS-018-SO-0-0.5	24-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-018	CFISS-018-SO-0.5-2	24-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-019	CFISS-019-SO-0-0.5	24-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-019	CFISS-019-SO-0.5-2	24-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-020	CFISS-020-SO-0-0.5	25-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-020	CFISS-020-SO-0.5-2	25-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-021	CFISS-021-SO-0-0.5	25-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-021	CFISS-021-SO-0.5-2	25-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-022	CFISS-022-SO-0-0.5	27-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-022	CFISS-022-SO-0.5-2	27-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-023	CFISS-023-SO-0-0.5	27-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-023	CFISS-023-SO-0.5-2	27-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-024	CFISS-024-SO-0-0.5	29-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-024	CFISS-024-SO-0.5-2	29-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-025	CFISS-025-SO-0-0.5	30-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs

Table 4-2
Samples Used in the Baseline Ecological Risk Assessment - Central Landfills Area
Central Landfills Area Terrestrial Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
CFISS-025	CFISS-025-SO-0.5-2	30-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-026	CFISS-026-SO-0-0.5	30-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-026	CFISS-026-SO-0.5-2	30-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-027	CFISS-027-SO-0-0.5	1-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-027	CFISS-027-SO-0.5-2	1-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-028	CFISS-028-SO-0-0.5	1-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-028	CFISS-028-SO-0.5-2	1-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
CFISS-029	CFISS-029-SO-0-0.5	27-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFISS-029	CFISS-029-SO-0.5-2	27-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs
Soil Samples (Grab Soil Samples)				
CFLP-007	CFLP-007-SO-0-0.5	9-Jun-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFLP-007	CFLP-007-SO-0.5-2	9-Jun-18	0.5 - 2	Gen Chem, Metals, Phys, SVOCs
CFLP-008	CFLP-008-SO-0-0.5	9-Jun-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFLP-008	CFLP-008-SO-0.5-2	9-Jun-18	0.5 - 2	Gen Chem, Metals, Phys, SVOCs
CFLP-009	CFLP-009-SO-0-0.5	9-Jun-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFLP-009	CFLP-009-SO-0.5-2	9-Jun-18	0.5 - 2	Gen Chem, Metals, Phys, SVOCs
CFLP-010	CFLP-010-SO-0-0.5	9-Jun-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFLP-010	CFLP-010-SO-0.5-2	9-Jun-18	0.5 - 2	Gen Chem, Metals, Phys, SVOCs
CFLP-011	CFLP-011-SO-0-0.5	9-Jun-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFLP-011	CFLP-011-SO-0.5-2	9-Jun-18	0.5 - 2	Gen Chem, Metals, Phys, SVOCs
CFLP-012	CFLP-012-SO-0-0.5	9-Jun-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFLP-012	CFLP-012-SO-0.5-2	9-Jun-18	0.5 - 2	Gen Chem, Metals, Phys, SVOCs
CFLP-013	CFLP-013-SO-0-0.5	9-Jun-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFLP-013	CFLP-013-SO-0.5-2	9-Jun-18	0.5 - 2	Gen Chem, Metals, Phys, SVOCs
CFLP-014	CFLP-014-SO-0-0.5	9-Jun-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFLP-014	CFLP-014-SO-0.5-2	9-Jun-18	0.5 - 2	Gen Chem, Metals, Phys, SVOCs
CFLP-015	CFLP-015-SO-0-0.5	16-Jun-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFLP-015	CFLP-015-SO-0.5-2	16-Jun-18	0.5 - 2	Gen Chem, Metals, Phys, SVOCs
CFLP-016	CFLP-016-SO-0-0.5	16-Jun-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFLP-016	CFLP-016-SO-0.5-2	16-Jun-18	0.5 - 2	Gen Chem, Metals, Phys, SVOCs
CFLP-017	CFLP-017-SO-0-0.5	16-Jun-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFLP-017	CFLP-017-SO-0.5-2	16-Jun-18	0.5 - 2	Gen Chem, Metals, Phys, SVOCs
CFLP-018	CFLP-018-SO-0-0.5	16-Jun-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFLP-018	CFLP-018-SO-0.5-2	16-Jun-18	0.5 - 2	Gen Chem, Metals, Phys, SVOCs
CFMW-002	CFMW-002-SO-0-0.5	13-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-002	CFMW-002-SO-0.5-2	13-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-008A	CFMW-008a-SO-0-0.5	13-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-008A	CFMW-008a-SO-0.5-2	13-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-010	CFMW-010-SO-0-0.5	18-May-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-010	CFMW-010-SO-0.5-2.0	18-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-012A	CFMW-012A-SO-0-0.5	20-May-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-012A	CFMW-012A-SO-0.5-2	20-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-016A	CFMW-016a-SO-0-0.5	21-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-016A	CFMW-016a-SO-0.5-2	21-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-018	CFMW-018-SO-0-0.5	19-May-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-018	CFMW-018-SO-0.5-2.0	19-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-019A	CFMW-019a-SO-0-0.5	25-May-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-019A	CFMW-019a-SO-0.5-2	25-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-022	CFMW-022-SO-0-0.5	2-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-022	CFMW-022-SO-0.5-2	2-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs

Table 4-2
Samples Used in the Baseline Ecological Risk Assessment - Central Landfills Area
Central Landfills Area Terrestrial Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
CFMW-023A	CFMW-023a-SO-0-0.5	17-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-023A	CFMW-023a-SO-0.5-2	17-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-029	CFMW-029-SO-0-0.5	18-May-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-029	CFMW-029-SO-0.5-2.0	18-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-001	CFSB-001-SO-0-0.5	25-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-001	CFSB-001-SO-0.5-2	25-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-002	CFSB-002-SO-0-0.5	25-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-002	CFSB-002-SO-0.5-2	25-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-003	CFSB-003-SO-0-0.5	25-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-003	CFSB-003-SO-0.5-2	25-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-004	CFSB-004-SO-0-0.5	25-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-004	CFSB-004-SO-0.5-2	25-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-005	CFSB-005-SO-0-0.5	25-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-005	CFSB-005-SO-0.5-2	25-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-006	CFSB-006-SO-0-0.5	23-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-006	CFSB-006-SO-0.5-2	23-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-007	CFSB-007-SO-0-0.5	25-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-007	CFSB-007-SO-0.5-2	25-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-008	CFSB-008-SO-0-0.5	23-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-008	CFSB-008-SO-0.5-2	23-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-009	CFSB-009-SO-0-0.5	23-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-009	CFSB-009-SO-0.5-2	23-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-021	CFSB-021-SO-0-0.5	23-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-021	CFSB-021-SO-0.5-2	23-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-022	CFSB-022-SO-0-0.5	23-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-022	CFSB-022-SO-0.5-2	23-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-029	CFSB-029-SO-0-0.5	23-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-029	CFSB-029-SO-0.5-2	23-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-033	CFSB-033-SO-0-0.5	23-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-033	CFSB-033-SO-0.5-2	23-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-034	CFSB-034-SO-0-0.5	31-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-034	CFSB-034-SO-0.5-2	31-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-035	CFSB-035-SO-0-0.5	31-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-035	CFSB-035-SO-0.5-2	31-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-036	CFSB-036-SO-0-0.5	31-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-036	CFSB-036-SO-0.5-2	31-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-037	CFSB-037-SO-0-0.5	31-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-037	CFSB-037-SO-0.5-2	31-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-177	CFSB-177-SO-0-0.5	25-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-177	CFSB-177-SO-0.5-2	25-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-178	CFSB-178-SO-0-0.5	25-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-178	CFSB-178-SO-0.5-2	25-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-179	CFSB-179-SO-0-0.5	25-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-179	CFSB-179-SO-0.5-2	25-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-180	CFSB-180-SO-0-0.5	25-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-180	CFSB-180-SO-0.5-2	25-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-219	CFSB-219-SO-0-0.5	16-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-219	CFSB-219-SO-0.5-2	16-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-220	CFSB-220-SO-0-0.5	22-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-220	CFSB-220-SO-0.5-2	22-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs

Table 4-2
Samples Used in the Baseline Ecological Risk Assessment - Central Landfills Area
Central Landfills Area Terrestrial Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
CFSB-221	CFSB-221-SO-0-0.5	7-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-221	CFSB-221-SO-0.5-2	7-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-222	CFSB-222-SO-0-0.5	7-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-222	CFSB-222-SO-0.5-2	7-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-223	CFSB-223-SO-0-0.5	7-May-18	0 - 0.5	PCBs
CFSB-223	CFSB-223-SO-0.5-2	7-May-18	0.5 - 2	PCBs
CFSB-224	CFSB-224-SO-0-0.5	7-May-18	0 - 0.5	PCBs
CFSB-224	CFSB-224-SO-0.5-2	7-May-18	0.5 - 2	PCBs
CFSB-225	CFSB-225-SO-0-0.5	7-May-18	0 - 0.5	PCBs
CFSB-225	CFSB-225-SO-0.5-2	7-May-18	0.5 - 2	PCBs
CFSB-226	CFSB-226-SO-0-0.5	7-May-18	0 - 0.5	PCBs
CFSB-226	CFSB-226-SO-0.5-2	7-May-18	0.5 - 2	PCBs
CFSB-227	CFSB-227-SO-0-0.5	7-May-18	0 - 0.5	PCBs
CFSB-227	CFSB-227-SO-0.5-2	7-May-18	0.5 - 2	PCBs
CFSB-228	CFSB-228-SO-0-0.5	7-May-18	0 - 0.5	PCBs
CFSB-228	CFSB-228-SO-0.5-2	7-May-18	0.5 - 2	PCBs
CFSB-229	CFSB-229-SO-0-0.5	7-May-18	0 - 0.5	PCBs
CFSB-229	CFSB-229-SO-0.5-2	7-May-18	0.5 - 2	PCBs
CFSB-230	CFSB-230-SO-0-0.5	7-May-18	0 - 0.5	PCBs
CFSB-230	CFSB-230-SO-0.5-2	7-May-18	0.5 - 2	PCBs
CFSB-261	CFSB-261-SO-0-0.5	2-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-261	CFSB-261-SO-0.5-2	2-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-262	CFSB-262-SO-0-0.5	2-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-262	CFSB-262-SO-0.5-2	2-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-263	CFSB-263-SO-0-0.5	2-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-263	CFSB-263-SO-0.5-2	2-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-264	CFSB-264-SO-0-0.5	3-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-264	CFSB-264-SO-0.5-2	3-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-265	CFSB-265-SO-0-0.5	3-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-265	CFSB-265-SO-0.5-2	3-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-270	CFSB-270-SO-0-0.5	2-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-270	CFSB-270-SO-0.5-2	2-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-271	CFSB-271-SO-0-0.5	2-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-271	CFSB-271-SO-0.5-2	2-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-277	CFSB-277-SO-0-0.5	3-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-277	CFSB-277-SO-0.5-2	3-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-289	CFSB-289-SO-0-0.5	28-Jun-18	0 - 0.5	Metals, Hex Chrom
CFSB-289	CFSB-289-SO-0-0.5	27-Sep-18	0 - 0.5	Dioxins
CFSB-289	CFSB-289-SO-0.5-2	28-Jun-18	0.5 - 2	Metals, Hex Chrom
CFSB-289	CFSB-289-SO-0.5-2	27-Sep-18	0.5 - 2	Dioxins
CFSB-290	CFSB-290-SO-0-0.5	28-Jun-18	0 - 0.5	Metals, Hex Chrom
CFSB-290	CFSB-290-SO-0-0.5	27-Sep-18	0 - 0.5	Dioxins
CFSB-290	CFSB-290-SO-0.5-2	28-Jun-18	0.5 - 2	Metals, Hex Chrom
CFSB-290	CFSB-290-SO-0.5-2	27-Sep-18	0.5 - 2	Dioxins
CFSB-291	CFSB-291-SO-0-0.5	22-Jun-18	0 - 0.5	Metals, Hex Chrom
CFSB-291	CFSB-291-SO-0.5-2	22-Jun-18	0.5 - 2	Metals, Hex Chrom
CFSB-292	CFSB-292-SO-0-0.5	22-Jun-18	0 - 0.5	Metals
CFSB-292	CFSB-292-SO-0.5-2	22-Jun-18	0.5 - 2	Metals, Hex Chrom

Notes:

Table 4-2
Samples Used in the Baseline Ecological Risk Assessment - Central Landfills Area
Central Landfills Area Terrestrial Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses

[a]: Triplicate incremental field replicates were collected for these samples.

Gen Chem: general chemistry parameters

Hex Chrom: hexavalent chromium

PCBs: polychlorinated biphenyls

Pest: pesticides

Phys: physical characteristics

SVOCs: semivolatile organic compounds

VOCs: volatile organic compounds

Table 4-3
Samples Used in the Baseline Ecological Risk Assessment - Industrial Landfill Area
Industrial Landfill Terrestrial Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
Soil Samples				
CFLP-001	CFLP-001-SO-0-0.5	5-May-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFLP-001	CFLP-001-SO-0.5-2	5-May-18	0.5 - 2	Gen Chem, Metals, Phys, SVOCs
CFLP-002	CFLP-002-SO-0-0.5	5-May-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFLP-002	CFLP-002-SO-0.5-2	5-May-18	0.5 - 2	Gen Chem, Metals, Phys, SVOCs
CFLP-003	CFLP-003-SO-0-0.5	5-May-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFLP-003	CFLP-003-SO-0.5-2	5-May-18	0.5 - 2	Gen Chem, Metals, Phys, SVOCs
CFLP-004	CFLP-004-SO-0-0.5	5-May-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFLP-004	CFLP-004-SO-0.5-2	5-May-18	0.5 - 2	Gen Chem, Metals, Phys, SVOCs
CFLP-005	CFLP-005-SO-0-0.5	5-May-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFLP-005	CFLP-005-SO-0.5-2	5-May-18	0.5 - 2	Gen Chem, Metals, Phys, SVOCs
CFLP-006	CFLP-006-SO-0-0.5	5-May-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFLP-006	CFLP-006-SO-0.5-2	5-May-18	0.5 - 2	Gen Chem, Metals, Phys, SVOCs

Notes:

Gen Chem: general chemistry parameters

PCBs: polychlorinated biphenyls

Phys: physical characteristics

SVOCs: semivolatile organic compounds

Table 4-4
Samples Used in the Baseline Ecological Risk Assessment - Eastern Undeveloped Area
Eastern Undeveloped Area Terrestrial Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
Soil Samples				
CFSB-181	CFSB-181-SO-0-0.5	26-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-181	CFSB-181-SO-0.5-2	26-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-182	CFSB-182-SO-0-0.5	26-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-182	CFSB-182-SO-0.5-2	26-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-183	CFSB-183-SO-0-0.5	26-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-183	CFSB-183-SO-0.5-2	26-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-184	CFSB-184-SO-0-0.5	26-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-184	CFSB-184-SO-0.5-2	26-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-185	CFSB-185-SO-0-0.5	26-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-185	CFSB-185-SO-0.5-2	26-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-186	CFSB-186-SO-0-0.5	26-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-186	CFSB-186-SO-0.5-2	26-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-187	CFSB-187-SO-0-0.5	27-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-187	CFSB-187-SO-0.5-2	27-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-188	CFSB-188-SO-0-0.5	26-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-188	CFSB-188-SO-0.5-2	26-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-209	CFSB-209-SO-0-0.5	26-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-209	CFSB-209-SO-0.5-2	26-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-210	CFSB-210-SO-0-0.5	26-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-210	CFSB-210-SO-0.5-2	26-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-211	CFSB-211-SO-0-0.5	26-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-211	CFSB-211-SO-0.5-2	26-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-212	CFSB-212-SO-0-0.5	26-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-212	CFSB-212-SO-0.5-2	26-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-267	CFSB-267-SO-0-0.5	10-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-267	CFSB-267-SO-0.5-2	10-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-268	CFSB-268-SO-0-0.5	10-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-268	CFSB-268-SO-0.5-2	10-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-269	CFSB-269-SO-0-0.5	9-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-269	CFSB-269-SO-0.5-2	9-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFTP-17	CFTP-17-SO-0-0.5	25-Aug-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFTP-18	CFTP-18-SO-0-0.5	26-Aug-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFTP-19	CFTP-19-SO-0-0.5	25-Aug-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFTP-20	CFTP-20-SO-0-0.5	25-Aug-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFTP-21	CFTP-21-SO-0-0.5	25-Aug-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFTP-22	CFTP-22-SO-0-0.5	25-Aug-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFTP-23	CFTP-23-SO-0-0.5	26-Aug-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs

Notes:

Gen Chem: general chemistry parameters

PCBs: polychlorinated biphenyls

Pest: pesticides

SVOCs: semivolatile organic compounds

VOCs: volatile organic compounds

Table 4-5
Samples Used in the Baseline Ecological Risk Assessment - North-Central Undeveloped Area
North-Central Terrestrial Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
Soil Samples				
CFMW-003A	CFMW-003a-SO-0-0.5	31-May-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-003A	CFMW-003a-SO-0.5-2	31-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-011A	CFMW-011a-SO-0-0.5	25-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-011A	CFMW-011a-SO-0.5-2	25-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-066	CFMW-066-SO-0-0.5	30-Apr-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFMW-066	CFMW-066-SO-0.5-2	30-Apr-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFMW-067	CFMW-067-SO-0-0.5	1-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFMW-067	CFMW-067-SO-0.5-2	1-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-011	CFSB-011-SO-0-0.5	19-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-011	CFSB-011-SO-0.5-2.0	19-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-013	CFSB-013-SO-0-0.5	19-May-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-013	CFSB-013-SO-0.5-2.0	19-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-173	CFSB-173-SO-0-0.5	25-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-173	CFSB-173-SO-0.5-2	25-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-174	CFSB-174-0-0.5	25-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-174	CFSB-174-0.5-2	25-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-175	CFSB-175-SO-0-0.5	25-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-175	CFSB-175-SO-0.5-2	25-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-176	CFSB-176-SO-0-0.5	16-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-176	CFSB-176-SO-0.5-2	16-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-191	CFSB-191-SO-0-0.5	22-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-191	CFSB-191-SO-0.5-2	22-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-192	CFSB-192-SO-0-0.5	22-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-192	CFSB-192-SO-0.5-2	22-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-193	CFSB-193-SO-0-0.5	27-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-193	CFSB-193-SO-0.5-2	27-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-194	CFSB-194-SO-0-0.5	27-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-194	CFSB-194-SO-0.5-2	27-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-195	CFSB-195-SO-0-0.5	27-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-195	CFSB-195-SO-0.5-2	27-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-197	CFSB-197-SO-0-0.5	21-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-197	CFSB-197-SO-0.5-2	21-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-198	CFSB-198-SO-0-0.5	21-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-198	CFSB-198-SO-0.5-2	21-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-200	CFSB-200-SO-0-0.5	28-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-200	CFSB-200-SO-0.5-2	28-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-241	CFSB-241-SO-0-0.5	5-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-241	CFSB-241-SO-0.5-2	5-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-250	CFSB-250-SO-0-0.5	1-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-250	CFSB-250-SO-0.5-2	1-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-252	CFSB-252-SO-0-0.5	1-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-252	CFSB-252-SO-0.5-2	1-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-253	CFSB-253-SO-0-0.5	1-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-253	CFSB-253-SO-0.5-2	1-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-254	CFSB-254-SO-0-0.5	30-Apr-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-254	CFSB-254-SO-0.5-2	30-Apr-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-257	CFSB-257-SO-0-0.5	30-Apr-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-257	CFSB-257-SO-0.5-2	30-Apr-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-258	CFSB-258-SO-0-0.5	30-Apr-18	0 - 0.5	Gen Chem, Metals, SVOCs

Table 4-5
Samples Used in the Baseline Ecological Risk Assessment - North-Central Undeveloped Area
North-Central Terrestrial Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
CFSB-258	CFSB-258-SO-0.5-2	30-Apr-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-259	CFSB-259-SO-0-0.5	30-Apr-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-259	CFSB-259-SO-0.5-2	30-Apr-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-260	CFSB-260-SO-0-0.5	5-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-260	CFSB-260-SO-0.5-2	5-May-18	0.5 - 2	Gen Chem, Metals, SVOCs

Notes:

Gen Chem: general chemistry parameters

PCBs: polychlorinated biphenyls

Pest: pesticides

SVOCs: semivolatile organic compounds

VOCs: volatile organic compounds

Table 4-6
Samples Used in the Baseline Ecological Risk Assessment - Western Undeveloped Area
Western Undeveloped Area Terrestrial Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
Soil Samples				
CFMW-025A	CFMW-025a-SO-0-0.5	13-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-025A	CFMW-025a-SO-0.5-2	13-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-026	CFMW-026-SO-0-0.5	14-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-026	CFMW-026-SO-0.5-2	14-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-056A	CFMW-056a-SO-0-0.5	15-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-056A	CFMW-056a-SO-0.5-2	15-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-057A	CFMW-057a-SO-0-0.5	27-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-057A	CFMW-057a-SO-0.5-2	27-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-059A	CFMW-059a-SO-0-0.5	22-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-059A	CFMW-059a-SO-0.5-2	22-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-065	CFMW-065-SO-0-0.5	2-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFMW-065	CFMW-065-SO-0.5-2	2-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFMW-068	CFMW-068-SO-0-0.5	10-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFMW-068	CFMW-068-SO-0.5-2	10-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFMW-069	CFMW-069-SO-0-0.5	8-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFMW-069	CFMW-069-SO-0.5-2	8-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFMW-071	CFMW-071-SO-0-0.5	3-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFMW-071	CFMW-071-SO-0.5-2	3-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-120	CFSB-120-SO-0-0.5	18-May-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-120	CFSB-120-SO-0.5-2.0	18-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-121	CFSB-121-SO-0-0.5	18-May-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-121	CFSB-121-SO-0.5-2.0	18-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-122	CFSB-122-SO-0-0.5	19-May-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-122	CFSB-122-SO-0.5-2.0	19-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-123	CFSB-123-SO-0-0.5	19-May-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-123	CFSB-123-SO-0.5-2.0	19-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-124	CFSB-124-SO-0-0.5	19-May-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-124	CFSB-124-SO-0.5-2.0	19-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-125	CFSB-125-SO-0-0.5	18-May-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-125	CFSB-125-SO-0.5-2.0	18-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-126	CFSB-126-SO-0-0.5	18-May-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-126	CFSB-126-SO-0.5-2.0	18-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-127	CFSB-127-SO-0-0.5	18-May-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-127	CFSB-127-SO-0.5-2.0	18-May-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-132	CFSB-132-SO-0-0.5	3-Jun-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-132	CFSB-132-SO-0.5-2	3-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-133	CFSB-133-SO-0-0.5	3-Jun-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-133	CFSB-133-SO-0.5-2	3-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-168	CFSB-168-SO-0-0.5	27-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-168	CFSB-168-SO-0-0.5	27-Sep-18	0 - 0.5	Dioxins
CFSB-168	CFSB-168-SO-0.5-2	27-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-168	CFSB-168-SO-0.5-2	27-Sep-18	0.5 - 2	Dioxins
CFSB-169	CFSB-169-SO-0-0.5	27-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-169	CFSB-169-SO-0.5-2	27-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-170	CFSB-170-SO-0-0.5	27-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-170	CFSB-170-SO-0.5-2	27-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-171	CFSB-171-SO-0-0.5	27-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-171	CFSB-171-SO-0.5-2	27-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-172	CFSB-172-SO-0-0.5	27-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-172	CFSB-172-SO-0-0.5	26-Sep-18	0 - 0.5	Dioxins
CFSB-172	CFSB-172-SO-0.5-2	27-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs

Table 4-6
Samples Used in the Baseline Ecological Risk Assessment - Western Undeveloped Area
Western Undeveloped Area Terrestrial Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
CFSB-172	CFSB-172-SO-0.5-2	26-Sep-18	0.5 - 2	Dioxins
CFSB-196	CFSB-196-SO-0-0.5	27-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-196	CFSB-196-SO-0-0.5	27-Sep-18	0 - 0.5	Dioxins
CFSB-196	CFSB-196-SO-0.5-2	27-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-196	CFSB-196-SO-0.5-2	27-Sep-18	0.5 - 2	Dioxins
CFSB-215	CFSB-215-SO-0-0.5	21-Jun-18	0 - 0.5	Dioxins, Gen Chem, Metals, SVOCs
CFSB-215	CFSB-215-SO-0.5-2	21-Jun-18	0.5 - 2	Dioxins, Gen Chem, Metals, SVOCs
CFSB-216	CFSB-216-SO-0-0.5	21-Jun-18	0 - 0.5	Dioxins, Gen Chem, Metals, SVOCs
CFSB-216	CFSB-216-SO-0.5-2	21-Jun-18	0.5 - 2	Dioxins, Gen Chem, Metals, SVOCs
CFSB-217	CFSB-217-SO-0-0.5	21-Jun-18	0 - 0.5	Dioxins, Gen Chem, Metals, SVOCs
CFSB-217	CFSB-217-SO-0.5-2	21-Jun-18	0.5 - 2	Dioxins, Gen Chem, Metals, SVOCs
CFSB-218	CFSB-218-SO-0-0.5	21-Jun-18	0 - 0.5	Dioxins, Gen Chem, Metals, SVOCs
CFSB-218	CFSB-218-SO-0.5-2	21-Jun-18	0.5 - 2	Dioxins, Gen Chem, Metals, SVOCs
CFSB-237	CFSB-237-SO-0-0.5	21-Jun-18	0 - 0.5	Dioxins, Gen Chem, Metals, SVOCs
CFSB-237	CFSB-237-SO-0.5-2	21-Jun-18	0.5 - 2	Dioxins, Gen Chem, Metals, SVOCs
CFSB-238	CFSB-238a-SO-0-0.5	25-Sep-18	0 - 0.5	VOCs
CFSB-238	CFSB-238-SO-0-0.5	27-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-238	CFSB-238-SO-0-0.5	25-Sep-18	0 - 0.5	Dioxins
CFSB-238	CFSB-238a-SO-0.5-2	25-Sep-18	0.5 - 2	VOCs
CFSB-238	CFSB-238-SO-0.5-2	27-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-238	CFSB-238-SO-0.5-2	25-Sep-18	0.5 - 2	Dioxins
CFSB-239	CFSB-239-SO-0-0.5	27-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-239	CFSB-239-SO-0-0.5	27-Sep-18	0 - 0.5	Dioxins
CFSB-239	CFSB-239-SO-0.5-2	27-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-239	CFSB-239-SO-0.5-2	27-Sep-18	0.5 - 2	Dioxins
CFSB-244	CFSB-244-SO-0-0.5	9-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-244	CFSB-244-SO-0.5-2	9-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-245	CFSB-245-SO-0-0.5	8-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-245	CFSB-245-SO-0.5-2	8-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-246	CFSB-246-SO-0-0.5	9-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-246	CFSB-246-SO-0.5-2	9-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-247	CFSB-247-SO-0-0.5	9-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-247	CFSB-247-SO-0.5-2	9-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-248	CFSB-248-SO-0-0.5	1-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-248	CFSB-248-SO-0.5-2	1-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-249	CFSB-249-SO-0-0.5	1-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-249	CFSB-249-SO-0.5-2	1-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-251	CFSB-251-SO-0-0.5	1-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-251	CFSB-251-SO-0.5-2	1-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-255	CFSB-255-SO-0-0.5	30-Apr-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-255	CFSB-255-SO-0.5-2	30-Apr-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-256	CFSB-256-SO-0-0.5	30-Apr-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-256	CFSB-256-SO-0.5-2	30-Apr-18	0.5 - 2	Gen Chem, Metals, SVOCs

Notes:

Gen Chem: general chemistry parameters

PCBs: polychlorinated biphenyls

Pest: pesticides

SVOCs: semivolatile organic compounds

VOCs: volatile organic compounds

Table 4-7
Samples Used in the Baseline Ecological Risk Assessment - Flathead River Riparian Area
Flathead River Riparian Area Transitional Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
Soil Samples				
CFMW-061	CFMW-061-SO-0-0.5	12-Jul-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFMW-061	CFMW-061-SO-0.5-2	12-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFMW-064	CFMW-064-SO-0-0.5	11-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-064	CFMW-064-SO-0.5-2	11-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-114	CFSB-114-SO-0-0.5	12-Jul-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-114	CFSB-114-SO-0.5-2	12-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-119	CFSB-119-SO-0-0.5	12-Jul-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-119	CFSB-119-SO-0.5-2	12-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-134	CFSB-134-SO-0-0.5	31-Oct-17	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-134	CFSB-134-SO-0.5-2	31-Oct-17	0.5 - 2	Gen Chem, Metals, SVOCs, VOCs
CFSB-135	CFSB-135-SO-0-0.5	31-Oct-17	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-135	CFSB-135-SO-0.5-2	31-Oct-17	0.5 - 2	Gen Chem, Metals, SVOCs, VOCs
CFSB-136	CFSB-136-SO-0-0.5	31-Oct-17	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-136	CFSB-136-SO-0.5-2	31-Oct-17	0.5 - 2	Gen Chem, Metals, SVOCs, VOCs
CFSB-137	CFSB-137-SO-0-0.5	1-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-137	CFSB-137-SO-0.5-2	1-Nov-17	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-137	CFSB-137-SO-0.5-2	2-Nov-17	0.5 - 2	VOCs
CFSB-138	CFSB-138-SO-0-0.5	1-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-138	CFSB-138-SO-0.5-2	1-Nov-17	0.5 - 2	Gen Chem, Metals, SVOCs, VOCs
CFSB-139	CFSB-139-SO-0-0.5	31-Oct-17	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-139	CFSB-139-SO-0.5-2	31-Oct-17	0.5 - 2	Gen Chem, Metals, SVOCs, VOCs
CFSB-140	CFSB-140-SO-0-0.5	31-Oct-17	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-140	CFSB-140-SO-0.5-2	31-Oct-17	0.5 - 2	Gen Chem, Metals, SVOCs, VOCs
CFSB-141	CFSB-141-SO-0-0.5	1-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-141	CFSB-141-SO-0.5-2	1-Nov-17	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-141	CFSB-141-SO-0.5-2	2-Nov-17	0.5 - 2	VOCs
CFSB-142	CFSB-142-SO-0-0.5	2-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-142	CFSB-142-SO-0.5-2	2-Nov-17	0.5 - 2	Gen Chem, Metals, SVOCs, VOCs
CFSB-143	CFSB-143-SO-0-0.5	2-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-143	CFSB-143-SO-0.5-2	2-Nov-17	0.5 - 2	Gen Chem, Metals, SVOCs, VOCs
CFSB-144	CFSB-144-SO-0-0.5	3-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-144	CFSB-144-SO-0.5-2	3-Nov-17	0.5 - 2	Gen Chem, Metals, SVOCs, VOCs
CFSB-145	CFSB-145-SO-0-0.5	6-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-145	CFSB-145-SO-0.5-2	6-Nov-17	0.5 - 2	Gen Chem, Metals, SVOCs, VOCs
CFSB-146	CFSB-146-SO-0-0.5	6-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-146	CFSB-146-SO-0.5-2	6-Nov-17	0.5 - 2	Gen Chem, Metals, SVOCs, VOCs
CFSB-147	CFSB-147-SO-0-0.5	6-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-147	CFSB-147-SO-0.5-2	6-Nov-17	0.5 - 2	Gen Chem, Metals, SVOCs, VOCs
CFSB-148	CFSB-148-SO-0-0.5	6-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-148	CFSB-148-SO-0.5-2	6-Nov-17	0.5 - 2	Gen Chem, Metals, SVOCs, VOCs
Sediment Samples [a]				
CFSDP-029	CFSDP-029-SD	1-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs, VOCs
CFSDP-030	CFSDP-030-SD	3-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs, VOCs
CFSDP-031	CFSDP-031-SD	3-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs, VOCs
CFSDP-032	CFSDP-032-SD	3-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs, VOCs
CFSDP-033	CFSDP-033-SD	3-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs, VOCs
CFSDP-029	CFSDP-029-SD	18-Oct-18	0 - 0.5	Gen Chem, Metals, Metals-SEM, Phys, SVOCs, SVOCs-SIM
CFSDP-030	CFSDP-030-SD	18-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-031	CFSDP-031-SD	18-Oct-18	0 - 0.5	Gen Chem, Metals, Metals-SEM, Phys, SVOCs
CFSDP-032	CFSDP-032-SD	17-Oct-18	0 - 0.5	Gen Chem, Metals, Metals-SEM, Phys, SVOCs, SVOCs-SIM
CFSDP-033	CFSDP-033-SD	17-Oct-18	0 - 0.5	Gen Chem, Metals, Metals-SEM, Phys, SVOCs, SVOCs-SIM
Surface Water Samples [a]				
CFSWP-029	CFSWP-029-SW	1-Nov-17	NA	Gen Chem, Metals (f&uf), SVOCs, VOCs
CFSWP-029	CFSWP-029-SW	22-Jun-18	NA	Gen Chem, Metals (f&uf)

Table 4-7
Samples Used in the Baseline Ecological Risk Assessment - Flathead River Riparian Area
Flathead River Riparian Area Transitional Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
CFSWP-029	CFSWP-029-SW	18-Oct-18	NA	Gen Chem, Metals (f&uf), SVOCs, SVOCs-SIM
CFSWP-030	CFSWP-030-SW	3-Nov-17	NA	Gen Chem, Metals (f&uf), SVOCs, VOCs
CFSWP-030	CFSWP-030-SW	22-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-030	CFSWP-030-SW	18-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-031	CFSWP-031-SW	3-Nov-17	NA	Gen Chem, Metals (f&uf), SVOCs, VOCs
CFSWP-031	CFSWP-031-SW	22-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-031	CFSWP-031-SW	18-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-032	CFSWP-032-SW	3-Nov-17	NA	Gen Chem, Metals (f&uf), SVOCs, VOCs
CFSWP-032	CFSWP-032-SW	22-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-032	CFSWP-032-SW	17-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-033	CFSWP-033-SW	3-Nov-17	NA	Gen Chem, Metals (f&uf), SVOCs, VOCs
CFSWP-033	CFSWP-033-SW	22-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-033	CFSWP-033-SW	17-Oct-18	NA	Gen Chem, Metals (f&uf)
Pore Water Samples [a]				
CFPWP-029	CFPWP-029-PW	18-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs, SVOCs-SIM
CFPWP-030	CFPWP-030-PW	18-Oct-18	0.5 - 1.5	Gen Chem, Metals, Phys, SVOCs
CFPWP-031	CFPWP-031-PW	18-Oct-18	0.5 - 1.5	Gen Chem, Metals, Phys, SVOCs
CFPWP-032	CFPWP-032-PW	17-Oct-18	0.5 - 1.5	Gen Chem, Metals, Phys, SVOCs
CFPWP-033	CFPWP-033-PW	17-Oct-18	0.5 - 1.5	Gen Chem, Metals, Phys, SVOCs

Notes:

[a]: Samples collected from channel draining the Flathead River Riparian Area to the Backwater Seep Sampling Area. Although located in the Flathead River Riparian Area, these samples will collected primarily to evaluate cyanide and fluoride pathways from the shallow groundwater to the Backwater Seep area, and will be evaluated separately.

Gen Chem: general chemistry parameters

Metals-SEM: simultaneously extracted metals

Metals (f&uf): filtered and unfiltered metals

PCBs: polychlorinated biphenyls

Pest: pesticides

SVOCs: semivolatile organic compounds

SVOCs-SIM: semivolatile organic compounds, selected ion monitoring

VOC: volatile organic compounds

Table 4-8
Samples Used in the Baseline Ecological Risk Assessment - North Percolation Pond Area
North Percolation Pond Transitional Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
Soil Samples				
CFMW-027	CFMW-027-SO-0-0.5	30-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFMW-027	CFMW-027-SO-0.5-2	30-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-014	CFSB-014-SO-0-0.5	2-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-014	CFSB-014-SO-0.5-2	2-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-016	CFSB-016-SO-0-0.5	2-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-016	CFSB-016-SO-0.5-2	2-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-019	CFSB-019-SO-0-0.5	4-Jun-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-019	CFSB-019-SO-0.5-2	4-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-025	CFSB-025-SO-0-0.5	13-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-025	CFSB-025-SO-0.5-2	13-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-026	CFSB-026-SO-0-0.5	13-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-026	CFSB-026-SO-0.5-2	13-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-027	CFSB-027-SO-0-0.5	13-Jun-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-027	CFSB-027-SO-0.5-2	13-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-028	CFSB-028-SO-0-0.5	18-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-028	CFSB-028-SO-0.5-2	18-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-030	CFSB-030-SO-0-0.5	13-Jun-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-030	CFSB-030-SO-0.5-2	13-Jun-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-199	CFSB-199-SO-0-0.5	28-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs, SVOCs-SIM
CFSB-199	CFSB-199-SO-0.5-2	28-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs, SVOCs-SIM
CFSB-201	CFSB-201-SO-0-0.5	22-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs, SVOCs-SIM
CFSB-201	CFSB-201-SO-0-0.5	29-Jun-18	0 - 0.5	SVOCs
CFSB-201	CFSB-201-SO-0.5-2	22-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs-SIM
CFSB-202	CFSB-202-SO-0-0.5	22-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs, SVOCs-SIM
CFSB-202	CFSB-202-SO-0-0.5	29-Jun-18	0 - 0.5	SVOCs
CFSB-202	CFSB-202-SO-0.5-2	22-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs, SVOCs-SIM
CFSB-203	CFSB-203-SO-0-0.5	28-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs, SVOCs-SIM
CFSB-203	CFSB-203-SO-0.5-2	28-Jun-18	0.5 - 2	Gen Chem, Metals, SVOCs, SVOCs-SIM
CFSB-204	CFSB-204-SO-0-0.5	22-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-204	CFSB-204-SO-0.5-2	22-Jun-18	0.5 - 2	Gen Chem, Metals
CFSB-214	CFSB-214-SO-0-0.5	22-Jun-18	0 - 0.5	Gen Chem, Metals, Hex Chrom, SVOCs, SVOCs-SIM
CFSB-214	CFSB-214-SO-0.5-2	22-Jun-18	0.5 - 2	Gen Chem, Metals, Hex Chrom, SVOCs, SVOCs-SIM
CFSB-272	CFSB-272-SO-0-0.5	4-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-272	CFSB-272-SO-0-0.5	28-Jun-18	0 - 0.5	SVOCs-SIM
CFSB-272	CFSB-272-SO-0.5-2	4-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-272	CFSB-272-SO-0.5-2	28-Jun-18	0.5 - 2	SVOCs-SIM
CFSB-273	CFSB-273-SO-0-0.5	4-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-273	CFSB-273-SO-0-0.5	22-Jun-18	0 - 0.5	Metals, Hex Chrom
CFSB-273	CFSB-273-SO-0.5-2	4-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-273	CFSB-273-SO-0.5-2	22-Jun-18	0.5 - 2	Metals, Hex Chrom
CFSB-279	CFSB-279-SO-0-0.5	8-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-279	CFSB-279-SO-0-0.5	22-Jun-18	0 - 0.5	SVOCs-SIM
CFSB-279	CFSB-279-SO-0.5-2	22-Jun-18	0.5 - 2	SVOCs-SIM
CFSB-279	CFSB-279-SO-0.5-2	8-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-280	CFSB-280-SO-0-0.5	8-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-280	CFSB-280-SO-0-0.5	22-Jun-18	0 - 0.5	SVOCs-SIM
CFSB-280	CFSB-280-SO-0.5-2	8-May-18	0.5 - 2	Gen Chem, Metals, SVOCs
CFSB-280	CFSB-280-SO-0.5-2	22-Jun-18	0.5 - 2	SVOCs-SIM
CFSB-281	CFSB-281-SO-0-0.5	4-May-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-281	CFSB-281-SO-0-0.5	22-Jun-18	0 - 0.5	Metals, Hex Chrom
CFSB-281	CFSB-281-SO-0.5-2	4-May-18	0.5 - 2	Gen Chem, Metals, SVOCs

Table 4-8
Samples Used in the Baseline Ecological Risk Assessment - North Percolation Pond Area
North Percolation Pond Transitional Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
CFSB-281	CFSB-281-SO-0.5-2	22-Jun-18	0.5 - 2	Metals, Hex Chrom
Sediment Samples				
CFSDP-023	CFSDP-023-SD	7-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-024	CFSDP-024-SD	7-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
Surface Water Samples				
CFSWP-023	CFSWP-023-SW	3-Apr-17	NA	Gen Chem, Metals
CFSWP-024	CFSWP-024-SW	15-Jun-17	NA	Gen Chem, Metals (f&uf), Pest, PCBs, SVOCs, VOCs

Notes:

Gen Chem: general chemistry parameters

Hex Chrom: hexavalent chromium

Metals (f&uf): filtered and unfiltered metals

PCBs: polychlorinated biphenyls

Pest: pesticides

Phys: physical characteristics

SVOCs: semivolatile organic compounds

SVOCs-SIM: semivolatile organic compounds, selected ion monitoring

VOCs: volatile organic compounds

Table 4-9
Samples Used in the Baseline Ecological Risk Assessment - South Percolation Pond Area
South Percolation Pond Transitional Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
Soil Samples				
CFSB-101	CFSB-101-SO-0-0.5	21-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-101	CFSB-101-SO-0.5-2	21-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-102	CFSB-102-SO-0-0.5	13-Jul-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-102	CFSB-102-SO-0.5-2	13-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-104	CFSB-104-SO-0-0.5	13-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-104	CFSB-104-SO-0.5-2	13-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-109	CFSB-109-SO-0-0.5	13-Jul-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-109	CFSB-109-SO-0.5-2	13-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-110	CFSB-110-SO-0-0.5	14-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-110	CFSB-110-SO-0.5-2	14-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-113	CFSB-113-SO-0-0.5	31-Aug-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-113	CFSB-113-SO-0.5-2	31-Aug-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-115	CFSB-115-SO-0-0.5	31-Aug-16	0 - 0.5	Gen Chem, Metals, PCBs, SVOCs
CFSB-115	CFSB-115-SO-0.5-2	31-Aug-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-116	CFSB-116-SO-0-0.5	22-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-116	CFSB-116-SO-0.5-2	22-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-118	CFSB-118-SO-0-0.5	21-Jul-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSB-118	CFSB-118-SO-0.5-2	21-Jul-16	0.5 - 2	Gen Chem, Metals, PCBs, SVOCs, VOCs
CFSB-151	CFSB-151-SO-0-0.5	7-Nov-17	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSB-151	CFSB-151-SO-0.5-2	7-Nov-17	0.5 - 2	Gen Chem, Metals, Phys, SVOCs, VOCs
CFSB-152	CFSB-152-SO-0-0.5	7-Nov-17	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSB-152	CFSB-152-SO-0.5-2	7-Nov-17	0.5 - 2	Gen Chem, Metals, Phys, SVOCs, VOCs
CFSB-153	CFSB-153-SO-0-0.5	6-Nov-17	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSB-153	CFSB-153-SO-0.5-2	6-Nov-17	0.5 - 2	Gen Chem, Metals, Phys, SVOCs, VOCs
Sediment Samples				
CFSB-149	CFSB-149-SD-0-0.5	7-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs, VOCs
CFSB-150	CFSB-150-SD-0-0.5	7-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs, VOCs
CFSDP-018	CFSDP-018-SD	7-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-018	CFSDP-018-SD	7-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs, VOCs
CFSDP-018	CFSDP-018-SD	17-Oct-18	0 - 0.5	Gen Chem, Metals, Metals SEM, Phys, SVOCs
CFSDP-019	CFSDP-019-SD	7-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-019	CFSDP-019-SD	7-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs, VOCs
CFSDP-019	CFSDP-019-SD	16-Oct-18	0 - 0.5	Gen Chem, Metals, Metals SEM, Phys, SVOCs
CFSDP-020	CFSDP-020-SD	7-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-020	CFSDP-020-SD	7-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs, VOCs
CFSDP-020	CFSDP-020-SD	11-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-058	CFSDP-058-SD	11-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-059	CFSDP-059-SD	11-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-060	CFSDP-060-SD	16-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
Surface Water Samples				
CFSWP-018	CFSWP-018-SW	6-Jun-16	NA	Gen Chem, Metals, Pest, PCBs, SVOCs, VOCs
CFSWP-018	CFSWP-018-SW	1-Dec-16	NA	Gen Chem, Metals
CFSWP-018	CFSWP-018-SW	3-Apr-17	NA	Gen Chem, Metals
CFSWP-018	CFSWP-018-SW	15-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-018	CFSWP-018-SW	21-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-018	CFSWP-018-SW	17-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-019	CFSWP-019-SW	6-Jun-16	NA	Gen Chem, Metals, Pest, PCBs, SVOCs, VOCs
CFSWP-019	CFSWP-019-SW	1-Dec-16	NA	Gen Chem, Metals
CFSWP-019	CFSWP-019-SW	3-Apr-17	NA	Gen Chem, Metals

Table 4-9
Samples Used in the Baseline Ecological Risk Assessment - South Percolation Pond Area
South Percolation Pond Transitional Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
CFSWP-019	CFSWP-019-SW	15-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-019	CFSWP-019-SW	7-Nov-17	NA	Gen Chem, Metals (f&uf), SVOCs, VOCs
CFSWP-019	CFSWP-019-SW	21-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-019	CFSWP-019-SW	16-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-020	CFSWP-020-SW	6-Jun-16	NA	Gen Chem, Metals, Pest, PCBs, SVOCs, VOCs
CFSWP-020	CFSWP-020-SW	1-Dec-16	NA	Gen Chem, Metals
CFSWP-020	CFSWP-020-SW	16-Mar-17	NA	Gen Chem, Metals
CFSWP-020	CFSWP-020-SW	15-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-020	CFSWP-020-SW	7-Nov-17	NA	Gen Chem, Metals (f&uf), SVOCs, VOCs
CFSWP-020	CFSWP-020-SW	21-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-020	CFSWP-020-SW	11-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-058	CFSWP-058-SW	21-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-058	CFSWP-058-SW	11-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-059	CFSWP-059-SW	22-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-059	CFSWP-059-SW	11-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-060	CFSWP-060-SW	22-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-060	CFSWP-060-SW	16-Oct-18	NA	Gen Chem, Metals (f&uf)
Pore Water Samples				
CFSWP-018	CFSWP-018-SW	17-Oct-18	NA	Gen Chem, Metals, SVOCs
CFSWP-019	CFSWP-019-SW	16-Oct-18	NA	Gen Chem, Metals, SVOCs
CFSWP-020	CFSWP-020-SW	11-Oct-18	NA	Gen Chem, Metals, SVOCs
CFSWP-058	CFSWP-058-SW	11-Oct-18	NA	Gen Chem, Metals, SVOCs
CFSWP-059	CFSWP-059-SW	11-Oct-18	NA	Gen Chem, Metals, SVOCs
CFSWP-060	CFSWP-060-SW	16-Oct-18	NA	Gen Chem, Metals, SVOCs

Notes:

Gen Chem: general chemistry parameters
Metals (f&uf): filtered and unfiltered metals
Metals - SEM: simultaneously extracted metals
PCBs: polychlorinated biphenyls
Pest: pesticides
Phys: physical characteristics
SVOCs: semivolatile organic compounds

Table 4-10
Samples Used in the Baseline Ecological Risk Assessment - Cedar Creek Reservoir Overflow Ditch
Cedar Creek Reservoir Overflow Ditch Transitional Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
Soil Samples				
CFSB-282	CFSB-283-SO-0-0.5	16-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-283	CFSB-283-SO-0-0.5	16-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSB-284	CFSB-283-SO-0-0.5	16-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
Sediment Samples				
CFSDP-009	CFSDP-009-SO	6-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-010	CFSDP-010-SO	6-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-011	CFSDP-011-SO	6-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-012	CFSDP-012-SO	6-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-013	CFSDP-013-SO	6-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
Surface Water Samples				
CFSWP-009	CFSWP-009-SW	7-Jun-16	NA	Gen Chem, Metals
CFSWP-009	CFSWP-009-SW	3-Apr-17	NA	Gen Chem, Metals
CFSWP-009	CFSWP-009-SW	12-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-009	CFSWP-009-SW	14-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-010	CFSWP-010-SW	7-Jun-16	NA	Gen Chem, Metals
CFSWP-010	CFSWP-010-SW	15-Mar-17	NA	Gen Chem, Metals
CFSWP-010	CFSWP-010-SW	12-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-010	CFSWP-010-SW	14-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-011	CFSWP-011-SW	7-Jun-16	NA	Gen Chem, Metals
CFSWP-011	CFSWP-011-SW	3-Apr-17	NA	Gen Chem, Metals
CFSWP-011	CFSWP-011-SW	12-Jun-17	NA	Gen Chem, Metals
CFSWP-011	CFSWP-011-SW	14-Jun-18	NA	Gen Chem, Metals
CFSWP-012	CFSWP-012-SW	7-Jun-16	NA	Gen Chem, Metals
CFSWP-012	CFSWP-012-SW	3-Apr-17	NA	Gen Chem, Metals
CFSWP-012	CFSWP-012-SW	12-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-012	CFSWP-012-SW	14-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-013	CFSWP-013-SW	7-Jun-16	NA	Gen Chem, Metals
CFSWP-013	CFSWP-013-SW	30-Nov-16	NA	Gen Chem, Metals
CFSWP-013	CFSWP-013-SW	15-Mar-17	NA	Gen Chem, Metals
CFSWP-013	CFSWP-013-SW	12-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-013	CFSWP-013-SW	14-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-039	CFSWP-039-SW	15-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-039	CFSWP-039-SW	11-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-040	CFSWP-040-SW	15-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-041	CFSWP-041-SW	14-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-042	CFSWP-042-SW	14-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-043	CFSWP-043-SW	14-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-043	CFSWP-043-SW	18-Jun-18	NA	Gen Chem

Notes:

Gen Chem: general chemistry parameters

Metals (f&uf): filtered and unfiltered metals

PCBs: polychlorinated biphenyls

Pest: pesticides

Phys: physical characteristics

SVOCs: semivolatile organic compounds

Table 4-11
Samples Used in the Baseline Ecological Risk Assessment - Northern Surface Water Feature
Northern Surface Water Feature Transitional Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
Sediment Samples				
CFSDP-021	CFSDP-021-SD	19-Jun-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-021	CFSDP-021-SO	6-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-022	CFSDP-022-SD	20-Jun-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-022	CFSDP-022-SO	6-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-046	CFSDP-046-SD	19-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSDP-047	CFSDP-047-SD	19-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSDP-048	CFSDP-048-SD	20-Jun-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-049	CFSDP-049-SD	20-Jun-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-050	CFSDP-050-SD	21-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSDP-051	CFSDP-051-SD	21-Jun-18	0 - 0.5	Gen Chem, Metals, SVOCs
CFSDP-052	CFSDP-052-SD	18-Jun-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-053	CFSDP-053-SD	18-Jun-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
Surface Water				
CFSWP-021	CFSWP-021-SW	6-Jun-16	NA	Gen Chem, Metals
CFSWP-021	CFSWP-021-SW	30-Nov-16	NA	Gen Chem, Metals
CFSWP-021	CFSWP-021-SW	15-Mar-17	NA	Gen Chem, Metals
CFSWP-021	CFSWP-021-SW	15-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-021	CFSWP-021-SW	19-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-022	CFSWP-022-SW	6-Jun-16	NA	Gen Chem, Metals
CFSWP-022	CFSWP-022-SW	3-Apr-17	NA	Gen Chem, Metals
CFSWP-022	CFSWP-022-SW	20-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-046	CFSWP-046-SW	19-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-047	CFSWP-047-SW	19-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-048	CFSWP-048-SW	20-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-049	CFSWP-049-SW	20-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-050	CFSWP-050-SW	21-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-051	CFSWP-051-SW	21-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-052	CFSWP-052-SW	18-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-053	CFSWP-053-SW	18-Jun-18	NA	Gen Chem, Metals (f&uf)
Pore Water				
CFPWP-021	CFPWP-021-PW	19-Jun-18	0.5 - 1.5	Gen Chem, Metals
CFPWP-022	CFPWP-022-PW	20-Jun-18	0.5 - 1.5	Gen Chem, Metals
CFPWP-046	CFPWP-046-PW	19-Jun-18	0.5 - 1.5	Gen Chem, Metals
CFPWP-047	CFPWP-047-PW	19-Jun-18	0.5 - 1.5	Gen Chem, Metals
CFPWP-048	CFPWP-048-PW	20-Jun-18	0.5 - 1.5	Gen Chem, Metals
CFPWP-049	CFPWP-049-PW	20-Jun-18	0.5 - 1.5	Gen Chem, Metals
CFPWP-050	CFPWP-050-PW	21-Jun-18	0.5 - 1.5	Gen Chem, Metals
CFPWP-051	CFPWP-051-PW	21-Jun-18	0.5 - 1.5	Gen Chem, Metals
CFPWP-052	CFPWP-052-PW	18-Jun-18	0.5 - 1.5	Gen Chem, Metals
CFPWP-053	CFPWP-053-PW	18-Jun-18	0.5 - 1.5	Gen Chem, Metals

Notes:

Gen Chem: general chemistry parameters

Metals (f&uf): filtered and unfiltered metals

PCBs: polychlorinated biphenyls

Pest: pesticides

Phys: physical characteristics

SVOCs: semivolatile organic compounds

Table 4-12
Samples Used in the Baseline Ecological Risk Assessment - Flathead River Area
Flathead River Aquatic Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
Sediment Samples				
CFSDP-001	CFSDP-001-SO	8-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-001	CFSDP-001-SD	5-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-002	CFSDP-002-SO	8-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSDP-002	CFSDP-002-SO	16-Sep-16	0 - 0.5	Phys
CFSDP-002	CFSDP-002-SD	5-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-003	CFSDP-003-SD	9-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-003	CFSDP-003-SD	31-Oct-17	0 - 0.5	Gen Chem, Metals, SVOCs, VOCs
CFSDP-003	CFSDP-003-SD	4-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-004	CFSDP-004-SD	9-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-004	CFSDP-004-SD	31-Oct-17	0 - 0.5	Gen Chem, Metals, SVOCs, VOCs
CFSDP-004	CFSDP-004-SD	4-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-005	CFSDP-005-SD	9-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-005	CFSDP-005-SD	1-Nov-17	0 - 0.5	Gen Chem, Metals, SVOCs
CFSDP-005	CFSDP-005-SD	2-Nov-17	0 - 0.5	VOCs
CFSDP-005	CFSDP-005-SD	18-Oct-18	0 - 0.5	Gen Chem, Metals, Metals-SEM, Phys, SVOCs, SVOCs-SIM
CFSDP-006	CFSDP-006-SD	9-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, PCBs, SVOCs
CFSDP-006	CFSDP-006-SO	9-Sep-16	0 - 0.5	Phys
CFSDP-006	CFSDP-006-SD	4-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-007	CFSDP-007-SO	8-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-007	CFSDP-007-SD	3-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-008	CFSDP-008-SO	8-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-008	CFSDP-008-SD	3-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-017	CFSDP-017-SO	8-Sep-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-017	CFSDP-017-SD	3-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-026	CFSDP-026-SD	31-Oct-17	0 - 0.5	Gen Chem, Metals, SVOCs, VOCs
CFSDP-026	CFSDP-026-SD	5-Oct-18	0 - 0.5	Gen Chem, Metals, Metals-SEM, Phys, SVOCs, SVOCs-SIM
CFSDP-027	CFSDP-027-SD	31-Oct-17	0 - 0.5	Gen Chem, Metals, SVOCs, VOCs
CFSDP-027	CFSDP-027-SD	5-Oct-18	0 - 0.5	Gen Chem, Metals, Metals-SEM, Phys, SVOCs, SVOCs-SIM
CFSDP-028	CFSDP-028-SD	31-Oct-17	0 - 0.5	Gen Chem, Metals, SVOCs, VOCs
CFSDP-028	CFSDP-028-SD	4-Oct-18	0 - 0.5	Gen Chem, Metals, Metals-SEM, SVOCs, SVOCs-SIM
CFSDP-034	CFSDP-034-SD	5-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-035	CFSDP-035-SD	5-Oct-18	0 - 0.5	Gen Chem, Metals, Metals-SEM, Phys, SVOCs, SVOCs-SIM
CFSDP-036	CFSDP-036-SD	4-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-037	CFSDP-037-SD	3-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-038	CFSDP-038-SD	3-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
Surface Water Samples				
CFSWP-001	CFSWP-001-SW	16-Sep-16	NA	Gen Chem, Metals
CFSWP-001	CFSWP-001-SW	2-Dec-16	NA	Gen Chem, Metals
CFSWP-001	CFSWP-001-SW	4-Apr-17	NA	Gen Chem, Metals
CFSWP-001	CFSWP-001-SW	14-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-001	CFSWP-001-SW	7-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-001	CFSWP-001-SW	5-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-002	CFSWP-002-SW	16-Sep-16	NA	Gen Chem, Metals
CFSWP-002	CFSWP-002-SW	2-Dec-16	NA	Gen Chem, Metals
CFSWP-002	CFSWP-002-SW	4-Apr-17	NA	Gen Chem, Metals
CFSWP-002	CFSWP-002-SW	14-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-002	CFSWP-002-SW	7-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-002	CFSWP-002-SW	5-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-003	CFSWP-003-SW	9-Sep-16	NA	Gen Chem, Metals
CFSWP-003	CFSWP-003-SW	1-Dec-16	NA	Gen Chem, Metals
CFSWP-003	CFSWP-003-SW	16-Mar-17	NA	Gen Chem, Metals
CFSWP-003	CFSWP-003-SW	14-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-003	CFSWP-003-SW	31-Oct-17	NA	Gen Chem, Metals (f&uf), SVOCs, VOCs
CFSWP-003	CFSWP-003-SW	6-Jun-18	NA	Gen Chem, Metals (f&uf)

Table 4-12
Samples Used in the Baseline Ecological Risk Assessment - Flathead River Area
Flathead River Aquatic Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
CFSWP-003	CFSWP-003-SW	7-Jun-18	NA	Gen Chem
CFSWP-003	CFSWP-003-SW	4-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-004	CFSWP-004-SW	9-Sep-16	NA	Gen Chem, Metals
CFSWP-004	CFSWP-004-SW	1-Dec-16	NA	Gen Chem, Metals
CFSWP-004	CFSWP-004-SW	16-Mar-17	NA	Gen Chem, Metals
CFSWP-004	CFSWP-004-SW	14-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-004	CFSWP-004-SW	31-Oct-17	NA	Gen Chem, Metals (f&uf), SVOCs, VOCs
CFSWP-004	CFSWP-004-SW	6-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-004	CFSWP-004-SW	4-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-005	CFSWP-005-SW	9-Sep-16	NA	Gen Chem, Metals
CFSWP-005	CFSWP-005-SW	1-Dec-16	NA	Gen Chem, Metals
CFSWP-005	CFSWP-005-SW	16-Mar-17	NA	Gen Chem, Metals
CFSWP-005	CFSWP-005-SW	14-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-005	CFSWP-005-SW	1-Nov-17	NA	Gen Chem, Metals (f&uf), SVOCs, VOCs
CFSWP-005	CFSWP-005-SW	6-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-005	CFSWP-005-SW	18-Oct-18	NA	Gen Chem, Metals (f&uf), SVOCs, SVOCs-SIM, VOCs
CFSWP-006	CFSWP-006-SW	9-Sep-16	NA	Gen Chem, Metals
CFSWP-006	CFSWP-006-SW	1-Dec-16	NA	Gen Chem, Metals
CFSWP-006	CFSWP-006-SW	16-Mar-17	NA	Gen Chem, Metals
CFSWP-006	CFSWP-006-SW	14-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-006	CFSWP-006-SW	6-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-006	CFSWP-006-SW	4-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-007	CFSWP-007-SW	16-Sep-16	NA	Gen Chem, Metals
CFSWP-007	CFSWP-007-SW	2-Dec-16	NA	Gen Chem, Metals
CFSWP-007	CFSWP-007-SW	16-Mar-17	NA	Gen Chem, Metals
CFSWP-007	CFSWP-007-SW	14-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-007	CFSWP-007-SW	7-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-007	CFSWP-007-SW	3-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-008	CFSWP-008-SW	16-Sep-16	NA	Gen Chem, Metals
CFSWP-008	CFSWP-008-SW	2-Dec-16	NA	Gen Chem, Metals
CFSWP-008	CFSWP-008-SW	4-Apr-17	NA	Gen Chem, Metals
CFSWP-008	CFSWP-008-SW	14-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-008	CFSWP-008-SW	7-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-008	CFSWP-008-SW	3-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-017	CFSWP-017-SW	16-Sep-16	NA	Gen Chem, Metals
CFSWP-017	CFSWP-017-SW	2-Dec-16	NA	Gen Chem, Metals
CFSWP-017	CFSWP-017-SW	4-Apr-17	NA	Gen Chem, Metals
CFSWP-017	CFSWP-017-SW	14-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-017	CFSWP-017-SW	7-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-017	CFSWP-017-SW	3-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-026	CFSWP-026-SW	31-Oct-17	NA	Gen Chem, Metals (f&uf), SVOCs, VOCs
CFSWP-026	CFSWP-026-SW	7-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-026	CFSWP-026-SW	5-Oct-18	NA	Gen Chem, Metals (f&uf), SVOCs, SVOCs-SIM
CFSWP-027	CFSWP-027-SW	31-Oct-17	NA	Gen Chem, Metals (f&uf), SVOCs, VOCs
CFSWP-027	CFSWP-027-SW	6-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-027	CFSWP-027-SW	5-Oct-18	NA	Gen Chem, Metals (f&uf), SVOCs, SVOCs-SIM
CFSWP-028	CFSWP-028-SW	31-Oct-17	NA	Gen Chem, Metals (f&uf), SVOCs, VOCs
CFSWP-028	CFSWP-028-SW	6-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-028	CFSWP-028-SW	4-Oct-18	NA	Gen Chem, Metals (f&uf), SVOCs, SVOCs-SIM
CFSWP-034	CFSWP-034-SW	7-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-034	CFSWP-034-SW	5-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-035	CFSWP-035-SW	7-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-035	CFSWP-035-SW	5-Oct-18	NA	Gen Chem, Metals (f&uf), SVOCs, SVOCs-SIM
CFSWP-036	CFSWP-036-SW	6-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-036	CFSWP-036-SW	4-Oct-18	NA	Gen Chem, Metals (f&uf)

Table 4-12
Samples Used in the Baseline Ecological Risk Assessment - Flathead River Area
Flathead River Aquatic Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
CFSWP-037	CFSWP-037-SW	6-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-037	CFSWP-037-SW	3-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-038	CFSWP-038-SW	7-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-038	CFSWP-038-SW	3-Oct-18	NA	Gen Chem, Metals (f&uf)
Pore Water Samples				
CFPWP-001	CFPWP-001-PW	5-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs
CFPWP-002	CFPWP-002-PW	5-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs
CFPWP-003	CFPWP-003-PW	4-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs
CFPWP-004	CFPWP-004-PW	4-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs
CFPWP-005	CFPWP-005-PW	18-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs, SVOCs-SIM
CFPWP-006	CFPWP-006-PW	4-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs
CFPWP-007	CFPWP-007-PW	3-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs
CFPWP-008	CFPWP-008-PW	3-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs
CFPWP-017	CFPWP-017-PW	3-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs
CFPWP-026	CFPWP-026-PW	5-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs, SVOCs-SIM
CFPWP-027	CFPWP-027-PW	5-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs, SVOCs-SIM
CFPWP-028	CFPWP-028-PW	4-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs, SVOCs-SIM
CFPWP-034	CFPWP-034-PW	5-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs
CFPWP-035	CFPWP-035-PW	5-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs, SVOCs-SIM
CFPWP-036	CFPWP-036-PW	4-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs
CFPWP-037	CFPWP-037-PW	3-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs
CFPWP-038	CFPWP-038-PW	3-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs

Notes:
Gen Chem: general chemistry parameters
Metals-SEM: simultaneously extracted metals
Metals (f&uf), filtered and unfiltered metals
PCBs: polychlorinated biphenyls
Pest: pesticides
Phys: physical characteristics
SVOCs: semivolatile organic compounds
SVOCs-SIM: semivolatile organic compounds, selected ion monitoring
VOCs: volatile organic compounds

Table 4-13
Samples Used in the Baseline Ecological Risk Assessment - Cedar Creek
Cedar Creek Aquatic Exposure Area
Columbia Falls Aluminum Company
Columbia Falls, Montana

Location	Sample Number	Sample Date	Depth (ft)	Analyses
Sediment Samples				
CFSDP-014	CFSDP-014-SD	29-Aug-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-015	CFSDP-015-SD	29-Aug-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-016	CFSDP-016-SD	29-Aug-16	0 - 0.5	Gen Chem, Metals, Pest, Phys, PCBs, SVOCs
CFSDP-014	CFSDP-014-SD	10-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-015	CFSDP-015-SD	9-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-016	CFSDP-016-SD	9-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-025	CFSDP-025-SD	10-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-044	CFSDP-044-SD	10-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
CFSDP-045	CFSDP-045-SD	9-Oct-18	0 - 0.5	Gen Chem, Metals, Phys, SVOCs
Surface Water Samples				
CFSWP-014	CFSWP-014-SW	29-Aug-16	NA	Gen Chem, Metals
CFSWP-014	CFSWP-014-SW	30-Nov-16	NA	Gen Chem, Metals
CFSWP-014	CFSWP-014-SW	13-Mar-17	NA	Gen Chem, Metals
CFSWP-014	CFSWP-014-SW	13-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-014	CFSWP-014-SW	11-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-014	CFSWP-014-SW	10-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-014	CFSWP-014-SW	16-Oct-18	NA	Gen Chem
CFSWP-015	CFSWP-015-SW	29-Aug-16	NA	Gen Chem, Metals
CFSWP-015	CFSWP-015-SW	30-Nov-16	NA	Gen Chem, Metals
CFSWP-015	CFSWP-015-SW	20-Dec-16	NA	Gen Chem, Metals
CFSWP-015	CFSWP-015-SW	13-Mar-17	NA	Gen Chem, Metals
CFSWP-015	CFSWP-015-SW	13-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-015	CFSWP-015-SW	11-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-015	CFSWP-015-SW	9-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-015	CFSWP-015-SW	16-Oct-18	NA	Gen Chem
CFSWP-016	CFSWP-016-SW	29-Aug-16	NA	Gen Chem, Metals
CFSWP-016	CFSWP-016-SW	30-Nov-16	NA	Gen Chem, Metals
CFSWP-016	CFSWP-016-SW	13-Mar-17	NA	Gen Chem, Metals
CFSWP-016	CFSWP-016-SW	12-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-016	CFSWP-016-SW	12-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-016	CFSWP-016-SW	9-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-025	CFSWP-025-SW	20-Dec-16	NA	Gen Chem, Metals
CFSWP-025	CFSWP-025-SW	13-Mar-17	NA	Gen Chem, Metals
CFSWP-025	CFSWP-025-SW	13-Jun-17	NA	Gen Chem, Metals (f&uf)
CFSWP-025	CFSWP-025-SW	12-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-025	CFSWP-025-SW	10-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-044	CFSWP-044-SW	11-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-044	CFSWP-044-SW	10-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-044	CFSWP-044-SW	16-Oct-18	NA	Gen Chem
CFSWP-045	CFSWP-045-SW	11-Jun-18	NA	Gen Chem, Metals (f&uf)
CFSWP-045	CFSWP-045-SW	9-Oct-18	NA	Gen Chem, Metals (f&uf)
CFSWP-045	CFSWP-045-SW	16-Oct-18	NA	Gen Chem
Pore Water Samples				
CFPWP-014	CFPWP-014-PW	10-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs
CFPWP-015	CFPWP-015-PW	9-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs
CFPWP-016	CFPWP-016-PW	9-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs
CFPWP-025	CFPWP-025-PW	10-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs
CFPWP-044	CFPWP-044-PW	10-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs
CFPWP-045	CFPWP-045-PW	9-Oct-18	0.5 - 1.5	Gen Chem, Metals, SVOCs

Notes:

Gen Chem: general chemistry parameters
Metals (f&uf): filtered and unfiltered metals
PCBs: polychlorinated biphenyls
Pest: pesticides
Phys: physical characteristics
SVOCs: semivolatile organic compounds

Table 4-14
Summary of Preliminary Bulk Soil and Sediment COPECs by Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Habitat		Terrestrial							ISS	Transitional								Aquatic		
Exposure Area		Main Plant (Soil)	Central Landfills (Soil)	Industrial Landfill (Soil)	Eastern Undeveloped (Soil)	North-Central Undeveloped (Soil)	Western Undeveloped (Soil)	Flathead River Riparian (Soil)	Incremental Soil Sample (Soil)	Cedar Creek Reservoir Overflow Ditch (Soil)	Cedar Creek Reservoir Overflow Ditch (Sediment)	South Percolation Pond (Soil)	South Percolation Pond (Sediment)	Northern Surface Water Feature (Soil)	Northern Surface Water Feature (Sediment)	North Percolation Pond (Soil)	North Percolation Pond (Sediment)	Cedar Creek (Sediment)	Flathead River Riparian (Sediment)	Flathead River (Sediment)
Constituent	**Sample Depth (ft):**	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-0.5	0-2	0-0.5	0-2	0-0.5	0-2	0-0.5	0-0.5	0-0.5	0-0.5
	CAS Number																			
TAL Metals																				
Aluminum	7429-90-5	●	●	●	●	●	●	●	●	●		●		●	●	●	●			
Antimony	7440-36-0	●	●	●			●		●			●				●	●			
Arsenic	7440-38-2	●	●	●	●	●	●	●	●	●				●	●	●	●			
Barium	7440-39-3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Beryllium	7440-41-7		●	●			●		●		●		●	●	●	●	●	●	●	●
Cadmium	7440-43-9	●	●	●	●	●	●		●			●	●			●	●			
Chromium, Total	7440-47-3	●	●	●					●			●				●	●			
Chromium, Hexavalent	18540-29-9	●	●	●	●	●	●		●	●	●	●	●	NA	NA	●	●	NA	NA	NA
Chromium, Trivalent	16065-83-1	●	●	●					●		●	●	●	NA	NA	●	●	NA	NA	NA
Cobalt	7440-48-4	●	●	●	●	●	●	●	●	●		●		●		●				
Copper	7440-50-8	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●			
Iron	7439-89-6	●	●	●	●	●	●	●	●	●		●		●	●	●				
Lead	7439-92-1	●	●	●	●	●	●	●	●	●		●	●	●		●	●			
Manganese	7439-96-5	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●		
Mercury	7439-97-6	●			●							●	●			●				
Nickel	7440-02-0	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●			
Selenium	7782-49-2	●	●	●	●	●	●	●	●	●		●		●	●	●	●			
Silver	7440-22-4											●	●				●			
Thallium	7440-28-0	●	●	●	●	●	●		●			●	●			●	●		●	
Vanadium	7440-62-2	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Zinc	7440-66-6	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●			
Other Inorganic Parameters																				
Cyanide (Total)	57-12-5	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Cyanide (Free)	STL00131	NA	NA	NA	NA	NA	NA		NA	NA	NA		●	NA	NA	NA	NA	NA		
Fluoride	16984-48-8	●	●	●					●							●				
Essential Nutrients (mg/kg)																				
Calcium	7440-70-2	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Magnesium	7439-95-4	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Potassium	7440-09-7	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Sodium	7440-23-5	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Dioxins and Furans																				
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	35822-46-9	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-14
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Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Habitat		Terrestrial							ISS	Transitional								Aquatic		
Exposure Area		Main Plant (Soil)	Central Landfills (Soil)	Industrial Landfill (Soil)	Eastern Undeveloped (Soil)	North-Central Undeveloped (Soil)	Western Undeveloped (Soil)	Flathead River Riparian (Soil)	Incremental Soil Sample (Soil)	Cedar Creek Reservoir Overflow Ditch (Soil)	Cedar Creek Reservoir Overflow Ditch (Sediment)	South Percolation Pond (Soil)	South Percolation Pond (Sediment)	Northern Surface Water Feature (Soil)	Northern Surface Water Feature (Sediment)	North Percolation Pond (Soil)	North Percolation Pond (Sediment)	Cedar Creek (Sediment)	Flathead River Riparian (Sediment)	Flathead River (Sediment)
Constituent	**Sample Depth (ft):**	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-0.5	0-2	0-0.5	0-2	0-0.5	0-2	0-0.5	0-0.5	0-0.5	0-0.5
	CAS Number																			
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	●		NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	39227-28-6	●		NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	57653-85-7	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	●		NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	19408-74-3	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	●		NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	40321-76-4	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	●	●	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1746-01-6	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzofuran	39001-02-0	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzo-P-Dioxin	3268-87-9	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
$TEC_{2,3,7,8\text{-}TCDD\text{-}Bird\text{-}1/2MDL}$	---	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
$TEC_{2,3,7,8\text{-}TCDD\text{-}Bird\text{-}MDL}$	---	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
$TEC_{2,3,7,8\text{-}TCDD\text{-}Bird\text{-}Zero}$	---	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
$TEC_{2,3,7,8\text{-}TCDD\text{-}Mammal\text{-}1/2MDL}$	---	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
$TEC_{2,3,7,8\text{-}TCDD\text{-}Mammal\text{-}MDL}$	---	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
$TEC_{2,3,7,8\text{-}TCDD\text{-}Mammal\text{-}Zero}$	---	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Polychlorinated Biphenyls (PCBs)																				
PCB-1248 (Aroclor 1248)	12672-29-6			NA					●									NA		
PCB-1254 (Aroclor 1254)	11097-69-1	●	●	NA					●									NA		
Polychlorinated Biphenyl (PCBs)	1336-36-3	●	●	NA					●									NA		
Polycyclic Aromatic Hydrocarbons (PAHs)																				
2-Methylnaphthalene	91-57-6		●						●						●	●				
Acenaphthene	83-32-9	●	●	●					●		●		●			●	●	●		●
Acenaphthylene	208-96-8															●	●			
Anthracene	120-12-7	●	●						●		●		●		●	●	●	●		●
Fluoranthene	206-44-0	●	●	●					●		●		●		●	●	●	●	●	●
Fluorene	86-73-7	●	●						●		●		●			●	●	●		●
Naphthalene	91-20-3	●	●	●				●	●		●					●	●			●
Phenanthrene	85-01-8	●	●	●					●		●		●		●	●	●	●	●	●

Table 4-14
Summary of Preliminary Bulk Soil and Sediment COPECs by Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Habitat		Terrestrial							ISS	Transitional									Aquatic		
Exposure Area		Main Plant (Soil)	Central Landfills (Soil)	Industrial Landfill (Soil)	Eastern Undeveloped (Soil)	North-Central Undeveloped (Soil)	Western Undeveloped (Soil)	Flathead River Riparian (Soil)	Incremental Soil Sample (Soil)	Cedar Creek Reservoir Overflow Ditch (Soil)	Cedar Creek Reservoir Overflow Ditch (Sediment)	South Percolation Pond (Soil)	South Percolation Pond (Sediment)	Northern Surface Water Feature (Soil)	Northern Surface Water Feature (Sediment)	North Percolation Pond (Soil)	North Percolation Pond (Sediment)	Cedar Creek (Sediment)	Flathead River Riparian (Sediment)	Flathead River (Sediment)
Constituent	**Sample Depth (ft):**	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-0.5	0-2	0-0.5	0-2	0-0.5	0-2	0-0.5	0-0.5	0-0.5	0-0.5
	CAS Number																			
Total LMW PAHs - 1/2MDL	---	●	●	●					●		●		●		●	●	●	●	●	●
Total LMW PAHs - MDL	---	●	●	●					●		●		●		●	●	●	●	●	●
Total LMW PAHs - Zero	---	●	●	●					●		●		●		●	●	●	●	●	●
Benzo(A)Pyrene	50-32-8	●	●	●	●				●		●	●	●		●	●	●	●	●	●
Benzo(A)Anthracene	56-55-3	●	●	●	●				●	●	●	●	●		●	●	●	●	●	●
Benzo(B)Fluoranthene	205-99-2	●	●	●					●							●	●			
Benzo(G,H,I)Perylene	191-24-2	●	●	●					●		●		●		●	●	●	●	●	●
Benzo(K)Fluoranthene	207-08-9								●		●		●			●	●			●
Chrysene	218-01-9	●	●	●					●		●		●		●	●	●	●	●	●
Dibenz(A,H)Anthracene	53-70-3	●	●						●		●		●		●	●	●		●	●
Indeno(1,2,3-C,D)Pyrene	193-39-5	●	●						●		●		●		●	●	●	●	●	●
Pyrene	129-00-0	●	●	●					●		●		●		●	●	●	●	●	●
Total HMW PAHs - 1/2MDL	---	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●
Total HMW PAHs - MDL	---	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●
Total HMW PAHs - Zero	---	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●
Total PAHs - 1/2MDL	---	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●
Total PAHs - MDL	---	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●
Total PAHs - Zero	---	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																				
2,4-Dimethylphenol	105-67-9								●											
3- And 4- Methylphenol (Total)	106445	●	●	NA	●				●			●	●							●
4-Chloroaniline	106-47-8											●	●							
Acetophenone	98-86-2										●				●		●		●	
Benzaldehyde	100-52-7	●	●		●	●	●	●	●	●	●	●	●	●	●			●	●	●
Benzyl Butyl Phthalate	85-68-7	●	●						●							●				
Bis(2-Ethylhexyl) Phthalate	117-81-7	●	●		●	●	●		●	●		●	●			●				●
Caprolactam	105-60-2		●					●												
Carbazole	86-74-8										●		●		●	●	●	●	●	●
Dibenzofuran	132-64-9		●						●							●	●			
Di-N-Butyl Phthalate	84-74-2	●	●		●		●	●	●	●		●								
Hexachlorobenzene	118-74-1	●																		
Pentachlorophenol	87-86-5	●																		
Phenol	108-95-2		●												●				●	

Table 4-14
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Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Habitat		Terrestrial							ISS	Transitional								Aquatic		
Exposure Area		Main Plant (Soil)	Central Landfills (Soil)	Industrial Landfill (Soil)	Eastern Undeveloped (Soil)	North-Central Undeveloped (Soil)	Western Undeveloped (Soil)	Flathead River Riparian (Soil)	Incremental Soil Sample (Soil)	Cedar Creek Reservoir Overflow Ditch (Soil)	Cedar Creek Reservoir Overflow Ditch (Sediment)	South Percolation Pond (Soil)	South Percolation Pond (Sediment)	Northern Surface Water Feature (Soil)	Northern Surface Water Feature (Sediment)	North Percolation Pond (Soil)	North Percolation Pond (Sediment)	Cedar Creek (Sediment)	Flathead River Riparian (Sediment)	Flathead River (Sediment)
Constituent	**Sample Depth (ft):**	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-0.5	0-2	0-0.5	0-2	0-0.5	0-2	0-0.5	0-0.5	0-0.5	0-0.5
	CAS Number																			
TCL Volatile Organic Compounds (TCL VOCs)																				
Acetone	67-64-1			NA	NA				NA	NA	NA		●	NA	NA		NA	NA	●	●
Carbon Disulfide	75-15-0			NA	NA				NA	NA	NA		●	NA	NA		NA	NA	●	●
Cyclohexane	110-82-7	●	●	NA	NA		●	●	NA	NA	NA	●	●	NA	NA	●	NA	NA	●	●
Isopropylbenzene (Cumene)	98-82-8	●	●	NA	NA				NA	NA	NA			NA	NA	●	NA	NA		
Methyl Acetate	79-20-9	●	●	NA	NA	●	●	●	NA	NA	NA	●		NA	NA	●	NA	NA		●
Methyl Ethyl Ketone (2-Butanone)	78-93-3			NA	NA				NA	NA	NA		●	NA	NA		NA	NA		
Methylcyclohexane	108-87-2	●	●	NA	NA		●	●	NA	NA	NA	●	●	NA	NA	●	NA	NA	●	●
M,P-Xylene	179601-23-1	●	●	NA	NA		●	●	NA	NA	NA	●		NA	NA	●	NA	NA		
O-Xylene (1,2-Dimethylbenzene)	95-47-6	●	●	NA	NA			●	NA	NA	NA	●		NA	NA	●	NA	NA		

Notes:

● - COPEC
Blank - Constituent measured but not COPEC
ft - feet
HMW - High molecular weight
ISS - Incremental Soil Sample
LMW - Low molecular weight
MDL - Method Detection Limit
mg/kg - milligrams per kilogram
NA - Not Applicable, constituent was not measured
PAH - Polycyclic Aromatic Hydrocarbons
PCB - Polychlorinated Biphenyls
SVOC - Semi-volatile organic compound
TAL - Target Analyte List
TCL - Target Compound List
VOC - Volatile organic compound

Table 4-15
Summary of Preliminary Surface Water COPECs by Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Exposure Area			Cedar Creek	Cedar Creek Reservoir Overflow Ditch	South Percolation Pond	Northern Surface Water Feature	North Percolation Pond	Flathead River Riparian Area	Flathead River
Constituent	**CAS Number**	**Fraction**							
TAL Metals									
Aluminum	7429-90-5	U		●	●	●	●	●	●
Aluminum	7429-90-5	F			●		●	●	
Arsenic	7440-38-2	U						●	
Arsenic	7440-38-2	F						●	
Barium	7440-39-3	U	●	●	●	●	●	●	●
Barium	7440-39-3	F	●	●	●	●	●	●	●
Beryllium	7440-41-7	U			●		●	●	
Cadmium	7440-43-9	U			●		●	●	
Cadmium	7440-43-9	F					●		
Chromium, Total	7440-47-3	U	●		●			●	
Cobalt	7440-48-4	U			●			●	
Copper	7440-50-8	U	●	●	●	●	●	●	●
Copper	7440-50-8	F			●		●	●	●
Iron	7439-89-6	U	●	●	●	●	●	●	●
Iron	7439-89-6	F			●			●	●
Lead	7439-92-1	U					●	●	
Manganese	7439-96-5	U		●	●	●		●	●
Manganese	7439-96-5	F			●			●	
Mercury	7439-97-6	U			●			●	
Nickel	7440-02-0	U					●		
Nickel	7440-02-0	F					●		●
Selenium	7782-49-2	U			●	●			
Vanadium	7440-62-2	U		●	●	●	●	●	●

Table 4-15
Summary of Preliminary Surface Water COPECs by Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Exposure Area			Cedar Creek	Cedar Creek Reservoir Overflow Ditch	South Percolation Pond	Northern Surface Water Feature	North Percolation Pond	Flathead River Riparian Area	Flathead River
Constituent	**CAS Number**	**Fraction**							
Zinc	7440-66-6	U					●		
Zinc	7440-66-6	F	●		●		●	●	
Other Inorganic Parameters									
Cyanide (Total)	57-12-5	U	●		●		●	●	●
Cyanide (Total)	57-12-5	F			●			●	●
Cyanide (Free)	FREE CN	U	●	●	●		NA	●	●
Cyanide (Free)	FREE CN	F		NA		NA	NA	●	●
Fluoride	16984-48-8	U	●	●	●	●	●	●	●
Fluoride	16984-48-8	F	●	●	●	●	●	NA	●
Nitrogen, Ammonia (As N)	7664-41-7	U			●				
Essential Nutrients									
Calcium	7440-70-2	U			●			●	
Calcium	7440-70-2	F			●				
Polycyclic Aromatic Hydrocarbons (PAHs)									
Benzo(A)Anthracene	56-55-3	U	NA	NA		NA	●	●	●
Benzo(A)Pyrene	50-32-8	U	NA	NA	●	NA	●	●	●
Benzo(B)Fluoranthene	205-99-2	U	NA	NA	●	NA	●	●	●
Benzo(G,H,I)Perylene	191-24-2	U	NA	NA		NA	●	●	●
Benzo(K)Fluoranthene	207-08-9	U	NA	NA		NA		●	●
Chrysene	218-01-9	U	NA	NA		NA	●	●	●
Dibenz(A,H)Anthracene	53-70-3	U	NA	NA		NA		●	●
Fluoranthene	206-44-0	U	NA	NA		NA	●	●	●
Indeno(1,2,3-C,D)Pyrene	193-39-5	U	NA	NA	●	NA	●	●	●
Phenanthrene	85-01-8	U	NA	NA		NA	●	●	●

Table 4-15
Summary of Preliminary Surface Water COPECs by Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Exposure Area			Cedar Creek	Cedar Creek Reservoir Overflow Ditch	South Percolation Pond	Northern Surface Water Feature	North Percolation Pond	Flathead River Riparian Area	Flathead River
Constituent	**CAS Number**	**Fraction**							
Pyrene	129-00-0	U	NA	NA		NA	●	●	●
TCL Semi-Volatile Organic Compounds (TCL SVOCs)									
3- And 4- Methylphenol (Total)	MEPH3MEPH4	U	NA	NA		NA		●	
Benzaldehyde	100-52-7	U	NA	NA		NA		●	
Bis(2-Ethylhexyl) Phthalate	117-81-7	U	NA	NA		NA			●
Caprolactam	105-60-2	U	NA	NA		NA		●	●
Carbazole	86-74-8	U	NA	NA		NA		●	
Phenol	108-95-2	U	NA	NA		NA		●	
TCL Volatile Organic Compounds (TCL VOCs)									
Toluene	108-88-3	U	NA	NA		NA		●	

Notes:

● - COPEC

Blank - Constituent measured but not COPEC

F - Filtered

NA - Not Applicable, constituent was not measured

PAH - Polycyclic Aromatic Hydrocarbons

SVOC - Semi-volatile organic compound

TAL - Target Analyte List

TCL - Target Compound List

U - Unfiltered

VOC - Volatile organic compound

Table 4-16
Reference Area Selection for Ecological Exposure Areas
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Exposure Areas	Predominant Soil Type	Secondary Soil Type	Contribution of Secondary Soil Type	Soil Reference Area for Comparison	Notes	Sediment Reference Area for Comparison	Notes	Surface Water Reference Area for Comparison	Notes
Terrestrial Exposure Areas									
Main Plant Area	Qgr; Glacial and Fluvioglacial Deposits (Pleistocene)	None	NA	SO 1 (Glacial Till and Alluvium)		NA		NA	
Central Landfills Area	Qgr; Glacial and Fluvioglacial Deposits (Pleistocene)	Yr; Revett Formation (Middle Proterozoic) (Teakettle Mountain)	Minor	SO 1 (Glacial Till and Alluvium)		NA		NA	
Industrial Landfill Area	Qgr; Glacial and Fluvioglacial Deposits (Pleistocene)	None	NA	SO 1 (Glacial Till and Alluvium)		NA		NA	
Eastern Undeveloped Area	Qgr; Glacial and Fluvioglacial Deposits (Pleistocene)	Yr; Revett Formation (Middle Proterozoic) (Teakettle Mountain)	Minor	SO 1 (Glacial Till and Alluvium)		NA		NA	
North-Central Undeveloped Area	Qgr; Glacial and Fluvioglacial Deposits (Pleistocene)	Yr; Revett Formation (Middle Proterozoic) (Teakettle Mountain)	Minor	SO 1 (Glacial Till and Alluvium)		NA		NA	
Western Undeveloped Area	Qgr; Glacial and Fluvioglacial Deposits (Pleistocene)	Qgl; Glacial Lake Deposit	Very Minor	SO 1 (Glacial Till and Alluvium)		NA		NA	
Flathead River Riparian Area	Qal; Alluvial Deposits (Holocene)	None	NA	Lower of SO 2 and SO 3 (Fluvial Deposits and Riverwash)	1.	NA		NA	
Transitional Exposure Areas									
North Percolation Pond Area	Qgr; Glacial and Fluvioglacial Deposits (Pleistocene)	None	NA	SO 1 (Glacial Till and Alluvium)		SO 1 (Glacial Till and Alluvium)	2.	Cedar Creek	3.
Cedar Creek Reservoir Overflow Ditch	Qgr; Glacial and Fluvioglacial Deposits (Pleistocene)	None	NA	SO 1 (Glacial Till and Alluvium)		Cedar Creek		Cedar Creek	3.
South Percolation Pond Area	Qal; Alluvial Deposits (Holocene)	None	NA	Lower of SO 2 and SO 3 (Fluvial Deposits and Riverwash)	1.	Lower of SO 2 and SO 3 (Fluvial Deposits and Riverwash)	1., 2.	Flathead River	3.
Northern Surface Water Feature	Qgr; Glacial and Fluvioglacial Deposits (Pleistocene)	None	NA	SO 1 (Glacial Till and Alluvium)		SO 1 (Glacial Till and Alluvium)	2.	Cedar Creek	3.
Aquatic Exposure Areas									
Flathead River	NA					Flathead River		Flathead River	
Cedar Creek	NA					Cedar Creek		Cedar Creek	
Backwater Seeps Area (Flathead River Riparian Area)									
Seeps Area	NA					Flathead River		Flathead River	

NA, not applicable

Notes:

1. Soil type at Exposure Area similar to two Reference Areas; comparison will be made to the lower (more conservative) concentration from Reference Areas SO2 and SO3.
2. Depositional sediment at these transitional areas likely more similar to surrounding soil; therefore, comparison will be made to the corresponding soil Reference Area data for site sediment.
3. Reference Area water body selected based on proximity and drainage patterns at the Site.

Qal, alluvial deposits (soils deposited by Holocene)
Qgl, glacial lake deposit (Pleistocene)
Qgr, glacial and fluvioglacial deposits (pleistocenne)
Yr, Revett formation (middle Proterozoic)

Table 4-17
Summary of Refined Bulk Soil and Sediment COPECs by Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Habitat		Terrestrial											ISS	Transitional					Aquatic	
Exposure Area		Main Plant (Soil)	Central Landfills (Soil)	Industrial Landfill (Soil)	Eastern Undeveloped (Soil)	North-Central Undeveloped (Soil)	Western Undeveloped (Soil)	Flathead River Riparian (Soil)	North Percolation Pond (Soil)	North Percolation Pond (Sediment)	South Percolation Pond (Soil)	South Percolation Pond (Sediment)	Incremental Soil Sample (Soil)	Cedar Creek Reservoir Overflow Ditch (Soil)	Cedar Creek Reservoir Overflow Ditch (Sediment)	Northern Surface Water Feature (Soil)	Northern Surface Water Feature (Sediment)	Flathead River (Sediment)	Cedar Creek (Sediment)
Constituent	Sample Depth (ft):	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-0.5	0-2	0-0.5	0-2	0-2	0-0.5	0-2	0-0.5	0-0.5	0-0.5
	CAS Number																		
TAL Metals																			
Antimony	7440-36-0	●		●					●	●			●						
Arsenic	7440-38-2	●	●	●	●	●	●	●	●	●			●	●		●	●		
Barium	7440-39-3		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Beryllium	7440-41-7		●	●					●	●			●		●		●	●	
Cadmium	7440-43-9	●		●	●				●	●	●	●	●						
Chromium, Total	7440-47-3	●	●	●					●	●	●		●						
Cobalt	7440-48-4			●					●										
Copper	7440-50-8	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●		
Lead	7439-92-1	●	●	●	●	●	●	●	●	●	●	●	●	●		●			
Manganese	7439-96-5		●		●	●	●	●					●	●	●	●	●		●
Mercury	7439-97-6	●			●				●		●	●							
Nickel	7440-02-0	●	●	●	●				●	●	●	●	●	●	●				
Selenium	7782-49-2	●	●	●	●		●		●	●	●		●	●		●	●		
Silver	7440-22-4									●	●	●							
Thallium	7440-28-0		●	●	●	●			●	●			●						
Vanadium	7440-62-2	●	●	●	●	●	●		●	●			●	●	●	●	●	●	
Zinc	7440-66-6	●	●	●	●	●	●	●	●	●	●	●	●	●	●				
Other Inorganic Parameters																			
Cyanide	57-12-5	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Cyanide (Free)	STL00131	NA	NA	NA	NA	NA	NA		NA	NA		●	NA	NA	NA	NA	NA		NA
Fluoride	16984-48-8	●	●	●					●				●						
Dioxins and Furans																			
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	35822-46-9	●	●	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	●		NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-17
Summary of Refined Bulk Soil and Sediment COPECs by Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Habitat		Terrestrial											ISS	Transitional				Aquatic	
Exposure Area		Main Plant (Soil)	Central Landfills (Soil)	Industrial Landfill (Soil)	Eastern Undeveloped (Soil)	North-Central Undeveloped (Soil)	Western Undeveloped (Soil)	Flathead River Riparian (Soil)	North Percolation Pond (Soil)	North Percolation Pond (Sediment)	South Percolation Pond (Soil)	South Percolation Pond (Sediment)	Incremental Soil Sample (Soil)	Cedar Creek Reservoir Overflow Ditch (Soil)	Cedar Creek Reservoir Overflow Ditch (Sediment)	Northern Surface Water Feature (Soil)	Northern Surface Water Feature (Sediment)	Flathead River (Sediment)	Cedar Creek (Sediment)
Constituent	Sample Depth (ft):	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-0.5	0-2	0-0.5	0-2	0-2	0-0.5	0-2	0-0.5	0-0.5	0-0.5
	CAS Number																		
1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	39227-28-6	●		NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	57653-85-7	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	19408-74-3	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	●		NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	40321-76-4	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	●	●	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1746-01-6	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzofuran	39001-02-0	●	●	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzo-P-Dioxin	3268-87-9	●	●	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TEC2,3,7,8-TCDD-Bird-1/2MDL	---	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TEC2,3,7,8-TCDD-Bird-MDL	---	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TEC2,3,7,8-TCDD-Bird-Zero	---	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TEC2,3,7,8-TCDD-Mammal-1/2MDL	---	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TEC2,3,7,8-TCDD-Mammal-MDL	---	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TEC2,3,7,8-TCDD-Mammal-Zero	---	●	●	NA	NA	NA	●	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Polychlorinated Biphenyls (PCBs)																			
PCB-1254 (Aroclor 1254)	11097-69-1		●	NA									●						
Polychlorinated Biphenyl (PCBs)	1336-36-3		●	NA									●						
Polycyclic Aromatic Hydrocarbons (PAHs)																			
2-Methylnaphthalene	91-57-6		●						●	●			●						
Acenaphthene	83-32-9	●	●	●					●	●		●	●		●			●	●
Acenaphthylene	208-96-8									●									●
Anthracene	120-12-7	●	●						●	●		●	●		●			●	●
Fluoranthene	206-44-0	●	●	●					●	●		●	●		●			●	●

Table 4-17
Summary of Refined Bulk Soil and Sediment COPECs by Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Habitat		Terrestrial											ISS	Transitional					Aquatic	
Exposure Area		Main Plant (Soil)	Central Landfills (Soil)	Industrial Landfill (Soil)	Eastern Undeveloped (Soil)	North-Central Undeveloped (Soil)	Western Undeveloped (Soil)	Flathead River Riparian (Soil)	North Percolation Pond (Soil)	North Percolation Pond (Sediment)	South Percolation Pond (Soil)	South Percolation Pond (Sediment)	Incremental Soil Sample (Soil)	Cedar Creek Reservoir Overflow Ditch (Soil)	Cedar Creek Reservoir Overflow Ditch (Sediment)	Northern Surface Water Feature (Soil)	Northern Surface Water Feature (Sediment)	Flathead River (Sediment)	Cedar Creek (Sediment)
Constituent	**Sample Depth (ft):**	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-0.5	0-2	0-0.5	0-2	0-2	0-0.5	0-2	0-0.5	0-0.5	0-0.5
	CAS Number																		
Fluorene	86-73-7	●	●						●	●		●	●		●				●
Naphthalene	91-20-3	●	●	●				●	●	●			●		●			●	
Phenanthrene	85-01-8	●	●	●					●	●		●	●		●		●	●	●
Total LMW PAHs - 1/2MDL	---	●	●	●					●	NA		NA	●		NA		NA	NA	NA
Total LMW PAHs - MDL	---	●	●	●					●	NA		NA	●		NA		NA	NA	NA
Total LMW PAHs - Zero	---	●	●	●					●	NA		NA	●		NA		NA	NA	NA
Benzo(A)Pyrene	50-32-8	●	●						●	●		●	●		●		●	●	●
Benzo(A)Anthracene	56-55-3	●	●	●	●				●	●	●	●	●	●	●		●	●	●
Benzo(B)Fluoranthene	205-99-2	●	●	●					●	●			●						
Benzo(G,H,I)Perylene	191-24-2	●	●	●					●	●		●	●		●		●	●	●
Benzo(K)Fluoranthene	207-08-9								●	●		●	●		●			●	
Chrysene	218-01-9	●	●	●					●	●		●	●		●		●	●	●
Dibenz(A,H)Anthracene	53-70-3	●	●						●	●		●	●		●		●	●	
Indeno(1,2,3-C,D)Pyrene	193-39-5	●	●						●	●		●	●		●		●	●	●
Pyrene	129-00-0	●	●	●					●	●		●	●		●		●	●	●
Total HMW PAHs - 1/2MDL	---	●	●	●	●	●	●	●	●	NA	●	NA	●	●	NA		NA	NA	NA
Total HMW PAHs - MDL	---	●	●	●	●	●	●	●	●	NA	●	NA	●	●	NA		NA	NA	NA
Total HMW PAHs - Zero	---	●	●	●	●	●	●	●	●	NA	●	NA	●	●	NA		NA	NA	NA
Total PAHs - 1/2MDL	---	NA	NA	NA	NA	NA	NA	NA	NA	●	NA	●	NA	NA	●	NA	●	●	●
Total PAHs - MDL	---	NA	NA	NA	NA	NA	NA	NA	NA	●	NA	●	NA	NA	●	NA	●	●	●
Total PAHs - Zero	---	NA	NA	NA	NA	NA	NA	NA	NA	●	NA	●	NA	NA	●	NA	●	●	●
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																			
3- And 4- Methylphenol (Total)	106445		●		●														
4-Chloroaniline	106-47-8										●	●							
Acetophenone	98-86-2														●		●		
Benzaldehyde	100-52-7							●						●	●	●	●	●	●
Bis(2-Ethylhexyl) Phthalate	117-81-7	●	●		●	●	●		●		●		●	●					

Table 4-17
Summary of Refined Bulk Soil and Sediment COPECs by Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Habitat		Terrestrial											ISS	Transitional					Aquatic	
Exposure Area		Main Plant (Soil)	Central Landfills (Soil)	Industrial Landfill (Soil)	Eastern Undeveloped (Soil)	North-Central Undeveloped (Soil)	Western Undeveloped (Soil)	Flathead River Riparian (Soil)	North Percolation Pond (Soil)	North Percolation Pond (Sediment)	South Percolation Pond (Soil)	South Percolation Pond (Sediment)	Incremental Soil Sample (Soil)	Cedar Creek Reservoir Overflow Ditch (Soil)	Cedar Creek Reservoir Overflow Ditch (Sediment)	Northern Surface Water Feature (Soil)	Northern Surface Water Feature (Sediment)	Flathead River (Sediment)	Cedar Creek (Sediment)
Constituent	**Sample Depth (ft):**	**0-2**	**0-2**	**0-2**	**0-2**	**0-2**	**0-2**	**0-2**	**0-2**	**0-0.5**	**0-2**	**0-0.5**	**0-2**	**0-2**	**0-0.5**	**0-2**	**0-0.5**	**0-0.5**	**0-0.5**
	CAS Number																		
Caprolactam	105-60-2							●											
Carbazole	86-74-8								●	●		●			●		●	●	●
Dibenzofuran	132-64-9		●						●				●						
Di-N-Butyl Phthalate	84-74-2	●	●					●			●		●	●					
TCL Volatile Organic Compounds (TCL VOCs)																			
Cyclohexane	110-82-7	●		NA	NA		●	●	●		●	●	NA	NA	NA	NA	NA	●	NA
Isopropylbenzene (Cumene)	98-82-8			NA	NA				●				NA	NA	NA	NA	NA		NA
Methyl Acetate	79-20-9	●	●	NA	NA	●	●	●	●		●		NA	NA	NA	NA	NA	●	NA
Methylcyclohexane	108-87-2	●	●	NA	NA		●	●	●		●	●	NA	NA	NA	NA	NA	●	NA
M,P-Xylene	179601-23-1	●	●	NA	NA		●	●	●		●		NA	NA	NA	NA	NA		NA
O-Xylene (1,2-Dimethylbenzene)	95-47-6	●	●	NA	NA			●	●		●		NA	NA	NA	NA	NA		NA

Notes:

Blank - Constituent measured but not COPEC

ISS - Incremental Soil Sample

MDL - Method Detection Limit

NA - Not Applicable, constituent was not measured

● - COPEC

Table 4-18
Summary of Refined Surface Water COPECs by Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Exposure Area			North Percolation Pond	South Percolation Pond	Cedar Creek Reservoir Overflow Ditch	Northern Surface Water Feature	Flathead River	Cedar Creek
Constituent	**CAS Number**	**Fraction**						
TAL Metals								
Aluminum	7429-90-5	U	●	●	●	●	●	
Aluminum	7429-90-5	F	●	●				
Barium	7440-39-3	U	●	●	●	●	●	●
Barium	7440-39-3	F	●	●	●	●	●	●
Beryllium	7440-41-7	U	●					
Copper	7440-50-8	U	●	●				
Iron	7439-89-6	U		●	●	●	●	
Iron	7439-89-6	F		●			●	
Lead	7439-92-1	U	●					
Manganese	7439-96-5	U		●	●	●	●	
Vanadium	7440-62-2	U	●	●	●	●	●	
Other Inorganic Parameters								
Cyanide (Total)	57-12-5	U	●	●			●	●
Cyanide (Total)	57-12-5	F		●			●	
Cyanide (Free)	FREE CN	U	NA	●	●		●	●
Cyanide (Free)	FREE CN	F	NA		NA	NA	●	
Fluoride	16984-48-8	F	●					
Polycyclic Aromatic Hydrocarbons (PAHs)								
Benzo(A)Anthracene	56-55-3	U	●		NA	NA		NA
Benzo(A)Pyrene	50-32-8	U	●		NA	NA		NA
Benzo(B)Fluoranthene	205-99-2	U	●		NA	NA	●	NA
Benzo(G,H,I)Perylene	191-24-2	U	●		NA	NA		NA
Chrysene	218-01-9	U	●		NA	NA		NA

Table 4-18
Summary of Refined Surface Water COPECs by Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Exposure Area			North Percolation Pond	South Percolation Pond	Cedar Creek Reservoir Overflow Ditch	Northern Surface Water Feature	Flathead River	Cedar Creek
Constituent	**CAS Number**	**Fraction**						
Fluoranthene	206-44-0	U	●		NA	NA		NA
Indeno(1,2,3-C,D)Pyrene	193-39-5	U	●	●	NA	NA		NA
Pyrene	129-00-0	U	●		NA	NA	●	NA
TCL Semi-Volatile Organic Compounds (TCL SVOCs)								
Bis(2-Ethylhexyl) Phthalate	117-81-7	U			NA	NA	●	NA

Notes:

● - COPEC

Blank - Constituent measured but not COPEC

F - Filtered

NA - Not Applicable, constituent was not measured

PAH - Polycyclic Aromatic Hydrocarbons

SVOC - Semi-volatile organic compound

TAL - Target Analyte List

TCL - Target Compound List

U - Unfiltered

Table 4-19
Hot Spot Evaluation for Refined COPECs Eliminated
Due to Low Frequency of Detection
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	BTV Soil Background Concentration	Refined ESV	Maximum > Higher of 10x BTV or ESV?	Retain for Further Evaluation?
Main Plant Area (Soil)											
TAL Metals (mg/kg)											
Thallium	7440-28-0	152	1	1%	0.13	0.13	0.13	0.15	0.05	No	No (A)
Dioxins and Furans (mg/kg)											
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	58	2	3%	5.20E-08	6.40E-08	7.70E-08	2.60E-07	ND	No	No (A)
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1254 (Aroclor 1254)	11097-69-1	136	4	3%	0.056	0.073	0.11	ND	0.041	No	No (A)
Polychlorinated Biphenyl (PCBs)	1336-36-3	136	4	3%	0.056	0.073	0.11	ND	0.000332	**Yes**	No (B)
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
3- And 4- Methylphenol (Total)	106445	120	4	3%	0.011	0.023	0.036	ND	ND	NA	No (C)
Benzaldehyde	100-52-7	152	6	4%	0.0049	0.0302	0.093	0.181	ND	No	No (A)
Hexachlorobenzene	118-74-1	152	1	1%	0.091	0.091	0.091	0.012	0.079	No	No (A)
Pentachlorophenol	87-86-5	151	4	3%	0.17	0.32	0.53	0.28	0.36	No	No (A)
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)											
Isopropylbenzene (Cumene)	98-82-8	64	1	2%	0.0003	0.0003	0.0003	ND	ND	NA	No (C,D)
Central Landfill Area (Soil)											
TAL Metals (mg/kg)											
Antimony	7440-36-0	110	4	4%	0.37	0.91	1.5	0.43	0.27	No	No (A)
Cadmium	7440-43-9	110	5	5%	0.27	0.77	1.6	0.382	0.27	No	No (A)
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
Caprolactam	105-60-2	110	2	2%	0.039	0.052	0.066	0.11	ND	No	No (A)
Phenol	108-95-2	110	4	4%	0.016	0.349	1.2	0.052	0.79	No	No (A)
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)											
Cyclohexane	110-82-7	27	1	4%	0.00052	0.00052	0.00052	ND	ND	NA	No (C,D)
Isopropylbenzene (Cumene)	98-82-8	27	1	4%	0.00034	0.00034	0.00034	ND	ND	NA	No (C,D)
Industrial Landfill Area (Soil): NONE											
Eastern Undeveloped Area (Soil)											
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
Di-N-Butyl Phthalate	84-74-2	37	1	3%	0.22	0.22	0.22	0.075	0.011	No	No (C,D)
North-Central Undeveloped Area (Soil)											
TAL Metals (mg/kg)											
Cadmium	7440-43-9	54	2	4%	0.3	0.3	0.4	0.382	0.27	No	No (A)
Western Undeveloped Area (Soil)											
TAL Metals (mg/kg)											
Antimony	7440-36-0	82	1	1%	0.36	0.36	0.36	0.43	0.27	No	No (A)
Cadmium	7440-43-9	82	3	4%	0.48	0.64	0.78	0.382	0.27	No	No (A)
Thallium	7440-28-0	82	3	4%	0.12	0.22	0.41	0.15	0.05	No	No (A)
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
Di-N-Butyl Phthalate	84-74-2	82	4	5%	0.011	0.129	0.48	0.075	0.011	No	No (A)

Table 4-19
Hot Spot Evaluation for Refined COPECs Eliminated
Due to Low Frequency of Detection
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	BTV Soil Background Concentration	Refined ESV	Maximum > Higher of 10x BTV or ESV?	Retain for Further Evaluation?
Flathead River Riparian Area (Soil)											
TAL Metals (mg/kg)											
Selenium	7782-49-2	38	1	3%	0.65	0.65	0.65	1.376	0.52	No	No (A)
North Percolation Pond Area (Soil)											
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
Benzyl Butyl Phthalate	85-68-7	40	1	3%	0.55	0.55	0.55	0.12	90	No	No (A)
North Percolation Pond Area (Sediment)											
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
Acetophenone	98-86-2	22	1	5%	0.011	0.011	0.011	0.034	ND	No	No (A)
North Percolation Pond Area (Surface Water): NONE											
South Percolation Pond Area (Soil)											
TAL Metals (mg/kg)											
Antimony	7440-36-0	38	1	3%	0.67	0.67	0.67	0.43	0.27	No	No (A)
Thallium	7440-28-0	38	1	3%	0.2	0.2	0.2	0.15	0.05	No	No (A)
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
3- And 4- Methylphenol (Total)	106445	32	1	3%	0.13	0.13	0.13	ND	ND	NA	No (C,D)
Benzaldehyde	100-52-7	38	1	3%	0.038	0.038	0.038	0.0185	ND	No	No (A)
South Percolation Pond Area (Sediment)											
TAL Metals (mg/kg)											
Thallium	7440-28-0	26	1	4%	0.2	0.2	0.2	0.15	ND	No	No (A)
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
Benzaldehyde	100-52-7	26	1	4%	0.038	0.038	0.038	0.0185	ND	No	No (A)
South Percolation Pond Area (Surface Water): NONE											
Cedar Creek Overflow Ditch Area (All Media): NONE											
Northern Surface Water Feature Area (All Media): NONE											
Flathead River (Sediment)											
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
Fluorene	86-73-7	32	1	3%	0.03	0.03	0.03	0.022	ND	No	No (A)
Flathead River (Surface Water)											
TAL Metals (µg/L)											
Copper - Filtered	7440-50-8	49	2	4%	3	15	26	1.9	0.12	**Yes**	No (D)
Nickel - Filtered	7440-02-0	49	2	4%	1.3	16.8	32.2	1.3	32.612	No	No (A)
Cedar Creek (All Media): NONE											

Notes:
µg/L: microgram per liter
BTV: Background threshold value
ESV: Ecological screening value
mg/kg: milligram per kilogram
NA: Not applicable; BTV and ESV values not available.
ND: No background data/ESV available
PAH: Polycyclic Aromatic Hydrocarbons
PCB: Polychlorinated Biphenyls
SVOC: Semi-Volatile Organic Compounds
TAL: Target Analyte List
TCL: Target Compound List
VOC: Volatile Organic Compounds

Basis for excluding for further evaluation:
A: Detected concentrations do not exceed criteria (i.e., maximum concentration is lower than the greater of 10-times the BTV and ESV).
B: Total PCBs data are identical to PCB-1254 (Aroclor 1254) data, which were not retained for further evaluation.
C: Neither ESVs nor BTVs are available; therefore, there is no basis to retain chemical.
D: Only one sample was detected or one result exceeds criteria; therefore, multiple samples representing a hot spot are not present.

Table 4-20
Sitewide Summary of Non-Detected Constituents in Soil with MDLs Exceeding Minimum Soil ESVs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Detection Frequency	Minimum Detection Limit	Maximum Detection Limit	Minimum ESV	Maximum ESV	Comparison of Maximum Detection Limit to ESVs	Count of Detection Limits Exceeding Maximum ESV
Pesticides (mg/kg)								
Dieldrin	60-57-1	0 / 138	0.00084	0.0029	0.00238	0.00238	**Maximum DL > Maximum ESV**	3
Endrin	72-20-8	0 / 139	0.00082	0.0028	0.0014	0.0014	**Maximum DL > Maximum ESV**	13
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)								
1,2,4,5-Tetrachlorobenzene	95-94-3	0 / 721	0.00079	8.6	2.02	2.02	**Maximum DL > Maximum ESV**	7
1,4-Dioxane (P-Dioxane)	123-91-1	0 / 721	0.0057	62	2.05	2.05	**Maximum DL > Maximum ESV**	19
2,3,4,6-Tetrachlorophenol	58-90-2	0 / 721	0.0076	83	0.199	0.199	**Maximum DL > Maximum ESV**	75
2,4,5-Trichlorophenol	95-95-4	0 / 721	0.0013	14	4	4	**Maximum DL > Maximum ESV**	6
2,4,6-Trichlorophenol	88-06-2	0 / 721	0.001	11	9.94	9.94	**Maximum DL > Maximum ESV**	1
2,4-Dinitrophenol	51-28-5	0 / 721	0.049	540	0.0609	0.0609	**Maximum DL > Maximum ESV**	718
2,4-Dinitrotoluene	121-14-2	0 / 721	0.00091	9.9	1.28	1.28	**Maximum DL > Maximum ESV**	6
2,6-Dinitrotoluene	606-20-2	0 / 721	0.0011	12	0.0328	0.0328	**Maximum DL > Maximum ESV**	121
2-Chloronaphthalene	91-58-7	0 / 721	0.00084	9.2	0.0122	0.0122	**Maximum DL > Maximum ESV**	141
2-Chlorophenol	95-57-8	0 / 721	0.00085	9.3	0.243	0.243	**Maximum DL > Maximum ESV**	17
2-Methylphenol (O-Cresol)	95-48-7	0 / 721	0.0052	57	0.67	0.67	**Maximum DL > Maximum ESV**	20
2-Nitroaniline	88-74-4	0 / 721	0.0083	91	5.3	5.3	**Maximum DL > Maximum ESV**	4
2-Nitrophenol	88-75-5	0 / 721	0.001	11	1.6	1.6	**Maximum DL > Maximum ESV**	5
3,3'-Dichlorobenzidine	91-94-1	0 / 721	0.017	190	0.646	0.646	**Maximum DL > Maximum ESV**	58
3-Nitroaniline	99-09-2	0 / 721	0.0046	51	3.16	3.16	**Maximum DL > Maximum ESV**	4
4,6-Dinitro-2-Methylphenol	534-52-1	0 / 721	0.032	340	0.144	0.144	**Maximum DL > Maximum ESV**	190
4-Chloro-3-Methylphenol	59-50-7	0 / 721	0.00086	9.4	7.95	7.95	**Maximum DL > Maximum ESV**	1
4-Nitrophenol	100-02-7	0 / 721	0.013	140	5.12	5.12	**Maximum DL > Maximum ESV**	14
Bis(2-Chloroethoxy) Methane	111-91-1	0 / 721	0.00087	9.5	0.302	0.302	**Maximum DL > Maximum ESV**	16
Hexachlorobutadiene	87-68-3	0 / 721	0.0011	12	0.0398	0.0398	**Maximum DL > Maximum ESV**	90
Hexachlorocyclopentadiene	77-47-4	0 / 721	0.00093	10	0.755	0.755	**Maximum DL > Maximum ESV**	12
Hexachloroethane	67-72-1	0 / 721	0.00094	10	0.596	0.596	**Maximum DL > Maximum ESV**	12
Nitrobenzene	98-95-3	0 / 721	0.0067	73	1.31	1.31	**Maximum DL > Maximum ESV**	10
N-Nitrosodi-N-Propylamine	621-64-7	0 / 721	0.0012	14	0.544	0.544	**Maximum DL > Maximum ESV**	14
N-Nitrosodiphenylamine	86-30-6	0 / 721	0.0061	67	0.545	0.545	**Maximum DL > Maximum ESV**	32

Notes:
ESV, Ecological Screening Value
MDL, Method Detection Limit
mg/kg, milligrams per kilograms
SVOC, Semi-Volatile Organic Compound
TCL, Target Compound List

Table 4-21
Sitewide Summary of Non-Detected Constituents in Sediment with MDLs Exceeding Sediment ESVs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Detection Frequency	Minimum Detection Limit	Maximum Detection Limit	Minimum ESV	Maximum ESV	Comparison of Maximum Detection Limit to ESVs	Count of Detection Limits Exceeding Maximum ESV
Pesticides (mg/kg)								
Aldrin	309-00-2	0 / 138	0.00078	0.0027	0.002	0.002	**Maximum DL > Maximum ESV**	4
Dieldrin	60-57-1	0 / 137	0.00084	0.0029	0.0019	0.0019	**Maximum DL > Maximum ESV**	6
Endrin	72-20-8	0 / 138	0.00082	0.0028	0.0022	0.0022	**Maximum DL > Maximum ESV**	3
Heptachlor Epoxide	1024-57-3	0 / 138	0.001	0.0044	0.0025	0.0025	**Maximum DL > Maximum ESV**	8
P,P'-DDE	72-55-9	0 / 138	0.00079	0.0032	0.0032	0.0032	**Maximum DL > Maximum ESV**	1
Toxaphene	8001-35-2	0 / 138	0.019	0.065	0.000077	0.0001	**Maximum DL > Maximum ESV**	138
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)								
2,3,4,6-Tetrachlorophenol	58-90-2	0 / 387	0.0076	83	0.0011	14.0	**Maximum DL > Maximum ESV**	20
2,4,5-Trichlorophenol	95-95-4	0 / 387	0.0013	14	0.288	0.819	**Maximum DL > Maximum ESV**	8
2,4,6-Trichlorophenol	88-06-2	0 / 387	0.001	11	0.0008	10.5	**Maximum DL > Maximum ESV**	4
2,4-Dichlorophenol	120-83-2	0 / 387	0.0014	15	0.0004	5.78	**Maximum DL > Maximum ESV**	7
2,4-Dinitrophenol	51-28-5	0 / 387	0.049	540	0.0062	0.0062	**Maximum DL > Maximum ESV**	387
2,4-Dinitrotoluene	121-14-2	0 / 387	0.00091	9.9	0.0002	2.05504	**Maximum DL > Maximum ESV**	31
2,6-Dinitrotoluene	606-20-2	0 / 387	0.0011	12	0.0398	0.0398	**Maximum DL > Maximum ESV**	70
2-Chloronaphthalene	91-58-7	0 / 387	0.00084	9.2	0.417	0.417	**Maximum DL > Maximum ESV**	7
2-Chlorophenol	95-57-8	0 / 387	0.00085	9.3	0.0001	1.54	**Maximum DL > Maximum ESV**	26
2-Methylphenol (O-Cresol)	95-48-7	0 / 387	0.0052	57	0.0119	0.0554	**Maximum DL > Maximum ESV**	79
3,3'-Dichlorobenzidine	91-94-1	0 / 387	0.017	190	0.0005	6.2738	**Maximum DL > Maximum ESV**	51
4,6-Dinitro-2-Methylphenol	534-52-1	0 / 387	0.032	340	0.104	0.104	**Maximum DL > Maximum ESV**	221
4-Bromophenyl Phenyl Ether	101-55-3	0 / 387	0.0013	14	0.0047	60.762	Maximum DL < Maximum ESV	1
4-Chloro-3-Methylphenol	59-50-7	0 / 387	0.00086	9.4	0.388	0.388	**Maximum DL > Maximum ESV**	10
4-Nitrophenol	100-02-7	0 / 387	0.013	140	0.013	0.013	**Maximum DL > Maximum ESV**	386
Atrazine	1912-24-9	0 / 387	0.008	87	0.000025	0.327	**Maximum DL > Maximum ESV**	294
Hexachlorobenzene	118-74-1	0 / 387	0.0013	14	0.02	0.02	**Maximum DL > Maximum ESV**	112
Hexachlorobutadiene	87-68-3	0 / 387	0.0011	12	0.0265	0.0265	**Maximum DL > Maximum ESV**	68
Hexachlorocyclopentadiene	77-47-4	0 / 387	0.00093	10	0.901	0.901	**Maximum DL > Maximum ESV**	7
Nitrobenzene	98-95-3	0 / 387	0.0067	73	0.145	0.145	**Maximum DL > Maximum ESV**	41
N-Nitrosodiphenylamine	86-30-6	0 / 387	0.0061	67	0.0103	132.4	Maximum DL < Maximum ESV	1
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)								
1,1-Dichloroethane	75-34-3	0 / 17	0.00021	0.0017	0.0006	0.0006	**Maximum DL > Maximum ESV**	5
Bromomethane	74-83-9	0 / 17	0.00048	0.0038	0.0014	0.0014	**Maximum DL > Maximum ESV**	5

Notes:
ESV, Ecological Screening Value
MDL, Method Detection Limit
mg/kg, milligrams per kilograms
SVOC, Semi-Volatile Organic Compound
TCL, Target Compound List
VOC, Volatile Organic Compound

Table 4-22
Sitewide Summary of Non-Detected Constituents in Surface Water with MDLs Exceeding Minimum Surface Water ESVs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Detection Frequency	Minimum Detection Limit	Maximum Detection Limit	Minimum ESV	Maximum ESV	Comparison of Maximum Detection Limit to ESVs	Count of Detection Limits Exceeding Maximum ESV
TAL Metals (µg/L)									
Silver	7440-22-4	U	0 / 190	1.3	1.5	0.25	0.25	**Maximum DL > Maximum ESV**	190
Silver	7440-22-4	F	0 / 125	1.3	1.4	0.12	0.12	**Maximum DL > Maximum ESV**	125
Pesticides (µg/L)									
Gamma Bhc (Lindane)	58-89-9	U	0 / 4	0.004	0.012	0.01	0.01	**Maximum DL > Maximum ESV**	1
Heptachlor	76-44-8	U	0 / 4	0.003	0.004	0.0019	0.0038	**Maximum DL > Maximum ESV**	3
Heptachlor Epoxide	1024-57-3	U	0 / 4	0.004	0.005	0.0019	0.0038	**Maximum DL > Maximum ESV**	4
P,P'-DDD	72-54-8	U	0 / 4	0.005	0.006	0.001	0.001	**Maximum DL > Maximum ESV**	4
P,P'-DDE	72-55-9	U	0 / 4	0.002	0.004	0.001	0.001	**Maximum DL > Maximum ESV**	4
P,P'-DDT	50-29-3	U	0 / 4	0.004	0.004	0.0005	0.001	**Maximum DL > Maximum ESV**	4
Toxaphene	8001-35-2	U	0 / 4	0.06	0.11	0.0002	0.0002	**Maximum DL > Maximum ESV**	4
trans-Chlordane	5103-74-2	U	0 / 4	0.003	0.005	0.0043	0.0043	**Maximum DL > Maximum ESV**	3
Polychlorinated Biphenyls (PCBs) (µg/L)									
PCB-1016 (Aroclor 1016)	12674-11-2	U	0 / 4	0.098	0.1	0.000074	0.000074	**Maximum DL > Maximum ESV**	4
PCB-1221 (Aroclor 1221)	11104-28-2	U	0 / 4	0.098	0.1	0.000074	0.000074	**Maximum DL > Maximum ESV**	4
PCB-1232 (Aroclor 1232)	11141-16-5	U	0 / 4	0.098	0.1	0.000074	0.000074	**Maximum DL > Maximum ESV**	4
PCB-1242 (Aroclor 1242)	53469-21-9	U	0 / 4	0.098	0.1	0.000074	0.000074	**Maximum DL > Maximum ESV**	4
PCB-1248 (Aroclor 1248)	12672-29-6	U	0 / 4	0.098	0.1	0.000074	0.000074	**Maximum DL > Maximum ESV**	4
PCB-1254 (Aroclor 1254)	11097-69-1	U	0 / 4	0.084	0.099	0.000074	0.000074	**Maximum DL > Maximum ESV**	4
PCB-1260 (Aroclor 1260)	11096-82-5	U	0 / 4	0.084	0.099	0.000074	0.000074	**Maximum DL > Maximum ESV**	4
Polychlorinated Biphenyl (PCBs	1336-36-3	U	0 / 4	0.098	0.1	0.000074	0.014	**Maximum DL > Maximum ESV**	4
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (µg/L)									
Hexachlorobenzene	118-74-1	U	0 / 23	0.052	0.51	0.0003	0.0003	**Maximum DL > Maximum ESV**	23
Pentachlorophenol	87-86-5	U	0 / 23	0.22	2.4	0.5	16.0442415	Maximum DL < Maximum ESV	1
TCL Volatile Organic Compounds (TCL VOCs) (µg/L)									
Cis-1,3-Dichloropropene	10061-01-5	U	0 / 17	0.16	0.16	0.055	0.055	**Maximum DL > Maximum ESV**	17
Trans-1,3-Dichloropropene	10061-02-6	U	0 / 17	0.19	0.19	0.055	0.055	**Maximum DL > Maximum ESV**	17

Notes:
µg/L, microgram per liter
ESV, Ecological Screening Value
F, Filtered
MDL, Method Detection Limit
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
TAL, Target Analyte List
TCL, Target Compound List
VOC, Volatile Organic Compound
U, Unfiltered

Table 4-23
Sitewide Summary of Refined Soil COPECs Lacking Ecological Screening Values
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum BTV	Maximum BTV	Minimum Concentration	Mean Concentration	Maximum Concentration
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)									
3- And 4- Methylphenol (Total)	106445	95	7	7%	---	---	0.01	0.168	1
Benzaldehyde	100-52-7	58	8	14%	0.0069	0.0237	0.031	0.059	0.1
Caprolactam	105-60-2	38	2	5%	0.0154	0.0161	0.042	0.044	0.046
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)									
Cyclohexane	110-82-7	126	46	37%	---	---	0.00039	0.00193	0.0086
Isopropylbenzene (Cumene)	98-82-8	9	2	22%	---	---	0.0002	0.00036	0.00052
Methyl Acetate	79-20-9	157	43	27%	---	---	0.0016	0.059	0.6
Methylcyclohexane	108-87-2	153	66	43%	---	---	0.00027	0.003	0.015
M,P-Xylene	179601-23-1	153	87	57%	---	---	0.000091	0.001	0.0091
O-Xylene (1,2-Dimethylbenzene)	95-47-6	136	50	37%	---	---	0.00011	0.0006	0.0051

Notes:
---, No value
BTV, Background Threshold Value
mg/kg, milligrams per kilograms
SVOC, Semi-Volatile Organic Compound
TCL, Target Compound List
VOC, Volatile Organic Compound

Table 4-24
Sitewide Summary of Refined Sediment COPECs Lacking Ecological Screening Values
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum BTV	Maximum BTV	Minimum Concentration	Mean Concentration	Maximum Concentration
TAL Metals (mg/kg)									
Barium	7440-39-3	138	138	100%	55.08	154.95	19.6	246	972
Beryllium	7440-41-7	103	100	97%	0.256	0.534	0.22	0.960	17.2
Thallium	7440-28-0	51	20	39%	0.056	0.076	0.14	0.821	4.6
Vanadium	7440-62-2	103	103	100%	9.58	14.95	7.5	27.2	348
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)									
Acetophenone	98-86-2	48	4	8%	0.0006	0.0045	0.0085	0.010	0.011
Benzaldehyde	100-52-7	84	16	19%	0.0018	0.0237	0.0098	0.074	0.17
Carbazole	86-74-8	132	77	58%	0.0005	0.0031	0.0023	4.48	190
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)									
Cyclohexane	110-82-7	16	13	81%	---	---	0.00093	0.002	0.0046
Methyl Acetate	79-20-9	6	1	17%	---	---	0.11	0.11	0.11
Methylcyclohexane	108-87-2	16	13	81%	---	---	0.0014	0.005	0.0085

Notes:
---: No value
BTV: Background Threshold Value
mg/kg, milligrams per kilograms
SVOC, Semi-Volatile Organic Compound
TAL: Target Analyte List
TCL: Target Compound List
VOC, Volatile Organic Compound

Table 4-25
Sitewide Summary of Refined Surface Water COPECs Lacking Ecological Screening Values
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Detection Frequency	Minimum BTV	Maximum BTV	Minimum Concentration	Mean Concentration	Maximum Concentration
TAL Metals (µg/L)										
Vanadium	7440-62-2	U	162	27	17%	0.6	0.6	1.2	6.2	46.8
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (µg/L)										
3- And 4- Methylphenol (Total)	MEPH3MEPH4	U	5	1	20%	---	---	7.5	7.5	7.5
Benzaldehyde	100-52-7	U	6	1	17%	0.053	0.054	2.3	2.3	2.3
Caprolactam	105-60-2	U	6	1	17%	0.567	1.14	0.97	0.97	0.97
Carbazole	86-74-8	U	6	2	33%	0.024	0.025	1.9	2.4	2.9

Notes:
---: No value
µg/L, microgram per liter
BTV: Background Threshold Value
F, Filtered
SVOC, Semi-Volatile Organic Compound
TAL: Target Analyte List
TCL: Target Compound List
U, Unfiltered

Table 5-1
Summary of Ecological Receptors, Assessment Endpoints, Measurement Endpoints, and Risk Questions - Terrestrial Exposure Areas
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Ecological Receptor Category	Assessment Endpoints	Risk Questions	Focal Species/Level of Organization	Measurement Endpoints
Terrestrial Exposure Areas				
Soil Invertebrate Community	Survival, growth, and reproduction of amphibian populations to support the maintenance of viable and functional amphibian communities.	Are concentrations of site-related COPECs in surface water and sediment greater than effects thresholds for the survival, growth, or reproduction of amphibians?	Community	1) Comparisons of COPEC concentrations in surface water to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative amphibian test organisms. 2) Comparisons of COPEC concentrations in sediment to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative amphibian test organisms.
Terrestrial Plant Community	Survival, growth, and reproduction of terrestrial plant populations to support the maintenance of viable and functional terrestrial plant communities.	Are concentrations of site-related COPECs in soil greater than effects thresholds for the survival, growth, or reproduction of terrestrial plants?	Community	1) Comparisons of COPEC concentrations in surficial soil (0-2-feet bgs) to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative terrestrial plants.
Special Status Species Terrestrial Plant	Survival, growth, and reproduction of Spalding's Catchfly (*Silene spaldingii*) individuals, if present, to support the maintenance of viable and functional populations.	Are concentrations of site-related COPECs in soil greater than effects thresholds for the survival, growth, or reproduction of terrestrial plants?	Individual - Threatened	1) Comparisons of COPEC concentrations in surficial soil (0-2-feet bgs) to NOECs derived from survival, growth, and reproductive endpoints for representative terrestrial plants.
Reptiles	Survival, growth, and reproduction of reptile populations to support the maintenance of viable and functional reptilian communities.	Are concentrations of site-related COPECs in surface water and sediment greater than effects thresholds for the survival, growth, or reproduction of reptiles?	Community	1) Comparisons of COPEC concentrations in surface water to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative reptilian test organisms. 2) Comparisons of COPEC concentrations in sediment to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative reptilian test organisms.
Birds				
Carnivores	Survival, growth, and reproduction of avian carnivore populations to support the maintenance of viable and functional avian communities.	Does the daily dose of site-related COPEC experienced by carnivorous birds through the direct ingestion of dietary items, incidental ingestion of sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of avian test organisms?	Red-tailed hawk (Buteo jamaicensis)	Comparison of NOAEL and LOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.
Invertivores	Survival, growth, and reproduction of avian invertivore populations to support the maintenance of viable and functional avian communities.	Does the daily dose of site-related COPEC experienced by invertivorous birds through the direct ingestion of dietary items, incidental ingestion of soil/sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of avian test organisms?	American woodcock (*Scolopax minor*)	Comparison of NOAEL and LOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.
Herbivores	Survival, growth, and reproduction of avian herbivore populations to support the maintenance of viable and functional avian communities.	Does the daily dose of site-related COPEC experienced by herbivorous birds through the direct ingestion of dietary items, incidental ingestion of soil/sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of avian test organisms?	Mourning dove (*Zenaida macroura*)	Comparison of NOAEL and LOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.
Invertivores (Special Status Species)	Survival, growth, and reproduction of Yellow-billed Cuckoo (*Coccyzus americanus*) individuals, if present, to support the maintenance of viable and functional populations.	Does the daily dose of site-related COPEC experienced by Yellow-billed Cuckoo (*Coccyzus americanus*) through the direct ingestion of dietary items, incidental ingestion of soil/sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of avian test organisms?	Individual - Threatened Yellow-billed Cuckoo (*Coccyzus americanus*)	Comparison of NOAEL and LOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.

Table 5-1
Summary of Ecological Receptors, Assessment Endpoints, Measurement Endpoints, and Risk Questions - Terrestrial Exposure Areas
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Ecological Receptor Category	Assessment Endpoints	Risk Questions	Focal Species/Level of Organization	Measurement Endpoints
Mammals				
Carnivores	Survival, growth, and reproduction of mammalian carnivore populations to support the maintenance of viable and functional mammalian communities.	Does the daily dose of site-related COPEC experienced by carnivorous mammals through the direct ingestion of dietary items, incidental ingestion of sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of mammalian test organisms?	Long-tailed weasel (*Mustela frenata*)	Comparison of NOAEL and LOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.
Invertivores	Survival, growth, and reproduction of mammalian invertivore populations to support the maintenance of viable and functional mammalian communities.	Does the daily dose of site-related COPEC experienced by invertivorous mammals through the direct ingestion of dietary items, incidental ingestion of soil/sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of mammalian test organisms?	Northern short-tailed shrew (*Blarina brevicauda*)	Comparison of NOAEL and LOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.
Herbivores	Survival, growth, and reproduction of mammalian herbivore populations to support the maintenance of viable and functional mammalian communities.	Does the daily dose of site-related COPEC experienced by herbivorous mammals through the direct ingestion of dietary items, incidental ingestion of soil/sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of mammalian test organisms?	Meadow vole (Microtus pennsylvanicus)	Comparison of NOAEL and LOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.
Carnivores (Special Status Species)	Survival, growth, and reproduction of Canada Lynx (*Lynx canadensis*) individuals, if present, to support the maintenance of viable and functional populations.	Does the daily dose of site-related COPEC potentially experienced by Canada Lynx through the direct ingestion of dietary items, incidental ingestion of sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of mammalian test organisms?	Individual - Threatened Canada Lynx (*Lynx canadensis*)	Comparison of NOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.
Carnivores (Special Status Species)	Survival, growth, and reproduction of Grizzly Bear (*Ursus arctos horribilis*) individuals, if present, to support the maintenance of viable and functional populations.	Does the daily dose of site-related COPEC potentially experienced by Grizzly Bear through the direct ingestion of dietary items, incidental ingestion of sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of mammalian test organisms?	Individual - Threatened Grizzly Bear (*Ursus arctos horribilis*)	Comparison of NOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.
Carnivores (Special Status Species)	Survival, growth, and reproduction of North American Wolverine (*Gulo gulo luscus*) individuals, if present, to support the maintenance of viable and functional populations.	Does the daily dose of site-related COPEC potentially experienced by North American Wolverine through the direct ingestion of dietary items, incidental ingestion of sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of mammalian test organisms?	Individual - Proposed Threatened North American Wolverine (*Gulo gulo luscus*)	Comparison of NOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.

Notes:
bgs, Below ground surface
COPEC, Constituent of potential ecological concern
LOAEL, Lowest observed adverse effects level
LOEC, Lowest observed effect concentration
NOAEL, No observed adverse effects level
NOEC, No observed effect concentration

Table 5-2
Summary of Ecological Receptors, Assessment Endpoints, Measurement Endpoints, and Risk Questions - Transitional Exposure Areas
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Ecological Receptor Category	Assessment Endpoints	Risk Questions	Focal Species/Level of Organization	Measurement Endpoints
Transitional Exposure Areas				
Benthic invertebrate community	Survival, growth, and reproduction of benthic macroinvertebrate populations to support the maintenance of viable and functional benthic macroinvertebrate communities.	Are concentrations of site-related COPECs in sediment, pore water, or surface water greater than effects thresholds for the survival, growth, or reproduction of benthic invertebrates?	Population	Tier 1: 1) Comparisons of COPEC concentrations in bulk sediment to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative benthic invertebrate test organisms. 2) Comparisons of COPEC concentrations in surface water to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative benthic invertebrate test organisms. Tier 2: 3) Comparisons of COPEC concentrations in pore water to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative benthic invertebrate test organisms.
		Is the survival or growth of freshwater test organisms exposed to whole sediments from transitional exposure areas significantly lower than comparable endpoints for test organisms exposed to whole sediments from reference areas?	Population	Tier 3: 4) SQT Line of Evidence: Sediment Toxicity Testing Statistical comparisons of survival, growth, and biomass endpoints from chronic, long-term sediment toxicity testing of bulk sediments from aquatic exposure areas to comparable endpoints from reference areas.
		Is the benthic community structure in transitional exposure areas different from the benthic community structure in reference areas with similar habitat? If differences in structure are observed, are those differences explained by site-related COPEC concentrations in abiotic exposure media and/or other habitat parameters?	Community	5) SQT Line of Evidence: Benthic Invertebrate Community Analysis a) SQT Line of Evidence: Statistical comparisons of multiple metrics (e.g., richness, composition, tolerance measures) that measure the structure and function of benthic invertebrate communities between study and reference stations; statistical evaluation of the results of the multi-metric community analyses with site-related COPEC concentrations in exposure media and other habitat parameters. b) Multivariate statistical comparisons (e.g., ordination) of benthic invertebrate taxa-abundance data to evaluate the structure and function of benthic communities between exposure area and reference area stations.
Soil invertebrate community	Survival, growth, and reproduction of amphibian populations to support the maintenance of viable and functional amphibian communities.	Are concentrations of site-related COPECs in surface water and sediment greater than effects thresholds for the survival, growth, or reproduction of amphibians?	Population	1) Comparisons of COPEC concentrations in surface water to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative amphibian test organisms. 2) Comparisons of COPEC concentrations in sediment to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative amphibian test organisms.
Aquatic plant community	Survival, growth, and reproduction of aquatic plant populations to support the maintenance of viable and functional aquatic plant communities.	Are concentrations of site-related COPECs in surface water greater than effects thresholds for the survival, growth, or reproduction of aquatic plants?	Population	1) Comparisons of COPEC concentrations in surface water to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative aquatic plant test organisms.

Table 5-2
Summary of Ecological Receptors, Assessment Endpoints, Measurement Endpoints, and Risk Questions - Transitional Exposure Areas
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Ecological Receptor Category	Assessment Endpoints	Risk Questions	Focal Species/Level of Organization	Measurement Endpoints
Terrestrial plant community	Survival, growth, and reproduction of terrestrial plant populations to support the maintenance of viable and functional terrestrial plant communities.	Are concentrations of site-related COPECs in soil greater than effects thresholds for the survival, growth, or reproduction of terrestrial plants?	Population	1) Comparisons of COPEC concentrations in surficial soil (0-2-feet bgs) to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative terrestrial plants.
Amphibians	Survival, growth, and reproduction of amphibian populations to support the maintenance of viable and functional amphibian communities.	Are concentrations of site-related COPECs in surface water and sediment greater than effects thresholds for the survival, growth, or reproduction of amphibians?	Population	1) Comparisons of COPEC concentrations in surface water to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative amphibian test organisms. 2) Comparisons of COPEC concentrations in sediment to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative amphibian test organisms.
Reptiles	Survival, growth, and reproduction of reptile populations to support the maintenance of viable and functional reptilian communities.	Are concentrations of site-related COPECs in surface water and sediment greater than effects thresholds for the survival, growth, or reproduction of reptiles?	Population	1) Comparisons of COPEC concentrations in surface water to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative reptilian test organisms. 2) Comparisons of COPEC concentrations in sediment to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative reptilian test organisms.
Birds				
Terrestrial carnivores	Survival, growth, and reproduction of avian carnivore populations to support the maintenance of viable and functional avian communities.	Does the daily dose of site-related COPEC experienced by carnivorous birds through the direct ingestion of dietary items, incidental ingestion of sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of avian test organisms?	Red-tailed hawk (Buteo jamaicensis)	Comparison of NOAEL and LOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.
Terrestrial invertivores	Survival, growth, and reproduction of avian invertivore populations to support the maintenance of viable and functional avian communities.	Does the daily dose of site-related COPEC experienced by invertivorous birds through the direct ingestion of dietary items, incidental ingestion of soil/sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of avian test organisms?	American woodcock (*Scolopax minor*)	Comparison of NOAEL and LOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.
Terrestrial herbivores	Survival, growth, and reproduction of avian herbivore populations to support the maintenance of viable and functional avian communities.	Does the daily dose of site-related COPEC experienced by herbivorous birds through the direct ingestion of dietary items, incidental ingestion of soil/sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of avian test organisms?	Mourning dove (*Zenaida macroura*)	Comparison of NOAEL and LOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.
Semi-Aquatic invertivore	Survival, growth, and reproduction of semi-aquatic avian invertivore populations to support the maintenance of viable and functional avian communities.	Does the daily dose of site-related COPEC experienced by semi-aquatic invertivorous birds through the direct ingestion of dietary items, incidental ingestion of soil/sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of avian test organisms?	American dipper (*Cinclus mexicanus*)	Comparison of NOAEL and LOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, sediment, and surface water.

Table 5-2
Summary of Ecological Receptors, Assessment Endpoints, Measurement Endpoints, and Risk Questions - Transitional Exposure Areas
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Ecological Receptor Category	Assessment Endpoints	Risk Questions	Focal Species/Level of Organization	Measurement Endpoints
Mammals				
Terrestrial carnivores	Survival, growth, and reproduction of mammalian carnivore populations to support the maintenance of viable and functional mammalian communities.	Does the daily dose of site-related COPEC experienced by carnivorous mammals through the direct ingestion of dietary items, incidental ingestion of sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of mammalian test organisms?	Long-tailed weasel (*Mustela frenata*)	Comparison of NOAEL and LOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.
Terrestrial invertivores	Survival, growth, and reproduction of mammalian invertivore populations to support the maintenance of viable and functional mammalian communities.	Does the daily dose of site-related COPEC experienced by invertivorous mammals through the direct ingestion of dietary items, incidental ingestion of soil/sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of mammalian test organisms?	Northern short-tailed shrew (*Blarina brevicauda*)	Comparison of NOAEL and LOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.
Terrestrial herbivores	Survival, growth, and reproduction of mammalian herbivore populations to support the maintenance of viable and functional mammalian communities.	Does the daily dose of site-related COPEC experienced by herbivorous mammals through the direct ingestion of dietary items, incidental ingestion of soil/sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of mammalian test organisms?	Meadow Vole (Microtus pennsylvanicus)	Comparison of NOAEL and LOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.
Carnivores (Special Status Species)	Survival, growth, and reproduction of Canada Lynx (*Lynx canadensis*) individuals, if present, to support the maintenance of viable and functional populations.	Does the daily dose of site-related COPEC potentially experienced by Canada Lynx through the direct ingestion of dietary items, incidental ingestion of sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of mammalian test organisms?	Individual - Threatened Canada Lynx (*Lynx canadensis*)	Comparison of NOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.
Carnivores (Special Status Species)	Survival, growth, and reproduction of Grizzly Bear (*Ursus arctos horribilis*) individuals, if present, to support the maintenance of viable and functional populations.	Does the daily dose of site-related COPEC potentially experienced by Grizzly Bear through the direct ingestion of dietary items, incidental ingestion of sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of mammalian test organisms?	Individual - Threatened Grizzly Bear (*Ursus arctos horribilis*)	Comparison of NOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.
Carnivores (Special Status Species)	Survival, growth, and reproduction of North American Wolverine (*Gulo gulo luscus*) individuals, if present, to support the maintenance of viable and functional populations.	Does the daily dose of site-related COPEC potentially experienced by North American Wolverine through the direct ingestion of dietary items, incidental ingestion of sediment, and direct ingestion of surface water from transitional exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of mammalian test organisms?	Individual - Proposed Threatened North American Wolverine (*Gulo gulo luscus*)	Comparison of NOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs in dietary items, soil, and surface water.

Notes:
bgs, Below ground surface
COPEC, Constituent of potential ecological concern
LOAEL, Lowest observed adverse effects level
LOEC, Lowest observed effect concentration
NOAEL, No observed adverse effects level
NOEC, No observed effect concentration
SQT, Sediment quality triad

Table 5-3
Summary of Ecological Receptors, Assessment Endpoints, Measurement Endpoints, and Risk Questions - Aquatic Exposure Areas
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Ecological Receptor Category	Assessment Endpoints	Risk Questions	Focal Species/Level of Organization	Measurement Endpoints
Aquatic Exposure Areas				
Benthic invertebrate community	Survival, growth, and reproduction of benthic macroinvertebrate populations to support the maintenance of viable and functional benthic macroinvertebrate communities.	Are concentrations of site-related COPECs in sediment, pore water, or surface water greater than effects thresholds for the survival, growth, or reproduction of benthic invertebrates?	Population	Tier 1: 1) Comparisons of COPEC concentrations in bulk sediment to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative benthic invertebrate test organisms. 2) Comparisons of COPEC concentrations in surface water to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative benthic invertebrate test organisms. Tier 2: 3) Comparisons of COPEC concentrations in pore water to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative benthic invertebrate test organisms.
		Is the survival or growth of freshwater test organisms exposed to whole sediments from aquatic exposure areas significantly lower than comparable endpoints for test organisms exposed to whole sediments from reference areas?	Population	Tier 3: 4) SQT Line of Evidence: Sediment Toxicity Testing Statistical comparisons of survival, growth, and biomass endpoints from chronic, long-term sediment toxicity testing of bulk sediments from aquatic exposure areas to comparable endpoints from reference areas.
		Is the benthic community structure in aquatic exposure areas different from the benthic community structure in reference areas with similar habitat? If differences in structure are observed, are those differences explained by site-related COPEC concentrations in abiotic exposure media and/or other habitat parameters?	Community	5) SQT Line of Evidence: Benthic Invertebrate Community Analysis a) SQT Line of Evidence: Statistical comparisons of multiple metrics (e.g., richness, composition, tolerance measures) that measure the structure and function of benthic invertebrate communities between study and reference stations; statistical evaluation of the results of the multi-metric community analyses with site-related COPEC concentrations in exposure media and other habitat parameters. b) Multivariate statistical comparisons (e.g., ordination) of benthic invertebrate taxa-abundance data to evaluate the structure and function of benthic communities between exposure area and reference area stations.
Pelagic (water-column) invertebrates	Survival, growth, and reproduction of pelagic invertebrate populations to support the maintenance of viable and functional pelagic invertebrate communities.	Are concentrations of site-related COPECs in surface water greater than effects thresholds for the survival, growth, or reproduction of pelagic invertebrates?	Population	1) Comparisons of COPEC concentrations in surface water to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative pelagic invertebrate test organisms.
Aquatic plant community	Survival, growth, and reproduction of aquatic plant populations to support the maintenance of viable and functional aquatic plant communities.	Are concentrations of site-related COPECs in surface water greater than effects thresholds for the survival, growth, or reproduction of aquatic plants?	Population	1) Comparisons of COPEC concentrations in surface water to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative aquatic plant test organisms. 2) Comparisons of COPEC concentrations in pore water to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative aquatic plant test organisms.

Table 5-3
Summary of Ecological Receptors, Assessment Endpoints, Measurement Endpoints, and Risk Questions - Aquatic Exposure Areas
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Ecological Receptor Category	Assessment Endpoints	Risk Questions	Focal Species/Level of Organization	Measurement Endpoints
Fish	Survival, growth, and reproduction of fish populations to support the maintenance of viable and functional fish communities.	Are concentrations of site-related COPECs in surface water greater than effects thresholds for the survival, growth, or reproduction of fish?	Population	1) Comparisons of COPEC concentrations in surface water to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative fish test organisms (DEQ-7 standards are used preferentially).
Special Status Fish (Flathead River Only)	Survival, growth, and reproduction of Bull Trout (*Salvelinus confluentus*) individuals, if present, to support the maintenance of viable and functional populations.	Are concentrations of site-related COPECs in surface water greater than effects thresholds for the survival, growth, or reproduction of Bull Trout?	Individual - Threatened	1) Comparisons of COPEC concentrations in surface water to NOECs derived from survival, growth, and reproductive endpoints for salmonids.
Amphibians	Survival, growth, and reproduction of amphibian populations to support the maintenance of viable and functional amphibian communities.	Are concentrations of site-related COPECs in surface water greater than effects thresholds for the survival, growth, or reproduction of amphibians?	Population	1) Comparisons of COPEC concentrations in surface water to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative amphibian test organisms. 2) Comparisons of COPEC concentrations in pore water to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative amphibian test organisms.
Reptiles	Survival, growth, and reproduction of reptile populations to support the maintenance of viable and functional reptilian communities.	Are concentrations of site-related COPECs in surface water and sediment greater than effects thresholds for the survival, growth, or reproduction of reptiles?	Population	1) Comparisons of COPEC concentrations in surface water to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative reptilian test organisms. 2) Comparisons of COPEC concentrations in sediment to NOECs and LOECs derived from survival, growth, and reproductive endpoints for representative reptilian test organisms.
Birds				
Piscivores	Survival, growth, and reproduction of semi-aquatic avian populations to support the maintenance of viable and functional avian communities.	Does the daily dose of site-related COPEC experienced by piscivorous birds through the direct ingestion of dietary items, incidental ingestion of sediment, and direct ingestion of surface water from aquatic exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of avian test organisms?	Belted Kingfisher (*Megaceryle alcyon*)	Comparison of NOAEL and LOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs fish tissues, sediment, and surface water.
Invertivore		Does the daily dose of site-related COPEC experienced by omnivorous birds through the direct ingestion of dietary items, incidental ingestion of sediment, and direct ingestion of surface water from aquatic exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of avian test organisms?	American Dipper (*Cinclus mexicanus*)	Comparison of NOAEL and LOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs fish tissues, sediment, and surface water.
Mammals				
Piscivores	Survival, growth, and reproduction of piscivorous mammalian populations to support the maintenance of viable and functional mammalian communities.	Does the daily dose of site-related COPEC experienced by piscivorous mammals through the direct ingestion of dietary items, incidental ingestion of sediment, and direct ingestion of surface water from aquatic exposure areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of mammalian test organisms?	Mink (*Mustela vison*)	Comparison of NOAEL and LOAEL TRVs to dietary doses modeled using estimated concentrations of site-specific COPECs fish tissues, sediment, and surface water.

Notes:
COPEC, Constituent of potential ecological concern
DEQ, Department of Environmental Quality
LOAEL, Lowest observed adverse effects level
LOEC, Lowest observed effect concentration
NOAEL, No observed adverse effects level
NOEC, No observed effect concentration
SQT, Sediment quality triad
TRV, Toxicity reference values

Table 5-4
NOEC and LOEC Values Used to Evaluate Direct Contact Effects - Soil
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Soil Invertebrates			Plants		
	NOEC (mg/kg)	LOEC (mg/kg)	Source	NOEC (mg/kg)	LOEC (mg/kg)	Source
Dioxins and Furans						
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	5	10	LANL ESL	---	---	---
Other Inorganic Parameters						
Cyanide	---	---	---	6.4	---	
Fluoride	---	---	---	---	---	---
Polychlorinated Biphenyls (PCBs)						
PCB-1254 (Aroclor 1254)	---	---	---	160	620	LANL ESL
Polychlorinated Biphenyl (PCBs)	---	---	---	160	620	LANL ESL
Polycyclic Aromatic Hydrocarbons (PAHs)						
Total HMW PAHs	29	---	ECO-SSL	---	---	---
Total LMW PAHs	18	---	ECO-SSL	---	---	---
TAL Metals						
Antimony	78	780	LANL ESL	11	58	LANL ESL
Arsenic	6.8	68	LANL ESL	18	91	LANL ESL
Barium	330	3200	LANL ESL	110	260	LANL ESL
Beryllium	40	400	LANL ESL	2.5	25	LANL ESL
Cadmium	140	760	LANL ESL	32	160	LANL ESL
Chromium, Total	3360	---	LANL PRG	3360	---	LANL PRG
Cobalt	---	---	---	13	130	LANL ESL
Copper	80	530	LANL ESL	70	490	LANL ESL
Lead	1700	8400	LANL ESL	120	570	LANL ESL
Manganese	450	4500	LANL ESL	220	1100	LANL ESL
Mercury	0.05	0.5	LANL ESL	34	64	LANL ESL
Nickel	280	1300	LANL ESL	38	270	LANL ESL
Selenium	4.1	41	LANL ESL	0.52	3	LANL ESL
Silver	---	---	---	560	2800	LANL ESL
Thallium	---	---	---	0.05	0.5	LANL ESL
Vanadium	---	---	---	60	80	LANL ESL
Zinc	120	930	LANL ESL	160	810	LANL ESL
TCL Semi-Volatile Organic Compounds (TCL SVOCs)						
3- And 4- Methylphenol (Total)	---	---	---	0.67	7	LANL ESL
4-Chloroaniline	1.8	18	LANL ESL	1	10	LANL ESL
Benzaldehyde	---	---	---	---	---	---
Bis(2-Ethylhexyl) Phthalate	---	---	---	---	---	---
Caprolactam	---	---	---	---	---	---
Carbazole	---	---	---	---	---	---
Dibenzofuran	---	---	---	6.1	61	LANL ESL
Di-N-Butyl Phthalate	---	---	---	160	600	LANL ESL

Table 5-4
NOEC and LOEC Values Used to Evaluate Direct Contact Effects - Soil
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Soil Invertebrates			Plants		
	NOEC (mg/kg)	LOEC (mg/kg)	Source	NOEC (mg/kg)	LOEC (mg/kg)	Source
TCL Volatile Organic Compounds (TCL VOCs)						
Cyclohexane	---	---	---	---	---	---
Isopropylbenzene (Cumene)	---	---	---	---	---	---
M,P-Xylene	---	---	---	100	1000	LANL ESL
Methyl Acetate	---	---	---	---	---	---
Methylcyclohexane	---	---	---	---	---	---
O-Xylene (1,2-Dimethylbenzene)	---	---	---	---	---	---

Notes:
---, Value not applicable
Eco-SSL, USEPA Ecological Soil Screening Level
HMW, High molecular weight
LANL ESL, Los Alamos National Laboratory Ecological Screening Level (LANL, 2018)
LANL PRG, Los Alamos National Laboratory Preliminary Remediation Goal (LANL, 2018)
LMW, Low molecular weight
LOEC, Lowest observed effect concentration
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
TAL, Target analyte list
TCL, Target compound list

Table 5-5
NOEC and LOEC Values Used to Evaluate Direct Contact Effects - Surface Water
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fish/Herptiles			Benthic/Pelagic Invertebrates			Water Column Invertebrates			Aquatic Plants		
	NOEC (µg/L)	LOEC (µg/L)	Source	NOEC (µg/L)	LOEC (µg/L)	Source	NOEC (µg/L)	LOEC (µg/L)	Source	NOEC (µg/L)	LOEC (µg/L)	Source
Other Inorganic Parameters												
Cyanide (Total)	5.2	22	LANL ESL	5.2	22	LANL ESL	5.2	22	LANL ESL	5.2	22	LANL ESL
Cyanide (Free)	5.2	22	LANL ESL	5.2	22	LANL ESL	5.2	22	LANL ESL	5.2	22	LANL ESL
Fluoride	---	6000	Pearcy et al. 2015	1800	4100	Pearcy et al. 2015	1800	4100	Pearcy et al. 2015	66500	380000	Rai et al. 1998
Nitrogen, Ammonia (As N)	---	---	---	---	---	---	---	---	---	---	---	---
Polycyclic Aromatic Hydrocarbons (PAHs)												
Benzo(A)Anthracene	2.227	---	EPA (2003) FCV	2.227	---	EPA (2003) FCV	2.227	---	EPA (2003) FCV	2.227	---	EPA (2003) FCV
Benzo(A)Pyrene	0.9573	---	EPA (2003) FCV	0.9573	---	EPA (2003) FCV	0.9573	---	EPA (2003) FCV	0.9573	---	EPA (2003) FCV
Benzo(B)Fluoranthene	0.6774	---	EPA (2003) FCV	0.6774	---	EPA (2003) FCV	0.6774	---	EPA (2003) FCV	0.6774	---	EPA (2003) FCV
Benzo(G,H,I)Perylene	0.4391	---	EPA (2003) FCV	0.4391	---	EPA (2003) FCV	0.4391	---	EPA (2003) FCV	0.4391	---	EPA (2003) FCV
Benzo(K)Fluoranthene	0.6415	---	EPA (2003) FCV	0.6415	---	EPA (2003) FCV	0.6415	---	EPA (2003) FCV	0.6415	---	EPA (2003) FCV
Chrysene	2.042	---	EPA (2003) FCV	2.042	---	EPA (2003) FCV	2.042	---	EPA (2003) FCV	2.042	---	EPA (2003) FCV
Dibenz(A,H)Anthracene	0.2825	---	EPA (2003) FCV	0.2825	---	EPA (2003) FCV	0.2825	---	EPA (2003) FCV	0.2825	---	EPA (2003) FCV
Indeno(1,2,3-C,D)Pyrene	0.275	---	EPA (2003) FCV	0.275	---	EPA (2003) FCV	0.275	---	EPA (2003) FCV	0.275	---	EPA (2003) FCV
Pyrene	10.11	---	EPA (2003) FCV	10.11	---	EPA (2003) FCV	10.11	---	EPA (2003) FCV	10.11	---	EPA (2003) FCV
Fluoranthene	7.109	---	EPA (2003) FCV	7.109	---	EPA (2003) FCV	7.109	---	EPA (2003) FCV	7.109	---	EPA (2003) FCV
TAL Metals												
Aluminum	87*	750*	DEQ-7	87*	750*	DEQ-7	87*	750*	DEQ-7	87*	750*	DEQ-7
Arsenic	150	340	LANL ESL	150	340	LANL ESL	150	340	LANL ESL	150	340	LANL ESL
Barium	3.9	39	LANL ESL	3.9	39	LANL ESL	3.9	39	LANL ESL	3.9	39	LANL ESL
Beryllium	0.66	6.6	LANL ESL	0.66	6.6	LANL ESL	0.66	6.6	LANL ESL	0.66	6.6	LANL ESL
Cadmium	0.25*	0.49*	DEQ-7	0.25*	0.49*	DEQ-7	0.25*	0.49*	DEQ-7	0.25*	0.49*	DEQ-7
Copper	2.85*	3.79*	DEQ-7	2.85*	3.79*	DEQ-7	2.85*	3.79*	DEQ-7	2.85*	3.79*	DEQ-7
Iron	1000	10000	LANL ESL	1000	10000	LANL ESL	1000	10000	LANL ESL	1000	10000	LANL ESL
Lead	0.545*	13.98*	DEQ-7	0.545*	13.98*	DEQ-7	0.545*	13.98*	DEQ-7	0.545*	13.98*	DEQ-7
Manganese	1300	2300	LANL ESL	1300	2300	LANL ESL	1300	2300	LANL ESL	1300	2300	LANL ESL
Nickel	16.1*	145*	DEQ-7	16.1*	145*	DEQ-7	16.1*	145*	DEQ-7	16.1*	145*	DEQ-7
Vanadium	19	190	LANL ESL	19	190	LANL ESL	19	190	LANL ESL	19	190	LANL ESL
Zinc	37*	37*	DEQ-7	37*	37*	DEQ-7	37*	37*	DEQ-7	37*	37*	DEQ-7
TCL Semi-Volatile Organic Compounds (TCL SVOCs)												
3- And 4- Methylphenol (Total)	---	---	---	---	---	---	---	---	---	---	---	---
Acetophenone	---	---	---	---	---	---	---	---	---	---	---	---
Benzaldehyde	---	---	---	---	---	---	---	---	---	---	---	---
Bis(2-Ethylhexyl) Phthalate	32	320	LANL ESL	32	320	LANL ESL	32	320	LANL ESL	32	320	LANL ESL
Caprolactam	---	---	---	---	---	---	---	---	---	---	---	---
Carbazole	---	---	---	---	---	---	---	---	---	---	---	---
Phenol	320	3200	LANL ESL	320	3200	LANL ESL	320	3200	LANL ESL	320	3200	LANL ESL
TCL Volatile Organic Compounds (TCL VOCs)												
Toluene	9.8	98	LANL ESL	9.8	98	LANL ESL	9.8	98	LANL ESL	9.8	98	LANL ESL

Notes:
---, Value not applicable
µg/L, micrograms per liter
DEQ, Department of Environmental Quality
EPA, Environmental Protection Agency
FCV, Final chronic value
LANL ESL, Los Alamos National Laboratory Ecological Screening Level (LANL, 2018)
LOEC, Lowest observed effect concentration
NOEC, No observed effect concentration
PAH, Polycyclic Aromatic Hydrocarbons
SVOC, Semi-volatile organic compound
TAL, Target analyte list
TCL, Target compound list
VOC, Volatile organic compound
Citations - see report reference list.
An asterisk (*) indicates that the NOEC and LOEC are sample specific. Default values are presented in this table.

Table 5-6
NOEC and LOEC Values Used to Evaluate Direct Contact Effects - Sediment
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Benthic Invertebrates		
	NOEC (mg/kg)	LOEC (mg/kg)	Source
Other Inorganic Parameters			
Cyanide (Total)	0.1	1	LANL ESL
Cyanide (Free)	---	---	---
Polycyclic Aromatic Hydrocarbons (PAHs)			
2-Methylnaphthalene	$\sum ESBTU_{FCV,Total}$ = 1, protective of benthic receptors based on USEPA (2003)	$\sum ESBTU_{FCV,Total}$ = 10, indicative of frequent adverse effects to benthic receptors based on USEPA (2003)	USEPA (2003)
Acenaphthene			
Acenaphthylene			
Anthracene			
Benzo(A)Anthracene			
Benzo(A)Pyrene			
Benzo(B)Fluoranthene			
Benzo(G,H,I)Perylene			
Benzo(K)Fluoranthene			
Chrysene			
Dibenz(A,H)Anthracene			
Fluoranthene			
Fluorene			
Indeno(1,2,3-C,D)Pyrene			
Naphthalene			
Phenanthrene			
Pyrene			
Total HMW PAHs			
Total LMW PAHs			
Total PAHs			
TAL Metals			
Antimony	---	---	---
Arsenic	9.7	33	LANL ESL
Barium	150	300	LANL ESL
Beryllium	---	---	---
Cadmium	0.99	4.9	LANL ESL
Chromium, Total	43	110	LANL ESL
Copper	31	140	LANL ESL
Lead	35	120	LANL ESL
Manganese	460	1100	LANL ESL
Mercury	0.18	1	LANL ESL
Nickel	22	48	LANL ESL
Selenium	0.72	2.9	LANL ESL
Silver	0.5	5	LANL ESL
Thallium	---	---	---
Vanadium	---	---	---
Zinc	120	450	LANL ESL
TCL Semi-Volatile Organic Compounds (TCL SVOCs)			
4-Chloroaniline	---	---	---
Acetophenone	---	---	---
Benzaldehyde	---	---	---
Carbazole	---	---	---
TCL Volatile Organic Compounds (TCL VOCs)			
Cyclohexane	---	---	---
Methyl Acetate	---	---	---
Methylcyclohexane	---	---	---

Table 5-6
NOEC and LOEC Values Used to Evaluate Direct Contact Effects - Sediment
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:
---, Value not applicable
ESBTU, Equilibrium partitioning sediment benchmark toxic unit
FCV, Final chronic value
HMW, High molecular weight
LANL ESL, Los Alamos National Laboratory Ecological Screening Level (LANL, 2018)
LMW, Low molecular weight
LOEC, Lowest observed effect concentration
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
PAH, Polycyclic Aromatic Hydrocarbons
SVOC, Semi-volatile organic compound
TAL, Target analyte list
TCL, Target compound list
USEPA, United States Environmental Protection Agency
VOC, Volatile organic compound

Table 5-7
Areal Proportions Used to Evaluate Cumulative Risk for Large Range Receptors
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Species	Ecological Exposure Area	Main Plant Area	Cedar Creek Reservoir Overflow Ditch	South Percolation Pond Area	Northern Surface Water Feature	North Percolation Pond Area	Central Landfills Area	Industrial Landfill Area	Eastern Undeveloped Area	North-Central Undeveloped Area	Western Undeveloped Area	Flathead River Riparian Area	Outside of Site Boundary	Total
American Woodcock (11.1 acres)	Main Plant Area	1	0	0	0	0	0	0	0	0	0	0	0	1
	Cedar Creek Reservoir Overflow Ditch	4.4E-05	0.03366	0	0	0	0.96629	0	0	0	0	0	8.1E-06	1
	South Percolation Pond Area	0.00383	0	0.22379	0	0	0	0	0	0	0	0.6959	0.07649	1
	Northern Surface Water Feature	0	0	0	0.09953	0	0.04368	0	0	0.85678	0	0	1.1E-05	1
	North Percolation Pond Area	0	0	0	0	1	0	0	0	0	0	0	0	1
	Central Landfills Area	0	0	0	0	0	1	0	0	0	0	0	0	1
	Industrial Landfill Area	0	0	0	0	0	0	1	0	0	0	0	0	1
	Eastern Undeveloped Area	0	0	0	0	0	0	0	1	0	0	0	0	1
	North-Central Undeveloped Area	0	0	0	0	0	0	0	0	1	0	0	0	1
	Western Undeveloped Area	0	0	0	0	0	0	0	0	0	1	0	0	1
	Flathead River Riparian Area	0	0	0	0	0	0	0	0	0	0	1	0	1
Mourning Dove (1,986 acres)	Main Plant Area	0.11674	0.00213	0.00456	0.00307	0.00567	0.06838	0.00622	0.04885	0.06059	0.14722	0.04329	0.49329	1
	Cedar Creek Reservoir Overflow Ditch	0.11674	0.00242	0.00456	0.00307	0.00567	0.06838	0.00637	0.04885	0.07193	0.10814	0.03708	0.52679	1
	South Percolation Pond Area	0.11674	0.00171	0.00456	0.00257	0.00567	0.06747	0	0.04885	0.0243	0.09426	0.04371	0.59017	1
	Northern Surface Water Feature	0.10435	0.00206	0.00083	0.00307	0.00567	0.06838	0.00637	0.01756	0.07277	0.18966	0.01615	0.51314	1
	North Percolation Pond Area	0.11063	0.00206	0.00349	0.00307	0.00567	0.06838	0.00637	0.0201	0.07273	0.22131	0.04075	0.44544	1
	Central Landfills Area	0.11674	0.00261	0.00456	0.00307	0.00567	0.06838	0.00637	0.04831	0.07277	0.15352	0.03609	0.48191	1
	Industrial Landfill Area	0.07672	0.00183	0	0.00307	0.00567	0.06838	0.00637	0.00371	0.07277	0.17361	0	0.58786	1
	Eastern Undeveloped Area	0.11514	0.00183	0.00456	0	0.00183	0.06812	0	0.04885	0.01723	0.01346	0.03556	0.69342	1
	North-Central Undeveloped Area	0.09298	0.002	0	0.00307	0.00567	0.06838	0.00637	0.01253	0.07277	0.16196	0	0.57428	1
	Western Undeveloped Area	0.09203	0.00144	0.00165	0.00307	0.00567	0.06189	0.00637	0.00012	0.07226	0.22016	0.03383	0.50152	1
	Flathead River Riparian Area	0.11674	0.00167	0.00456	0.00284	0.00567	0.06501	0	0.04885	0.0271	0.15606	0.04727	0.52422	1
Red-tailed Hawk (551 acres)	Main Plant Area	0.41086	0.00321	0.01616	0	0.00673	0.14999	0	0.09046	0.02215	0.06461	0.11571	0.12013	1
	Cedar Creek Reservoir Overflow Ditch	0.25925	0.00508	0	0	0.00528	0.24489	0	0.102	0.0425	0.00686	0	0.33412	1
	South Percolation Pond Area	0.36646	0	0.01643	0	0	0	0	0.05217	0	0.004	0.12072	0.44023	1
	Northern Surface Water Feature	0.03791	0.00438	0	0.01107	0.02042	0.18641	0.02295	0	0.25957	0.29045	0	0.16684	1
	North Percolation Pond Area	0.17674	0	0	0.01107	0.02042	0.11426	0.01286	0	0.14313	0.48907	0.00242	0.03002	1
	Central Landfills Area	0.20036	0.00502	0	0.00991	0.0083	0.24648	0.00171	0.03964	0.16385	0.01576	0	0.30897	1
	Industrial Landfill Area	0	0.00422	0	0.01107	0.00982	0.10395	0.02295	0	0.25881	0.25318	0	0.33601	1
	Eastern Undeveloped Area	0.20338	0.00433	0.01046	0	0	0.04773	0	0.17606	0	0	0.0421	0.51595	1
	North-Central Undeveloped Area	0	0.00476	0	0.01107	0.00969	0.16347	0.02295	0	0.26035	0.21115	0	0.31656	1
	Western Undeveloped Area	0.05779	0	0	0.00929	0.01578	0.00333	0	0	0.1001	0.61423	0.00036	0.19911	1
	Flathead River Riparian Area	0.29373	0	0.01365	0	0	0	0	0	0	0.07579	0.12229	0.49453	1

Table 5-7
Areal Proportions Used to Evaluate Cumulative Risk for Large Range Receptors
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Species	Ecological Exposure Area	Main Plant Area	Cedar Creek Reservoir Overflow Ditch	South Percolation Pond Area	Northern Surface Water Feature	North Percolation Pond Area	Central Landfills Area	Industrial Landfill Area	Eastern Undeveloped Area	North-Central Undeveloped Area	Western Undeveloped Area	Flathead River Riparian Area	Outside of Site Boundary	Total
Yellow-billed Cuckoo (42 acres)	Main Plant Area	1	0	0	0	0	0	0	0	0	0	0	3.4E-06	1
	Cedar Creek Reservoir Overflow Ditch	0.14086	0.01757	0	0	0	0.8135	0	0.02237	0	0	0	0.0057	1
	South Percolation Pond Area	0.19725	0	0.11426	0	0	0	0	0	0	0	0.5447	0.14379	1
	Northern Surface Water Feature	0	0	0	0.05338	0	0.16259	0.04575	0	0.73827	0	0	5.5E-06	1
	North Percolation Pond Area	0.00325	0	0	0.00027	0.19789	0	0	0	0.30549	0.49307	0	4.2E-05	1
	Central Landfills Area	0	0	0	0	0	1	0	0	0	0	0	0	1
	Industrial Landfill Area	0	0	0	0.00733	0	0	0.30108	0	0.54423	0.14735	0	4.4E-06	1
	Eastern Undeveloped Area	0	0	0	0	0	0	0	1	0	0	0	0	1
	North-Central Undeveloped Area	0	0	0	0	0	0	0	0	1	0	0	0	1
	Western Undeveloped Area	0	0	0	0	0	0	0	0	0	1	0	0	1
	Flathead River Riparian Area	0	0	0	0	0	0	0	0	0	0	1	0	1
Canada Lynx (10,625 acres)	Main Plant Area	0.02182	0.00049	0.00085	0.00057	0.00106	0.01278	0.00119	0.00913	0.0136	0.04137	0.00884	0.88829	1
	Cedar Creek Reservoir Overflow Ditch	0.02182	0.00049	0.00085	0.00057	0.00106	0.01278	0.00119	0.00913	0.0136	0.04137	0.00884	0.88829	1
	South Percolation Pond Area	0.02182	0.00049	0.00085	0.00057	0.00106	0.01278	0.00119	0.00913	0.0136	0.04137	0.00884	0.88829	1
	Northern Surface Water Feature	0.02182	0.00049	0.00085	0.00057	0.00106	0.01278	0.00119	0.00913	0.0136	0.04137	0.00884	0.88829	1
	North Percolation Pond Area	0.02182	0.00049	0.00085	0.00057	0.00106	0.01278	0.00119	0.00913	0.0136	0.04137	0.00884	0.88829	1
	Central Landfills Area	0.02182	0.00049	0.00085	0.00057	0.00106	0.01278	0.00119	0.00913	0.0136	0.04137	0.00884	0.88829	1
	Industrial Landfill Area	0.02182	0.00049	0.00085	0.00057	0.00106	0.01278	0.00119	0.00913	0.0136	0.04137	0.00884	0.88829	1
	Eastern Undeveloped Area	0.02182	0.00049	0.00085	0.00057	0.00106	0.01278	0.00119	0.00913	0.0136	0.04137	0.00884	0.88829	1
	North-Central Undeveloped Area	0.02182	0.00049	0.00085	0.00057	0.00106	0.01278	0.00119	0.00913	0.0136	0.04137	0.00884	0.88829	1
	Western Undeveloped Area	0.02182	0.00049	0.00085	0.00057	0.00106	0.01278	0.00119	0.00913	0.0136	0.04137	0.00884	0.88829	1
	Flathead River Riparian Area	0.02182	0.00049	0.00085	0.00057	0.00106	0.01278	0.00119	0.00913	0.0136	0.04137	0.00884	0.88829	1
Grizzly Bear (32,000 acres)	Main Plant Area	0.00725	0.00016	0.00028	0.00019	0.00035	0.00424	0.0004	0.00303	0.00452	0.01374	0.00293	0.96291	1
	Cedar Creek Reservoir Overflow Ditch	0.00725	0.00016	0.00028	0.00019	0.00035	0.00424	0.0004	0.00303	0.00452	0.01374	0.00293	0.96291	1
	South Percolation Pond Area	0.00725	0.00016	0.00028	0.00019	0.00035	0.00424	0.0004	0.00303	0.00452	0.01374	0.00293	0.96291	1
	Northern Surface Water Feature	0.00725	0.00016	0.00028	0.00019	0.00035	0.00424	0.0004	0.00303	0.00452	0.01374	0.00293	0.96291	1
	North Percolation Pond Area	0.00725	0.00016	0.00028	0.00019	0.00035	0.00424	0.0004	0.00303	0.00452	0.01374	0.00293	0.96291	1
	Central Landfills Area	0.00725	0.00016	0.00028	0.00019	0.00035	0.00424	0.0004	0.00303	0.00452	0.01374	0.00293	0.96291	1
	Industrial Landfill Area	0.00725	0.00016	0.00028	0.00019	0.00035	0.00424	0.0004	0.00303	0.00452	0.01374	0.00293	0.96291	1
	Eastern Undeveloped Area	0.00725	0.00016	0.00028	0.00019	0.00035	0.00424	0.0004	0.00303	0.00452	0.01374	0.00293	0.96291	1
	North-Central Undeveloped Area	0.00725	0.00016	0.00028	0.00019	0.00035	0.00424	0.0004	0.00303	0.00452	0.01374	0.00293	0.96291	1
	Western Undeveloped Area	0.00725	0.00016	0.00028	0.00019	0.00035	0.00424	0.0004	0.00303	0.00452	0.01374	0.00293	0.96291	1
	Flathead River Riparian Area	0.00725	0.00016	0.00028	0.00019	0.00035	0.00424	0.0004	0.00303	0.00452	0.01374	0.00293	0.96291	1

Table 5-7
Areal Proportions Used to Evaluate Cumulative Risk for Large Range Receptors
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Species	Ecological Exposure Area	Main Plant Area	Cedar Creek Reservoir Overflow Ditch	South Percolation Pond Area	Northern Surface Water Feature	North Percolation Pond Area	Central Landfills Area	Industrial Landfill Area	Eastern Undeveloped Area	North-Central Undeveloped Area	Western Undeveloped Area	Flathead River Riparian Area	Outside of Site Boundary	Total
Long-tailed Weasel (12 acres)	Main Plant Area	1	0	0	0	0	0	0	0	0	0	0	0	1
	Cedar Creek Reservoir Overflow Ditch	0.00316	0.03243	0	0	0	0.9644	0	0	0	0	0	8.1E-06	1
	South Percolation Pond Area	0.01131	0	0.21674	0	0	0	0	0	0	0	0.69068	0.08127	1
	Northern Surface Water Feature	0	0	0	0.10047	0	0.05364	0	0	0.84588	0	0	9.6E-06	1
	North Percolation Pond Area	0	0	0	0	1	0	0	0	0	0	0	0	1
	Central Landfills Area	0	0	0	0	0	1	0	0	0	0	0	0	1
	Industrial Landfill Area	0	0	0	0	0	0	1	0	0	0	0	0	1
	Eastern Undeveloped Area	0	0	0	0	0	0	0	1	0	0	0	0	1
	North-Central Undeveloped Area	0	0	0	0	0	0	0	0	1	0	0	0	1
	Western Undeveloped Area	0	0	0	0	0	0	0	0	0	1	0	0	1
	Flathead River Riparian Area	0	0	0	0	0	0	0	0	0	0	1	0	1
Meadow Vole (0.13 acre)	Main Plant Area	1	0	0	0	0	0	0	0	0	0	0	0	1
	Cedar Creek Reservoir Overflow Ditch	0	1	0	0	0	0	0	0	0	0	0	0	1
	South Percolation Pond Area	0	0	1	0	0	0	0	0	0	0	0	0	1
	Northern Surface Water Feature	0	0	0	1	0	0	0	0	0	0	0	0	1
	North Percolation Pond Area	0	0	0	0	1	0	0	0	0	0	0	0	1
	Central Landfills Area	0	0	0	0	0	1	0	0	0	0	0	0	1
	Industrial Landfill Area	0	0	0	0	0	0	1	0	0	0	0	0	1
	Eastern Undeveloped Area	0	0	0	0	0	0	0	1	0	0	0	0	1
	North-Central Undeveloped Area	0	0	0	0	0	0	0	0	1	0	0	0	1
	Western Undeveloped Area	0	0	0	0	0	0	0	0	0	1	0	0	1
	Flathead River Riparian Area	0	0	0	0	0	0	0	0	0	0	1	0	1
North American Wolverine (26,000 acres)	Main Plant Area	0.00892	0.0002	0.00035	0.00023	0.00043	0.00522	0.00049	0.00373	0.00556	0.01691	0.00361	0.95435	1
	Cedar Creek Reservoir Overflow Ditch	0.00892	0.0002	0.00035	0.00023	0.00043	0.00522	0.00049	0.00373	0.00556	0.01691	0.00361	0.95435	1
	South Percolation Pond Area	0.00892	0.0002	0.00035	0.00023	0.00043	0.00522	0.00049	0.00373	0.00556	0.01691	0.00361	0.95435	1
	Northern Surface Water Feature	0.00892	0.0002	0.00035	0.00023	0.00043	0.00522	0.00049	0.00373	0.00556	0.01691	0.00361	0.95435	1
	North Percolation Pond Area	0.00892	0.0002	0.00035	0.00023	0.00043	0.00522	0.00049	0.00373	0.00556	0.01691	0.00361	0.95435	1
	Central Landfills Area	0.00892	0.0002	0.00035	0.00023	0.00043	0.00522	0.00049	0.00373	0.00556	0.01691	0.00361	0.95435	1
	Industrial Landfill Area	0.00892	0.0002	0.00035	0.00023	0.00043	0.00522	0.00049	0.00373	0.00556	0.01691	0.00361	0.95435	1
	Eastern Undeveloped Area	0.00892	0.0002	0.00035	0.00023	0.00043	0.00522	0.00049	0.00373	0.00556	0.01691	0.00361	0.95435	1
	North-Central Undeveloped Area	0.00892	0.0002	0.00035	0.00023	0.00043	0.00522	0.00049	0.00373	0.00556	0.01691	0.00361	0.95435	1
	Western Undeveloped Area	0.00892	0.0002	0.00035	0.00023	0.00043	0.00522	0.00049	0.00373	0.00556	0.01691	0.00361	0.95435	1
	Flathead River Riparian Area	0.00892	0.0002	0.00035	0.00023	0.00043	0.00522	0.00049	0.00373	0.00556	0.01691	0.00361	0.95435	1

Table 5-7
Areal Proportions Used to Evaluate Cumulative Risk for Large Range Receptors
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Species	Ecological Exposure Area	Main Plant Area	Cedar Creek Reservoir Overflow Ditch	South Percolation Pond Area	Northern Surface Water Feature	North Percolation Pond Area	Central Landfills Area	Industrial Landfill Area	Eastern Undeveloped Area	North-Central Undeveloped Area	Western Undeveloped Area	Flathead River Riparian Area	Outside of Site Boundary	Total
Short-tailed Shrew (1 acre)	Main Plant Area	1	0	0	0	0	0	0	0	0	0	0	0	1
	Cedar Creek Reservoir Overflow Ditch	0	1	0	0	0	0	0	0	0	0	0	0	1
	South Percolation Pond Area	0	0	1	0	0	0	0	0	0	0	0	0	1
	Northern Surface Water Feature	0	0	0	1	0	0	0	0	0	0	0	0	1
	North Percolation Pond Area	0	0	0	0	1	0	0	0	0	0	0	0	1
	Central Landfills Area	0	0	0	0	0	1	0	0	0	0	0	0	1
	Industrial Landfill Area	0	0	0	0	0	0	1	0	0	0	0	0	1
	Eastern Undeveloped Area	0	0	0	0	0	0	0	1	0	0	0	0	1
	North-Central Undeveloped Area	0	0	0	0	0	0	0	0	1	0	0	0	1
	Western Undeveloped Area	0	0	0	0	0	0	0	0	0	1	0	0	1
	Flathead River Riparian Area	0	0	0	0	0	0	0	0	0	0	1	0	1

Shaded cells indicate that the receptor species home range is smaller than the target ecological exposure, and the receptor was assumed to have 100 percent exposure to that exposure area. See text for details. Please note that although the long-tailed weasel's home range of 12 acres slightly exceeds the area of the North Percolation Pond Area (11.3 acres), it was assumed that 100 percent of the weasel's exposure is derived from that exposure area.

Area of Exposure Areas[a]:

Main Plant Area	231.9	acres	Industrial Landfill Area	12.6	acres
Cedar Creek Reservoir Overflow Ditch	5.2	acres	Eastern Undeveloped Area	64.9	acres
South Percolation Pond Area	5.6	acres	North-Central Undeveloped Area	114.4	acres
Northern Surface Water Feature	6.1	acres	Western Undeveloped Area	439.6	acres
North Percolation Pond Area	11.3	acres	Flathead River Riparian Area	93.9	acres
Central Landfills Area	44.4	acres			

a, Please note that the percent inclusion values were spatially calculated assuming the receptor was placed in the geometric center of the target exposure area. Therefore, a receptor whose home range is smaller than the target exposure area may have exposure to a mixture of adjacent exposure areas and less than 100 percent exposure to the target exposure area if the assumed circular home range from that midpoint location did not fully overlap the target area and intersected adjacent areas.

Table 5-8
Soil Benchmark Values Protective of Small Range Receptors (Meadow Vole and Short-tailed Shrew)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Meadow Vole Soil Benchmarks		Short-tailed Shrew Soil Benchmarks		Minimum NOAEL-Based Benchmark Concentration ($C_{soil-NOAEL}$) (mg/kg, dry weight)	Minimum LOAEL-Based Benchmark Concentration ($C_{soil-LOAEL}$) (mg/kg, dry weight)	BTV[a]			
	NOAEL-Based Benchmark Concentration ($C_{soil-NOAEL}$) (mg/kg, dry weight)	LOAEL-Based Benchmark Concentration ($C_{soil-LOAEL}$) (mg/kg, dry weight)	NOAEL-Based Benchmark Concentration ($C_{soil-NOAEL}$) (mg/kg, dry weight)	LOAEL-Based Benchmark Concentration ($C_{soil-LOAEL}$) (mg/kg, dry weight)			SO1	SO2	SO3	SO4
Inorganics - Metals										
Aluminum	NC	NC	NC	NC	NC	NC	1.42E+04	1.30E+04	1.42E+04	4.44E+04
Antimony	8.26E+00	4.60E+02	4.35E-01	2.04E+01	4.35E-01	2.04E+01	*4.30E-01*	*4.30E-01*	*4.30E-01*	*4.30E-01*
Arsenic	1.37E+02	5.99E+02	1.08E+02	7.46E+02	1.08E+02	5.99E+02	6.29E+00	6.29E+00	1.16E+01	1.12E+02
Barium	2.04E+03	3.26E+03	3.79E+03	6.05E+03	2.04E+03	3.26E+03	3.00E+02	3.00E+02	3.00E+02	7.34E+02
Beryllium	1.10E+01	1.50E+01	7.09E+01	8.93E+01	1.10E+01	1.50E+01	1.09E+00	1.09E+00	1.30E+00	1.30E+00
Cadmium	3.93E+01	1.21E+03	6.31E-01	9.89E+00	6.31E-01	9.89E+00	3.82E-01	3.82E-01	3.82E-01	3.82E-01
Chromium	2.96E+02	7.17E+03	5.65E+01	1.37E+03	5.65E+01	1.37E+03	1.24E+01	1.24E+01	1.59E+01	2.14E+01
Cobalt	2.38E+03	6.14E+03	4.11E+02	1.06E+03	4.11E+02	1.06E+03	7.58E+00	7.58E+00	1.02E+01	6.87E+00
Copper	7.91E+02	3.33E+04	7.94E+01	1.17E+03	7.94E+01	1.17E+03	1.79E+01	2.45E+01	2.13E+01	1.06E+02
Lead	1.28E+03	8.37E+04	1.03E+02	9.36E+03	1.03E+02	9.36E+03	1.72E+01	1.72E+01	2.29E+01	2.29E+01
Manganese	3.73E+03	1.06E+04	1.14E+04	4.18E+04	3.73E+03	1.06E+04	1.84E+03	6.72E+02	1.84E+03	1.84E+03
Mercury	2.06E+02	4.47E+03	2.67E+00	2.67E+01	2.67E+00	2.67E+01	5.97E-02	6.32E-02	6.32E-02	1.30E-01
Nickel	2.91E+02	3.70E+03	1.61E+01	1.40E+02	1.61E+01	1.40E+02	1.73E+01	1.73E+01	2.17E+01	2.17E+01
Selenium	1.73E+00	6.93E+00	1.19E+00	9.48E+00	1.19E+00	6.93E+00	1.38E+00	1.38E+00	2.20E+00	2.20E+00
Thallium	1.88E+02	5.60E+02	5.50E+01	1.64E+02	5.50E+01	1.64E+02	*1.50E-01*	*1.50E-01*	4.50E-01	4.50E-01
Vanadium	1.55E+03	3.52E+03	5.86E+02	1.33E+03	5.86E+02	1.33E+03	1.57E+01	2.10E+01	2.10E+01	1.57E+01
Zinc	3.65E+03	3.34E+04	3.07E+02	1.61E+04	3.07E+02	1.61E+04	8.29E+01	6.15E+01	1.02E+02	1.02E+02
Inorganics - Other Inorganics										
Cyanide	3.52E+04	3.52E+05	4.66E+04	4.66E+05	3.52E+04	3.52E+05	2.73E-01	1.78E-01	2.73E-01	7.93E-01
Fluoride	2.43E+03	4.47E+03	1.47E+03	2.71E+03	1.47E+03	2.71E+03	4.17E+00	*2.68E+00*	*2.68E+00*	1.13E+01
Polycholrinated Biphenyls (PCBs)										
Aroclor 1248	2.59E+00	2.59E+01	2.30E-02	2.30E-01	2.30E-02	2.30E-01				
Aroclor 1254	4.44E+00	4.44E+01	1.73E-02	1.73E-01	1.73E-02	1.73E-01				
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)										
Acenaphthene	See LMW PAH protective concentrations						5.94E-03	5.94E-03	5.94E-03	5.94E-03
Acenaphthylene	See LMW PAH protective concentrations						7.50E-03	7.50E-03	*7.50E-03*	7.50E-03
Anthracene	See LMW PAH protective concentrations						3.26E-03	3.26E-03	3.26E-03	1.36E-02
Benzo[a]anthracene	See HMW PAH protective concentrations						1.60E-02	1.60E-02	1.58E-02	3.85E-02
Benzo[a]pyrene	See HMW PAH protective concentrations						3.17E-02	3.17E-02	2.05E-02	4.09E-01
Benzo[b]fluoranthene	See HMW PAH protective concentrations						5.89E-02	5.89E-02	3.94E-02	7.69E-01
Benzo[g,h,i]perylene	See HMW PAH protective concentrations						4.06E-02	4.06E-02	3.05E-02	5.28E-01
Benzo[k]fluoranthene	See HMW PAH protective concentrations						2.46E-02	1.25E-02	1.25E-02	8.01E-02
Chrysene	See HMW PAH protective concentrations						4.16E-02	4.16E-02	2.39E-02	5.72E-01
Dibenz(a,h)anthracene	See HMW PAH protective concentrations						6.19E-03	6.19E-03	*4.90E-03*	7.48E-02
Fluoranthene	See LMW PAH protective concentrations						3.10E-02	3.73E-02	3.73E-02	2.30E-01
Fluorene	See LMW PAH protective concentrations						2.23E-02	2.23E-02	2.23E-02	7.93E-03
Indeno[1,2,3-cd]pyrene	See HMW PAH protective concentrations						3.91E-02	2.63E-02	1.52E-02	5.63E-01
Naphthalene	See HMW PAH protective concentrations						3.35E-03	3.63E-03	3.63E-03	3.63E-03
Phenanthrene	See LMW PAH protective concentrations						2.17E-02	2.17E-02	2.17E-02	6.23E-02
Pyrene	See HMW PAH protective concentrations						3.31E-02	3.31E-02	2.78E-02	2.00E-01
Low Molecular Weight (LMW) PAHs	3.13E+04	1.77E+05	1.60E+02	8.71E+02	1.60E+02	8.71E+02	*9.51E-02*	*1.02E-01*	*1.02E-01*	*3.31E-01*
High Molecular Weight (HMW) PAH	2.45E+01	1.89E+03	1.76E+00	1.10E+02	1.76E+00	1.10E+02	*2.92E-01*	*2.67E-01*	*1.91E-01*	*3.23E+00*
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs										
1,2,4,5-Tetrachlorobenzene	NC	NC	NC	NC	NC	NC	NA	NA	NA	NA
2-Chloronaphthalene	NC	NC	NC	NC	NC	NC	NA	NA	NA	NA
Biphenyl (Diphenyl)	NC	NC	NC	NC	NC	NC	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	3.31E+03	3.31E+04	2.51E+00	2.51E+01	2.51E+00	2.51E+01	NA	NA	NA	NA
Butylbenzylphthalate	1.59E+03	1.59E+04	1.04E+02	1.04E+03	1.04E+02	1.04E+03	NA	NA	NA	NA
Dibenzofuran	NC	NC	NC	NC	NC	NC	NA	NA	NA	NA
Di-n-butyl phthalate	4.43E+03	1.47E+04	3.98E+02	1.32E+03	3.98E+02	1.32E+03	NA	NA	NA	NA

Table 5-8
Soil Benchmark Values Protective of Small Range Receptors (Meadow Vole and Short-tailed Shrew)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Meadow Vole Soil Benchmarks		Short-tailed Shrew Soil Benchmarks		Minimum NOAEL-Based Benchmark Concentration ($C_{soil-NOAEL}$) (mg/kg, dry weight)	Minimum LOAEL-Based Benchmark Concentration ($C_{Soil-LOAEL}$) (mg/kg, dry weight)	BTV[a]			
	NOAEL-Based Benchmark Concentration ($C_{soil-NOAEL}$) (mg/kg, dry weight)	LOAEL-Based Benchmark Concentration ($C_{Soil-LOAEL}$) (mg/kg, dry weight)	NOAEL-Based Benchmark Concentration ($C_{soil-NOAEL}$) (mg/kg, dry weight)	LOAEL-Based Benchmark Concentration ($C_{Soil-LOAEL}$) (mg/kg, dry weight)			SO1	SO2	SO3	SO4
Di-n-octyl phthalate	1.29E+04	1.29E+05	8.36E+00	8.36E+01	8.36E+00	8.36E+01	NA	NA	NA	NA
Hexachlorobenzene	1.77E+02	1.77E+03	2.96E+00	2.96E+01	2.96E+00	2.96E+01	NA	NA	NA	NA
Hexachlorobutadiene	1.78E+03	1.78E+04	1.38E+02	1.38E+03	1.38E+02	1.38E+03	NA	NA	NA	NA
Hexachlorocyclopentadiene	NC	NC	NC	NC	NC	NC	NA	NA	NA	NA
Hexachloroethane	NC	NC	NC	NC	NC	NC	NA	NA	NA	NA
Pentachlorophenol	9.43E+00	2.54E+01	5.76E+00	1.55E+01	5.76E+00	1.55E+01	NA	NA	NA	NA
Volatile Organic Compounds (VOCs)										
Methylcyclohexane	NC	NC	NC	NC	NC	NC	NA	NA	NA	NA
Dioxin/Furans										
1,2,3,4,6,7,8-HpCDD							2.17E-05	1.30E-05	4.10E-05	2.17E-05
1,2,3,4,6,7,8-HpCDF							3.58E-06	2.55E-06	3.28E-06	3.58E-06
1,2,3,4,7,8,9-HpCDF							1.90E-07	2.76E-06	1.90E-07	1.90E-07
1,2,3,4,7,8-HxCDD							4.10E-07	4.10E-07	4.10E-07	4.10E-07
1,2,3,4,7,8-HxCDF							6.34E-07	2.50E-07	6.34E-07	6.34E-07
1,2,3,6,7,8-HxCDD							1.28E-06	4.50E-07	1.28E-06	1.28E-06
1,2,3,6,7,8-HxCDF							2.18E-07	2.18E-07	2.18E-07	5.50E-07
1,2,3,7,8,9-HxCDD							1.10E-06	9.11E-07	1.10E-06	1.10E-06
1,2,3,7,8,9-HxCDF							2.60E-07	2.60E-07	2.60E-07	2.60E-07
1,2,3,7,8-PeCDD							2.86E-07	2.36E-07	3.33E-07	3.33E-07
1,2,3,7,8-PeCDF							9.20E-08	4.57E-07	9.20E-08	9.20E-08
2,3,4,6,7,8-HxCDF							1.89E-07	1.89E-07	1.89E-07	1.35E-07
2,3,4,7,8-PeCDF							1.30E-07	1.30E-07	1.30E-07	1.30E-07
2,3,7,8-TCDD							3.00E-07	3.00E-07	3.00E-07	3.00E-07
2,3,7,8-TCDF							1.30E-07	4.96E-07	1.30E-07	4.96E-07
OCDD							1.53E-04	4.09E-04	4.09E-04	1.53E-04
OCDF							1.04E-05	5.60E-06	7.84E-06	1.04E-05
$TEC_{2,3,7,8\text{-TCDD-Mammal}}$	3.49E-05	2.34E-04	1.42E-06	7.08E-06	1.42E-06	7.08E-06	1.35E-06	1.21E-06	1.67E-06	1.46E-06

Notes:
Shaded cells indicate that all values were non-detect. Value is the maximum method detection limit for all reference samples.
All values are in milligrams per kilogram (mg/kg).
a, SO1 BTVs are used to represent soil and sediment background concentrations in all exposure areas except for the Flathead River Riparian Area and the South Percolation Pond Area.
The lower of SO2 and SO3 BTVs for each chemical are used to represent soil background concentrations in the Flathead River Riparian Area and the South Percolation Pond Area.
BTV, Background threshold value
HMW, High molecular weight
LMW, Low molecular weight
LOAEL, Lowest-observed adverse effect level
NA, Not applicable; background considerations only apply to metals and PAHs
NC, Soil benchmark was not calculated due to a lack of TRVs
NOAEL, No observed adverse effect level
mg/kg, milligrams per kilogram

Table 6-1
Soil Direct Contact Exposure Estimate - Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Soil Invertebrate Communities						Terrestrial Plant Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																		
Cyanide	mg/kg	152	126	0.153	0.239	2.4	---	---	---	---	---	---	6.4	---	<1	---	<1	---
Fluoride	mg/kg	152	152	61	118.8	571	---	---	---	---	---	---	---	---	---	---	---	---
TAL Metals																		
Antimony	mg/kg	152	9	0.443	0.272	0.61	78	780	<1	<1	<1	<1	11	58	<1	<1	<1	<1
Arsenic	mg/kg	152	152	4	5	8.8	6.8	68	**1.3**	<1	<1	<1	18	91	<1	<1	<1	<1
Cadmium	mg/kg	152	19	1	0.354	1.7	140	760	<1	<1	<1	<1	32	160	<1	<1	<1	<1
Chromium, Total	mg/kg	154	154	12	16	80.8	3360	---	<1	---	<1	---	3360	---	<1	---	<1	---
Copper	mg/kg	152	152	15	16	52.6	80	530	<1	<1	<1	<1	70	490	<1	<1	<1	<1
Lead	mg/kg	152	152	14	22	57.7	1700	8400	<1	<1	<1	<1	120	570	<1	<1	<1	<1
Mercury	mg/kg	152	130	0.023	0.021	0.27	0.05	0.5	**5.4**	<1	<1	<1	34	64	<1	<1	<1	<1
Nickel	mg/kg	152	152	18	32	140	280	1300	<1	<1	<1	<1	38	270	**3.7**	<1	<1	<1
Selenium	mg/kg	152	9	0.472	0.265	0.66	4.1	41	<1	<1	<1	<1	0.5	3	**1.3**	<1	<1	<1
Vanadium	mg/kg	152	152	12	14	31.8	---	---	---	---	---	---	60	80	<1	<1	<1	<1
Zinc	mg/kg	152	152	50	59	244	120	930	**2.0**	<1	<1	<1	160	810	**1.5**	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)																		
Total LMW PAHs - 1/2MDL	mg/kg	152	145	11	40	341.6	18	---	**19.0**	---	**2.2**	---	---	---	---	---	---	---
Total LMW PAHs - MDL	mg/kg	152	145	11	40	341.9	18	---	**19.0**	---	**2.2**	---	---	---	---	---	---	---
Total LMW PAHs - Zero	mg/kg	152	145	11	40	341.4	18	---	**19.0**	---	**2.2**	---	---	---	---	---	---	---
Total HMW PAHs - 1/2MDL	mg/kg	152	145	33	124	1035	29	---	**35.7**	---	**4.3**	---	---	---	---	---	---	---
Total HMW PAHs - MDL	mg/kg	152	145	33	124	1035	29	---	**35.7**	---	**4.3**	---	---	---	---	---	---	---
Total HMW PAHs - Zero	mg/kg	152	145	33	124	1035	29	---	**35.7**	---	**4.3**	---	---	---	---	---	---	---
Dioxins and Furans (mg/kg)																		
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	mg/kg	58	15	0.0000002	0.0000001	0.0000006	5.0	10	<1	<1	<1	<1	---	---	---	---	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																		
Bis(2-Ethylhexyl) Phthalate	mg/kg	152	47	0.2680	0.532	5.8	---	---	---	---	---	---	---	---	---	---	---	---
Di-N-Butyl Phthalate	mg/kg	152	21	0.0380	0.019	0.19	---	---	---	---	---	---	160	600	<1	<1	<1	<1
TCL Volatile Organic Compounds (TCL VOCs)																		
Cyclohexane	mg/kg	64	17	0.0011	NC	0.0055	---	---	---	---	---	---	---	---	---	---	---	---
Methyl Acetate	mg/kg	64	12	0.0330	NC	0.32	---	---	---	---	---	---	---	---	---	---	---	---
Methylcyclohexane	mg/kg	64	29	0.0013	NC	0.0076	---	---	---	---	---	---	---	---	---	---	---	---
M,P-Xylene	mg/kg	64	41	0.0007	NC	0.0042	---	---	---	---	---	---	100	1000	<1	<1	---	---
O-Xylene (1,2-Dimethylbenzene)	mg/kg	64	20	0.0006	NC	0.0051	---	---	---	---	---	---	---	---	---	---	---	---

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HMW, High molecular weight
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LMW, Low molecular weight
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
MDL, Method detection limit
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-2
Summary of Refined Wildlife Hazard Quotients for the Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

	American Woodcock		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		orth American Wolverir		Short-tailed Shrew	
Constituent	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	$NOEC_{Plants}$	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}
Inorganics - Metals																						
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.15E+00	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	<1	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics																						
Cyanide	--	--	<1	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																						
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--	--	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																						
Total LMW PAHs	--	--	<1	--	--	--	1.03E+00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total HMW PAHs	1.39E+01	1.39E+00	1.59E+00	<1	<1	--	1.97E+01	1.97E+00	<1	--	<1	<1	--	--	3.64E+00	--	--	--	<1	--	2.28E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																						
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	2.79E+00	--	--	--	--	--	4.17E+00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)																						
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans																						
Total Dioxins/Furans	1.8E+00	--	--	--	--	--	2.7E+00	--	--	--	--	--	--	--	--	--	--	--	--	--	3.4E+00	--

Notes:
--, HQ is negligible. Chemical was either not a COPEC, or had minimal HQs (i.e., <1) for all relevant exposure areas. Full ingestion model results are presented in Appendix H2.
Dark shaded cells for threatened or endangered species indicate that conclusions for that species are only based upon HQ_{NOAEL} values.
HQ, Hazard quotient
$HQ_{LOAEL,}$ Hazard quotient calculated using the lowest-observable-adverse-effect toxicity reference value.
$HQ_{NOAEL,}$ Hazard quotient calculated using the no-observable-adverse-effect toxicity reference value.
$NOEC_{Plants}$, No Observed Effect Concentration, plants
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
VOC, Volatile Organic Compound

Table 6-3
Soil Direct Contact Exposure Estimate - Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Soil Invertebrate Communities						Terrestrial Plant Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																		
Cyanide	mg/kg	110	75	0.6	1.2	13	---	---	---	---	---	---	6.4	---	**2.0**	---	<1	---
Fluoride	mg/kg	110	110	60.9	140	796	---	---	---	---	---	---	---	---	---	---	---	---
TAL Metals																		
Arsenic	mg/kg	110	110	6.22	6.566	17.9	7	68	**2.6**	<1	<1	<1	18	91	<1	<1	<1	<1
Barium	mg/kg	110	110	133.5	196.6	436	330	3200	**1.3**	<1	<1	<1	110	260	**4.0**	**1.7**	**1.8**	<1
Beryllium	mg/kg	110	108	0.6	0.6	4.7	40	400	<1	<1	<1	<1	3	25	**1.9**	<1	<1	<1
Chromium, Total	mg/kg	118	117	10.98	13.81	84.8	3360	---	<1	---	<1	---	3360	---	<1	---	<1	---
Copper	mg/kg	110	110	81.0	721	7260	80	530	**90.8**	**13.7**	**9.0**	**1.4**	70	490	**104**	**14.8**	**10.3**	**1.5**
Lead	mg/kg	110	110	12.9	14.8	63.7	1700	8400	<1	<1	<1	<1	120	570	<1	<1	<1	<1
Manganese	mg/kg	110	110	455	511	1140	450	4500	**2.5**	<1	**1.1**	<1	220	1100	**5.2**	1.0	**2.3**	<1
Nickel	mg/kg	110	110	24	24	534	280	1300	**1.9**	<1	<1	<1	38	270	**14.1**	**2.0**	<1	<1
Selenium	mg/kg	110	16	0.832	0.325	3	4	41	<1	<1	<1	<1	1	3	**5.8**	1.0	<1	<1
Thallium	mg/kg	110	16	0.246	0.111	1.1	---	---	---	---	---	---	0.05	0.5	**22.0**	**2.2**	**2.2**	<1
Vanadium	mg/kg	110	110	14	15	151	---	---	---	---	---	---	60	80	**2.5**	**1.9**	<1	<1
Zinc	mg/kg	110	110	49.5	56.0	114	120	930	<1	<1	<1	<1	160	810	<1	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)																		
Total LMW PAHs - 1/2MDL	mg/kg	110	108	12	54	596	18	---	**33**	---	**3.0**	---	---	---	---	---	---	---
Total LMW PAHs - MDL	mg/kg	110	108	12	54	596	18	---	**33**	---	**3.0**	---	---	---	---	---	---	---
Total LMW PAHs - Zero	mg/kg	110	108	12	54	596	18	---	**33**	---	**3.0**	---	---	---	---	---	---	---
Total HMW PAHs - 1/2MDL	mg/kg	110	109	21	87	789	29	---	**27**	---	**3.0**	---	---	---	---	---	---	---
Total HMW PAHs - MDL	mg/kg	110	109	21	87	789	29	---	**27**	---	**3.0**	---	---	---	---	---	---	---
Total HMW PAHs - Zero	mg/kg	110	109	21	87	789	29	---	**27**	---	**3.0**	---	---	---	---	---	---	---
Dioxins and Furans (mg/kg)																		
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	mg/kg	4	1	0.0000003	NC	0.0000003	5.0	10	<1	<1	---	---	---	---	---	---	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																		
3- And 4- Methylphenol (Total)	mg/kg	54	4	0.27	NC	1	---	---	---	---	---	---	0.7	7	**1.5**	<1	---	---
Bis(2-Ethylhexyl) Phthalate	mg/kg	110	14	0.25	0.279	2.5												
Dibenzofuran	mg/kg	110	52	0.5	1.0	15	---	---	---	---	---	---	6.1	61	**2.5**	<1	<1	<1
Di-N-Butyl Phthalate	mg/kg	110	6	0.033	0.016	0.056	---	---	---	---	---	---	160	600	<1	<1	<1	<1
TCL Volatile Organic Compounds (TCL VOCs)																		
Methyl Acetate	mg/kg	27	7	0.0088	NC	0.017	---	---	---	---	---	---	---	---	---	---	---	---
Methylcyclohexane	mg/kg	27	5	0.0007	NC	0.001	---	---	---	---	---	---	---	---	---	---	---	---
M,P-Xylene	mg/kg	27	10	0.0006	NC	0.0038	---	---	---	---	---	---	100	1000	<1	<1	---	---
O-Xylene (1,2-Dimethylbenzene)	mg/kg	27	2	0.0009	NC	0.0016	---	---	---	---	---	---	---	---	---	---	---	---

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HMW, High molecular weight
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LMW, Low molecular weight
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
MDL, Method detection limit
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-4
Summary of Refined Wildlife Hazard Quotients for the Central Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

	American Woodcock		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		North American Wolverine		Short-tailed Shrew	
Constituent	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**$NOEC_{Plants}$**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**
Inorganics - Metals																				
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	1.13E+01	1.32E+00	<1	--	--	--	1.45E+01	1.69E+00	--	--	--	--	--	--	--	--	--	--	2.43E+00	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.74E+00	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	<1	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics																				
Cyanide	--	--	<1	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																				
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	2.07E+01	2.07E+00	--	--	--	--	3.09E+01	3.09E+00	--	--	<1	--	--	--	--	--	--	--	5.93E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)																				
Total LMW PAHs	--	--	<1	--	--	--	1.41E+00	--	--	--	--	--	--	--	--	--	--	--	--	--
Total HMW PAHs	9.72E+00	--	1.59E+00	<1	<1	--	1.38E+01	1.38E+00	<1	--	<1	<1	--	--	4.99E+00	--	<1	--	3.34E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																				
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	1.46E+00	--	--	--	--	--	2.19E+00	--	--	--	--	--	--	--	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)																				
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans																				
Total Dioxins/Furans	--	--	--	--	--	--	1.10E+00	--	--	--	--	--	--	--	--	--	--	--	2.88E+00	--

Notes:
--, HQ is negligible. Chemical was either not a COPEC, or had minimal HQs (i.e., <1) for all relevant exposure areas. Full ingestion model results are presented in Appendix H2.
Dark shaded cells for threatened or endangered species indicate that conclusions for that species are only based upon HQ_{NOAEL} values.
HQ, Hazard quotient
HQ_{LOAEL}, Hazard quotient calculated using the lowest-observable-adverse-effect toxicity reference value.
HQ_{NOAEL}, Hazard quotient calculated using the no-observable-adverse-effect toxicity reference value.
$NOEC_{Plants}$, No Observed Effect Concentration, plants
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
VOC, Volatile Organic Compound

Table 6-5
Soil Direct Contact Exposure Estimate - Incremental Soil Sampling (ISS) Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Chemical	Units	Number of Samples	Number of Detections	Mean Detected Concentration[1]	Maximum Detected Concentration[1]	Soil Invertebrate Communities						Terrestrial Plant Communities					
						$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		# Samples Exceeding		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		# Samples Exceeding	
								HQ_{NOEC}	HQ_{LOEC}	NOEC	LOEC			HQ_{NOEC}	HQ_{LOEC}	NOEC	LOEC
Other Inorganic Parameters (mg/kg unless otherwise noted)																	
Cyanide	mg/kg	86	84	1.2	25.5	---	---	**---**	**---**	0	0	6.4	---	**4.0**	**---**	1	0
Fluoride	mg/kg	86	86	332.5	1218	---	---	**---**	**---**	0	0	---	---	**---**	**---**	0	0
TAL Metals (mg/kg)																	
Antimony	mg/kg	86	75	0.8	11.0	78.0	780	<1	<1	0	0	11.0	58	1.0	<1	1	0
Arsenic	mg/kg	86	86	7.0	35.6	6.8	68	**5.2**	<1	19	0	18.0	91	**2.0**	<1	2	0
Barium	mg/kg	86	86	159.1	329.9	330.0	3200	<1	<1	0	0	110.0	260	**3.0**	**1.3**	73	9
Beryllium	mg/kg	86	86	0.9	3.9	40.0	400	<1	<1	0	0	2.5	25	**1.6**	<1	1	0
Cadmium	mg/kg	86	86	0.3	1.8	140.0	760	<1	<1	0	0	32.0	160	<1	<1	0	0
Chromium, Total	mg/kg	86	86	23.1	58.6	3360	---	<1	**---**	0	0	3360	---	<1	**---**	0	0
Cobalt	mg/kg	86	86	6.6	14.0	---	---	**---**	**---**	0	0	13.0	130	**1.1**	<1	1	0
Copper	mg/kg	86	86	69.5	995.9	80.0	530	**12.4**	**1.9**	9	2	70.0	490	**14.2**	**2.0**	11	3
Lead	mg/kg	86	86	46.5	603.0	1700	8400	<1	<1	0	0	120.0	570	**5.0**	**1.1**	4	0
Manganese	mg/kg	86	86	521.7	902.5	450.0	4500	**2.0**	<1	67	0	220.0	1100	**4.1**	<1	86	0
Mercury	mg/kg	86	60	0.0	0.1	0.1	1	**2.8**	<1	3	0	34.0	64	<1	<1	0	0
Nickel	mg/kg	86	86	33.4	162.6	280.0	1300	<1	<1	0	0	38.0	270	**4.3**	<1	23	0
Selenium	mg/kg	86	86	1.7	16.0	4.1	41	**3.9**	<1	4	0	0.5	3	**30.7**	**5.3**	74	6
Thallium	mg/kg	86	86	0.1	0.5	---	---	**---**	**---**	0	0	0.1	1	**9.1**	<1	86	0
Vanadium	mg/kg	86	86	20.1	59.5	---	---	**---**	**---**	0	0	60.0	80	<1	<1	0	0
Zinc	mg/kg	86	86	125.3	1938.6	120.0	930	**16.2**	**2.1**	12	2	160.0	810	**12.1**	**2.4**	7	2
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)																	
Total LMW PAHs - 1/2MDL	mg/kg	86	86	73.3	2339	18.0	---	**129.9**	**---**	27	0	---	---	**---**	**---**	0	0
Total LMW PAHs - MDL	mg/kg	86	86	73.3	2339	18.0	---	**129.9**	**---**	27	0	---	---	**---**	**---**	0	0
Total LMW PAHs - Zero	mg/kg	86	86	73.3	2339	18.0	---	**129.9**	**---**	27	0	---	---	**---**	**---**	0	0
Total HMW PAHs - 1/2MDL	mg/kg	86	86	133.3	3263	29.0	---	**112.5**	**---**	41	0	---	---	**---**	**---**	0	0
Total HMW PAHs - MDL	mg/kg	86	86	133.3	3263	29.0	---	**112.5**	**---**	41	0	---	---	**---**	**---**	0	0
Total HMW PAHs - Zero	mg/kg	86	86	133.3	3263	29.0	---	**112.5**	**---**	41	0	---	---	**---**	**---**	0	0
Polychlorinated Biphenyls (PCBs) (mg/kg)																	
PCB-1248 (Aroclor 1248)	mg/kg	86	1	0.2	0.2	---	---	**---**	**---**	0	0	160.0	620	<1	<1	0	0
PCB-1254 (Aroclor 1254)	mg/kg	86	14	0.4	1.7	---	---	**---**	**---**	0	0	160.0	620	<1	<1	0	0
Polychlorinated Biphenyl (PCBs)	mg/kg	86	15	0.4	1.7	---	---	**---**	**---**	0	0	160.0	620	<1	<1	0	0
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)																	
2,4-Dimethylphenol	mg/kg	86	2	0.5	0.7	---	---	**---**	**---**	0	0	0.01	---	**71.0**	**---**	0	0
Bis(2-Ethylhexyl) Phthalate	mg/kg	86	16	0.1	0.8	---	---	**---**	**---**	0	0	---	---	**---**	**---**	0	0
Carbazole	mg/kg	86	84	4.1	137.4	---	---	**---**	**---**	0	0	---	---	**---**	**---**	0	0
Dibenzofuran	mg/kg	86	78	2.3	93.5	---	---	**---**	**---**	0	0	6.1	61	**15.3**	**1.5**	4	1
Di-N-Butyl Phthalate	mg/kg	86	22	0.0	0.1	---	---	**---**	**---**	0	0	160.0	600	<1	<1	0	0

Notes:
[1]: The upper RSD-adjusted results are displayed.
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HMW, High molecular weight
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value

Table 6-6
Soil Direct Contact Exposure Estimate - Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Soil Invertebrate Communities						Terrestrial Plant Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																		
Cyanide	mg/kg	6	1	0.2	NC	0.19	---	---	---	---	---	---	6.4	---	<1	---	---	---
Fluoride	mg/kg	6	6	79.0	358	398	---	---	---	---	---	---	---	---	---	---	---	---
TAL Metals																		
Antimony	mg/kg	6	3	1.15	NC	2.8	78	780	<1	<1	---	---	11	58	<1	<1	---	---
Arsenic	mg/kg	6	6	9.0	21.8	23.5	7	68	**3.5**	<1	**3.2**	<1	18	91	**1.3**	<1	**1.2**	<1
Barium	mg/kg	6	6	123	221	227	330	3200	<1	<1	<1	<1	110	260	**2.1**	<1	**2.0**	<1
Beryllium	mg/kg	6	6	1.60	6.49	7.2	40	400	<1	<1	<1	<1	3	25	**2.9**	<1	**2.6**	<1
Cadmium	mg/kg	6	2	0.7	NC	0.94	140	760	<1	<1	---	---	32	160	<1	<1	---	---
Chromium, Total	mg/kg	6	6	16.0	35.8	39.2	3360	---	<1	---	<1	---	3360	---	<1	---	<1	---
Cobalt	mg/kg	6	6	7	11	16	---	---	---	---	---	---	13	130	**1.2**	<1	<1	<1
Copper	mg/kg	6	6	23	51	54.6	80	530	<1	<1	<1	<1	70	490	<1	<1	<1	<1
Lead	mg/kg	6	6	13	17	19.4	1700	8400	<1	<1	<1	<1	120	570	<1	<1	<1	<1
Nickel	mg/kg	6	6	99	418	463	280	1300	**1.7**	<1	**1.5**	<1	38	270	**12.2**	**1.7**	**11.0**	**1.5**
Selenium	mg/kg	6	3	0.500	NC	0.75	4	41	<1	<1	---	---	1	3	**1.4**	<1	---	---
Thallium	mg/kg	6	2	0.155	NC	0.17	---	---	---	---	---	---	0	1	**3.4**	<1	---	---
Vanadium	mg/kg	6	6	41	153	169	---	---	---	---	---	---	60	80	**2.8**	**2.1**	**2.6**	**1.9**
Zinc	mg/kg	6	6	54.6	65.0	67	120	930	<1	<1	<1	<1	160	810	<1	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)																		
Total LMW PAHs - 1/2MDL	mg/kg	6	6	29	117	126	18	---	**7.0**	---	**6.5**	---	---	---	---	---	---	---
Total LMW PAHs - MDL	mg/kg	6	6	29	117	126	18	---	**7.0**	---	**6.5**	---	---	---	---	---	---	---
Total LMW PAHs - Zero	mg/kg	6	6	29	117	126	18	---	**7.0**	---	**6.5**	---	---	---	---	---	---	---
Total HMW PAHs - 1/2MDL	mg/kg	6	6	97	375	388	29	---	**13.4**	---	**12.9**	---	---	---	---	---	---	---
Total HMW PAHs - MDL	mg/kg	6	6	97	375	388	29	---	**13.4**	---	**12.9**	---	---	---	---	---	---	---
Total HMW PAHs - Zero	mg/kg	6	6	97	375	388	29	---	**13.4**	---	**12.9**	---	---	---	---	---	---	---

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HMW, High molecular weight
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LMW, Low molecular weight
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
MDL, Method detection limit
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-7
Summary of Refined Wildlife Hazard Quotients for the Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

	American Woodcock		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		North American Wolverine		Short-tailed Shrew	
Constituent	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	$NOEC_{Plants}$	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}
Inorganics - Metals																				
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.60E+00	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.63E+00	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	<1	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	6.72E+00	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	5.69E+00	2.05E+00	--	--	--	--	2.31E+00	<1	--	--	--	--	--	--	1.45E+00	--	--	--	2.81E+01	3.23E+00
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	5.93E+00	1.20E+00	<1	--	<1	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics																				
Cyanide	--	--	<1	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																				
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--	--	--	--	--	<1	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																				
Total LMW PAHs	1.93E+00	--	<1	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--
Total HMW PAHs	3.54E+01	3.54E+00	1.49E+00	<1	<1	--	1.51E+01	1.51E+00	<1	--	<1	<1	--	--	6.95E+00	--	<1	--	3.82E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																				
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)																				
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans																				
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
--, HQ is negligible. Chemical was either not a COPEC, or had minimal HQs (i.e., <1) for all relevant exposure areas. Full ingestion model results are presented in Appendix H2.
Dark shaded cells for threatened or endangered species indicate that conclusions for that species are only based upon HQ_{NOAEL} values.
HMW, High molecular weight
HQ, Hazard quotient
$HQ_{LOAEL,}$ Hazard quotient calculated using the lowest-observable-adverse-effect toxicity reference value.
$HQ_{NOAEL,}$ Hazard quotient calculated using the no-observable-adverse-effect toxicity reference value.
LMW, Low molecular weight
$NOEC_{Plants}$, No Observed Effect Concentration, plants
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
VOC, Volatile Organic Compound

Table 6-8
Soil Direct Contact Exposure Estimate - Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Soil Invertebrate Communities						Terrestrial Plant Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																		
Cyanide	mg/kg	37	21	0.2	0.3	0.64	---	---	---	---	---	---	6.4	---	<1	---	<1	---
TAL Metals																		
Arsenic	mg/kg	37	37	5.35	6.38	12.4	7	68	**1.8**	<1	<1	<1	18	91	<1	<1	<1	<1
Barium	mg/kg	37	37	371	579	1060	330	3200	**3.2**	<1	**1.8**	<1	110	260	**9.6**	**4.1**	**5.3**	**2.2**
Cadmium	mg/kg	37	6	1	0	0.7	140	760	<1	<1	<1	<1	32	160	<1	<1	<1	<1
Copper	mg/kg	37	37	11.1	13.3	25.5	80	530	<1	<1	<1	<1	70	490	<1	<1	<1	<1
Lead	mg/kg	37	37	13.4	18	36.2	1700	8400	<1	<1	<1	<1	120	570	<1	<1	<1	<1
Manganese	mg/kg	37	37	818	1443	3950	450	4500	**8.8**	<1	**3.2**	<1	220	1100	**18.0**	**3.6**	**6.6**	**1.3**
Mercury	mg/kg	37	34	0.028	0.046	0.12	0.05	1	**2.4**	<1	<1	<1	34	64	<1	<1	<1	<1
Nickel	mg/kg	37	37	18	41	68.9	280	1300	<1	<1	<1	<1	38	270	**1.8**	<1	**1.1**	<1
Selenium	mg/kg	37	2	0.58	NC	0.64	4	41	<1	<1	---	---	0.5	3.0	**1.2**	<1	---	---
Thallium	mg/kg	37	7	0.13	0.12	0.15	---	---	---	---	---	---	0.05	0.5	**3.0**	<1	**2.3**	<1
Vanadium	mg/kg	37	37	12.3	16.5	25.7	---	---	---	---	---	---	60	80	<1	<1	<1	<1
Zinc	mg/kg	37	37	58.9	80.4	150	120	930	**1.3**	<1	<1	<1	160	810	<1	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)																		
Total HMW PAHs - 1/2MDL	mg/kg	37	37	3	7	21	29	---	<1	---	<1	---	---	---	---	---	---	---
Total HMW PAHs - MDL	mg/kg	37	37	3	7	21	29	---	<1	---	<1	---	---	---	---	---	---	---
Total HMW PAHs - Zero	mg/kg	37	37	3	7	21	29	---	<1	---	<1	---	---	---	---	---	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																		
3- And 4- Methylphenol (Total)	mg/kg	7	2	0.04	NC	0.068	---	---	---	---	---	---	0.7	7	<1	<1	---	---
Bis(2-Ethylhexyl) Phthalate	mg/kg	37	8	0.09	NC	0.15	---	---	---	---	---	---	---	---	---	---	---	---

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HMW, High molecular weight
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
MDL, Method detection limit
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-9
Summary of Refined Wildlife Hazard Quotients for the Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

	American Woodcock		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		North American Wolverine		Short-tailed Shrew	
Constituent	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**$NOEC_{Plants}$**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**
Inorganics - Metals																				
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.01E+00	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics																				
Cyanide	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																				
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--	--	--	--	--	<1	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																				
Total LMW PAHs	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total HMW PAHs	--	--	<1	<1	--	--	--	--	<1	--	<1	<1	--	--	--	--	<1	--	--	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																				
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	1.18E+00	--	--	--	--	--	--	--	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)																				
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans																				
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
--, HQ is negligible. Chemical was either not a COPEC, or had minimal HQs (i.e., <1) for all relevant exposure areas. Full ingestion model results are presented in Appendix H2.
Dark shaded cells for threatened or endangered species indicate that conclusions for that species are only based upon HQ_{NOAEL} values.
HMW, High molecular weight
HQ, Hazard quotient
$HQ_{LOAEL,}$ Hazard quotient calculated using the lowest-observable-adverse-effect toxicity reference value.
$HQ_{NOAEL,}$ Hazard quotient calculated using the no-observable-adverse-effect toxicity reference value.
LMW, Low molecular weight
$NOEC_{Plants}$, No Observed Effect Concentration, plants
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
VOC, Volatile Organic Compound

EHS Support

Table 6-10
Soil Direct Contact Exposure Estimate - North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Soil Invertebrate Communities						Terrestrial Plant Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																		
Cyanide	mg/kg	54	26	0.2	0.2	0.42	---	---	---	---	---	---	6.4	---	<1	---	<1	---
TAL Metals																		
Arsenic	mg/kg	54	54	6.03	6.26	15.3	7	68	**2.3**	<1	<1	<1	18	91	<1	<1	<1	<1
Barium	mg/kg	54	54	209	295	482	330	3200	**1.5**	<1	<1	<1	110	260	**4.4**	**1.9**	**2.7**	**1.1**
Copper	mg/kg	54	54	13	14	26.7	80	530	<1	<1	<1	<1	70	490	<1	<1	<1	<1
Lead	mg/kg	54	54	11.6	12.9	21.8	1700	8400	<1	<1	<1	<1	120	570	<1	<1	<1	<1
Manganese	mg/kg	54	54	585.8	1140	2620	450	4500	**5.8**	<1	**2.5**	<1	220	1100	**11.9**	**2.4**	**5.2**	1.0
Thallium	mg/kg	54	3	0.14	NC	0.19	---	---	---	---	---	---	0	1	**3.8**	<1	---	---
Vanadium	mg/kg	54	54	11.6	13.4	20.4	---	---	---	---	---	---	60	80	<1	<1	<1	<1
Zinc	mg/kg	54	54	55	68	116	120	930	<1	<1	<1	<1	160	810	<1	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)																		
Total HMW PAHs - 1/2MDL	mg/kg	54	49	0.523	1.14	4.14	29	---	<1	---	<1	---	---	---	---	---	---	---
Total HMW PAHs - MDL	mg/kg	54	49	0.528	1.14	4.14	29	---	<1	---	<1	---	---	---	---	---	---	---
Total HMW PAHs - Zero	mg/kg	54	49	0.518	1.14	4.14	29	---	<1	---	<1	---	---	---	---	---	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																		
Bis(2-Ethylhexyl) Phthalate	mg/kg	54	21	0.16	0.121	0.66	---	---	---	---	---	---	---	---	---	---	---	---
TCL Volatile Organic Compounds (TCL VOCs)																		
Methyl Acetate	mg/kg	4	3	0.09	NC	0.27	---	---	---	---	---	---	---	---	---	---	---	---

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HMW, High molecular weight
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
MDL, Method detection limit
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-11
Summary of Refined Wildlife Hazard Quotients for the North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

	American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		North American Wolverine		Short-tailed Shrew	
Constituent	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	$NOEC_{Plants}$	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}
Inorganics - Metals																						
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	<1	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics																						
Cyanide	--	--	--	--	<1	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																						
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--	--	--	--	--	--	--	<1	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																						
Total LMW PAHs	--	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total HMW PAHs	--	--	--	--	1.53E+00	<1	<1	--	--	--	<1	--	<1	<1	--	--	--	--	<1	--	--	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																						
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)																						
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans																						
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
--, HQ is negligible. Chemical was either not a COPEC, or had minimal HQs (i.e., <1) for all relevant exposure areas. Full ingestion model results are presented in Appendix H2.
Dark shaded cells for threatened or endangered species indicate that conclusions for that species are only based upon HQ_{NOAEL} values.
HMW, High molecular weight
HQ, Hazard quotient
HQ_{LOAEL}, Hazard quotient calculated using the lowest-observable-adverse-effect toxicity reference value.
HQ_{NOAEL}, Hazard quotient calculated using the no-observable-adverse-effect toxicity reference value.
LMW, Low molecular weight
$NOEC_{Plants}$, No Observed Effect Concentration, plants
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
VOC, Volatile Organic Compound

EHS Support

Table 6-12
Soil Direct Contact Exposure Estimate - Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Soil Invertebrate Communities						Terrestrial Plant Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																		
Cyanide	mg/kg	82	55	0.2	0.4	2.2	---	---	---	---	---	---	6.4	---	<1	---	<1	---
TAL Metals																		
Arsenic	mg/kg	82	82	5.27	5.98	15.8	7	68	**2.3**	<1	<1	<1	18	91	<1	<1	<1	<1
Barium	mg/kg	82	82	249	307	533	330	3200	**1.6**	<1	<1	<1	110	260	**4.8**	**2.1**	**2.8**	**1.2**
Copper	mg/kg	82	82	16	18	33.2	80	530	<1	<1	<1	<1	70	490	<1	<1	<1	<1
Lead	mg/kg	82	82	12.4	15.6	44.8	1700	8400	<1	<1	<1	<1	120	570	<1	<1	<1	<1
Manganese	mg/kg	82	82	426.8	626	2210	450	4500	**4.9**	<1	**1.4**	<1	220	1100	**10.0**	**2.0**	**2.8**	<1
Selenium	mg/kg	82	23	0.62	0	1.1	4	41	<1	<1	<1	<1	1	3	**2.1**	<1	<1	<1
Vanadium	mg/kg	82	82	11.9	12.9	21.4	---	---	---	---	---	---	60	80	<1	<1	<1	<1
Zinc	mg/kg	82	82	51	67	238	120	930	**2.0**	<1	<1	<1	160	810	**1.5**	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)																		
Total HMW PAHs - 1/2MDL	mg/kg	82	54	0.399	0.73	2.50	29	---	<1	---	<1	---	---	---	---	---	---	---
Total HMW PAHs - MDL	mg/kg	82	54	0.411	0.74	2.50	29	---	<1	---	<1	---	---	---	---	---	---	---
Total HMW PAHs - Zero	mg/kg	82	54	0.387	0.73	2.50	29	---	<1	---	<1	---	---	---	---	---	---	---
Dioxins and Furans (mg/kg)																		
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	mg/kg	20	4	0.0000006	NC	0.0000018	5.0	10	<1	<1	---	---	---	---	---	---	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																		
Bis(2-Ethylhexyl) Phthalate	mg/kg	82	13	0.13	0.049	0.35	---	---	---	---	---	---	---	---	---	---	---	---
TCL Volatile Organic Compounds (TCL VOCs)																		
Cyclohexane	mg/kg	17	1	0.00	NC	0.001	---	---	---	---	---	---	---	---	---	---	---	---
Methyl Acetate	mg/kg	17	10	0.08	NC	0.4	---	---	---	---	---	---	---	---	---	---	---	---
Methylcyclohexane	mg/kg	17	1	0.00	NC	0.0015	---	---	---	---	---	---	---	---	---	---	---	---
M,P-Xylene	mg/kg	17	1	0.00	NC	0.00051	---	---	---	---	---	---	100	1000	<1	<1	---	---

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HMW, High molecular weight
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
MDL, Method detection limit
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-13
Summary of Refined Wildlife Hazard Quotients for the Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

	American Woodcock		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		North American Wolverine		Short-tailed Shrew	
Constituent	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	$NOEC_{Plants}$	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}
Inorganics - Metals																				
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	<1	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics																				
Cyanide	--	--	<1	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																				
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--	--	--	--	--	<1	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																				
Total LMW PAHs	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total HMW PAHs	--	--	1.52E+00	<1	<1	--	--	--	<1	--	<1	<1	--	--	--	--	<1	--	--	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																				
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)																				
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans																				
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.12E+00	--

Notes:
--, HQ is negligible. Chemical was either not a COPEC, or had minimal HQs (i.e., <1) for all relevant exposure areas. Full ingestion model results are presented in Appendix H2.
Dark shaded cells for threatened or endangered species indicate that conclusions for that species are only based upon HQ_{NOAEL} values.
HMW, High molecular weight
HQ, Hazard quotient
HQ_{LOAEL}, Hazard quotient calculated using the lowest-observable-adverse-effect toxicity reference value.
HQ_{NOAEL}, Hazard quotient calculated using the no-observable-adverse-effect toxicity reference value.
LMW, Low molecular weight
$NOEC_{Plants}$, No Observed Effect Concentration, plants
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
VOC, Volatile Organic Compound

Table 6-14
Soil Direct Contact Exposure Estimate - Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Soil Invertebrate Communities						Terrestrial Plant Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																		
Cyanide	mg/kg	38	25	0.773	0.876	3.7	---	---	---	---	---	---	6.4	---	<1	---	<1	---
TAL Metals																		
Arsenic	mg/kg	38	38	4.5	4.9	8.2	7	68	**1.2**	<1	<1	<1	18	91	<1	<1	<1	<1
Barium	mg/kg	38	38	131	158	236	330	3200	<1	<1	<1	<1	110	260	**2.1**	<1	**1.4**	<1
Copper	mg/kg	38	38	15.2	17.1	22.7	80	530	<1	<1	<1	<1	70	490	<1	<1	<1	<1
Lead	mg/kg	38	38	9	10	13.6	1700	8400	<1	<1	<1	<1	120	570	<1	<1	<1	<1
Manganese	mg/kg	38	38	301	363	467	450	4500	1.0	<1	<1	<1	220	1100	**2.1**	<1	**1.6**	<1
Zinc	mg/kg	38	38	42	47	56.3	120	930	<1	<1	<1	<1	160	810	<1	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)																		
Total HMW PAHs - 1/2MDL	mg/kg	38	27	0.737	1.32	3.4	29	---	<1	---	<1	---	---	---	---	---	---	---
Total HMW PAHs - MDL	mg/kg	38	27	0.766	1.43	3.4	29	---	<1	---	<1	---	---	---	---	---	---	---
Total HMW PAHs - Zero	mg/kg	38	27	0.708	1.31	3.4	29	---	<1	---	<1	---	---	---	---	---	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																		
Benzaldehyde	mg/kg	38	4	0.0518	0.039	0.088	---	---	---	---	---	---	---	---	---	---	---	---
Caprolactam	mg/kg	38	2	0.0440	NC	0.046	---	---	---	---	---	---	---	---	---	---	---	---
Di-N-Butyl Phthalate	mg/kg	38	4	0.0215	NC	0.034	---	---	---	---	---	---	160	600	<1	<1	---	---
TCL Volatile Organic Compounds (TCL VOCs)																		
Cyclohexane	mg/kg	19	18	0.0023	NC	0.005	---	---	---	---	---	---	---	---	---	---	---	---
Methyl Acetate	mg/kg	19	3	0.3237	NC	0.6	---	---	---	---	---	---	---	---	---	---	---	---
Methylcyclohexane	mg/kg	19	19	0.0042	NC	0.011	---	---	---	---	---	---	---	---	---	---	---	---
M,P-Xylene	mg/kg	19	19	0.0014	NC	0.0033	---	---	---	---	---	---	100	1000	<1	<1	---	---
O-Xylene (1,2-Dimethylbenzene)	mg/kg	19	18	0.0005	NC	0.0011	---	---	---	---	---	---	---	---	---	---	---	---

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HMW, High molecular weight
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
MDL, Method detection limit
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-15
Summary of Refined Wildlife Hazard Quotients for the Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

	American Woodcock		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		North American Wolverine		Short-tailed Shrew	
Constituent	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	$NOEC_{Plants}$	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}
Inorganics - Metals																				
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics																				
Cyanide	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																				
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--	--	--	--	--	<1	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																				
Total LMW PAHs	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total HMW PAHs	--	--	1.54E+00	<1	--	--	--	--	<1	--	<1	<1	--	--	--	--	<1	--	--	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																				
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)																				
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans																				
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
--, HQ is negligible. Chemical was either not a COPEC, or had minimal HQs (i.e., <1) for all relevant exposure areas. Full ingestion model results are presented in Appendix H2.
Dark shaded cells for threatened or endangered species indicate that conclusions for that species are only based upon HQ_{NOAEL} values.
HMW, High molecular weight
HQ, Hazard quotient
$HQ_{LOAEL,}$ Hazard quotient calculated using the lowest-observable-adverse-effect toxicity reference value.
$HQ_{NOAEL,}$ Hazard quotient calculated using the no-observable-adverse-effect toxicity reference value.
LMW, Low molecular weight
$NOEC_{Plants}$, No Observed Effect Concentration, plants
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
VOC, Volatile Organic Compound

EHS Support

Table 6-16
Soil Direct Contact Exposure Estimate - North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Soil Invertebrate Communities						Terrestrial Plant Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																		
Cyanide	mg/kg	42	41	13.6	41.2	137	---	---	**---**	---	**---**	---	6.4	---	**21.4**	---	**6.4**	---
Fluoride	mg/kg	42	42	86.4	147	306	---	---	**---**	---	**---**	---	---	---	**---**	---	**---**	---
TAL Metals																		
Antimony	mg/kg	42	10	1.45	0.930	2.6	78	780	<1	<1	<1	<1	11	58	<1	<1	<1	<1
Arsenic	mg/kg	42	42	11.0	13.5	34.1	7	68	**5.0**	<1	**2.0**	<1	18	91	**1.9**	<1	<1	<1
Barium	mg/kg	42	42	212	245	1560	330	3200	**4.7**	<1	<1	<1	110	260	**14.2**	**6.0**	**2.2**	<1
Beryllium	mg/kg	42	42	2.71	3.99	17.2	40	400	<1	<1	<1	<1	3	25	**6.9**	<1	**1.6**	<1
Cadmium	mg/kg	42	36	2.48	3.62	9.6	140	760	<1	<1	<1	<1	32	160	<1	<1	<1	<1
Chromium, Total	mg/kg	46	46	21.7	28.7	53	3360	---	<1	**---**	<1	**---**	3360	---	<1	**---**	<1	**---**
Cobalt	mg/kg	42	42	6.64	9.47	27.4	---	---	**---**	---	**---**	---	13	130	**2.1**	<1	<1	<1
Copper	mg/kg	42	42	28	44	83.6	80	530	1.0	<1	<1	<1	70	490	**1.2**	<1	<1	<1
Lead	mg/kg	42	42	48	111	238	1700	8400	<1	<1	<1	<1	120	570	**2.0**	<1	<1	<1
Mercury	mg/kg	42	32	0.035	0.063	0.12	0.05	0.5	**2.4**	<1	**1.3**	<1	34	64	<1	<1	<1	<1
Nickel	mg/kg	42	42	188	360	1250	280	1300	**4.5**	<1	**1.3**	<1	38	270	**32.9**	**4.6**	**9.5**	**1.3**
Selenium	mg/kg	42	26	1.2	1.8	3.4	4	41	<1	<1	<1	<1	1	3	**6.5**	**1.1**	**3.5**	<1
Thallium	mg/kg	42	35	0.947	1.89	4.6	---	---	**---**	**---**	**---**	**---**	0.05	0.5	**92.0**	**9.2**	**37.8**	**3.8**
Vanadium	mg/kg	42	42	63	110	348	---	---	**---**	**---**	**---**	**---**	60	80	**5.8**	**4.4**	**1.8**	**1.4**
Zinc	mg/kg	42	42	216	342	871	120	930	**7.3**	<1	**2.9**	<1	160	810	**5.4**	**1.1**	**2.1**	<1
Polycyclic Aromatic Hydrocarbons (PAHs)																		
Total LMW PAHs - 1/2MDL	mg/kg	41	40	459	2318	5561	18	---	**309**	**---**	**129**	**---**	---	---	**---**	**---**	**---**	**---**
Total LMW PAHs - MDL	mg/kg	41	40	461	2328	5594	18	---	**311**	**---**	**129**	**---**	---	---	**---**	**---**	**---**	**---**
Total LMW PAHs - Zero	mg/kg	41	40	458	2307	5529	18	---	**307**	**---**	**128**	**---**	---	---	**---**	**---**	**---**	**---**
Total HMW PAHs - 1/2MDL	mg/kg	41	41	1530	13433	22140	29	---	**763**	**---**	**463**	**---**	---	---	**---**	**---**	**---**	**---**
Total HMW PAHs - MDL	mg/kg	41	41	1530	9208	22140	29	---	**763**	**---**	**318**	**---**	---	---	**---**	**---**	**---**	**---**
Total HMW PAHs - Zero	mg/kg	41	41	1530	13433	22140	29	---	**763**	**---**	**463**	**---**	---	---	**---**	**---**	**---**	**---**
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																		
Bis(2-Ethylhexyl) Phthalate	mg/kg	40	4	1.63	NC	5.9	---	---	**---**	**---**	**---**	**---**	---	---	**---**	**---**	**---**	**---**
Carbazole	mg/kg	40	38	12.9	53.7	190	---	---	**---**	**---**	**---**	**---**	---	---	**---**	**---**	**---**	**---**
Dibenzofuran	mg/kg	40	37	2.57	7.7	28	---	---	**---**	**---**	**---**	**---**	6.1	61	**4.6**	<1	**1.3**	<1
TCL Volatile Organic Compounds (TCL VOCs)																		
Cyclohexane	mg/kg	9	3	0.0048	NC	0.0086	---	---	**---**	**---**	**---**	**---**	---	---	**---**	**---**	**---**	**---**
Isopropylbenzene (Cumene)	mg/kg	9	2	0.0004	NC	0.00052	---	---	**---**	**---**	**---**	**---**	---	---	**---**	**---**	**---**	**---**
Methyl Acetate	mg/kg	9	5	0.0044	NC	0.0065	---	---	**---**	**---**	**---**	**---**	---	---	**---**	**---**	**---**	**---**
Methylcyclohexane	mg/kg	9	3	0.0086	NC	0.015	---	---	**---**	**---**	**---**	**---**	---	---	**---**	**---**	**---**	**---**
M,P-Xylene	mg/kg	9	5	0.0036	NC	0.0091	---	---	**---**	**---**	**---**	**---**	100	1000	<1	<1	**---**	**---**
O-Xylene (1,2-Dimethylbenzene)	mg/kg	9	3	0.0019	NC	0.0032	---	---	**---**	**---**	**---**	**---**	---	---	**---**	**---**	**---**	**---**

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HMW, High molecular weight
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LMW, Low molecular weight
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
MDL, Method detection limit
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-17
Sediment Direct Contact Exposure Estimate - North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic Invertebrate Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry												
Cyanide	mg/kg	22	22	12.52	41.15	137	0.1	1.0	**1370**	**137**	**412**	**41.2**
TAL Metals												
Antimony	mg/kg	22	7	1.5	0.9	2.6	---	---	**---**	**---**	**---**	**---**
Arsenic	mg/kg	22	22	10.6	13.55	26.4	10	33	**2.7**	<1	**1.4**	<1
Barium	mg/kg	22	22	197.4	245	539	150	300	**3.6**	**1.8**	**1.6**	<1
Beryllium	mg/kg	22	22	2.6	4.0	17	---	---	**---**	**---**	**---**	**---**
Cadmium	mg/kg	22	21	2.561	3.620	8.3	1	5	**8.4**	**1.7**	**3.7**	<1
Chromium, Total	mg/kg	24	24	24	29	53	43	110	**1.2**	<1	<1	<1
Copper	mg/kg	22	22	36	44	83.6	31	140	**2.7**	<1	**1.4**	<1
Lead	mg/kg	22	22	52.8	110.7	238	35	120	**6.8**	**2.0**	**3.2**	<1
Nickel	mg/kg	22	22	240.0	359.84	1250.0	22	48	**56.8**	**26.0**	**16.4**	**7.5**
Selenium	mg/kg	22	16	1.2	2	3	1	3	**4.7**	**1.2**	**2.5**	<1
Silver	mg/kg	22	2	1.0	0.0	1	1	5	**2.0**	<1	<1	<1
Thallium	mg/kg	22	19	0.854	1.891	4.6	---	---	**---**	**---**	**---**	**---**
Vanadium	mg/kg	22	22	77	110	348	---	---	**---**	**---**	**---**	**---**
Zinc	mg/kg	22	22	260	342	871	120	450	**7.3**	**1.9**	**2.9**	<1
Polycyclic Aromatic Hydrocarbons (PAHs)												
$ESBTU_{13}$	ESBTU	30	30	11.0	NC	72.3	1.0	10	**72.3**	**7.2**	**---**	**---**
$ESBTU_{34}$	ESBTU	30	30	27.8	NC	199	1.0	10	**199**	**19.9**	**---**	**---**
TCL Semi-Volatile Organic Compounds (TCL SVOCs)												
Carbazole	mg/kg	22	21	16.2381	53.7367	190	---	---	**---**	**---**	**---**	**---**

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
$ESBTU_{13}$, Equilibrium Partitioning Sediment Benchmark Toxic Units based on 13 PAH model in USEPA (2003)
$ESBTU_{34}$, Equilibrium Partitioning Sediment Benchmark Toxic Units based on 34 PAH model in USEPA (2003)
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LMW, Low molecular weight
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-18
Surface Water Direct Contact Exposure Estimate - North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fraction	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic and Pelagic Invertebrate Communities						Aquatic Plant Communities						Fish and Amphibian Communities					
								$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC		$NOEC_{Fish/Amphibians}$	$LOEC_{Fish/Amphibians}$	Maximum EPC		Refined EPC	
										HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																									
Cyanide	U	µg/L	2	1	7.6	NC	7.6	5.2	22	**1.5**	<1	---	---	5.2	22	**1.5**	<1	---	---	5.2	22	**1.5**	<1	---	---
Fluoride	U	µg/L	2	2	12275	NC	22400	1800	4100	**12.4**	**5.5**	---	---	66500	380000	<1	<1	---	---	---	6000	---	**3.7**	---	---
Fluoride	F	µg/L	1	1	21500	NC	21500	1800	4100	**11.9**	**5.2**	---	---	66500	380000	<1	<1	---	---	---	6000	---	**3.6**	---	---
Metals																									
Aluminum	U	µg/L	2	2	4370	NC	8630	See Sample-Specific Evaluation in Table 6-19																	
Aluminum	F	µg/L	1	1	4780	NC	4780																		
Barium	U	µg/L	2	2	139	NC	234	3.9	39.0	**60.0**	**6.0**	---	---	3.9	39.0	**60.0**	**6.0**	---	---	3.9	39.0	**60.0**	**6.0**	---	---
Barium	F	µg/L	1	1	26	NC	26.4	3.9	39.0	**6.8**	<1	---	---	3.9	39.0	**6.8**	<1	---	---	3.9	39.0	**6.8**	<1	---	---
Beryllium	U	µg/L	2	1	1	NC	0.71	0.7	6.6	**1.1**	<1	---	---	0.7	6.6	**1.1**	<1	---	---	0.7	6.6	**1.1**	<1	---	---
Cadmium	U	µg/L	2	1	3	NC	3	See Sample-Specific Evaluation in Table 6-19																	
Cadmium	F	µg/L	1	1	3	NC	2.5																		
Copper	U	µg/L	2	2	10	NC	16.5	See Sample-Specific Evaluation in Table 6-19																	
Copper	F	µg/L	1	1	2	NC	2																		
Lead	U	µg/L	2	1	8	NC	7.6	See Sample-Specific Evaluation in Table 6-19																	
Nickel	U	µg/L	2	2	29	NC	55.9	See Sample-Specific Evaluation in Table 6-19																	
Vanadium	U	µg/L	2	2	12	NC	18	19.0	190.0	<1	<1	---	---	19.0	190.0	<1	<1	---	---	19.0	190.0	<1	<1	---	---
Zinc	U	µg/L	2	1	537	NC	537	See Sample-Specific Evaluation in Table 6-19																	
Zinc	F	µg/L	1	1	512	NC	512																		
Polycyclic Aromatic Hydrocarbons																									
Benzo(A)Anthracene	U	µg/L	1	1	3	NC	3	2.2	---	**1.3**	---	---	---	2.2	---	**1.3**	---	---	---	2.2	---	**1.3**	---	---	---
Benzo(A)Pyrene	U	µg/L	1	1	4	NC	3.9	1.0	---	**4.1**	---	---	---	1.0	---	**4.1**	---	---	---	1.0	---	**4.1**	---	---	---
Benzo(B)Fluoranthene	U	µg/L	1	1	10	NC	10	0.7	---	**14.8**	---	---	---	0.7	---	**14.8**	---	---	---	0.7	---	**14.8**	---	---	---
Benzo(G,H,I)Perylene	U	µg/L	1	1	4	NC	3.9	0.4	---	**8.9**	---	---	---	0.4	---	**8.9**	---	---	---	0.4	---	**8.9**	---	---	---
Chrysene	U	µg/L	1	1	8	NC	7.6	2.0	---	**3.7**	---	---	---	2.0	---	**3.7**	---	---	---	2.0	---	**3.7**	---	---	---
Fluoranthene	U	µg/L	1	1	9	NC	9.3	7.1	---	**1.3**	---	---	---	7.1	---	**1.3**	---	---	---	7.1	---	**1.3**	---	---	---
Indeno(1,2,3-C,D)Pyrene	U	µg/L	1	1	3	NC	3.1	0.3	---	**11.3**	---	---	---	0.3	---	**11.3**	---	---	---	0.3	---	**11.3**	---	---	---
Pyrene	U	µg/L	1	1	7	NC	7	10.1	---	<1	---	---	---	10.1	---	<1	---	---	---	10.1	---	<1	---	---	---

Notes:
µg/L, micrograms per liter
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
Fraction: U, Unfiltered; F, Filtered
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-19
Sample-Specific Surface Water Direct Contact Exposure Estimate - North Percolation Pond
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample ID	Station ID	Sampling Date	Filtered Aluminum					Unfiltered Aluminum					Filtered Cadmium					Unfiltered Cadmium				
			Result (µg/L)	NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}	Result (µg/L)	NOEC	HQ_{NOEC}	$NOEC_{Plants}$	HQ_{LOEC}	Result (µg/L)	NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}	Result (µg/L)	NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}
CFSWP-023-SW-04032017	CFSWP-023	4/3/2017						109	240	<1	450	<1						0.355 U	1.5	<1	4.2	<1
CFSWP-024-SW-06152017	CFSWP-024	6/15/2017	4780	87	**54.9**	750	**6.4**	8630	7.1	**1215**	11	**785**	2.5	0.4264	**5.9**	0.94	**2.7**	3	0.455	**6.6**	0.964	**3.1**

Sample ID	Station ID	Sampling Date	Filtered Copper					Unfiltered Copper					Unfiltered Lead					Unfiltered Nickel				
			Result (µg/L)	NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}	Result (µg/L)	NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}	Result (µg/L)	NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}	Result (µg/L)	NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}
CFSWP-023-SW-04032017	CFSWP-023	4/3/2017						3.8	23.8		29.9		0.19 U	8.9		228		1.9	103	<1	928	<1
CFSWP-024-SW-06152017	CFSWP-024	6/15/2017	2	0.107	**18.6**	0.173	**11.6**	16.5	6.6	**2.5**	7.29	**2.3**	7.6	1.3	**5.8**	33.8	<1	55.9	29.0	**1.9**	261	<1

Sample ID	Station ID	Sampling Date	Filtered Zinc					Unfiltered Zinc				
			Result (µg/L)	NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}	Result (µg/L)	NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}
CFSWP-023-SW-04032017	CFSWP-023	4/3/2017						3.5 U	237.3	<1	237	<1
CFSWP-024-SW-06152017	CFSWP-024	6/15/2017	512	65.7	**7.8**	65.1	**7.9**	537	66.6	**8.1**	66.6	**8.1**

Notes:
µg/L, micrograms per liter
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants

Table 6-20
Summary of Refined Wildlife Hazard Quotients for the North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel	
	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	$NOEC_{Plants}$	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}
Inorganics - Metals																		
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	1.57E+00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	1.69E+00	--	--	--	--	--	--	--	<1	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	1.24E+00	--	--	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--
Lead	1.13E+00	--	2.95E+00	--	--	--	--	--	--	--	<1	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	1.37E+00	--	4.90E+00	1.77E+00	--	--	--	--	--	--	1.31E+00	<1	--	--	--	--	--	--
Selenium	3.94E+00	1.39E+00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	1.44E+01	2.91E+00	4.28E+00	--	1.27E+00	--	<1	--	<1	--	<1	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	<1	--	--	--	--	--	--	--
Inorganics - Other Inorganics																		
Cyanide	3.45E+00	--	9.09E+00	--	--	--	<1	--	<1	--	--	--	--	--	--	--	--	--
Fluoride	2.17E+00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																		
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																		
Total LMW PAHs	1.20E+02	1.20E+01	5.45E+01	5.45E+00	1.13E+01	--	<1	--	--	--	1.55E+01	1.55E+00	--	--	--	--	--	--
Total HMW PAHs	2.84E+03	2.84E+02	1.03E+03	1.03E+02	2.68E+02	2.68E+01	1.57E+00	<1	<1	--	2.90E+02	2.90E+01	<1	--	<1	<1	4.32E+00	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																		
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--	<1	--	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)																		
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans																		
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--	<1	--	--	--	--	--	--	--

Table 6-20
Summary of Refined Wildlife Hazard Quotients for the North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}
Inorganics - Metals								
Aluminum	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	1.39E+00	--
Arsenic	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	3.50E+00	--
Chromium	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--
Nickel	1.11E+00	--	--	--	--	--	2.03E+01	2.33E+00
Selenium	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics								
Cyanide	--	--	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs								
Aroclor 1248	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbon								
Total LMW PAHs	--	--	--	--	--	--	5.10E+00	--
Total HMW PAHs	2.31E+02	3.69E+00	--	--	<1	--	1.44E+03	2.30E+01
Semi-volatile Organic Compounds								
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	1.82E+00	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VO								
Methylcyclohexane	--	--	--	--	--	--	--	--
Dioxin/Furans								
Total Dioxins/Furans	--	--	--	--	--	--	--	--

Table 6-20
Summary of Refined Wildlife Hazard Quotients for the North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:
--, HQ is negligible. Chemical was either not a COPEC, or had minimal HQs (i.e., <1) for all relevant exposure areas. Full ingestion model results are presented in Appendix H2.
Dark shaded cells for threatened or endangered species indicate that conclusions for that species are only based upon HQ_{NOAEL} values.
HMW, High molecular weight
HQ, Hazard quotient
$HQ_{LOAEL,}$ Hazard quotient calculated using the lowest-observable-adverse-effect toxicity reference value.
$HQ_{NOAEL,}$ Hazard quotient calculated using the no-observable-adverse-effect toxicity reference value.
LMW, Low molecular weight
$NOEC_{Plants}$, No Observed Effect Concentration, plants
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
VOC, Volatile Organic Compound

Table 6-21
Soil Direct Contact Exposure Estimate - South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Soil Invertebrate Communities						Terrestrial Plant Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																		
Cyanide	mg/kg	38	33	1.243	4.429	16.4	---	---	---	---	---	---	6.4	---	**2.6**	---	<1	---
TAL Metals																		
Barium	mg/kg	38	38	430.963	640.099	972	330	3200	**2.9**	<1	**1.9**	<1	110	260	**8.8**	**3.7**	**5.8**	**2.5**
Cadmium	mg/kg	38	4	2	NC	2.5	140	760	<1	<1	---	---	32	160	<1	<1	---	---
Chromium, Total	mg/kg	38	38	9	11.363	32.8	3360	---	<1	---	<1	---	3360	---	<1	---	<1	---
Copper	mg/kg	38	38	81	203	694	80	530	**8.7**	**1.3**	**2.5**	<1	70	490	**9.9**	**1.4**	**2.9**	<1
Lead	mg/kg	38	38	15	34	116	1700	8400	<1	<1	<1	<1	120	570	<1	<1	<1	<1
Mercury	mg/kg	38	32	0.13	0.35	1.4	0.05	0.5	**28.0**	**2.8**	**7.0**	<1	34	64	<1	<1	<1	<1
Nickel	mg/kg	38	38	14.413	18.965	53.9	280.0	1300	<1	<1	<1	<1	38	270	**1.4**	<1	<1	<1
Selenium		38	7	0.814	0.572	1.3												
Silver	mg/kg	38	3	10	NC	23.5	---	---	---	---	---	---	560	2800	<1	<1	---	---
Zinc	mg/kg	38	38	81.137	115.622	351	120	930	**2.9**	<1	<1	<1	160.0	810	**2.2**	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)																		
Total HMW PAHs - 1/2MDL	mg/kg	38	35	3	5	19.6	29	---	<1	---	<1	---	---	---	---	---	---	---
Total HMW PAHs - MDL	mg/kg	38	35	3	5	20.2	29	---	<1	---	<1	---	---	---	---	---	---	---
Total HMW PAHs - Zero	mg/kg	38	35	3	4	19.1	29	---	<1	---	<1	---	---	---	---	---	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																		
4-Chloroaniline	mg/kg	38	4	0.7348	NC	1.9	1.8	18	**1.1**	<1	---	---	1.0	10	**1.9**	<1	---	---
Bis(2-Ethylhexyl) Phthalate	mg/kg	38	5	0.5960	NC	2.2	---	---	---	---	---	---	---	---	---	---	---	---
Di-N-Butyl Phthalate	mg/kg	38	6	0.0375	NC	0.058	---	---	---	---	---	---	160.0	600	<1	<1	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																		
Cyclohexane	mg/kg	17	7	0.0018	NC	0.0046	---	---	---	---	---	---	---	---	---	---	---	---
Methyl Acetate	mg/kg	17	3	0.0071	NC	0.0089												
Methylcyclohexane	mg/kg	17	9	0.0023	NC	0.0081												
M,P-Xylene	mg/kg	17	11	0.0010	NC	0.0033	---	---	---	---	---	---	100	1000	<1	<1	---	---
O-Xylene (1,2-Dimethylbenzene)	mg/kg	17	7	0.0004	NC	0.0011	---	---	---	---	---	---	---	---	---	---	---	---

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HMW, High molecular weight
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
MDL, Method detection limit
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-22
Sediment Direct Contact Exposure Estimate - South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic Invertebrate Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry												
Cyanide (Total)	mg/kg	26	22	1.72	4.43	16.4	0.1	1.0	**164.0**	**16.4**	**44.3**	**4.4**
Cyanide (Free)	mg/kg	2	1	0.89	NC	0.89	---	---	**---**	**---**	**---**	**---**
TAL Metals												
Barium	mg/kg	26	26	552	640	972	150	300	**6.5**	**3.2**	**4.3**	**2.1**
Cadmium	mg/kg	26	3	1.5	NC	2.5	1.0	4.9	**2.5**	<1	**---**	**---**
Copper	mg/kg	26	26	87.5	203	694	31	140	**22.4**	**5.0**	**6.5**	**1.4**
Lead	mg/kg	26	26	16.1	34.4	116	35	120	**3.3**	<1	<1	<1
Mercury	mg/kg	26	22	0.135	0.349	1.4	0.2	1.0	**7.8**	**1.4**	**1.9**	<1
Nickel	mg/kg	26	26	16	19	53.9	22	48	**2.5**	**1.1**	<1	<1
Silver	mg/kg	26	2	13	NC	23.5	0.5	5.0	**47.0**	**4.7**	**---**	**---**
Zinc	mg/kg	26	26	89	116	351	120	450	**2.9**	<1	<1	<1
Acid Volatile Sulfide-Simultaneously Extractable Metals												
(SEM-AVS)/fOC	$\mu mol/g_{OC}$	2	2	NC	NC	-24.4	130	1300	<1	<1	**---**	**---**
Polycyclic Aromatic Hydrocarbons (PAHs)												
$ESBTU_{13}$	ESBTU	26	26	0.05	NC	0.18	1.0	10	<1	<1	**---**	**---**
$ESBTU_{34}$	ESBTU	26	26	0.14	NC	0.49	1.0	10	<1	<1	**---**	**---**
TCL Semi-Volatile Organic Compounds (TCL SVOCs)												
4-Chloroaniline	mg/kg	26	2	1.02	NC	1.9	---	---	**---**	**---**	**---**	**---**
Carbazole	mg/kg	26	18	0.11	0.24	0.97	---	---	**---**	**---**	**---**	**---**
Cyclohexane	mg/kg	5	2	0.00	NC	0.0046	---	---	**---**	**---**	**---**	**---**
Methylcyclohexane	mg/kg	5	2	0.0048	NC	0.0081	---	---	**---**	**---**	**---**	**---**

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
$ESBTU_{13}$, Equilibrium Partitioning Sediment Benchmark Toxic Units based on 13 PAH model in USEPA (2003)
$ESBTU_{34}$, Equilibrium Partitioning Sediment Benchmark Toxic Units based on 34 PAH model in USEPA (2003)
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LMW, Low molecular weight
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

EHS Support

Table 6-23
Pore Water Direct Contact Exposure Estimate - South Percolation Pond
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fraction	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic and Pelagic Invertebrate Communities						Aquatic Plant Communities						Amphibian Communities					
								$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC		$NOEC_{Fish/Amphibians}$	$LOEC_{Fish/Amphibians}$	Maximum EPC		Refined EPC	
										HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																									
Fluoride	F	µg/L	6	6	146	NC	269	1800	4100	<1	<1	---	---	66500	380000	<1	<1	---	---	---	6000	---	<1	---	---
TAL Metals																									
Aluminum	F	µg/L	6	2	107	NC	172	See Sample-Specific Evaluation in Table 6-24																	
Barium	F	µg/L	6	6	287	NC	421	3.9	39.0	**107.9**	**10.8**	---	---	3.9	39.0	**107.9**	**10.8**	---	---	3.9	39.0	**107.9**	**10.8**	---	---
Copper	F	µg/L	6	1	3	NC	2.9	See Sample-Specific Evaluation in Table 6-24																	
Iron	F	µg/L	6	5	178	NC	387	1000	10000	<1	<1	---	---	1000	10000	<1	<1	---	---	1000	10000	<1	<1	---	---
Manganese	F	µg/L	6	5	55	NC	169	1300	2300	<1	<1	---	---	1300	2300	<1	<1	---	---	1300	2300	<1	<1	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																									
Bis(2-Ethylhexyl) Phthalate	U	µg/L	6	1	0.12	NC	0.12	32.0	320	<1	<1	---	---	32.0	320	<1	<1	---	---	32.0	320	<1	<1	---	---

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-24
Sample-Specific Pore Water Direct Contact Exposure Estimate - South Percolation Pond
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample ID	Station ID	Sampling Date	Filtered Aluminum						Filtered Copper					
			Result (µg/L)		NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}	Result (µg/L)		NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}
CFPWP-018-PW-10172018	CFPWP-018	10/17/2018	172		87	**2.0**	750	<1	2.9		7.1	<1	11.4	<1
CFPWP-019-PW-10162018	CFPWP-019	10/16/2018	7.5	U	87	<1	750	<1	0.95	U	4.6	<1	7.4	<1
CFPWP-020-PW-10112018	CFPWP-020	10/11/2018	7.5	U	87	<1	750	<1	0.95	U	7.0	<1	11.3	<1
CFPWP-058-PW-10112018	CFPWP-058	10/11/2018	7.5	U	87	<1	750	<1	0.95	U	2.1	<1	3.3	<1
CFPWP-059-PW-10112018	CFPWP-059	10/11/2018	7.5	U	87	<1	750	<1	0.95	U	2.3	<1	3.6	<1
CFPWP-060-PW-10162018	CFPWP-060	10/16/2018	42.9		87	<1	750	<1	0.95	U	5.1	<1	8.3	<1

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
NOEC, No observed effect concentration

Table 6-25
Surface Water Direct Contact Exposure Estimate - South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fraction	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic and Pelagic Invertebrate Communities						Aquatic Plant Communities						Fish and Amphibian Communities					
								$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC		$NOEC_{Fish/Amphibians}$	$LOEC_{Fish/Amphibians}$	Maximum EPC		Refined EPC	
										HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																									
Cyanide (Total)	U	µg/L	20	12	29.9	52.88	139	5.2	22	**26.7**	**6.3**	**10.2**	**2.4**	5.2	22	**26.7**	**6.3**	**10.2**	**2.4**	5.2	22	**26.7**	**6.3**	**10.2**	**2.4**
Cyanide (Total)	F	µg/L	5	3	44.1	NC	68.2	5.2	22	**13.1**	**3.1**	---	---	5.2	22	**13.1**	**3.1**	---	---	5.2	22	**13.1**	**3.1**	---	---
Cyanide (Free)	U	µg/L	16	13	4.4	5.62	10	5.2	22	**1.9**	<1	**1.1**	<1	5.2	22	**1.9**	<1	**1.1**	<1	5.2	22	**1.9**	<1	**1.1**	<1
Metals																									
Aluminum	U	µg/L	26	22	1761	6018	24500	See Sample-Specific Evaluation in Table 6-26																	
Aluminum	F	µg/L	17	9	483	907	2360																		
Barium	U	µg/L	26	26	371	788	2710	3.9	39	**694.9**	**69.5**	**202.0**	**20.2**	3.9	39	**694.9**	**69.5**	**202.0**	**20.2**	3.9	39	**694.9**	**69.5**	**202.0**	**20.2**
Barium	F	µg/L	17	17	259	314	527	3.9	39	**135.1**	**13.5**	**80.4**	**8.0**	3.9	39	**135.1**	**13.5**	**80.4**	**8.0**	3.9	39	**135.1**	**13.5**	**80.4**	**8.0**
Copper	U	µg/L	26	19	20	47	183	See Sample-Specific Evaluation in Table 6-26																	
Copper	F	µg/L	17	7	8	13	33.4																		
Iron	U	µg/L	26	23	1606	5192	22500	1000	10000	**22.5**	**2.3**	**5.2**	<1	1000	10000	**22.5**	**2.3**	**5.2**	<1	1000	10000	**22.5**	**2.3**	**5.2**	<1
Iron	F	µg/L	17	10	354	640	1430	1000	10000	**1.4**	<1	<1	<1	1000	10000	**1.4**	<1	<1	<1	1000	10000	**1.4**	<1	<1	<1
Manganese	U	µg/L	26	23	41	89	337	1300	2300	<1	<1	<1	<1	1300	2300	<1	<1	<1	<1	1300	2300	<1	<1	<1	<1
Vanadium	U	µg/L	26	8	5	7	24.8	19	190	**1.3**	<1	<1	<1	19	190	**1.3**	<1	<1	<1	19	190	**1.3**	<1	<1	<1
Polycyclic Aromatic Hydrocarbons																									
Indeno(1,2,3-C,D)Pyrene	U	µg/L	5	1	0.28	NC	0.28	0.275	---	1.0	---	---	---	0.275	---	1.0	---	---	---	0.275	---	1.0	---	---	---

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{Inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
NOEC, No observed effect concentration
$NOEC_{Inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-26
Sample-Specific Surface Water Direct Contact Exposure Estimate - South Percolation Pond
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample ID	Station ID	Sampling Date	Filtered Aluminum						Unfiltered Aluminum						Filtered Copper						Unfiltered Copper					
			Result (µg/L)		NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}	Result (µg/L)		NOEC	HQ_{NOEC}	$NOEC_{Plants}$	HQ_{LOEC}	Result (µg/L)		NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}	Result (µg/L)		NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}
CFSWP-018-SW-04032017	CFSWP-018	4/3/2017							60.7		690	<1	2500	<1							1.9		20.1	<1	24.9	<1
CFSWP-018-SW-06062016	CFSWP-018	6/6/2016							6.75	U	710	<1	2600	<1							2		19.7	<1	24.4	<1
CFSWP-018-SW-06152017	CFSWP-018	6/15/2017	9.1	U	87	<1	750	<1	285		1100	<1	3800	<1	0.7	U	28.0	<1	45.1	<1	5.3		23.1	<1	28.9	<1
CFSWP-018-SW-06212018	CFSWP-018	6/21/2018	7.5	U	87	<1	750	<1	289		490	<1	1600	<1	1.9		2.9	<1	4.6	<1	5		23.3	<1	29.2	<1
CFSWP-018-SW-10172018	CFSWP-018	10/17/2018	288		87	**3.3**	750	<1	1240		1000	**1.2**	4300	<1	5.9		46.3	<1	74.5	<1	20.1		19.4	**1.0**	23.8	<1
CFSWP-018-SW-12012016	CFSWP-018	12/1/2016							583		800	<1	3000	<1							9.8		27.0	<1	34.4	<1
CFSWP-019-SW-04032017	CFSWP-019	4/3/2017							24.5		700	<1	2500	<1							1.8		19.7	<1	24.4	<1
CFSWP-019-SW-06062016	CFSWP-019	6/6/2016							18.7		820	<1	2900	<1							3.3		19.7	<1	24.4	<1
CFSWP-019-SW-06152017	CFSWP-019	6/15/2017	9.1	U	87	<1	750	<1	9.1	U	1300	<1	3800	<1	0.7	U	32.0	<1	51.6	<1	0.7	U	18.6	<1	22.8	<1
CFSWP-019-SW-06212018	CFSWP-019	6/21/2018	7.5	U	87	<1	750	<1	46.3		900	<1	2200	<1	0.95	U	5.6	<1	8.9	<1	0.95	U	18.9	<1	23.2	<1
CFSWP-019-SW-10162018	CFSWP-019	10/16/2018	198		87	**2.3**	750	<1	853		1000	<1	4400	<1	4.4		58.4	<1	94.0	<1	19.6		18.6	**1.1**	22.8	<1
CFSWP-019-SW-11072017	CFSWP-019	11/7/2017	2360		87	**27.1**	750	**3.1**	4330		940	**4.6**	3500	**1.2**	33.4		17.6	**1.9**	28.4	**1.2**	75.9		50.1	**1.5**	68.0	**1.1**
CFSWP-019-SW-12012016	CFSWP-019	12/1/2016							61.7		760	<1	2800	<1							1.6		22.3	<1	27.9	<1
CFSWP-020-SW-03162017	CFSWP-020	3/16/2017							9.1	U	85	<1	140	<1							0.7	U	17.9	<1	21.8	<1
CFSWP-020-SW-06062016	CFSWP-020	6/6/2016							15.3		890	<1	3000	<1							1.8		19.4	<1	23.8	<1
CFSWP-020-SW-06152017	CFSWP-020	6/15/2017	9.1	U	87	<1	750	<1	9.1	U	1100	<1	3500	<1	0.7	U	21.4	<1	34.5	<1	0.7	U	17.9	<1	21.8	<1
CFSWP-020-SW-06212018	CFSWP-020	6/21/2018	7.5	U	87	<1	750	<1	27.4		800	<1	1900	<1	0.95	U	3.6	<1	5.8	<1	0.95	U	17.4	<1	21.2	<1
CFSWP-020-SW-10112018	CFSWP-020	10/11/2018	326		87	**3.7**	750	<1	2310		1700	**1.4**	4000	<1	3.1		46.8	<1	75.4	<1	12.9		16.3	<1	19.7	<1
CFSWP-020-SW-11072017	CFSWP-020	11/7/2017	265		87	**3.0**	750	<1	24500		660	**37.1**	2100	**11.7**	3.6		5.0	<1	8.0	<1	183		137.2	**1.3**	206.5	<1
CFSWP-020-SW-12012016	CFSWP-020	12/1/2016							615		850	<1	3100	<1							4		26.7	<1	33.9	<1
CFSWP-058-SW-06212018	CFSWP-058	6/21/2018	7.5	U	87	<1	750	<1	75		1000	<1	2100	<1	0.95	U	4.7	<1	7.6	<1	0.95	U	17.8	<1	21.7	<1
CFSWP-058-SW-10112018	CFSWP-058	10/11/2018	752		87	**8.6**	750	**1.0**	1970		840	**2.3**	2500	<1	4.7		7.3	<1	11.7	<1	10.5		23.8	<1	29.9	<1
CFSWP-059-SW-06222018	CFSWP-059	6/22/2018	42.6		87	<1	750	<1	46.2		630	<1	1700	<1	0.95	U	3.5	<1	5.7	<1	0.95	U	17.8	<1	21.7	<1
CFSWP-059-SW-10112018	CFSWP-059	10/11/2018	54.1		87	<1	750	<1	689		1300	<1	2900	<1	0.95	U	11.0	<1	17.7	<1	7.7		20.5	<1	25.4	<1
CFSWP-060-SW-06222018	CFSWP-060	6/22/2018	7.5	U	87	<1	750	<1	497		870	<1	2100	<1	0.95	U	5.0	<1	8.1	<1	3.3		17.8	<1	21.7	<1
CFSWP-060-SW-10162018	CFSWP-060	10/16/2018	58.3		87	<1	750	<1	196		810	<1	2400	<1	0.95	U	7.0	<1	11.2	<1	1.9		17.1	<1	20.8	<1

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
Bold, value exceeds benchmark concentration (greater than 1)
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
NOEC, No observed effect concentration

Table 6-27
Summary of Refined Wildlife Hazard Quotients for the South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear	
Constituent	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**	**$NOEC_{Plants}$**	**HQ_{LOAEL}**	**HQ_{NOAEL}**	**HQ_{LOAEL}**
Inorganics - Metals																
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	4.11E+00	2.30E+00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	<1	--	--	--	--	--	--	--	<1	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	5.66E+00	--	<1	--	--	--	<1	--	--	--	<1	--	--	--	--	--
Lead	--	--	<1	--	--	--	--	--	--	--	<1	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	<1	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	1.54E+00	--	--	--	--	--	<1	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics																
Cyanide	--	--	<1	--	--	--	<1	--	--	--	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1	--
Polycyclic Aromatic Hydrocarbons (PAHs)																
Total LMW PAHs	--	--	--	--	--	--	<1	--	--	--	<1	--	--	--	--	--
Total HMW PAHs	1.45E+00	--	<1	<1	--	--	1.54E+00	<1	--	--	3.88E+00	<1	<1	--	<1	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	2.59E+00	<1	--	--	--	--	--	--	2.79E+00	<1	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)																
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans																
Total Dioxins/Furans	--	--	<1	--	--	--	--	--	--	--	<1	--	--	--	--	--

Table 6-27
Summary of Refined Wildlife Hazard Quotients for the South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

	Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}
Inorganics - Metals										
Aluminum	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	2.25E+00	--
Chromium	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--	2.43E+00	--
Lead	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	1.02E+00	--
Selenium	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics										
Cyanide	--	--	--	--	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCB										
Aroclor 1248	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbc										
Total LMW PAHs	--	--	--	--	--	--	--	--	--	--
Total HMW PAHs	--	--	--	--	--	--	<1	--	--	--
Semi-volatile Organic Compoun										
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (V										
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans										
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--

Table 6-27
Summary of Refined Wildlife Hazard Quotients for the South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:
--, HQ is negligible. Chemical was either not a COPEC, or had minimal HQs (i.e., <1) for all relevant exposure areas. Full ingestion model results are presented in Appendix H2.
Dark shaded cells for threatened or endangered species indicate that conclusions for that species are only based upon HQ_{NOAEL} values.
HMW, High molecular weight
HQ, Hazard quotient
$HQ_{LOAEL,}$ Hazard quotient calculated using the lowest-observable-adverse-effect toxicity reference value.
$HQ_{NOAEL,}$ Hazard quotient calculated using the no-observable-adverse-effect toxicity reference value.
LMW, Low molecular weight
$NOEC_{Plants}$, No Observed Effect Concentration, plants
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
VOC, Volatile Organic Compound

Table 6-28
Soil Direct Contact Exposure Estimate - Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Soil Invertebrate Communities						Terrestrial Plant Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																		
Cyanide	mg/kg	8	8	0.528	0.832	1.5	---	---	---	---	---	---	6.4	---	<1	---	<1	---
TAL Metals																		
Arsenic	mg/kg	8	8	5.900	6.828	7.8	6.8	68	**1.1**	<1	1.0	<1	18	91	<1	<1	<1	<1
Barium	mg/kg	8	8	240	274	295	330	3200	<1	<1	<1	<1	110	260	**2.7**	**1.1**	**2.5**	**1.1**
Copper	mg/kg	8	8	22.0	24.1	27.8	80	530	<1	<1	<1	<1	70	490	<1	<1	<1	<1
Lead	mg/kg	8	8	15	17	18.5	1700	8400	<1	<1	<1	<1	120	570	<1	<1	<1	<1
Manganese	mg/kg	8	8	1070	1349	1640	450	4500	**3.6**	<1	**3.0**	<1	220	1100	**7.5**	**1.5**	**6.1**	**1.2**
Nickel	mg/kg	8	8	26	32	43.8	280	1300	<1	<1	<1	<1	38	270	**1.2**	<1	<1	<1
Selenium	mg/kg	8	6	0.645	0.788	1.4	4.1	41	<1	<1	<1	<1	0.5	3.0	**2.7**	<1	**1.5**	<1
Vanadium	mg/kg	8	8	13	15	18	---	---	---	---	---	---	60	80	<1	<1	<1	<1
Zinc	mg/kg	8	8	91.6	110	129	120	930	**1.1**	<1	<1	<1	160	810	<1	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)																		
Total HMW PAHs - 1/2MDL	mg/kg	8	8	6.1	8.5	10.3	29	---	<1	---	<1	---	---	---	---	---	---	---
Total HMW PAHs - MDL	mg/kg	8	8	6.1	8.5	10.3	29	---	<1	---	<1	---	---	---	---	---	---	---
Total HMW PAHs - Zero	mg/kg	8	8	6.1	8.5	10.3	29	---	<1	---	<1	---	---	---	---	---	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																		
Benzaldehyde	mg/kg	8	2	0.0625	NC	0.069	---	---	---	---	---	---	---	---	---	---	---	---
Bis(2-Ethylhexyl) Phthalate	mg/kg	8	1	0.0450	NC	0.045	---	---	---	---	---	---	---	---	---	---	---	---
Di-N-Butyl Phthalate	mg/kg	8	1	0.0390	NC	0.039	---	---	---	---	---	---	160	600	<1	<1	---	---

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HMW, High molecular weight
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
MDL, Method detection limit
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-29
Sediment Direct Contact Exposure Estimate - Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic Invertebrate Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry												
Cyanide	mg/kg	8	8	0.53	0.83	1.5	0.1	1.0	**15.0**	**1.5**	**8.3**	<1
TAL Metals												
Barium	mg/kg	8	8	240	274	295	150	300	**2.0**	<1	**1.8**	<1
Beryllium	mg/kg	8	8	0.746	0.87	1.0	---	---	**---**	**---**	**---**	**---**
Manganese	mg/kg	8	8	1070	1349	1640	460	1100	**3.6**	**1.5**	**2.9**	**1.2**
Nickel	mg/kg	8	8	26	32	43.8	22	48	**2.0**	<1	**1.5**	<1
Vanadium	mg/kg	8	8	13	15	18	---	---	**---**	**---**	**---**	**---**
Zinc	mg/kg	8	8	92	110	129	120	450	**1.1**	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)												
$ESBTU_{13}$	ESBTU	8	8	9.8	NC	77.1	1.0	10	**77.1**	**7.7**	**---**	**---**
$ESBTU_{34}$	ESBTU	8	8	26.8	NC	212	1.0	10	**212**	**21.2**	**---**	**---**
TCL Semi-Volatile Organic Compounds (TCL SVOCs)												
Acetophenone	mg/kg	8	1	0.01	NC	0.011	---	---	**---**	**---**	**---**	**---**
Benzaldehyde	mg/kg	8	2	0.06	NC	0.069	---	---	**---**	**---**	**---**	**---**
Carbazole	mg/kg	8	8	0.0948	NC	0.18	---	---	**---**	**---**	**---**	**---**

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
$ESBTU_{13}$, Equilibrium Partitioning Sediment Benchmark Toxic Units based on 13 PAH model in USEPA (2003)
$ESBTU_{34}$, Equilibrium Partitioning Sediment Benchmark Toxic Units based on 34 PAH model in USEPA (2003)
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LMW, Low molecular weight
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-30
Surface Water Direct Contact Exposure Estimate - Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fraction	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic and Pelagic Invertebrate Communities						Aquatic Plant Communities						Fish and Amphibian Communities					
								$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC		$NOEC_{Fish/Amphibians}$	$LOEC_{Fish/Amphibians}$	Maximum EPC		Refined EPC	
										HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																									
Cyanide (Free)	U	µg/L	11	3	3.3	NC	5.8	5.2	22.0	**1.1**	<1	---	---	5.2	22.0	**1.1**	<1	---	---	5.2	22.0	**1.1**	<1	---	---
Metals																									
Aluminum	U	µg/L	27	20	134	369	1610	See Sample-Specific Evaluation in Table 6-31																	
Barium	U	µg/L	27	27	91	101	209	3.9	39.0	**53.6**	**5.4**	**26.0**	**2.6**	3.9	39.0	**53.6**	**5.4**	**26.0**	**2.6**	3.9	39.0	**53.6**	**5.4**	**26.0**	**2.6**
Barium	F	µg/L	16	16	91	106	218	3.9	39.0	**55.9**	**5.6**	**27.3**	**2.7**	3.9	39.0	**55.9**	**5.6**	**27.3**	**2.7**	3.9	39.0	**55.9**	**5.6**	**27.3**	**2.7**
Iron	U	µg/L	27	5	696	688	2910	1000	10000	**2.9**	<1	<1	<1	1000	10000	**2.9**	<1	<1	<1	1000	10000	**2.9**	<1	<1	<1
Manganese	U	µg/L	27	26	150	749	3750	1300	2300	**2.9**	**1.6**	<1	<1	1300	2300	**2.9**	**1.6**	<1	<1	1300	2300	**2.9**	**1.6**	<1	<1
Vanadium	U	µg/L	27	6	2	2	2.2	19.0	190	<1	<1	<1	<1	19.0	190	<1	<1	<1	<1	19.0	190	<1	<1	<1	<1

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-31
Sample-Specific Surface Water Direct Contact Exposure Estimate - Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Station ID	Sampling Date	Sample ID	Unfiltered Aluminum				
			Result (µg/L)	NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}
CFSWP-043	6/14/18	CFSWP-043-SW-06142018	7.5 U	630	<1	1700	<1
CFSWP-013	6/7/16	CFSWP-013-SW-06072016	30	940	<1	2200	<1
CFSWP-013	11/30/16	CFSWP-013-SW-11302016	1610	860	**1.9**	2100	<1
CFSWP-013	3/15/17	CFSWP-013-SW-03152017	38.6	47	<1	75	<1
CFSWP-013	6/12/17	CFSWP-013-SW-06122017	23.1	1400	<1	2300	<1
CFSWP-013	6/14/18	CFSWP-013-SW-06142018	7.5 U	840	<1	2000	<1
CFSWP-042	6/14/18	CFSWP-042-SW-06142018	7.5 U	670	<1	1800	<1
CFSWP-012	6/7/16	CFSWP-012-SW-06072016	35.9	1000	<1	2300	<1
CFSWP-012	4/3/17	CFSWP-012-SW-04032017	27.4	660	<1	1800	<1
CFSWP-012	6/12/17	CFSWP-012-SW-06122017	9.1 U	1500	<1	2300	<1
CFSWP-012	6/14/18	CFSWP-012-SW-06142018	23	640	<1	1700	<1
CFSWP-011	6/7/16	CFSWP-011-SW-06072016	28.2	1100	<1	2300	<1
CFSWP-011	4/3/17	CFSWP-011-SW-04032017	37.9	1100	<1	2400	<1
CFSWP-011	6/12/17	CFSWP-011-SW-06122017	9.1 U	1400	<1	2300	<1
CFSWP-011	6/14/18	CFSWP-011-SW-06142018	17.1	830	<1	2100	<1
CFSWP-041	6/14/18	CFSWP-041-SW-06142018	16.7	640	<1	1800	<1
CFSWP-010	6/7/16	CFSWP-010-SW-06072016	44.6	1200	<1	2400	<1
CFSWP-010	3/15/17	CFSWP-010-SW-03152017	507	49	**10.3**	78	**6.5**
CFSWP-010	6/12/17	CFSWP-010-SW-06122017	9.1 U	1500	<1	2400	<1
CFSWP-010	6/14/18	CFSWP-010-SW-06142018	50.6	620	<1	1700	<1
CFSWP-040	6/15/18	CFSWP-040-SW-06152018	24.5	620	<1	1700	<1
CFSWP-039	6/15/18	CFSWP-039-SW-06152018	22	270	<1	680	<1
CFSWP-039	10/11/18	CFSWP-039-SW-10112018	7.5 U	560	<1	1900	<1
CFSWP-009	6/7/16	CFSWP-009-SW-06072016	16.8	1100	<1	2400	<1
CFSWP-009	4/3/17	CFSWP-009-SW-04032017	34.8	920	<1	2200	<1
CFSWP-009	6/12/17	CFSWP-009-SW-06122017	64.4	990	<1	2300	<1
CFSWP-009	6/14/18	CFSWP-009-SW-06142018	18.7	280	<1	730	<1

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
Bold, value exceeds benchmark concentration (greater than 1)
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
NOEC, No observed effect concentration

Table 6-32
Summary of Refined Wildlife Hazard Quotients for the Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear	
	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	$NOEC_{Plants}$	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}
Inorganics - Metals																
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	1.76E+00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	1.10E+01	1.27E+00	--	--	<1	--	--	--	1.18E+01	1.37E+00	--	--	--	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	<1	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	1.94E+00	--	--	--	--	--	<1	--	<1	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics																
Cyanide	--	--	--	--	--	--	<1	--	<1	--	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	2.00E+01	2.00E+00	--	--	--	--	--	--	2.51E+01	2.51E+00	--	--	<1	--
Polycyclic Aromatic Hydrocarbons (PAHs)																
Total LMW PAHs	--	--	--	--	--	--	<1	--	--	--	1.29E+00	--	--	--	--	--
Total HMW PAHs	2.26E+00	--	9.39E+00	<1	--	--	1.59E+00	<1	<1	--	1.40E+01	1.40E+00	<1	--	<1	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	1.41E+00	--	--	--	--	--	--	--	2.39E+00	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)																
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans																
Total Dioxins/Furans	--	--	<1	--	--	--	--	--	--	--	1.28E+00	--	--	--	--	--

Table 6-32
Summary of Refined Wildlife Hazard Quotients for the Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}
Inorganics - Metals										
Aluminum	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	2.01E+00	--
Selenium	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics										
Cyanide	--	--	--	--	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)										
Aroclor 1248	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)										
Total LMW PAHs	--	--	--	--	--	--	--	--	--	--
Total HMW PAHs	--	--	--	--	--	--	<1	--	--	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH S										
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)										
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans										
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--

Table 6-32
Summary of Refined Wildlife Hazard Quotients for the Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:
--, HQ is negligible. Chemical was either not a COPEC, or had minimal HQs (i.e., <1) for all relevant exposure areas. Full ingestion model results are presented in Appendix H2.
Dark shaded cells for threatened or endangered species indicate that conclusions for that species are only based upon HQ_{NOAEL} values.
HMW, High molecular weight
HQ, Hazard quotient
$HQ_{LOAEL,}$ Hazard quotient calculated using the lowest-observable-adverse-effect toxicity reference value.
$HQ_{NOAEL,}$ Hazard quotient calculated using the no-observable-adverse-effect toxicity reference value.
LMW, Low molecular weight
$NOEC_{Plants}$, No Observed Effect Concentration, plants
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
VOC, Volatile Organic Compound

Table 6-33
Soil Direct Contact Exposure Estimate - Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Soil Invertebrate Communities						Terrestrial Plant Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																		
Cyanide	mg/kg	12	7	0.4	0.4	0.84	---	---	**---**	**---**	**---**	**---**	6.4	---	<1	**---**	<1	**---**
TAL Metals																		
Arsenic	mg/kg	12	12	7.38	9.33	14.5	7	68	**2.1**	<1	**1.4**	<1	18	91	<1	<1	<1	<1
Barium	mg/kg	12	12	448	586	905	330	3200	**2.7**	<1	**1.8**	<1	110	260	**8.2**	**3.5**	**5.3**	**2.3**
Copper	mg/kg	12	12	20	26	42.5	80	530	<1	<1	<1	<1	70	490	<1	<1	<1	<1
Lead	mg/kg	12	12	11.6	13.5	17.6	1700	8400	<1	<1	<1	<1	120	570	<1	<1	<1	<1
Manganese	mg/kg	12	12	317.6	480	988	450	4500	**2.2**	<1	**1.1**	<1	220	1100	**4.5**	<1	**2.2**	<1
Selenium	mg/kg	12	4	2.07	2	4.4	4	41	**1.1**	<1	<1	<1	1	3	**8.5**	**1.5**	**3.1**	<1
Vanadium	mg/kg	12	12	11.6	12.9	17.2	---	---	**---**	**---**	**---**	**---**	60	80	<1	<1	<1	<1
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																		
Benzaldehyde	mg/kg	12	2	0.07	NC	0.1	---	---	**---**	**---**	**---**	**---**	---	---	**---**	**---**	**---**	**---**

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HMW, High molecular weight
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
MDL, Method detection limit
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-34
Sediment Direct Contact Exposure Estimate - Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic Invertebrate Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry												
Cyanide	mg/kg	12	7	0.41	0.41	0.84	0.1	1.0	**8.4**	<1	**4.1**	<1
TAL Metals												
Arsenic	mg/kg	12	12	7.4	9.3	14.5	10	33	**1.5**	<1	<1	<1
Barium	mg/kg	12	12	448	586	905.0	150	300	**6.0**	**3.0**	**3.9**	**2.0**
Beryllium	mg/kg	12	10	0.67	0.76	1.1	---	---	**---**	**---**	**---**	**---**
Copper	mg/kg	12	12	20.4	26.1	43	31	140	**1.4**	<1	<1	<1
Manganese	mg/kg	12	12	318	480	988	460	1100	**2.1**	<1	1.0	<1
Selenium	mg/kg	12	4	2	2	4.4	1	3	**6.1**	**1.5**	**2.2**	<1
Vanadium	mg/kg	12	12	12	13	17.2	---	---	**---**	**---**	**---**	**---**
Polycyclic Aromatic Hydrocarbons (PAHs)												
$ESBTU_{13}$	ESBTU	12	12	0.012	NC	0.037	1.0	10	<1	<1	**---**	**---**
$ESBTU_{34}$	ESBTU	12	12	0.034	NC	0.102	1.0	10	<1	<1	**---**	**---**
TCL Semi-Volatile Organic Compounds (TCL SVOCs)												
Acetophenone	mg/kg	12	1	0.01	NC	0.0093	---	---	**---**	**---**	**---**	**---**
Benzaldehyde	mg/kg	12	2	0.07	NC	0.1	---	---	**---**	**---**	**---**	**---**
Carbazole	mg/kg	12	9	0.0127	0.0148	0.023	---	---	**---**	**---**	**---**	**---**

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
$ESBTU_{13}$, Equilibrium Partitioning Sediment Benchmark Toxic Units based on 13 PAH model in USEPA (2003)
$ESBTU_{34}$, Equilibrium Partitioning Sediment Benchmark Toxic Units based on 34 PAH model in USEPA (2003)
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LMW, Low molecular weight
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-35
Pore Water Direct Contact Exposure Estimate - Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fraction	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic and Pelagic Invertebrate Communities						Aquatic Plant Communities						Amphibian Communities					
								$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC		$NOEC_{Fish/Amphibians}$	$LOEC_{Fish/Amphibians}$	Maximum EPC		Refined EPC	
										HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																									
Cyanide (Free)	F	µg/L	10	3	4	NC	8.3	5	22	**1.6**	<1	---	---	5	22	**1.6**	<1	---	---	5.2	22	**1.6**	<1	---	---
Fluoride	F	µg/L	10	10	209	NC	256	1800	4100	<1	<1	---	---	66500	380000	<1	<1	---	---	---	6000	---	<1	---	---
TAL Metals																									
Aluminum	F	µg/L	10	3	153	NC	337	See Sample-Specific Evaluation in Table 6-36																	
Barium	F	µg/L	10	10	146	NC	313	3.9	39.0	**80.3**	**8.0**	---	---	3.9	39.0	**80.3**	**8.0**	---	---	3.9	39.0	**80.3**	**8.0**	---	---
Iron	F	µg/L	10	6	189	NC	373	1000	10000	<1	<1	---	---	1000	10000	<1	<1	---	---	1000	10000	<1	<1	---	---
Manganese	F	µg/L	10	9	71	NC	345	1300	2300	<1	<1	---	---	1300	2300	<1	<1	---	---	1300	2300	<1	<1	---	---

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-36
Sample-Specific Pore Water Direct Contact Exposure Estimate - Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample ID	Station ID	Sampling Date	Filtered Aluminum				
			Result (µg/L)	NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}
CFPWP-021-PW-06192018	CFPWP-021	6/19/2018	337	87	**3.9**	750	<1
CFPWP-022-PW-06202018	CFPWP-022	6/20/2018	7.5 U	87	<1	750	<1
CFPWP-046-PW-06192018	CFPWP-046	6/19/2018	7.5 U	87	<1	750	<1
CFPWP-047-PW-06192018	CFPWP-047	6/19/2018	7.5 U	87	<1	750	<1
CFPWP-048-PW-06202018	CFPWP-048	6/20/2018	7.5 U	87	<1	750	<1
CFPWP-049-PW-06202018	CFPWP-049	6/20/2018	7.5 U	87	<1	750	<1
CFPWP-050-PW-06212018	CFPWP-050	6/21/2018	83.7	87	<1	750	<1
CFPWP-051-PW-06212018	CFPWP-051	6/21/2018	7.5 U	87	<1	750	<1
CFPWP-052-PW-06182018	CFPWP-052	6/18/2018	37.4	87	<1	750	<1
CFPWP-053-PW-06182018	CFPWP-053	6/18/2018	7.5 U	87	<1	750	<1

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
Bold, value exceeds benchmark concentration (greater than 1)
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
NOEC, No observed effect concentration

Table 6-37
Surface Water Direct Contact Exposure Estimate - Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fraction	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic and Pelagic Invertebrate Communities						Aquatic Plant Communities						Fish and Amphibian Communities					
								$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC		$NOEC_{Fish/Amphibians}$	$LOEC_{Fish/Amphibians}$	Maximum EPC		Refined EPC	
										HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Metals																									
Aluminum	U	µg/L	16	15	518	2713	5750	See Sample-Specific Evaluation in Table 6-38																	
Barium	U	µg/L	16	16	125	147	245	3.9	39.0	**62.8**	**6.3**	**37.6**	**3.8**	3.9	39.0	**62.8**	**6.3**	**37.6**	**3.8**	3.9	39.0	**62.8**	**6.3**	**37.6**	**3.8**
Barium	F	µg/L	11	11	121	147	229	3.9	39	**58.7**	**5.9**	**37.7**	**3.8**	3.9	39	**58.7**	**5.9**	**37.7**	**3.8**	3.9	39	**58.7**	**5.9**	**37.7**	**3.8**
Iron	U	µg/L	16	8	704	1696	4760	1000	10000	**4.8**	<1	**1.7**	<1	1000	10000	**4.8**	<1	**1.7**	<1	1000	10000	**4.8**	<1	**1.7**	<1
Manganese	U	µg/L	16	13	26	52	127	1300	2300	<1	<1	<1	<1	1300	2300	<1	<1	<1	<1	1300	2300	<1	<1	<1	<1
Vanadium	U	µg/L	16	3	3	NC	3.9	19.0	190	<1	<1	---	---	19.0	190	<1	<1	---	---	19.0	190	<1	<1	---	---

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-38
Sample-Specific Surface Water Direct Contact Exposure Estimate - Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample ID	Station ID	Sampling Date	Unfiltered Aluminum				
			Result (µg/L)	NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}
CFSWP-021-SW-06062016	CFSWP-021	6/6/2016	95.3	860	<1	2400	<1
CFSWP-021-SW-11302016	CFSWP-021	11/30/2016	5750	1500	**3.8**	3000	**1.9**
CFSWP-021-SW-03152017	CFSWP-021	3/15/2017	112	57	**2.0**	91	**1.2**
CFSWP-021-SW-06152017	CFSWP-021	6/15/2017	390	900	<1	3400	<1
CFSWP-021-SW-06192018	CFSWP-021	6/19/2018	36.5	310	<1	750	<1
CFSWP-022-SW-06062016	CFSWP-022	6/6/2016	937	810	**1.2**	2400	<1
CFSWP-022-SW-04032017	CFSWP-022	4/3/2017	140	550	<1	1800	<1
CFSWP-022-SW-06202018	CFSWP-022	6/20/2018	19	490	<1	1500	<1
CFSWP-046-SW-06192018	CFSWP-046	6/19/2018	45.8	620	<1	2300	<1
CFSWP-047-SW-06192018	CFSWP-047	6/19/2018	34.2	400	<1	1200	<1
CFSWP-048-SW-06202018	CFSWP-048	6/20/2018	16.1	300	<1	720	<1
CFSWP-049-SW-06202018	CFSWP-049	6/20/2018	17.1	590	<1	1900	<1
CFSWP-050-SW-06212018	CFSWP-050	6/21/2018	66.5	290	<1	600	<1
CFSWP-051-SW-06212018	CFSWP-051	6/21/2018	7.5 U	760	<1	2200	<1
CFSWP-052-SW-06182018	CFSWP-052	6/18/2018	59.2	730	<1	2800	<1
CFSWP-053-SW-06182018	CFSWP-053	6/18/2018	47.8	430	<1	1300	<1

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
Bold, value exceeds benchmark concentration (greater than 1)
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
NOEC, No observed effect concentration

Table 6-39
Summary of Refined Wildlife Hazard Quotients for the Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx	
	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	$NOEC_{Plants}$	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	3.76E+00	2.11E+00	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	<1	<1	--	--	<1	--	--	--	2.41E+00	<1	--	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	<1	<1	--	--
Selenium	3.49E+00	1.23E+00	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	<1	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	1.69E+00	--	--	--	--	--	<1	--	<1	--	<1	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics														
Cyanide	--	--	--	--	--	--	<1	--	<1	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	<1	<1	--	--	--	--	--	--	5.02E+00	<1	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Total LMW PAHs	--	--	--	--	--	--	<1	--	--	--	<1	--	--	--
Total HMW PAHs	--	--	<1	--	--	--	1.56E+00	<1	<1	--	4.54E+00	<1	<1	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	<1	--	--	--	--	--	--	--	<1	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans	--	--	--	--	--	--	--	--	--	--				
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--	<1	--	--	--

Table 6-39
Summary of Refined Wildlife Hazard Quotients for the Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	1.25E+00	--
Silver	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics												
Cyanide	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	<1	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs												
Total LMW PAHs	--	--	--	--	--	--	--	--	--	--	--	--
Total HMW PAHs	<1	<1	--	--	--	--	--	--	<1	--	--	--
Semi-volatile Organic Compounds (SVOC												
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans												
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--	--	--

Table 6-39
Summary of Refined Wildlife Hazard Quotients for the Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:
--, HQ is negligible. Chemical was either not a COPEC, or had minimal HQs (i.e., <1) for all relevant exposure areas. Full ingestion model results are presented in Appendix H2.
Dark shaded cells for threatened or endangered species indicate that conclusions for that species are only based upon HQ_{NOAEL} values.
HMW, High molecular weight
HQ, Hazard quotient
$HQ_{LOAEL,}$ Hazard quotient calculated using the lowest-observable-adverse-effect toxicity reference value.
$HQ_{NOAEL,}$ Hazard quotient calculated using the no-observable-adverse-effect toxicity reference value.
LMW, Low molecular weight
$NOEC_{Plants}$, No Observed Effect Concentration, plants
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
VOC, Volatile Organic Compound

Table 6-40
Sediment Direct Contact Exposure Estimate - Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic Invertebrate Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry												
Cyanide	mg/kg	32	17	1.60	1.69	8.3	0.1	1.0	**83.0**	**8.3**	**16.9**	**1.7**
TAL Metals												
Barium	mg/kg	32	32	89.0	100.2	151	150.0	300.0	1.0	<1	<1	<1
Beryllium	mg/kg	32	31	0.4	0.42	0.6	---	---	---	---	---	---
Vanadium	mg/kg	32	32	14.3	15.6	25.5	---	---	---	---	---	---
Acid Volatile Sulfide-Simultaneously Extractable Metals												
(SEM-AVS)/fOC	$\mu mol/g_{OC}$	5	5	NC	NC	69.3	130.0	3000	<1	<1	---	---
Polycyclic Aromatic Hydrocarbons (PAHs)												
$ESBTU_{13}$	ESBTU	32	32	0.66	NC	9.80	1.0	10	**9.8**	<1	---	---
$ESBTU_{34}$	ESBTU	32	32	1.70	NC	27.0	1.0	10	**27.0**	**2.7**	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)												
Benzaldehyde	mg/kg	27	2	0.0474	0.0000	0.085	---	---	---	---	---	---
Carbazole	mg/kg	27	6	0.1198	0.1062	0.36	---	---	---	---	---	---
TCL Volatile Organic Compounds (TCL VOCs)												
Cyclohexane	mg/kg	6	6	0.0025	0.0034	0.0039	---	---	---	---	---	---
Methyl Acetate	mg/kg	6	1	0.1100	0.0000	0.11	---	---	---	---	---	---
Methylcyclohexane	mg/kg	6	6	0.0049	0.0067	0.0085	---	---	---	---	---	---

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
$ESBTU_{13}$, Equilibrium Partitioning Sediment Benchmark Toxic Units based on 13 PAH model in USEPA (2003)
$ESBTU_{34}$, Equilibrium Partitioning Sediment Benchmark Toxic Units based on 34 PAH model in USEPA (2003)
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LMW, Low molecular weight
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-41
Pore Water Direct Contact Exposure Estimate - Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fraction	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic Invertebrate Communities						Aquatic Plant Communities						Amphibian Communities					
								$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC		$NOEC_{Fish/Amphibians}$	$LOEC_{Fish/Amphibians}$	Maximum EPC		Refined EPC	
										HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																									
Cyanide (Free)	F	µg/L	17	8	18	NC	62.4	5.2	22	**12.0**	**2.8**	---	---	5.2	22	**12.0**	**2.8**	---	---	5.2	22	**12.0**	**2.8**	---	---
Fluoride	F	µg/L	17	7	1604	NC	3140	1800	4100	**1.7**	<1	---	---	66500	380000	<1	<1	---	---	---	6000	---	<1	---	---
TAL Metals																									
Barium	F	µg/L	17	17	142	NC	261	3.9	39.0	**66.9**	**6.7**	---	---	3.9	39.0	**66.9**	**6.7**	---	---	3.9	39.0	**66.9**	**6.7**	---	---
Iron	F	µg/L	17	5	142	NC	172	1000	10000	<1	<1	---	---	1000	10000	<1	<1	---	---	1000	10000	<1	<1	---	---
Manganese	F	µg/L	17	6	148	NC	509	1300	2300	<1	<1	---	---	1300	2300	<1	<1	---	---	1300	2300	<1	<1	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																									
Acetophenone	U	µg/L	17	1	0.190	NC	0.19	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bis(2-Ethylhexyl) Phthalate	U	µg/L	17	12	11.458	NC	26	32.0	320	<1	<1	---	---	32.0	320	<1	<1	---	---	32.0	320	<1	<1	---	---
Caprolactam	U	µg/L	17	12	1.458	NC	2.7	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Carbazole	U	µg/L	17	1	0.130	NC	0.13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-42
Surface Water Direct Contact Exposure Estimate - Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fraction	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic and Pelagic Invertebrate Communities						Aquatic Plant Communities						Fish and Amphibian Communities					
								$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC		$NOEC_{Fish/Amphibians}$	$LOEC_{Fish/Amphibians}$	Maximum EPC		Refined EPC	
										HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																									
Cyanide (Total)	U	µg/L	59	22	96	62	327	5.2	22	**62.9**	**14.9**	**11.9**	**2.8**	5.2	22	**62.9**	**14.9**	**11.9**	**2.8**	5.2	22	**62.9**	**14.9**	**11.9**	**2.8**
Cyanide (Total)	F	µg/L	15	9	109	183	328	5.2	22	**63.1**	**14.9**	**35.2**	**8.3**	5.2	22	**63.1**	**14.9**	**35.2**	**8.3**	5.2	22	**63.1**	**14.9**	**35.2**	**8.3**
Cyanide (Free)	U	µg/L	48	26	19	26.8	139	5.2	22	**26.7**	**6.3**	**5.2**	**1.2**	5.2	22	**26.7**	**6.3**	**5.2**	**1.2**	5.2	22	**26.7**	**6.3**	**5.2**	**1.2**
Cyanide (Free)	F	µg/L	10	10	10	23.2	42.2	5.2	22	**8.1**	**1.9**	**4.5**	**1.1**	5.2	22	**8.1**	**1.9**	**4.5**	**1.1**	5.2	22	**8.1**	**1.9**	**4.5**	**1.1**
TAL Metals																									
Aluminum	U	µg/L	76	70	333	486	1540	See Sample-Specific Evaluation in Table 6-43																	
Barium	U	µg/L	76	76	110	117	216	3.9	39	**55.4**	**5.5**	**30.0**	**3.0**	3.9	39	**55.4**	**5.5**	**30.0**	**3.0**	3.9	39	**55.4**	**5.5**	**30.0**	**3.0**
Barium	F	µg/L	49	49	95	104	191	3.9	39	**49.0**	**4.9**	**26.6**	**2.7**	3.9	39	**49.0**	**4.9**	**26.6**	**2.7**	3.9	39	**49.0**	**4.9**	**26.6**	**2.7**
Iron	U	µg/L	76	51	552	477	1640	1000	10000	**1.6**	<1	<1	<1	1000	10000	**1.6**	<1	<1	<1	1000	10000	**1.6**	<1	<1	<1
Iron	F	µg/L	49	11	99	63	164	1000	10000	<1	<1	<1	<1	1000	10000	<1	<1	<1	<1	1000	10000	<1	<1	<1	<1
Manganese	U	µg/L	76	54	29	28	212	1300	2300	<1	<1	<1	<1	1300	2300	<1	<1	<1	<1	1300	2300	<1	<1	<1	<1
Vanadium	U	µg/L	76	4	1	1	1.9	19	190	<1	<1	<1	<1	19	190	<1	<1	<1	<1	19	190	<1	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)																									
Benzo(B)Fluoranthene	U	µg/L	11	3	0.269	NC	0.7	0.7	---	1.0	---	---	---	0.7	---	1.0	---	---	---	0.7	---	1.0	---	---	---
Pyrene	U	µg/L	11	4	0.453	NC	1.6	10.1	---	<1	---	---	---	10.1	---	<1	---	---	---	10.1	---	<1	---	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																									
Bis(2-Ethylhexyl) Phthalate	U	µg/L	11	4	9	8	22	32.0	320	<1	<1	<1	<1	32.0	320	<1	<1	<1	<1	32.0	320	<1	<1	<1	<1

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
NOEC, No observed effect concentration
$NOEC_{Inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-43
Sample-Specific Surface Water Direct Contact Exposure Estimate - Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample ID	Station ID	Sampling Date	Unfiltered Aluminum					
			Result (µg/L)		NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}
CFSWP-001-SW-09162016	CFSWP-001	9/16/2016	23.7		850	<1	1800	<1
CFSWP-001-SW-12022016	CFSWP-001	12/2/2016	25.6		1100	<1	2100	<1
CFSWP-001-SW-04042017	CFSWP-001	4/4/2017	103		430	<1	1100	<1
CFSWP-001-SW-06142017	CFSWP-001	6/14/2017	824		600	**1.4**	1400	<1
CFSWP-001-SW-06072018	CFSWP-001	6/7/2018	383		70	**5.5**	110	**3.5**
CFSWP-001-SW-10052018	CFSWP-001	10/5/2018	925		950	<1	2000	<1
CFSWP-002-SW-09162016	CFSWP-002	9/16/2016	28.8		830	<1	1800	<1
CFSWP-002-SW-12022016	CFSWP-002	12/2/2016	23.7		1200	<1	2100	<1
CFSWP-002-SW-04042017	CFSWP-002	4/4/2017	139		510	<1	1300	<1
CFSWP-002-SW-06142017	CFSWP-002	6/14/2017	9.1	U	1300	<1	2100	<1
CFSWP-002-SW-06072018	CFSWP-002	6/7/2018	324		200	**1.6**	440	<1
CFSWP-002-SW-10052018	CFSWP-002	10/5/2018	27.2		1000	<1	2000	<1
CFSWP-003-SW-09092016	CFSWP-003	9/9/2016	63.5		200	<1	440	<1
CFSWP-003-SW-12012016	CFSWP-003	12/1/2016	172		920	<1	2000	<1
CFSWP-003-SW-03162017	CFSWP-003	3/16/2017	794		54	**14.7**	87	**9.1**
CFSWP-003-SW-06142017	CFSWP-003	6/14/2017	746		1300	<1	2000	<1
CFSWP-003-SW-10312017	CFSWP-003	10/31/2017	800		850	<1	2000	<1
CFSWP-003-SW-06062018	CFSWP-003	6/6/2018	279		110	**2.5**	170	**1.6**
CFSWP-003-SW-10042018	CFSWP-003	10/4/2018	233		420	<1	1200	<1
CFSWP-004-SW-09092016	CFSWP-004	9/9/2016	522		380	**1.4**	1200	<1
CFSWP-004-SW-12012016	CFSWP-004	12/1/2016	53.3		700	<1	1900	<1
CFSWP-004-SW-03162017	CFSWP-004	3/16/2017	625		51	**12.3**	82	**7.6**
CFSWP-004-SW-06142017	CFSWP-004	6/14/2017	619		1400	<1	2200	<1
CFSWP-004-SW-10312017	CFSWP-004	10/31/2017	1180		790	**1.5**	2100	<1
CFSWP-004-SW-06062018	CFSWP-004	6/6/2018	139		230	<1	520	<1
CFSWP-004-SW-10042018	CFSWP-004	10/4/2018	861		430	**2.0**	1400	<1
CFSWP-005-SW-09092016	CFSWP-005	9/9/2016	143		380	<1	1200	<1
CFSWP-005-SW-12012016	CFSWP-005	12/1/2016	94.3		690	<1	2000	<1
CFSWP-005-SW-03162017	CFSWP-005	3/16/2017	521		51	**10.2**	81	**6.4**
CFSWP-005-SW-06142017	CFSWP-005	6/14/2017	553		1000	<1	2200	<1
CFSWP-005-SW-11012017	CFSWP-005	11/1/2017	33.9		480	<1	1500	<1
CFSWP-005-SW-06062018	CFSWP-005	6/6/2018	221		340	<1	900	<1
CFSWP-005-SW-10182018	CFSWP-005	10/18/2018	7.5	U	520	<1	1700	<1
CFSWP-006-SW-09092016	CFSWP-006	9/9/2016	19.9		690	<1	1600	<1
CFSWP-006-SW-12012016	CFSWP-006	12/1/2016	29.8		1400	<1	2300	<1
CFSWP-006-SW-03162017	CFSWP-006	3/16/2017	1540		54	**28.5**	87	**17.7**
CFSWP-006-SW-06142017	CFSWP-006	6/14/2017	1000		1300	<1	2000	<1
CFSWP-006-SW-06062018	CFSWP-006	6/6/2018	398		560	<1	1300	<1
CFSWP-006-SW-10042018	CFSWP-006	10/4/2018	53.9		160	<1	280	<1
CFSWP-007-SW-09162016	CFSWP-007	9/16/2016	28.9		640	<1	1500	<1
CFSWP-007-SW-12022016	CFSWP-007	12/2/2016	54.5		1200	<1	2100	<1
CFSWP-007-SW-03162017	CFSWP-007	3/16/2017	1460		55	**26.5**	89	**16.4**
CFSWP-007-SW-06142017	CFSWP-007	6/14/2017	879		1300	<1	1900	<1
CFSWP-007-SW-06072018	CFSWP-007	6/7/2018	647		370	**1.7**	930	<1
CFSWP-007-SW-10032018	CFSWP-007	10/3/2018	22.9		400	<1	1100	<1
CFSWP-008-SW-09162016	CFSWP-008	9/16/2016	33.9		540	<1	1400	<1
CFSWP-008-SW-12022016	CFSWP-008	12/2/2016	31		1200	<1	2100	<1
CFSWP-008-SW-04042017	CFSWP-008	4/4/2017	133		450	<1	1200	<1
CFSWP-008-SW-06142017	CFSWP-008	6/14/2017	9.1	U	1100	<1	2000	<1
CFSWP-008-SW-06072018	CFSWP-008	6/7/2018	454		450	**1.0**	1100	<1
CFSWP-008-SW-10032018	CFSWP-008	10/3/2018	7.5	U	320	<1	830	<1
CFSWP-017-SW-09162016	CFSWP-017	9/16/2016	33.2		540	<1	1500	<1
CFSWP-017-SW-12022016	CFSWP-017	12/2/2016	26.3		830	<1	1800	<1
CFSWP-017-SW-04042017	CFSWP-017	4/4/2017	138		54	**2.6**	87	**1.6**

Table 6-43
Sample-Specific Surface Water Direct Contact Exposure Estimate - Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample ID	Station ID	Sampling Date	Unfiltered Aluminum					
			Result (µg/L)		NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}
CFSWP-017-SW-06142017	CFSWP-017	6/14/2017	26.6		1300	<1	2000	<1
CFSWP-017-SW-06072018	CFSWP-017	6/7/2018	436		540	<1	1300	<1
CFSWP-017-SW-10032018	CFSWP-017	10/3/2018	38.5		240	<1	570	<1
CFSWP-026-SW-10312017	CFSWP-026	10/31/2017	41.1		490	<1	1300	<1
CFSWP-026-SW-06072018	CFSWP-026	6/7/2018	395		370	**1.1**	960	<1
CFSWP-026-SW-10052018	CFSWP-026	10/5/2018	232		320	<1	850	<1
CFSWP-027-SW-10312017	CFSWP-027	10/31/2017	154		720	<1	1700	<1
CFSWP-027-SW-06062018	CFSWP-027	6/6/2018	410		400	**1.0**	1000	<1
CFSWP-027-SW-10052018	CFSWP-027	10/5/2018	59.5		290	<1	740	<1
CFSWP-028-SW-10312017	CFSWP-028	10/31/2017	617		1000	<1	2100	<1
CFSWP-028-SW-06062018	CFSWP-028	6/6/2018	410		330	**1.2**	830	<1
CFSWP-028-SW-10042018	CFSWP-028	10/4/2018	7.5	U	490	<1	1400	<1
CFSWP-034-SW-06072018	CFSWP-034	6/7/2018	363		200	**1.8**	410	<1
CFSWP-034-SW-10052018	CFSWP-034	10/5/2018	23		1100	<1	2000	<1
CFSWP-035-SW-06072018	CFSWP-035	6/7/2018	331		300	**1.1**	760	<1
CFSWP-035-SW-10052018	CFSWP-035	10/5/2018	31.2		890	<1	2000	<1
CFSWP-036-SW-06062018	CFSWP-036	6/6/2018	539		440	**1.2**	1100	<1
CFSWP-036-SW-10042018	CFSWP-036	10/4/2018	39.8		390	<1	1000	<1
CFSWP-037-SW-06062018	CFSWP-037	6/6/2018	349		440	<1	1000	<1
CFSWP-037-SW-10032018	CFSWP-037	10/3/2018	17.5		480	<1	1200	<1
CFSWP-038-SW-06072018	CFSWP-038	6/7/2018	359		460	<1	1100	<1
CFSWP-038-SW-10032018	CFSWP-038	10/3/2018	7.5	U	410	<1	1100	<1

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
Bold, value exceeds benchmark concentration (greater than 1)
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
NOEC, No observed effect concentration

Table 6-44
Sediment Direct Contact Exposure Estimate - Flathead River Outside the Backwater Seep Sampling Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic Invertebrate Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
TAL Metals												
Barium	mg/kg	15	15	68.1	NC	146	150	300	<1	<1	---	---
Beryllium	mg/kg	15	14	0.4	NC	0.5	---	---	---	---	---	---
Vanadium	mg/kg	15	15	15.0	NC	25.5	---	---	---	---	---	---
Acid Volatile Sulfide-Simultaneously Extractable Metals												
(SEM-AVS)/fOC	$\mu mol/g_{OC}$	1	1	NC	NC	26.6	130	3000	<1	<1	---	---
Polycyclic Aromatic Hydrocarbons (PAHs)												
$ESBTU_{13}$	ESBTU	15	15	0.70	NC	9.80	1.0	10	**9.8**	<1	---	---
$ESBTU_{34}$	ESBTU	16	16	1.80	NC	27.0	1.0	10	**27.0**	**2.7**	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)												
Benzaldehyde	mg/kg	14	1	0.0098	NC	0.0098	---	---	---	---	---	---
Carbazole	mg/kg	14	3	0.0183	NC	0.048	---	---	---	---	---	---

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
$ESBTU_{13}$, Equilibrium Partitioning Sediment Benchmark Toxic Units based on 13 PAH model in USEPA (2003)
$ESBTU_{34}$, Equilibrium Partitioning Sediment Benchmark Toxic Units based on 34 PAH model in USEPA (2003)
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LMW, Low molecular weight
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-45
Pore Water Direct Contact Exposure Estimate - Flathead River Outside the Backwater Seep Sampling Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fraction	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic Invertebrate Communities						Aquatic Plant Communities						Amphibian Communities					
								$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC		$NOEC_{Fish/Amphibians}$	$LOEC_{Fish/Amphibians}$	Maximum EPC		Refined EPC	
										HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
TAL Metals																									
Barium	F	µg/L	10	10	135	NC	261	3.9	39.0	**66.9**	**6.7**	---	---	3.9	39.0	**66.9**	**6.7**	---	---	3.9	39.0	**66.9**	**6.7**	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																									
Acetophenone	U	µg/L	10	1	0.190	NC	0.19	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bis(2-Ethylhexyl) Phthalate	U	µg/L	10	7	10.214	NC	15	32.0	320	<1	<1	---	---	32.0	320	<1	<1	---	---	32.0	320	<1	<1	---	---
Caprolactam	U	µg/L	10	6	1.455	NC	2.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-46
Surface Water Direct Contact Exposure Estimate - Flathead River Outside the Backwater Seep Sampling Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fraction	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic and Pelagic Invertebrate Communities						Aquatic Plant Communities						Fish and Amphibian Communities					
								$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC		$NOEC_{Fish/Amphibians}$	$LOEC_{Fish/Amphibians}$	Maximum EPC		Refined EPC	
										HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
TAL Metals																									
Aluminum	U	µg/L	40	36	18	324	1540	See Sample-Specific Evaluation in Table 6-47																	
Barium	U	µg/L	40	40	63	94	139	3.9	39	**35.6**	**3.6**	**24.2**	**2.4**	3.9	39	**35.6**	**3.6**	**24.2**	**2.4**	3.9	39	**35.6**	**3.6**	**24.2**	**2.4**
Barium	F	µg/L	25	25	64	81	139	3.9	39	**35.6**	**3.6**	**20.7**	**2.1**	3.9	39	**35.6**	**3.6**	**20.7**	**2.1**	3.9	39	**35.6**	**3.6**	**20.7**	**2.1**
Iron	U	µg/L	40	19	127	685	1640	1000	10000	**1.6**	<1	<1	<1	1000	10000	**1.6**	<1	<1	<1	1000	10000	**1.6**	<1	<1	<1
Vanadium	U	µg/L	40	3	1	2	1.9	19	190	<1	<1	<1	<1	19	190	<1	<1	<1	<1	19	190	<1	<1	<1	<1
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																									
Bis(2-Ethylhexyl) Phthalate	U	µg/L	1	1	22	22	22	32.0	320	<1	<1	<1	<1	32.0	320	<1	<1	<1	<1	32.0	320	<1	<1	<1	<1
Caprolactam	U	µg/L	1	1	1	1	1.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-47
Sample-Specific Surface Water Direct Contact Exposure Estimate - Flathead River Outside the Backwater Seep Sampling Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample ID	Station ID	Sampling Date	Unfiltered Aluminum				
			Result (µg/L)	NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}
CFSWP-001-SW-04042017	CFSWP-001	4/4/2017	103	430	<1	1100	<1
CFSWP-001-SW-06072018	CFSWP-001	6/7/2018	383	70	**5.5**	110	**3.5**
CFSWP-001-SW-06142017	CFSWP-001	6/14/2017	824	600	**1.4**	1400	<1
CFSWP-001-SW-09162016	CFSWP-001	9/16/2016	23.7	850	<1	1800	<1
CFSWP-001-SW-10052018	CFSWP-001	10/5/2018	925	950	<1	2000	<1
CFSWP-001-SW-12022016	CFSWP-001	12/2/2016	25.6	1100	<1	2100	<1
CFSWP-002-SW-04042017	CFSWP-002	4/4/2017	139	510	<1	1300	<1
CFSWP-002-SW-06072018	CFSWP-002	6/7/2018	324	200	**1.6**	440	<1
CFSWP-002-SW-06142017	CFSWP-002	6/14/2017	9.1 U	1300	<1	2100	<1
CFSWP-002-SW-09162016	CFSWP-002	9/16/2016	28.8	830	<1	1800	<1
CFSWP-002-SW-10052018	CFSWP-002	10/5/2018	27.2	1000	<1	2000	<1
CFSWP-002-SW-12022016	CFSWP-002	12/2/2016	23.7	1200	<1	2100	<1
CFSWP-006-SW-03162017	CFSWP-006	3/16/2017	1540	54	**28.5**	87	**17.7**
CFSWP-006-SW-06062018	CFSWP-006	6/6/2018	398	560	<1	1300	<1
CFSWP-006-SW-06142017	CFSWP-006	6/14/2017	1000	1300	<1	2000	<1
CFSWP-006-SW-09092016	CFSWP-006	9/9/2016	19.9	690	<1	1600	<1
CFSWP-006-SW-10042018	CFSWP-006	10/4/2018	53.9	160	<1	280	<1
CFSWP-006-SW-12012016	CFSWP-006	12/1/2016	29.8	1400	<1	2300	<1
CFSWP-007-SW-03162017	CFSWP-007	3/16/2017	1460	55	**26.5**	89	**16.4**
CFSWP-007-SW-06072018	CFSWP-007	6/7/2018	647	370	**1.7**	930	<1
CFSWP-007-SW-06142017	CFSWP-007	6/14/2017	879	1300	<1	1900	<1
CFSWP-007-SW-09162016	CFSWP-007	9/16/2016	28.9	640	<1	1500	<1
CFSWP-007-SW-10032018	CFSWP-007	10/3/2018	22.9	400	<1	1100	<1
CFSWP-007-SW-12022016	CFSWP-007	12/2/2016	54.5	1200	<1	2100	<1
CFSWP-008-SW-04042017	CFSWP-008	4/4/2017	133	450	<1	1200	<1
CFSWP-008-SW-06072018	CFSWP-008	6/7/2018	454	450	**1.0**	1100	<1
CFSWP-008-SW-06142017	CFSWP-008	6/14/2017	9.1 U	1100	<1	2000	<1
CFSWP-008-SW-09162016	CFSWP-008	9/16/2016	33.9	540	<1	1400	<1
CFSWP-008-SW-10032018	CFSWP-008	10/3/2018	7.5 U	320	<1	830	<1
CFSWP-008-SW-12022016	CFSWP-008	12/2/2016	31	1200	<1	2100	<1
CFSWP-034-SW-06072018	CFSWP-034	6/7/2018	363	200	**1.8**	410	<1
CFSWP-034-SW-10052018	CFSWP-034	10/5/2018	23	1100	<1	2000	<1
CFSWP-035-SW-06072018	CFSWP-035	6/7/2018	331	300	**1.1**	760	<1
CFSWP-035-SW-10052018	CFSWP-035	10/5/2018	31.2	890	<1	2000	<1
CFSWP-036-SW-06062018	CFSWP-036	6/6/2018	539	440	**1.2**	1100	<1
CFSWP-036-SW-10042018	CFSWP-036	10/4/2018	39.8	390	<1	1000	<1
CFSWP-037-SW-06062018	CFSWP-037	6/6/2018	349	440	<1	1000	<1
CFSWP-037-SW-10032018	CFSWP-037	10/3/2018	17.5	480	<1	1200	<1
CFSWP-038-SW-06072018	CFSWP-038	6/7/2018	359	460	<1	1100	<1
CFSWP-038-SW-10032018	CFSWP-038	10/3/2018	7.5 U	410	<1	1100	<1

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
Bold, value exceeds benchmark concentration (greater than 1)
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
NOEC, No observed effect concentration

Table 6-48
Summary of Refined Wildlife Hazard Quotients for the Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	American Dipper		Belted Kingfisher		Mink	
	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}
Inorganics - Metals						
Aluminum	--	--	--	--	--	--
Antimony	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--
Barium	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--
Chromium	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--
Copper	--	--	--	--	--	--
Lead	--	--	--	--	--	--
Manganese	--	--	--	--	--	--
Mercury	--	--	--	--	--	--
Nickel	--	--	--	--	--	--
Selenium	--	--	--	--	--	--
Silver	--	--	--	--	--	--
Thallium	--	--	--	--	--	--
Vanadium	2.03E+00	--	1.46E+00	--	--	--
Zinc	--	--	--	--	--	--
Inorganics - Other Inorganics						
Cyanide	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)						
Aroclor 1248	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)						
Total LMW PAHs	--	--	--	--	--	--
Total HMW PAHs	1.41E+00	--	1.60E+00	--	1.46E+00	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs						
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)						
Methylcyclohexane	--	--	--	--	--	--
Dioxin/Furans						
Total Dioxins/Furans	--	--	--	--	--	--

Table 6-48
Summary of Refined Wildlife Hazard Quotients for the Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

--, HQ is negligible. Chemical was either not a COPEC, or had minimal HQs (i.e., <1) for all relevant exposure areas. Full ingestion model results are presented in Appendix H2.
Dark shaded cells for threatened or endangered species indicate that conclusions for that species are only based upon HQ_{NOAEL} values.

HMW, High molecular weight
HQ, Hazard quotient
$HQ_{LOAEL,}$ Hazard quotient calculated using the lowest-observable-adverse-effect toxicity reference value.
$HQ_{NOAEL,}$ Hazard quotient calculated using the no-observable-adverse-effect toxicity reference value.
LMW, Low molecular weight
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
VOC, Volatile Organic Compound

Table 6-49
Sediment Direct Contact Exposure Estimate - Flathead Riparian Area Channel
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic Invertebrate Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry												
Cyanide	mg/kg	10	10	0.82	1.05	1.7	0.1	1.0	**17.0**	**1.7**	**10.5**	**1.1**
TAL Metals												
Barium	mg/kg	10	10	135.7	160.9	208	150	300	**1.4**	<1	**1.1**	<1
Beryllium	mg/kg	10	10	0.5	0.57	0.7	---	---	---	---	---	---
Thallium	mg/kg	10	1	0.2	NC	0.18	---	---	---	---	---	---
Vanadium	mg/kg	10	10	16.3	18.6	24.2	---	---	---	---	---	---
Acid Volatile Sulfide-Simultaneously Extractable Metals												
(SEM-AVS)/fOC	$\mu mol/g_{OC}$	4	4	NC	NC	43.7	130	1300	<1	<1	---	---
Polycyclic Aromatic Hydrocarbons (PAHs)												
$ESBTU_{13}$	ESBTU	10	10	0.19	NC	1.45	1.0	10	**1.5**	<1	---	---
$ESBTU_{34}$	ESBTU	10	10	0.49	NC	3.99	1.0	10	**4.0**	<1	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)												
Acetophenone	mg/kg	9	1	0.0085	0.0000	0.0085	---	---	---	---	---	---
Benzaldehyde	mg/kg	9	3	0.0417	0.0000	0.062	---	---	---	---	---	---
Carbazole	mg/kg	9	5	0.0255	0.0319	0.07	---	---	---	---	---	---
TCL Volatile Organic Compounds (TCL VOCs)												
Cyclohexane	mg/kg	5	5	0.0023	0.0031	0.0032	---	---	---	---	---	---
Methylcyclohexane	mg/kg	5	5	0.0042	0.0054	0.006	---	---	---	---	---	---

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
$ESBTU_{13}$, Equilibrium Partitioning Sediment Benchmark Toxic Units based on 13 PAH model in USEPA (2003)
$ESBTU_{34}$, Equilibrium Partitioning Sediment Benchmark Toxic Units based on 34 PAH model in USEPA (2003)
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LMW, Low molecular weight
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-50
Pore Water Direct Contact Exposure Estimate - Flathead Riparian Area Channel
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fraction	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic Invertebrate Communities						Aquatic Plant Communities						Amphibian Communities				
								$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC		$NOEC_{Fish/Amphibians}$	$LOEC_{Fish/Amphibians}$	Maximum EPC		Refine
										HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}
Inorganic Chemistry																								
Cyanide	F	µg/L	5	5	238	NC	429	5.2	22	**82.5**	**19.5**	---	---	5.2	22	**82.5**	**19.5**	---	---	5.2	22	**82.5**	**19.5**	---
Cyanide (Free)	F	µg/L	5	5	20	NC	38.7	5.2	22	**7.4**	**1.8**	---	---	5.2	22	**7.4**	**1.8**	---	---	5.2	22	**7.4**	**1.8**	---
Fluoride	F	µg/L	5	5	2002	NC	2410	1800	4100	**1.3**	<1	---	---	66500	380000	<1	<1	---	---	---	6000	---	<1	---
TAL Metals																								
Arsenic	F	µg/L	5	3	1.97	NC	3.9	150	340	<1	<1	---	---	150	340	<1	<1	---	---	150	340	<1	<1	---
Barium	F	µg/L	5	5	288	NC	394	3.9	39.0	**101**	**10.1**	---	---	3.9	39.0	**101.0**	**10.1**	---	---	3.9	39.0	**101.0**	**10.1**	---
Iron	F	µg/L	5	5	2111	NC	6910	1000	10000	**6.9**	<1	---	---	1000	10000	**6.9**	<1	---	---	1000	10000	**6.9**	<1	---
Manganese	F	µg/L	5	4	213	NC	527	1300	2300	<1	<1	---	---	1300	2300	<1	<1	---	---	1300	2300	<1	<1	---
Polycyclic Aromatic Hydrocarbons (PAHs)																								
Benzo(A)Anthracene	U	µg/L	5	1	0.081	NC	0.081	2.2	---	<1	---	---	---	2.2	---	<1	---	---	---	2.2	---	<1	---	---
Benzo(A)Pyrene	U	µg/L	5	1	0.058	NC	0.058	1.0	---	<1	---	---	---	1.0	---	<1	---	---	---	1.0	---	<1	---	---
Benzo(G,H,I)Perylene	U	µg/L	5	1	0.093	NC	0.093	0.4	---	<1	---	---	---	0.4	---	<1	---	---	---	0.4	---	<1	---	---
Chrysene	U	µg/L	5	1	0.085	NC	0.085	2.0	---	<1	---	---	---	2.0	---	<1	---	---	---	2.0	---	<1	---	---
Dibenz(A,H)Anthracene	U	µg/L	5	1	0.140	NC	0.14	0.3	---	<1	---	---	---	0.3	---	<1	---	---	---	0.3	---	<1	---	---
Fluoranthene	U	µg/L	5	1	0.084	NC	0.084	7.1	---	<1	---	---	---	7.1	---	<1	---	---	---	7.1	---	<1	---	---
Indeno(1,2,3-C,D)Pyrene	U	µg/L	5	1	0.091	NC	0.091	0.3	---	<1	---	---	---	0.3	---	<1	---	---	---	0.3	---	<1	---	---
Pyrene	U	µg/L	5	1	0.071	NC	0.071	10.1	---	<1	---	---	---	10.1	---	<1	---	---	---	10.1	---	<1	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																								
Caprolactam	U	µg/L	5	3	0.603	NC	0.62	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Carbazole	U	µg/L	5	1	0.074	NC	0.074	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-51
Surface Water Direct Contact Exposure Estimate - Flathead Riparian Area Channel
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fraction	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic and Pelagic Invertebrate Communities						Aquatic Plant Communities						Fish and Amphibian Communities					
								$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC		$NOEC_{Fish/Amphibians}$	$LOEC_{Fish/Amphibians}$	Maximum EPC		Refined EPC	
										HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																									
Cyanide (Total)	U	µg/L	10	10	241	343	630	5.2	22	**121**	**28.6**	**66.0**	**15.6**	5.2	22	**121**	**28.6**	**66.0**	**15.6**	5.2	22	**121**	**28.6**	**66.0**	**15.6**
Cyanide (Total)	F	µg/L	5	5	95	184	245	5.2	22	**47.1**	**11.1**	**35.4**	**8.4**	5.2	22	**47.1**	**11.1**	**35.4**	**8.4**	5.2	22	**47.1**	**11.1**	**35.4**	**8.4**
Cyanide (Free)	U	µg/L	15	14	29	61.4	140	5.2	22	**26.9**	**6.4**	**11.8**	**2.8**	5.2	22	**26.9**	**6.4**	**11.8**	**2.8**	5.2	22	**26.9**	**6.4**	**11.8**	**2.8**
Cyanide (Free)	F	µg/L	5	5	19	44.9	63.5	5.2	22	**12.2**	**2.9**	**8.6**	**2.0**	5.2	22	**12.2**	**2.9**	**8.6**	**2.0**	5.2	22	**12.2**	**2.9**	**8.6**	**2.0**
Metals																									
Aluminum	U	µg/L	15	15	3592	25297	32000	See Sample-Specific Evaluation in Table 6-52																	
Aluminum	F	µg/L	15	11	248	292	614																		
Barium	U	µg/L	15	15	328	627	1230	3.9	39.0	**315**	**31.5**	**161**	**16.1**	3.9	39.0	**315**	**31.5**	**161**	**16.1**	3.9	39.0	**315**	**31.5**	**161**	**16.1**
Barium	F	µg/L	15	15	231	267	401	3.9	39.0	**103**	**10.3**	**69**	**6.9**	3.9	39.0	**103**	**10.3**	**68.6**	**6.9**	3.9	39.0	**103**	**10.3**	**68.6**	**6.9**
Beryllium	U	µg/L	15	3	1	NC	2	0.7	6.6	**3.0**	<1	---	---	0.7	6.6	**3.0**	<1	---	---	0.7	6.6	**3.0**	<1	---	---
Copper	U	µg/L	15	12	12	30	67.7	See Sample-Specific Evaluation in Table 6-52																	
Iron	U	µg/L	15	15	7172	17093	52100	1000	10000	**52.1**	**5.2**	**17.1**	**1.7**	1000	10000	**52.1**	**5.2**	**17.1**	**1.7**	1000.0	10000.0	**52.1**	**5.2**	**17.1**	**1.7**
Iron	F	µg/L	15	15	1372	8108	10200	1000	10000	**10.2**	1.0	**8.1**	<1	1000	10000	**10.2**	1.0	**8.1**	<1	1000.0	10000.0	**10.2**	1.0	**8.1**	<1
Lead	U	µg/L	15	11	6	21	38.5	See Sample-Specific Evaluation in Table 6-52																	
Manganese	U	µg/L	15	15	679	1404	2570	1300	2300	**2.0**	**1.1**	**1.1**	<1	1300	2300	**2.0**	**1.1**	**1.1**	<1	1300.0	2300.0	**2.0**	**1.1**	**1.1**	<1
Manganese	F	µg/L	15	15	509	1121	2420	1300	2300	**1.9**	**1.1**	<1	<1	1300	2300	**1.9**	**1.1**	<1	<1	1300.0	2300.0	**1.9**	**1.1**	<1	<1
Vanadium	U	µg/L	15	4	18	12	46.8	19	190	**2.5**	<1	<1	<1	19	190	**2.5**	<1	<1	<1	19.0	190.0	**2.5**	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)																									
Pyrene	U	µg/L	6	3	1	NC	1.8	10.1	---	<1	---	---	---	10.1	---	<1	---	---	---	10.1	---	<1	---	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																									
3- And 4- Methylphenol (Total)	U	µg/L	5	1	8	NC	7.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Benzaldehyde	U	µg/L	6	1	2	NC	2.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Caprolactam	U	µg/L	6	1	1	NC	0.97	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Carbazole	U	µg/L	6	2	2	NC	2.9	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-52
Sample-Specific Surface Water Direct Contact Exposure Estimate - Flathead Riparian Area Channel
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample ID	Station ID	Sampling Date	Filtered Aluminum					Unfiltered Aluminum					Unfiltered Copper					Unfiltered Lead				
			Result (µg/L)	NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}	Result (µg/L)	NOEC	HQ_{NOEC}	$NOEC_{Plants}$	HQ_{LOEC}	Result (µg/L)	NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}	Result (µg/L)	NOEC	HQ_{NOEC}	LOEC	HQ_{LOEC}
CFSWP-029-SW-06222018	CFSWP-029	6/22/2018	26.1	87	<1	755	<1	537	450	**1.2**	1400	<1	0.95 U	22.9	<1	28.66918	<1	0.44	8.38	<1	215	<1
CFSWP-029-SW-10182018	CFSWP-029	10/18/2018	33.3	87	<1	756	<1	53.1	490	<1	1600	<1	5.3	23.8	<1	29.92975	<1	0.185 U	8.88	<1	228	<1
CFSWP-029-SW-11012017	CFSWP-029	11/1/2017	9.1 U	87	<1	757	<1	383	770	<1	2900	<1	0.7 U	24.3	<1	30.68452	<1	0.41	9.19	<1	236	<1
CFSWP-030-SW-06222018	CFSWP-030	6/22/2018	43.4	87	<1	758	<1	1300	470	**2.8**	1500	<1	3.3	21.8	<1	27.15198	<1	1.2	7.79	<1	200	<1
CFSWP-030-SW-10182018	CFSWP-030	10/18/2018	7.5 U	87	<1	759	<1	109	740	<1	2500	<1	2.8	17.5	<1	21.2844	<1	0.53	5.60	<1	144	<1
CFSWP-030-SW-11032017	CFSWP-030	11/3/2017	245	87	**2.8**	760	<1	11800	650	**18.2**	2400	**4.9**	24.7	19.4	**1.3**	23.84632	**1.0**	12.5	6.53	**1.9**	168	<1
CFSWP-031-SW-06222018	CFSWP-031	6/22/2018	55.4	87	<1	761	<1	237	550	<1	1900	<1	2.1	23.3	<1	29.17381	<1	0.185 U	8.58	<1	220	<1
CFSWP-031-SW-10182018	CFSWP-031	10/18/2018	594	87	**6.8**	762	<1	709	940	<1	3500	<1	15.9	21.6	<1	26.89861	<1	0.77	7.69	<1	197	<1
CFSWP-031-SW-11032017	CFSWP-031	11/3/2017	614	87	**7.1**	763	<1	888	710	**1.3**	2700	<1	3.1	33.1	<1	42.99336	<1	0.88	14.49	<1	372	<1
CFSWP-032-SW-06222018	CFSWP-032	6/22/2018	7.5 U	87	<1	764	<1	69.5	370	<1	790	<1	0.95 U	24.0	<1	30.18147	<1	0.185 U	8.98	<1	231	<1
CFSWP-032-SW-10172018	CFSWP-032	10/17/2018	238	87	**2.7**	765	<1	189	770	<1	2800	<1	2.7	22.3	<1	27.91121	<1	0.4	8.08	<1	207	<1
CFSWP-032-SW-11032017	CFSWP-032	11/3/2017	586	87	**6.7**	766	<1	32000	770	**41.6**	3000	**10.7**	67.7	26.8	**2.5**	34.06735	**2.0**	38.5	10.58	**3.6**	272	<1
CFSWP-033-SW-06222018	CFSWP-033	6/22/2018	7.5 U	87	<1	767	<1	444	550	<1	1900	<1	2.4	23.3	<1	29.17381	<1	0.37	8.58	<1	220	<1
CFSWP-033-SW-10172018	CFSWP-033	10/17/2018	242	87	**2.8**	768	<1	66	980	<1	3900	<1	3.8	26.7	<1	33.94244	<1	0.185 U	10.53	<1	270	<1
CFSWP-033-SW-11032017	CFSWP-033	11/3/2017	50.4	87	<1	769	<1	5090	760	**6.7**	2900	**1.8**	13.8	25.1	<1	31.68912	<1	5.6	9.59	<1	246	<1

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
Bold, value exceeds benchmark concentration (greater than 1)
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
NOEC, No observed effect concentration

Table 6-53
Sediment Direct Contact Exposure Estimate - Cedar Creek
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic Invertebrate Communities					
							$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC	
									HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry												
Cyanide	mg/kg	9	4	0.16	0.16	0.24	0.1	1.0	**2.4**	<1	**1.6**	<1
TAL Metals												
Barium	mg/kg	9	9	123	165	249	150	300	**1.7**	<1	**1.1**	<1
Manganese	mg/kg	9	9	252	349	571	460	1100	**1.2**	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)												
$ESBTU_{13}$	ESBTU	9	9	0.065	NC	0.5	1.0	10	<1	<1	---	---
$ESBTU_{34}$	ESBTU	9	9	0.178	NC	1.3	1.0	10	**1.3**	<1	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)												
Benzaldehyde	mg/kg	9	3	0.16	NC	0.17	---	---	---	---	---	---
Carbazole	mg/kg	9	2	0.0074	NC	0.0098	---	---	---	---	---	---

Notes:
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
$ESBTU_{13}$, Equilibrium Partitioning Sediment Benchmark Toxic Units based on 13 PAH model in USEPA (2003)
$ESBTU_{34}$, Equilibrium Partitioning Sediment Benchmark Toxic Units based on 34 PAH model in USEPA (2003)
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LMW, Low molecular weight
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
mg/kg, milligrams per kilogram
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-54
Pore Water Direct Contact Exposure Estimate - Cedar Creek
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fraction	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic and Pelagic Invertebrate Communities						Aquatic Plant Communities						Amphibian Communities					
								$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC		$NOEC_{Fish/Amphibians}$	$LOEC_{Fish/Amphibians}$	Maximum EPC		Refined EPC	
										HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}
TAL Metals																									
Barium	F	µg/L	6	6	146	NC	269	3.9	39.0	**69.0**	**6.9**	---	---	3.9	39.0	**69.0**	**6.9**	---	---	3.9	39.0	**69.0**	**6.9**	---	---
Iron	F	µg/L	6	5	1567	NC	3640	1000	10000	**3.6**	<1	---	---	1000	10000	**3.6**	<1	---	---	1000	10000	**3.6**	<1	---	---
Manganese	F	µg/L	6	6	997	NC	2760	1300	2300	**2.1**	**1.2**	---	---	1300	2300	**2.1**	**1.2**	---	---	1300	2300	**2.1**	**1.2**	---	---
TCL Semi-Volatile Organic Compounds (TCL SVOCs)																									
Benzaldehyde	U	µg/L	6	1	0.12	NC	0.12	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Caprolactam	U	µg/L	6	1	1.6	NC	1.6	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Isophorone	U	µg/L	6	1	0.084	NC	0.084	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{Inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
NOEC, No observed effect concentration
$NOEC_{Inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
TAL, Target analyte list
TCL, Target compound list
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-55
Surface Water Direct Contact Exposure Estimate - Cedar Creek
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fraction	Units	Number of Samples	Number of Detections	Mean Detected Concentration	UCL_{Mean} Concentration	Maximum Detected Concentration	Benthic and Pelagic Invertebrate Communities						Aquatic Plant Communities						Fish and Amphibian Commun			
								$NOEC_{Inverts}$	$LOEC_{Inverts}$	Maximum EPC		Refined EPC		$NOEC_{Plants}$	$LOEC_{Plants}$	Maximum EPC		Refined EPC		$NOEC_{Fish/Amphibians}$	$LOEC_{Fish/Amphibians}$	Maximum EPC	
										HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}	HQ_{NOEC}	HQ_{LOEC}			HQ_{NOEC}	HQ_{LOEC}
Inorganic Chemistry																							
Cyanide (Total)	U	µg/L	22	7	5.46	6.32	15.3	5.2	22.0	**2.9**	<1	**1.2**	<1	5.2	22.0	**2.9**	<1	**1.2**	<1	5.2	22.0	**2.9**	<1
Cyanide (Free)	U	µg/L	20	2	4.8	NC	7.7	5.2	22.0	**1.5**	<1	---	---	5.2	22.0	**1.5**	<1	---	---	5.2	22.0	**1.5**	<1
TAL Metals																							
Barium	U	µg/L	28	28	105	108	130	3.9	39.0	**33.3**	**3.3**	**27.7**	**2.8**	3.9	39.0	**33.3**	**3.3**	**27.7**	**2.8**	3.9	39.0	**33.3**	**3.3**
Barium	F	µg/L	16	16	99.7	105	117	3.9	39.0	**30.0**	**3.0**	**26.8**	**2.7**	3.9	39.0	**30.0**	**3.0**	**26.8**	**2.7**	3.9	39.0	**30.0**	**3.0**

Notes:
µg/L, micrograms per liter
Fraction: U, Unfiltered; F, Filtered
---, Value not applicable
Bold, value exceeds benchmark concentration (greater than 1)
EPC, Exposure point concentration
HQ, Hazard quotient
HQ_{LOEC}, Hazard Quotient based on LOEC value
HQ_{NOEC}, Hazard Quotient based on NOEC value
LOEC, Lowest observed effect concentration
$LOEC_{inverts}$, Lowest Observed Effect Concentration, invertebrates
$LOEC_{Plants}$, Lowest Observed Effect Concentration, plants
NOEC, No observed effect concentration
$NOEC_{inverts}$, No Observed Effect Concentration, invertebrates
$NOEC_{Plants}$, No Observed Effect Concentration, plants
UCL_{Mean}, Upper confidence limit of the mean concentration

Table 6-56
Summary of Refined Wildlife Hazard Quotients for Cedar Creek
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	American Dipper		Belted Kingfisher		Mink	
	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}
Inorganics - Metals						
Aluminum	--	--	--	--	--	--
Antimony	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--
Barium	1.06E+00	--	--	--	--	--
Beryllium	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--
Chromium	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--
Copper	--	--	--	--	--	--
Lead	--	--	--	--	--	--
Manganese	--	--	--	--	--	--
Mercury	--	--	--	--	--	--
Nickel	--	--	--	--	--	--
Selenium	--	--	--	--	--	--
Silver	--	--	--	--	--	--
Thallium	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--
Zinc	--	--	--	--	--	--
Inorganics - Other Inorganics						
Cyanide	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)						
Aroclor 1248	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)						
Total LMW PAHs	--	--	--	--	--	--
Total HMW PAHs	--	--	--	--	--	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs						
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)						
Methylcyclohexane	--	--	--	--	--	--
Dioxin/Furans						
Total Dioxins/Furans	--	--	--	--	--	--

Notes:

--, HQ is negligible. Chemical was either not a COPEC, or had minimal HQs (i.e., <1) for all relevant exposure areas. Full ingestion m

HQ, Hazard quotient

HQ_{LOAEL}, Hazard quotient calculated using the lowest-observable-adverse-effect toxicity reference value.

HQ_{NOAEL}, Hazard quotient calculated using the no-observable-adverse-effect toxicity reference value.

PAH, Polycyclic Aromatic Hydrocarbon

PCB, Polychlorinated Biphenyl

SVOC, Semi-Volatile Organic Compound

VOC, Volatile Organic Compound

Table 6-57
Summary of Wildlife Hazard Quotients Calculated using Max EPC
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Main Plant Area (Soil)																										
Inorganics - Metals																										
Aluminum	NE	NE			NE	NE															NE	NE				
Antimony	NE	NE			NE	NE															NE	NE				
Arsenic	NE	NE			NE	NE															NE	NE				
Barium	NE	NE			NE	NE															NE	NE				
Beryllium	NE	NE			NE	NE															NE	NE				
Cadmium	NE	NE			NE	NE					●										NE	NE			●	
Chromium	NE	NE	●		NE	NE					●										NE	NE				
Cobalt	NE	NE			NE	NE															NE	NE				
Copper	NE	NE			NE	NE															NE	NE				
Lead	NE	NE	●		NE	NE					●										NE	NE				
Manganese	NE	NE			NE	NE															NE	NE				
Mercury	NE	NE			NE	NE															NE	NE				
Nickel	NE	NE	●		NE	NE					●										NE	NE			●	
Selenium	NE	NE			NE	NE															NE	NE				
Silver	NE	NE			NE	NE															NE	NE				
Thallium	NE	NE			NE	NE															NE	NE				
Vanadium	NE	NE	●		NE	NE															NE	NE				
Zinc	NE	NE			NE	NE					●										NE	NE				
Inorganics - Other Inorganics																										
Cyanide	NE	NE	●		NE	NE	●				●										NE	NE				
Fluoride	NE	NE	●		NE	NE					●										NE	NE				
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	NE	NE			NE	NE															NE	NE				
Aroclor 1254	NE	NE			NE	NE															NE	NE				
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	NE	NE	●		NE	NE	●				●										NE	NE				
Total HMW PAHs	NE	NE	●	●	NE	NE	●	●	●		●	●	●		●				●		NE	NE			●	●
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	NE	NE			NE	NE															NE	NE				
2,3,4,6-Tetrachlorophenol	NE	NE			NE	NE															NE	NE				
2-Chloronaphthalene	NE	NE			NE	NE															NE	NE				
Biphenyl (Diphenyl)	NE	NE			NE	NE															NE	NE				
Bis(2-ethylhexyl)phthalate	NE	NE	●	●	NE	NE					●	●									NE	NE				
Butylbenzylphthalate	NE	NE			NE	NE															NE	NE				
Dibenzofuran	NE	NE			NE	NE															NE	NE				
Di-n-butyl phthalate	NE	NE			NE	NE					●										NE	NE				
Di-n-octyl phthalate	NE	NE			NE	NE															NE	NE				
Hexachlorobenzene	NE	NE			NE	NE															NE	NE				
Hexachlorobutadiene	NE	NE			NE	NE															NE	NE				
Hexachloroethane	NE	NE			NE	NE															NE	NE				
Pentachlorophenol	NE	NE			NE	NE															NE	NE				
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	NE	NE			NE	NE															NE	NE				
Dioxin/Furans																										
Total Dioxins/Furans	NE	NE	●		NE	NE					●										NE	NE			●	●

Table 6-57
Summary of Wildlife Hazard Quotients Calculated using Max EPC
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Central Landfills Area (Soil)																										
Inorganics - Metals																										
Aluminum	NE	NE			NE	NE															NE	NE				
Antimony	NE	NE			NE	NE															NE	NE				
Arsenic	NE	NE			NE	NE															NE	NE				
Barium	NE	NE			NE	NE															NE	NE				
Beryllium	NE	NE			NE	NE															NE	NE				
Cadmium	NE	NE			NE	NE															NE	NE				
Chromium	NE	NE	●		NE	NE					●										NE	NE				
Cobalt	NE	NE			NE	NE															NE	NE				
Copper	NE	NE	●	●	NE	NE	●	●	●		●	●	●		●				●		NE	NE			●	●
Lead	NE	NE	●		NE	NE					●										NE	NE				
Manganese	NE	NE			NE	NE															NE	NE				
Mercury	NE	NE			NE	NE															NE	NE				
Nickel	NE	NE	●		NE	NE					●								●		NE	NE			●	●
Selenium	NE	NE			NE	NE													●		NE	NE			●	
Silver	NE	NE			NE	NE															NE	NE				
Thallium	NE	NE			NE	NE															NE	NE				
Vanadium	NE	NE	●		NE	NE															NE	NE				
Zinc	NE	NE			NE	NE															NE	NE				
Inorganics - Other Inorganics																										
Cyanide	NE	NE	●		NE	NE	●		●		●										NE	NE				
Fluoride	NE	NE	●		NE	NE	●				●										NE	NE				
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	NE	NE			NE	NE															NE	NE				
Aroclor 1254	NE	NE	●	●	NE	NE					●	●			●						NE	NE			●	●
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	NE	NE	●		NE	NE	●				●	●									NE	NE			●	
Total HMW PAHs	NE	NE	●	●	NE	NE	●	●			●	●	●		●				●		NE	NE			●	●
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	NE	NE			NE	NE															NE	NE				
2,3,4,6-Tetrachlorophenol	NE	NE			NE	NE															NE	NE				
2-Chloronaphthalene	NE	NE			NE	NE															NE	NE				
Biphenyl (Diphenyl)	NE	NE			NE	NE															NE	NE				
Bis(2-ethylhexyl)phthalate	NE	NE	I	I	NE	NE					●	●									NE	NE				
Butylbenzylphthalate	NE	NE			NE	NE															NE	NE				
Dibenzofuran	NE	NE			NE	NE															NE	NE				
Di-n-butyl phthalate	NE	NE			NE	NE															NE	NE				
Di-n-octyl phthalate	NE	NE			NE	NE															NE	NE				
Hexachlorobenzene	NE	NE			NE	NE															NE	NE				
Hexachlorobutadiene	NE	NE			NE	NE															NE	NE				
Hexachloroethane	NE	NE			NE	NE															NE	NE				
Pentachlorophenol	NE	NE			NE	NE															NE	NE				
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	NE	NE			NE	NE															NE	NE				
Dioxin/Furans																										
Total Dioxins/Furans	NE	NE			NE	NE					●										NE	NE			●	

Table 6-57
Summary of Wildlife Hazard Quotients Calculated using Max EPC
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Industrial Landfills Area (Soil)																										
Inorganics - Metals																										
Aluminum	NE	NE			NE	NE															NE	NE				
Antimony	NE	NE			NE	NE															NE	NE			●	
Arsenic	NE	NE			NE	NE															NE	NE				
Barium	NE	NE			NE	NE															NE	NE				
Beryllium	NE	NE			NE	NE															NE	NE				
Cadmium	NE	NE			NE	NE															NE	NE			●	
Chromium	NE	NE			NE	NE															NE	NE				
Cobalt	NE	NE			NE	NE															NE	NE				
Copper	NE	NE			NE	NE					●										NE	NE			●	
Lead	NE	NE			NE	NE															NE	NE				
Manganese	NE	NE			NE	NE															NE	NE				
Mercury	NE	NE			NE	NE															NE	NE				
Nickel	NE	NE	●	●	NE	NE					●	●							●		NE	NE			●	●
Selenium	NE	NE			NE	NE															NE	NE				
Silver	NE	NE			NE	NE															NE	NE				
Thallium	NE	NE			NE	NE															NE	NE				
Vanadium	NE	NE	●	●	NE	NE	●		●		●										NE	NE				
Zinc	NE	NE			NE	NE															NE	NE				
Inorganics - Other Inorganics																										
Cyanide	NE	NE	●		NE	NE					●										NE	NE				
Fluoride	NE	NE			NE	NE															NE	NE				
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	NE	NE			NE	NE															NE	NE				
Aroclor 1254	NE	NE			NE	NE															NE	NE				
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	NE	NE	●		NE	NE					●										NE	NE				
Total HMW PAHs	NE	NE	●	●	NE	NE	●				●	●			●				●		NE	NE			●	
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	NE	NE			NE	NE															NE	NE				
2,3,4,6-Tetrachlorophenol	NE	NE			NE	NE															NE	NE				
2-Chloronaphthalene	NE	NE			NE	NE															NE	NE				
Biphenyl (Diphenyl)	NE	NE			NE	NE															NE	NE				
Bis(2-ethylhexyl)phthalate	NE	NE			NE	NE															NE	NE				
Butylbenzylphthalate	NE	NE			NE	NE															NE	NE				
Dibenzofuran	NE	NE			NE	NE															NE	NE				
Di-n-butyl phthalate	NE	NE			NE	NE															NE	NE				
Di-n-octyl phthalate	NE	NE			NE	NE															NE	NE				
Hexachlorobenzene	NE	NE			NE	NE															NE	NE				
Hexachlorobutadiene	NE	NE			NE	NE															NE	NE				
Hexachloroethane	NE	NE			NE	NE															NE	NE				
Pentachlorophenol	NE	NE			NE	NE															NE	NE				
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	NE	NE			NE	NE															NE	NE				
Dioxin/Furans																										
Total Dioxins/Furans	NE	NE			NE	NE															NE	NE				

Table 6-57
Summary of Wildlife Hazard Quotients Calculated using Max EPC
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Eastern Undeveloped Area (Soil)																										
Inorganics - Metals																										
Aluminum	NE	NE			NE	NE															NE	NE				
Antimony	NE	NE			NE	NE															NE	NE				
Arsenic	NE	NE			NE	NE															NE	NE				
Barium	NE	NE			NE	NE															NE	NE				
Beryllium	NE	NE			NE	NE															NE	NE				
Cadmium	NE	NE			NE	NE															NE	NE				
Chromium	NE	NE			NE	NE															NE	NE				
Cobalt	NE	NE			NE	NE															NE	NE				
Copper	NE	NE			NE	NE															NE	NE				
Lead	NE	NE	●		NE	NE					●										NE	NE				
Manganese	NE	NE			NE	NE															NE	NE				
Mercury	NE	NE			NE	NE															NE	NE				
Nickel	NE	NE			NE	NE					●										NE	NE			●	
Selenium	NE	NE			NE	NE															NE	NE				
Silver	NE	NE			NE	NE															NE	NE				
Thallium	NE	NE			NE	NE															NE	NE				
Vanadium	NE	NE	●		NE	NE															NE	NE				
Zinc	NE	NE			NE	NE					●										NE	NE				
Inorganics - Other Inorganics																										
Cyanide	NE	NE	●		NE	NE	●				●										NE	NE				
Fluoride	NE	NE			NE	NE															NE	NE				
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	NE	NE			NE	NE															NE	NE				
Aroclor 1254	NE	NE			NE	NE															NE	NE				
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	NE	NE			NE	NE															NE	NE				
Total HMW PAHs	NE	NE			NE	NE															NE	NE				
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	NE	NE			NE	NE															NE	NE				
2,3,4,6-Tetrachlorophenol	NE	NE			NE	NE															NE	NE				
2-Chloronaphthalene	NE	NE			NE	NE															NE	NE				
Biphenyl (Diphenyl)	NE	NE			NE	NE															NE	NE				
Bis(2-ethylhexyl)phthalate	NE	NE			NE	NE					●										NE	NE				
Butylbenzylphthalate	NE	NE			NE	NE															NE	NE				
Dibenzofuran	NE	NE			NE	NE															NE	NE				
Di-n-butyl phthalate	NE	NE			NE	NE															NE	NE				
Di-n-octyl phthalate	NE	NE			NE	NE															NE	NE				
Hexachlorobenzene	NE	NE			NE	NE															NE	NE				
Hexachlorobutadiene	NE	NE			NE	NE															NE	NE				
Hexachloroethane	NE	NE			NE	NE															NE	NE				
Pentachlorophenol	NE	NE			NE	NE															NE	NE				
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	NE	NE			NE	NE															NE	NE				
Dioxin/Furans																										
Total Dioxins/Furans	NE	NE			NE	NE															NE	NE				

Table 6-57
Summary of Wildlife Hazard Quotients Calculated using Max EPC
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
North-Central Undeveloped Area (Soil)																										
Inorganics - Metals																										
Aluminum	NE	NE			NE	NE															NE	NE				
Antimony	NE	NE			NE	NE															NE	NE				
Arsenic	NE	NE			NE	NE															NE	NE				
Barium	NE	NE			NE	NE															NE	NE				
Beryllium	NE	NE			NE	NE															NE	NE				
Cadmium	NE	NE			NE	NE															NE	NE				
Chromium	NE	NE			NE	NE															NE	NE				
Cobalt	NE	NE			NE	NE															NE	NE				
Copper	NE	NE			NE	NE															NE	NE				
Lead	NE	NE			NE	NE															NE	NE				
Manganese	NE	NE			NE	NE															NE	NE				
Mercury	NE	NE			NE	NE															NE	NE				
Nickel	NE	NE			NE	NE															NE	NE				
Selenium	NE	NE			NE	NE															NE	NE				
Silver	NE	NE			NE	NE															NE	NE				
Thallium	NE	NE			NE	NE															NE	NE				
Vanadium	NE	NE			NE	NE															NE	NE				
Zinc	NE	NE			NE	NE															NE	NE				
Inorganics - Other Inorganics																										
Cyanide	NE	NE	●		NE	NE	●				●										NE	NE				
Fluoride	NE	NE			NE	NE															NE	NE				
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	NE	NE			NE	NE															NE	NE				
Aroclor 1254	NE	NE			NE	NE															NE	NE				
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	NE	NE			NE	NE															NE	NE				
Total HMW PAHs	NE	NE			NE	NE															NE	NE				
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	NE	NE			NE	NE															NE	NE				
2,3,4,6-Tetrachlorophenol	NE	NE			NE	NE															NE	NE				
2-Chloronaphthalene	NE	NE			NE	NE															NE	NE				
Biphenyl (Diphenyl)	NE	NE			NE	NE															NE	NE				
Bis(2-ethylhexyl)phthalate	NE	NE	●		NE	NE					●										NE	NE				
Butylbenzylphthalate	NE	NE			NE	NE															NE	NE				
Dibenzofuran	NE	NE			NE	NE															NE	NE				
Di-n-butyl phthalate	NE	NE			NE	NE															NE	NE				
Di-n-octyl phthalate	NE	NE			NE	NE															NE	NE				
Hexachlorobenzene	NE	NE			NE	NE															NE	NE				
Hexachlorobutadiene	NE	NE			NE	NE															NE	NE				
Hexachloroethane	NE	NE			NE	NE															NE	NE				
Pentachlorophenol	NE	NE			NE	NE															NE	NE				
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	NE	NE			NE	NE															NE	NE				
Dioxin/Furans																										
Total Dioxins/Furans	NE	NE			NE	NE															NE	NE				

Table 6-57
Summary of Wildlife Hazard Quotients Calculated using Max EPC
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Western Undeveloped Area (Soil)																										
Inorganics - Metals																										
Aluminum	NE	NE			NE	NE															NE	NE				
Antimony	NE	NE			NE	NE															NE	NE				
Arsenic	NE	NE			NE	NE															NE	NE				
Barium	NE	NE			NE	NE															NE	NE				
Beryllium	NE	NE			NE	NE															NE	NE				
Cadmium	NE	NE			NE	NE															NE	NE				
Chromium	NE	NE			NE	NE															NE	NE				
Cobalt	NE	NE			NE	NE															NE	NE				
Copper	NE	NE			NE	NE															NE	NE				
Lead	NE	NE	●		NE	NE					●										NE	NE				
Manganese	NE	NE			NE	NE															NE	NE				
Mercury	NE	NE			NE	NE															NE	NE				
Nickel	NE	NE			NE	NE															NE	NE				
Selenium	NE	NE			NE	NE															NE	NE				
Silver	NE	NE			NE	NE															NE	NE				
Thallium	NE	NE			NE	NE															NE	NE				
Vanadium	NE	NE			NE	NE															NE	NE				
Zinc	NE	NE			NE	NE					●										NE	NE				
Inorganics - Other Inorganics																										
Cyanide	NE	NE	●		NE	NE	●				●										NE	NE				
Fluoride	NE	NE			NE	NE															NE	NE				
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	NE	NE			NE	NE															NE	NE				
Aroclor 1254	NE	NE			NE	NE															NE	NE				
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	NE	NE			NE	NE															NE	NE				
Total HMW PAHs	NE	NE			NE	NE															NE	NE				
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	NE	NE			NE	NE															NE	NE				
2,3,4,6-Tetrachlorophenol	NE	NE			NE	NE															NE	NE				
2-Chloronaphthalene	NE	NE			NE	NE															NE	NE				
Biphenyl (Diphenyl)	NE	NE			NE	NE															NE	NE				
Bis(2-ethylhexyl)phthalate	NE	NE	●		NE	NE					●										NE	NE				
Butylbenzylphthalate	NE	NE			NE	NE															NE	NE				
Dibenzofuran	NE	NE			NE	NE															NE	NE				
Di-n-butyl phthalate	NE	NE			NE	NE															NE	NE				
Di-n-octyl phthalate	NE	NE			NE	NE															NE	NE				
Hexachlorobenzene	NE	NE			NE	NE															NE	NE				
Hexachlorobutadiene	NE	NE			NE	NE															NE	NE				
Hexachloroethane	NE	NE			NE	NE															NE	NE				
Pentachlorophenol	NE	NE			NE	NE															NE	NE				
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	NE	NE			NE	NE															NE	NE				
Dioxin/Furans																										
Total Dioxins/Furans	NE	NE			NE	NE															NE	NE			●	

Table 6-57
Summary of Wildlife Hazard Quotients Calculated using Max EPC
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Flathead River Riparian Area (Soil)																										
Inorganics - Metals																										
Aluminum	NE	NE			NE	NE															NE	NE				
Antimony	NE	NE			NE	NE															NE	NE				
Arsenic	NE	NE			NE	NE															NE	NE				
Barium	NE	NE			NE	NE															NE	NE				
Beryllium	NE	NE			NE	NE															NE	NE				
Cadmium	NE	NE			NE	NE															NE	NE				
Chromium	NE	NE			NE	NE															NE	NE				
Cobalt	NE	NE			NE	NE															NE	NE				
Copper	NE	NE			NE	NE															NE	NE				
Lead	NE	NE			NE	NE															NE	NE				
Manganese	NE	NE			NE	NE															NE	NE				
Mercury	NE	NE			NE	NE															NE	NE				
Nickel	NE	NE			NE	NE															NE	NE				
Selenium	NE	NE			NE	NE															NE	NE				
Silver	NE	NE			NE	NE															NE	NE				
Thallium	NE	NE			NE	NE															NE	NE				
Vanadium	NE	NE			NE	NE															NE	NE				
Zinc	NE	NE			NE	NE															NE	NE				
Inorganics - Other Inorganics																										
Cyanide	NE	NE	●		NE	NE	●				●										NE	NE				
Fluoride	NE	NE			NE	NE															NE	NE				
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	NE	NE			NE	NE															NE	NE				
Aroclor 1254	NE	NE			NE	NE															NE	NE				
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	NE	NE			NE	NE															NE	NE				
Total HMW PAHs	NE	NE			NE	NE															NE	NE				
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	NE	NE			NE	NE															NE	NE				
2,3,4,6-Tetrachlorophenol	NE	NE			NE	NE															NE	NE				
2-Chloronaphthalene	NE	NE			NE	NE															NE	NE				
Biphenyl (Diphenyl)	NE	NE			NE	NE															NE	NE				
Bis(2-ethylhexyl)phthalate	NE	NE			NE	NE															NE	NE				
Butylbenzylphthalate	NE	NE			NE	NE															NE	NE				
Dibenzofuran	NE	NE			NE	NE															NE	NE				
Di-n-butyl phthalate	NE	NE			NE	NE															NE	NE				
Di-n-octyl phthalate	NE	NE			NE	NE															NE	NE				
Hexachlorobenzene	NE	NE			NE	NE															NE	NE				
Hexachlorobutadiene	NE	NE			NE	NE															NE	NE				
Hexachloroethane	NE	NE			NE	NE															NE	NE				
Pentachlorophenol	NE	NE			NE	NE															NE	NE				
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	NE	NE			NE	NE															NE	NE				
Dioxin/Furans																										
Total Dioxins/Furans	NE	NE			NE	NE															NE	NE				

Table 6-57
Summary of Wildlife Hazard Quotients Calculated using Max EPC
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
North Percolation Pond (Transitional, soil/sediment)																										
Inorganics - Metals																										
Aluminum																										
Antimony																								●		
Arsenic																										
Barium	●	●																								
Beryllium																			●							
Cadmium			●								●	●												●		
Chromium																										
Cobalt																										
Copper	●		●								●															
Lead	●		●				●				●													●		
Manganese																										
Mercury																										
Nickel	●	●	●	●			●				●	●	●		●				●					●	●	
Selenium	●	●	●								●								●					●		
Silver																										
Thallium																										
Vanadium	●	●	●	●	●		●	●	●		●	●														
Zinc	●		●								●													●		
Inorganics - Other Inorganics																										
Cyanide	●	●	●	●			●	●	●																	
Fluoride																										
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248																										
Aroclor 1254																										
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	●	●	●	●	●	●	●	●			●	●			●				●						●	●
Total HMW PAHs	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●		●	●			●		●	●
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene																										
2,3,4,6-Tetrachlorophenol																										
2-Chloronaphthalene																										
Biphenyl (Diphenyl)																										
Bis(2-ethylhexyl)phthalate											●													●		
Butylbenzylphthalate																										
Dibenzofuran																										
Di-n-butyl phthalate																										
Di-n-octyl phthalate																										
Hexachlorobenzene																										
Hexachlorobutadiene																										
Hexachloroethane																										
Pentachlorophenol																										
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane																										
Dioxin/Furans																										
Total Dioxins/Furans																										

Table 6-57
Summary of Wildlife Hazard Quotients Calculated using Max EPC
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
South Percolation Pond (Transitional, soil/sediment)																										
Inorganics - Metals																										
Aluminum																										
Antimony																										
Arsenic																										
Barium	●	●																								
Beryllium																										
Cadmium			●								●														●	
Chromium																										
Cobalt																										
Copper	●	●	●	●	●		●				●	●													●	
Lead	●		●								●															
Manganese																										
Mercury	●		●								●															
Nickel																									●	
Selenium																										
Silver							●																			
Thallium																										
Vanadium	●																									
Zinc			●								●															
Inorganics - Other Inorganics																										
Cyanide	●		●				●		●																	
Fluoride																										
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248																										
Aroclor 1254																										
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs																										
Total HMW PAHs	●																								●	
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene																										
2,3,4,6-Tetrachlorophenol																										
2-Chloronaphthalene																										
Biphenyl (Diphenyl)																										
Bis(2-ethylhexyl)phthalate			●	●							●	●														
Butylbenzylphthalate																										
Dibenzofuran																										
Di-n-butyl phthalate																										
Di-n-octyl phthalate																										
Hexachlorobenzene																										
Hexachlorobutadiene																										
Hexachloroethane																										
Pentachlorophenol																										
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane																										
Dioxin/Furans																										
Total Dioxins/Furans																										

Table 6-57
Summary of Wildlife Hazard Quotients Calculated using Max EPC
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Cedar Creek Reservoir Overflow Ditch (Transitional, soil/sediment)																										
Inorganics - Metals																										
Aluminum																										
Antimony															●											
Arsenic																										
Barium	●	●																								
Beryllium																										
Cadmium																										
Chromium																										
Cobalt																										
Copper																										
Lead																										
Manganese																										
Mercury																										
Nickel																									●	
Selenium																									●	
Silver																										
Thallium																										
Vanadium	●																									
Zinc											●															
Inorganics - Other Inorganics																										
Cyanide																										
Fluoride																										
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248																										
Aroclor 1254																										
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs																										
Total HMW PAHs	●																									
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene																										
2,3,4,6-Tetrachlorophenol																										
2-Chloronaphthalene																										
Biphenyl (Diphenyl)																										
Bis(2-ethylhexyl)phthalate																										
Butylbenzylphthalate																										
Dibenzofuran																										
Di-n-butyl phthalate																										
Di-n-octyl phthalate																										
Hexachlorobenzene																										
Hexachlorobutadiene																										
Hexachloroethane																										
Pentachlorophenol																										
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane																										
Dioxin/Furans																										
Total Dioxins/Furans																										

Table 6-57
Summary of Wildlife Hazard Quotients Calculated using Max EPC
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Northern Surface Water Feature (Transitional, soil/sediment)																										
Inorganics - Metals																										
Aluminum																										
Antimony																										
Arsenic																										
Barium	●	●																								
Beryllium																										
Cadmium																										
Chromium																										
Cobalt																										
Copper	●																									
Lead																										
Manganese																										
Mercury																										
Nickel																										
Selenium	●	●	●				●				●								●						●	
Silver																										
Thallium																										
Vanadium	●																									
Zinc																										
Inorganics - Other Inorganics																										
Cyanide																										
Fluoride																										
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248																										
Aroclor 1254																										
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs																										
Total HMW PAHs																										
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene																										
2,3,4,6-Tetrachlorophenol																										
2-Chloronaphthalene																										
Biphenyl (Diphenyl)																										
Bis(2-ethylhexyl)phthalate																										
Butylbenzylphthalate																										
Dibenzofuran																										
Di-n-butyl phthalate																										
Di-n-octyl phthalate																										
Hexachlorobenzene																										
Hexachlorobutadiene																										
Hexachloroethane																										
Pentachlorophenol																										
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane																										
Dioxin/Furans																										
Total Dioxins/Furans																										

Table 6-57
Summary of Wildlife Hazard Quotients Calculated using Max EPC
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Flathead River Area (Surface Water/Sediment)																										
Inorganics - Metals																										
Aluminum			NE	NE	●		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Antimony			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Arsenic			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Barium			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Beryllium			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Cadmium			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Chromium			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Cobalt			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Copper			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Lead			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Manganese			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Mercury			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Nickel			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Selenium			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Silver			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Thallium			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Vanadium	●		NE	NE	●		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Zinc			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Inorganics - Other Inorganics																										
Cyanide	●		NE	NE	●		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Fluoride			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Aroclor 1254			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Total HMW PAHs	●		NE	NE	●		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	●		NE	NE	NE	NE
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
2,3,4,6-Tetrachlorophenol			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
2-Chloronaphthalene			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Biphenyl (Diphenyl)			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Bis(2-ethylhexyl)phthalate			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Butylbenzylphthalate			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Dibenzofuran			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Di-n-butyl phthalate			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Di-n-octyl phthalate			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Hexachlorobenzene			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Hexachlorobutadiene			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Hexachloroethane			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Pentachlorophenol			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Dioxin/Furans																										
Total Dioxins/Furans			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE

Table 6-57
Summary of Wildlife Hazard Quotients Calculated using Max EPC
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Cedar Creek Area (Surface Water/Sediment)																										
Inorganics - Metals																										
Aluminum			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Antimony			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Arsenic			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Barium	●		NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Beryllium			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Cadmium			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Chromium			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Cobalt			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Copper			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Lead			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Manganese			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Mercury			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Nickel			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Selenium			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Silver			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Thallium			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Vanadium			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Zinc			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Inorganics - Other Inorganics																										
Cyanide			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Fluoride			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Aroclor 1254			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Total HMW PAHs			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
2,3,4,6-Tetrachlorophenol			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
2-Chloronaphthalene			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Biphenyl (Diphenyl)			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Bis(2-ethylhexyl)phthalate			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Butylbenzylphthalate			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Dibenzofuran			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Di-n-butyl phthalate			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Di-n-octyl phthalate			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Hexachlorobenzene			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Hexachlorobutadiene			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Hexachloroethane			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Pentachlorophenol			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE
Dioxin/Furans																										
Total Dioxins/Furans			NE	NE			NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE			NE	NE	NE	NE

Table 6-57
Summary of Wildlife Hazard Quotients Calculated using Max EPC
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:
NE: Receptor was not evaluated for the exposure area
Blank: HQ <1 or not measured
HQ: Hazard Quotient
NOAEL: No Observed Adverse Effects Level
LOAEL: Lowest Observed Adverse Effects Level
I: HQ>1
Shaded cells indicate LOAEL results for endangered species, which are evaluated based on their NOAEL results only.

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Main Plant Area (Soil)														
Inorganics - Metals														
Aluminum	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Antimony	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Arsenic	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Barium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Beryllium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Cadmium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Chromium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Cobalt	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Copper	NE	NE	--	--	NE	NE	<1	--	--	--	--	--	--	--
Lead	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Manganese	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Mercury	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Nickel	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Selenium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Silver	NE	NE	--	--	NE	NE	<1	--	--	--	--	--	--	--
Thallium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Vanadium	NE	NE	--	--	NE	NE	<1	--	<1	--	--	--	--	--
Zinc	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics														
Cyanide	NE	NE	--	--	NE	NE	<1	--	<1	--	--	--	--	--
Fluoride	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Aroclor 1254	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Total LMW PAHs	NE	NE	--	--	NE	NE	<1	--	--	--	**1.0**	--	--	--
Total HMW PAHs	NE	NE	**13.9**	**1.4**	NE	NE	**1.6**	<1	<1	--	**19.7**	**2.0**	<1	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
2-Chloronaphthalene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	NE	NE	**2.8**	--	NE	NE	--	--	--	--	**4.2**	--	--	--
Butylbenzylphthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Dibenzofuran	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Hexachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Hexachlorobutadiene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Hexachloroethane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Pentachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Dioxin/Furans														
Total Dioxins/Furans	NE	NE	**1.8**	--	NE	NE	--	--	--	--	**2.7**	--	--	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Inorganics - Metals												
Aluminum	--	--	--	--	--	--	NE	NE	--	--	--	--
Antimony	--	--	--	--	--	--	NE	NE	--	--	--	--
Arsenic	--	--	--	--	--	--	NE	NE	--	--	--	--
Barium	--	--	--	--	--	--	NE	NE	--	--	--	--
Beryllium	--	--	--	--	--	--	NE	NE	--	--	--	--
Cadmium	--	--	--	--	--	--	NE	NE	--	--	--	--
Chromium	--	--	--	--	--	--	NE	NE	--	--	--	--
Cobalt	--	--	--	--	--	--	NE	NE	--	--	--	--
Copper	--	--	--	--	--	--	NE	NE	--	--	--	--
Lead	--	--	--	--	--	--	NE	NE	--	--	--	--
Manganese	--	--	--	--	--	--	NE	NE	--	--	--	--
Mercury	--	--	--	--	--	--	NE	NE	--	--	--	--
Nickel	--	--	--	--	--	--	NE	NE	--	--	**1.1**	--
Selenium	--	--	--	--	--	--	NE	NE	--	--	--	--
Silver	--	--	--	--	--	--	NE	NE	--	--	--	--
Thallium	--	--	--	--	--	--	NE	NE	--	--	--	--
Vanadium	--	--	--	--	--	--	NE	NE	--	--	--	--
Zinc	--	--	--	--	--	--	NE	NE	--	--	--	--
Inorganics - Other Inorganics												
Cyanide	--	--	--	--	--	--	NE	NE	--	--	--	--
Fluoride	--	--	--	--	--	--	NE	NE	--	--	--	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	--	--	--	--	--	--	NE	NE	--	--	--	--
Aroclor 1254	<1	--	--	--	--	--	NE	NE	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Total LMW PAHs	--	--	--	--	--	--	NE	NE	--	--	--	--
Total HMW PAHs	<1	<1	--	--	**3.6**	--	NE	NE	<1	--	**22.8**	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	NE	NE	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	NE	NE	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	NE	NE	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	NE	NE	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	NE	NE	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	NE	NE	--	--	--	--
Volatile Organic Compounds (V												
Methylcyclohexane	--	--	--	--	--	--	NE	NE	--	--	--	--
Dioxin/Furans												
Total Dioxins/Furans	--	--	--	--	--	--	NE	NE	--	--	**3.4**	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Central Landfills Area (Soil)														
Inorganics - Metals														
Aluminum	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Barium	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Copper	NE	NE	**11.3**	**1.3**	--	--	<1	--	--	--	**14.5**	**1.7**	--	--
Lead	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Silver	NE	NE	--	--	--	--	<1	--	--	--	--	--	--	--
Thallium	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	NE	NE	--	--	--	--	<1	--	<1	--	--	--	--	--
Zinc	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics														
Cyanide	NE	NE	--	--	--	--	<1	--	<1	--	--	--	--	--
Fluoride	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	NE	NE	**20.7**	**2.1**	--	--	--	--	--	--	**30.9**	**3.1**	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Total LMW PAHs	NE	NE	--	--	--	--	<1	--	--	--	**1.4**	--	--	--
Total HMW PAHs	NE	NE	**9.7**	--	--	--	**1.6**	<1	<1	--	**13.8**	**1.4**	<1	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	NE	NE	**1.5**	--	--	--	--	--	--	--	**2.2**	--	--	--
Butylbenzylphthalate	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans														
Total Dioxins/Furans	NE	NE	--	--	--	--	--	--	--	--	**1.1**	--	--	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics - Metals												
Aluminum	--	--	--	--	--	--	NE	NE	--	--	--	--
Antimony	--	--	--	--	--	--	NE	NE	--	--	--	--
Arsenic	--	--	--	--	--	--	NE	NE	--	--	--	--
Barium	--	--	--	--	--	--	NE	NE	--	--	--	--
Beryllium	--	--	--	--	--	--	NE	NE	--	--	--	--
Cadmium	--	--	--	--	--	--	NE	NE	--	--	--	--
Chromium	--	--	--	--	--	--	NE	NE	--	--	--	--
Cobalt	--	--	--	--	--	--	NE	NE	--	--	--	--
Copper	--	--	--	--	--	--	NE	NE	--	--	**2.4**	--
Lead	--	--	--	--	--	--	NE	NE	--	--	--	--
Manganese	--	--	--	--	--	--	NE	NE	--	--	--	--
Mercury	--	--	--	--	--	--	NE	NE	--	--	--	--
Nickel	--	--	--	--	--	--	NE	NE	--	--	**3.7**	--
Selenium	--	--	--	--	--	--	NE	NE	--	--	--	--
Silver	--	--	--	--	--	--	NE	NE	--	--	--	--
Thallium	--	--	--	--	--	--	NE	NE	--	--	--	--
Vanadium	--	--	--	--	--	--	NE	NE	--	--	--	--
Zinc	--	--	--	--	--	--	NE	NE	--	--	--	--
Inorganics - Other Inorganics												
Cyanide	--	--	--	--	--	--	NE	NE	--	--	--	--
Fluoride	--	--	--	--	--	--	NE	NE	--	--	--	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	--	--	--	--	--	--	NE	NE	--	--	--	--
Aroclor 1254	<1	--	--	--	--	--	NE	NE	--	--	**5.9**	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Total LMW PAHs	--	--	--	--	--	--	NE	NE	--	--	--	--
Total HMW PAHs	<1	<1	--	--	**5.0**	--	NE	NE	<1	--	**33.4**	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	NE	NE	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	NE	NE	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	NE	NE	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	NE	NE	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	NE	NE	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	NE	NE	--	--	--	--
Volatile Organic Compounds (V												
Methylcyclohexane	--	--	--	--	--	--	NE	NE	--	--	--	--
Dioxin/Furans												
Total Dioxins/Furans	--	--	--	--	--	--	NE	NE	--	--	**2.9**	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Industrial Landfills Area (Soil)														
Inorganics - Metals														
Aluminum	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Antimony	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Arsenic	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Barium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Beryllium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Cadmium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Chromium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Cobalt	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Copper	NE	NE	--	--	NE	NE	<1	--	--	--	<1	--	--	--
Lead	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Manganese	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Mercury	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Nickel	NE	NE	**5.7**	**2.1**	NE	NE	--	--	--	--	**2.3**	<1	--	--
Selenium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Silver	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Thallium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Vanadium	NE	NE	**5.9**	**1.2**	NE	NE	<1	--	<1	--	<1	--	--	--
Zinc	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics														
Cyanide	NE	NE	--	--	NE	NE	<1	--	<1	--	--	--	--	--
Fluoride	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Aroclor 1254	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)			--	--			--	--	--	--	--	--	--	--
Total LMW PAHs	NE	NE	**1.9**	--	NE	NE	<1	--	--	--	<1	--	--	--
Total HMW PAHs	NE	NE	**35.4**	**3.5**	NE	NE	**1.5**	<1	<1	--	**15.1**	**1.5**	<1	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
2-Chloronaphthalene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Butylbenzylphthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Dibenzofuran	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Hexachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Hexachlorobutadiene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Hexachloroethane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Pentachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Dioxin/Furans														
Total Dioxins/Furans	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics - Metals												
Aluminum	--	--	--	--	--	--	NE	NE	--	--	--	--
Antimony	--	--	--	--	--	--	NE	NE	--	--	**6.6**	--
Arsenic	--	--	--	--	--	--	NE	NE	--	--	--	--
Barium	--	--	--	--	--	--	NE	NE	--	--	--	--
Beryllium	--	--	--	--	--	--	NE	NE	--	--	--	--
Cadmium	--	--	--	--	--	--	NE	NE	--	--	**1.6**	--
Chromium	--	--	--	--	--	--	NE	NE	--	--	--	--
Cobalt	--	--	--	--	--	--	NE	NE	--	--	--	--
Copper	--	--	--	--	--	--	NE	NE	--	--	**6.7**	--
Lead	--	--	--	--	--	--	NE	NE	--	--	--	--
Manganese	--	--	--	--	--	--	NE	NE	--	--	--	--
Mercury	--	--	--	--	--	--	NE	NE	--	--	--	--
Nickel	--	--	--	--	**1.4**	--	NE	NE	--	--	**28.1**	**3.2**
Selenium	--	--	--	--	--	--	NE	NE	--	--	--	--
Silver	--	--	--	--	--	--	NE	NE	--	--	--	--
Thallium	--	--	--	--	--	--	NE	NE	--	--	--	--
Vanadium	--	--	--	--	--	--	NE	NE	--	--	--	--
Zinc	--	--	--	--	--	--	NE	NE	--	--	--	--
Inorganics - Other Inorganics												
Cyanide	--	--	--	--	--	--	NE	NE	--	--	--	--
Fluoride	--	--	--	--	--	--	NE	NE	--	--	--	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	--	--	--	--	--	--	NE	NE	--	--	--	--
Aroclor 1254	<1	--	--	--	--	--	NE	NE	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)	--	--	--	--	--	--			--	--	--	--
Total LMW PAHs	--	--	--	--	--	--	NE	NE	--	--	--	--
Total HMW PAHs	<1	<1	--	--	**6.9**	--	NE	NE	<1	--	**38.2**	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	NE	NE	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	NE	NE	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	NE	NE	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	NE	NE	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	NE	NE	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	NE	NE	--	--	--	--
Volatile Organic Compounds (V												
Methylcyclohexane	--	--	--	--	--	--	NE	NE	--	--	--	--
Dioxin/Furans												
Total Dioxins/Furans	--	--	--	--	--	--	NE	NE	--	--	--	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Eastern Undeveloped Area (Soil)														
Inorganics - Metals														
Aluminum	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Antimony	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Arsenic	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Barium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Beryllium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Cadmium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Chromium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Cobalt	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Copper	NE	NE	--	--	NE	NE	<1	--	--	--	--	--	--	--
Lead	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Manganese	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Mercury	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Nickel	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Selenium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Silver	NE	NE	--	--	NE	NE	<1	--	--	--	--	--	--	--
Thallium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Vanadium	NE	NE	--	--	NE	NE	<1	--	--	--	--	--	--	--
Zinc	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics														
Cyanide	NE	NE	--	--	NE	NE	<1	--	--	--	--	--	--	--
Fluoride	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Aroclor 1254	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Total LMW PAHs	NE	NE	--	--	NE	NE	<1	--	--	--	--	--	--	--
Total HMW PAHs	NE	NE	--	--	NE	NE	<1	<1	--	--	--	--	<1	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
2-Chloronaphthalene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	NE	NE	--	--	NE	NE	--	--	--	--	**1.2**	--	--	--
Butylbenzylphthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Dibenzofuran	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Hexachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Hexachlorobutadiene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Hexachloroethane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Pentachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Dioxin/Furans														
Total Dioxins/Furans	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Inorganics - Metals												
Aluminum	--	--	--	--	--	--	NE	NE	--	--	--	--
Antimony	--	--	--	--	--	--	NE	NE	--	--	--	--
Arsenic	--	--	--	--	--	--	NE	NE	--	--	--	--
Barium	--	--	--	--	--	--	NE	NE	--	--	--	--
Beryllium	--	--	--	--	--	--	NE	NE	--	--	--	--
Cadmium	--	--	--	--	--	--	NE	NE	--	--	--	--
Chromium	--	--	--	--	--	--	NE	NE	--	--	--	--
Cobalt	--	--	--	--	--	--	NE	NE	--	--	--	--
Copper	--	--	--	--	--	--	NE	NE	--	--	--	--
Lead	--	--	--	--	--	--	NE	NE	--	--	--	--
Manganese	--	--	--	--	--	--	NE	NE	--	--	--	--
Mercury	--	--	--	--	--	--	NE	NE	--	--	--	--
Nickel	--	--	--	--	--	--	NE	NE	--	--	**1.0**	--
Selenium	--	--	--	--	--	--	NE	NE	--	--	--	--
Silver	--	--	--	--	--	--	NE	NE	--	--	--	--
Thallium	--	--	--	--	--	--	NE	NE	--	--	--	--
Vanadium	--	--	--	--	--	--	NE	NE	--	--	--	--
Zinc	--	--	--	--	--	--	NE	NE	--	--	--	--
Inorganics - Other Inorganics												
Cyanide	--	--	--	--	--	--	NE	NE	--	--	--	--
Fluoride	--	--	--	--	--	--	NE	NE	--	--	--	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	--	--	--	--	--	--	NE	NE	--	--	--	--
Aroclor 1254	<1	--	--	--	--	--	NE	NE	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Total LMW PAHs	--	--	--	--	--	--	NE	NE	--	--	--	--
Total HMW PAHs	<1	<1	--	--	--	--	NE	NE	<1	--	--	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	NE	NE	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	NE	NE	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	NE	NE	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	NE	NE	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	NE	NE	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	NE	NE	--	--	--	--
Volatile Organic Compounds (V												
Methylcyclohexane	--	--	--	--	--	--	NE	NE	--	--	--	--
Dioxin/Furans												
Total Dioxins/Furans	--	--	--	--	--	--	NE	NE	--	--	--	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
North-Central Undeveloped Area (Soil)														
Inorganics - Metals														
Aluminum	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Antimony	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Arsenic	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Barium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Beryllium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Cadmium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Chromium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Cobalt	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Copper	NE	NE	--	--	NE	NE	<1	--	--	--	--	--	--	--
Lead	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Manganese	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Mercury	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Nickel	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Selenium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Silver	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Thallium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Vanadium	NE	NE	--	--	NE	NE	<1	--	<1	--	--	--	--	--
Zinc	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics														
Cyanide	NE	NE	--	--	NE	NE	<1	--	<1	--	--	--	--	--
Fluoride	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Aroclor 1254	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Total LMW PAHs	NE	NE	--	--	NE	NE	<1	--	--	--	--	--	--	--
Total HMW PAHs	NE	NE	--	--	NE	NE	**1.5**	<1	<1	--	--	--	<1	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
2-Chloronaphthalene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Butylbenzylphthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Dibenzofuran	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Hexachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Hexachlorobutadiene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Hexachloroethane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Pentachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Dioxin/Furans														
Total Dioxins/Furans	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics - Metals												
Aluminum	--	--	--	--	--	--	NE	NE	--	--	--	--
Antimony	--	--	--	--	--	--	NE	NE	--	--	--	--
Arsenic	--	--	--	--	--	--	NE	NE	--	--	--	--
Barium	--	--	--	--	--	--	NE	NE	--	--	--	--
Beryllium	--	--	--	--	--	--	NE	NE	--	--	--	--
Cadmium	--	--	--	--	--	--	NE	NE	--	--	--	--
Chromium	--	--	--	--	--	--	NE	NE	--	--	--	--
Cobalt	--	--	--	--	--	--	NE	NE	--	--	--	--
Copper	--	--	--	--	--	--	NE	NE	--	--	--	--
Lead	--	--	--	--	--	--	NE	NE	--	--	--	--
Manganese	--	--	--	--	--	--	NE	NE	--	--	--	--
Mercury	--	--	--	--	--	--	NE	NE	--	--	--	--
Nickel	--	--	--	--	--	--	NE	NE	--	--	--	--
Selenium	--	--	--	--	--	--	NE	NE	--	--	--	--
Silver	--	--	--	--	--	--	NE	NE	--	--	--	--
Thallium	--	--	--	--	--	--	NE	NE	--	--	--	--
Vanadium	--	--	--	--	--	--	NE	NE	--	--	--	--
Zinc	--	--	--	--	--	--	NE	NE	--	--	--	--
Inorganics - Other Inorganics												
Cyanide	--	--	--	--	--	--	NE	NE	--	--	--	--
Fluoride	--	--	--	--	--	--	NE	NE	--	--	--	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	--	--	--	--	--	--	NE	NE	--	--	--	--
Aroclor 1254	<1	--	--	--	--	--	NE	NE	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Total LMW PAHs	--	--	--	--	--	--	NE	NE	--	--	--	--
Total HMW PAHs	<1	<1	--	--	--	--	NE	NE	<1	--	--	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	NE	NE	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	NE	NE	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	NE	NE	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	NE	NE	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	NE	NE	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	NE	NE	--	--	--	--
Volatile Organic Compounds (V												
Methylcyclohexane	--	--	--	--	--	--	NE	NE	--	--	--	--
Dioxin/Furans												
Total Dioxins/Furans	--	--	--	--	--	--	NE	NE	--	--	--	--

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Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
												Western Undeveloped Area (Soil)		
Inorganics - Metals														
Aluminum	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Antimony	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Arsenic	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Barium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Beryllium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Cadmium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Chromium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Cobalt	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Copper	NE	NE	--	--	NE	NE	<1	--	--	--	--	--	--	--
Lead	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Manganese	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Mercury	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Nickel	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Selenium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Silver	NE	NE	--	--	NE	NE	<1	--	--	--	--	--	--	--
Thallium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Vanadium	NE	NE	--	--	NE	NE	<1	--	<1	--	--	--	--	--
Zinc	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics														
Cyanide	NE	NE	--	--	NE	NE	<1	--	<1	--	--	--	--	--
Fluoride	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Aroclor 1254	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Total LMW PAHs	NE	NE	--	--	NE	NE	<1	--	--	--	--	--	--	--
Total HMW PAHs	NE	NE	--	--	NE	NE	**1.5**	<1	<1	--	--	--	<1	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
2-Chloronaphthalene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Butylbenzylphthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Dibenzofuran	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Hexachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Hexachlorobutadiene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Hexachloroethane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Pentachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Dioxin/Furans														
Total Dioxins/Furans	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Inorganics - Metals												
Aluminum	--	--	--	--	--	--	NE	NE	--	--	--	--
Antimony	--	--	--	--	--	--	NE	NE	--	--	--	--
Arsenic	--	--	--	--	--	--	NE	NE	--	--	--	--
Barium	--	--	--	--	--	--	NE	NE	--	--	--	--
Beryllium	--	--	--	--	--	--	NE	NE	--	--	--	--
Cadmium	--	--	--	--	--	--	NE	NE	--	--	--	--
Chromium	--	--	--	--	--	--	NE	NE	--	--	--	--
Cobalt	--	--	--	--	--	--	NE	NE	--	--	--	--
Copper	--	--	--	--	--	--	NE	NE	--	--	--	--
Lead	--	--	--	--	--	--	NE	NE	--	--	--	--
Manganese	--	--	--	--	--	--	NE	NE	--	--	--	--
Mercury	--	--	--	--	--	--	NE	NE	--	--	--	--
Nickel	--	--	--	--	--	--	NE	NE	--	--	--	--
Selenium	--	--	--	--	--	--	NE	NE	--	--	--	--
Silver	--	--	--	--	--	--	NE	NE	--	--	--	--
Thallium	--	--	--	--	--	--	NE	NE	--	--	--	--
Vanadium	--	--	--	--	--	--	NE	NE	--	--	--	--
Zinc	--	--	--	--	--	--	NE	NE	--	--	--	--
Inorganics - Other Inorganics												
Cyanide	--	--	--	--	--	--	NE	NE	--	--	--	--
Fluoride	--	--	--	--	--	--	NE	NE	--	--	--	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	--	--	--	--	--	--	NE	NE	--	--	--	--
Aroclor 1254	<1	--	--	--	--	--	NE	NE	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Total LMW PAHs	--	--	--	--	--	--	NE	NE	--	--	--	--
Total HMW PAHs	<1	<1	--	--	--	--	NE	NE	<1	--	--	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	NE	NE	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	NE	NE	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	NE	NE	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	NE	NE	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	NE	NE	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	NE	NE	--	--	--	--
Volatile Organic Compounds (V												
Methylcyclohexane	--	--	--	--	--	--	NE	NE	--	--	--	--
Dioxin/Furans												
Total Dioxins/Furans	--	--	--	--	--	--	NE	NE	--	--	**1.1**	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Flathead River Riparian Area (Soil)														
Inorganics - Metals														
Aluminum	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Antimony	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Arsenic	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Barium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Beryllium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Cadmium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Chromium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Cobalt	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Copper	NE	NE	--	--	NE	NE	<1	--	--	--	--	--	--	--
Lead	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Manganese	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Mercury	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Nickel	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Selenium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Silver	NE	NE	--	--	NE	NE	<1	--	--	--	--	--	--	--
Thallium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Vanadium	NE	NE	--	--	NE	NE	<1	--	--	--	--	--	--	--
Zinc	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics														
Cyanide	NE	NE	--	--	NE	NE	<1	--	--	--	--	--	--	--
Fluoride	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Aroclor 1254	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Total LMW PAHs	NE	NE	--	--	NE	NE	<1	--	--	--	--	--	--	--
Total HMW PAHs	NE	NE	--	--	NE	NE	**1.5**	<1	--	--	--	--	<1	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
2-Chloronaphthalene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Butylbenzylphthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Dibenzofuran	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Hexachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Hexachlorobutadiene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Hexachloroethane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Pentachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--
Dioxin/Furans														
Total Dioxins/Furans	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Inorganics - Metals												
Aluminum	--	--	--	--	--	--	NE	NE	--	--	--	--
Antimony	--	--	--	--	--	--	NE	NE	--	--	--	--
Arsenic	--	--	--	--	--	--	NE	NE	--	--	--	--
Barium	--	--	--	--	--	--	NE	NE	--	--	--	--
Beryllium	--	--	--	--	--	--	NE	NE	--	--	--	--
Cadmium	--	--	--	--	--	--	NE	NE	--	--	--	--
Chromium	--	--	--	--	--	--	NE	NE	--	--	--	--
Cobalt	--	--	--	--	--	--	NE	NE	--	--	--	--
Copper	--	--	--	--	--	--	NE	NE	--	--	--	--
Lead	--	--	--	--	--	--	NE	NE	--	--	--	--
Manganese	--	--	--	--	--	--	NE	NE	--	--	--	--
Mercury	--	--	--	--	--	--	NE	NE	--	--	--	--
Nickel	--	--	--	--	--	--	NE	NE	--	--	--	--
Selenium	--	--	--	--	--	--	NE	NE	--	--	--	--
Silver	--	--	--	--	--	--	NE	NE	--	--	--	--
Thallium	--	--	--	--	--	--	NE	NE	--	--	--	--
Vanadium	--	--	--	--	--	--	NE	NE	--	--	--	--
Zinc	--	--	--	--	--	--	NE	NE	--	--	--	--
Inorganics - Other Inorganics												
Cyanide	--	--	--	--	--	--	NE	NE	--	--	--	--
Fluoride	--	--	--	--	--	--	NE	NE	--	--	--	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	--	--	--	--	--	--	NE	NE	--	--	--	--
Aroclor 1254	<1	--	--	--	--	--	NE	NE	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Total LMW PAHs	--	--	--	--	--	--	NE	NE	--	--	--	--
Total HMW PAHs	<1	<1	--	--	--	--	NE	NE	<1	--	--	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	NE	NE	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	NE	NE	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	NE	NE	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	NE	NE	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	NE	NE	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	NE	NE	--	--	--	--
Volatile Organic Compounds (V												
Methylcyclohexane	--	--	--	--	--	--	NE	NE	--	--	--	--
Dioxin/Furans												
Total Dioxins/Furans	--	--	--	--	--	--	NE	NE	--	--	--	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
North Percolation Pond (Transitional, soil/sedime														
Inorganics - Metals														
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	**1.6**	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	**1.7**	--	--	--	--	--	--	--	<1	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	**1.2**	--	--	--	--	--	<1	--	--	--	--	--	--	--
Lead	**1.1**	--	**3.0**	--	--	--	--	--	--	--	<1	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	**1.4**	--	**4.9**	**1.8**	--	--	--	--	--	--	**1.3**	<1	--	--
Selenium	**3.9**	**1.4**	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	<1	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	**14.4**	**2.9**	**4.3**	--	**1.3**	--	<1	--	<1	--	<1	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	<1	--	--	--
Inorganics - Other Inorganics														
Cyanide	**3.4**	--	**9.1**	--	--	--	<1	--	<1	--	--	--	--	--
Fluoride	**2.2**	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Total LMW PAHs	**119.7**	**12.0**	**54.5**	**5.5**	**11.3**	--	<1	--	--	--	**15.5**	**1.5**	--	--
Total HMW PAHs	**2835.7**	**283.6**	**1034.3**	**103.4**	**268.2**	**26.8**	**1.6**	<1	<1	--	**290.0**	**29.0**	<1	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--	<1	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans														
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--	<1	--	--	--
South Percolation Pond (Transitional, soil/sedime														

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
ent)												
Inorganics - Metals												
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	1.4	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	3.5	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	1.1	--	--	--	--	--	20.3	2.3
Selenium	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics												
Cyanide	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	<1	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Total LMW PAHs	--	--	--	--	--	--	--	--	--	--	5.1	--
Total HMW PAHs	<1	<1	4.3	--	230.5	3.7	--	--	<1	--	1438.8	23.0
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--	1.8	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (V												
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans												
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--	--	--
ent)												

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Inorganics - Metals														
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	**4.1**	**2.3**	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	<1	--	--	--	--	--	--	--	<1	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	**5.7**	--	<1	--	--	--	<1	--	--	--	<1	--	--	--
Lead	--	--	<1	--	--	--	--	--	--	--	<1	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	<1	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	**1.5**	--	--	--	--	--	<1	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics														
Cyanide	--	--	<1	--	--	--	<1	--	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Total LMW PAHs	--	--	--	--	--	--	<1	--	--	--	<1	--	--	--
Total HMW PAHs	**1.4**	--	<1	<1	--	--	**1.5**	<1	--	--	**3.9**	<1	<1	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	**2.6**	<1	--	--	--	--	--	--	**2.8**	<1	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans														
Total Dioxins/Furans	--	--	<1	--	--	--	--	--	--	--	<1	--	--	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Inorganics - Metals												
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	**2.3**	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--	--	--	**2.4**	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	**1.0**	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics												
Cyanide	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	<1	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Total LMW PAHs	--	--	--	--	--	--	--	--	--	--	--	--
Total HMW PAHs	<1	<1	--	--	--	--	--	--	<1	--	--	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (V												
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans												
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--	--	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Cedar Creek Reservoir Overflow Ditch (Transitional, soil														
Inorganics - Metals														
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	**1.8**	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	**11.0**	**1.3**	--	--	<1	--	--	--	**11.8**	**1.4**	--	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	<1	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	**1.9**	--	--	--	--	--	<1	--	<1	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics														
Cyanide	--	--	--	--	--	--	<1	--	<1	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	**20.0**	**2.0**	--	--	--	--	--	--	**25.1**	**2.5**	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Total LMW PAHs	--	--	--	--	--	--	<1	--	--	--	**1.3**	--	--	--
Total HMW PAHs	**2.3**	--	**9.4**	<1	--	--	**1.6**	<1	<1	--	**14.0**	**1.4**	<1	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	**1.4**	--	--	--	--	--	--	--	**2.4**	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans														
Total Dioxins/Furans	--	--	<1	--	--	--	--	--	--	--	**1.3**	--	--	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
	/sediment)											
Inorganics - Metals												
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	2.0	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics												
Cyanide	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	<1	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Total LMW PAHs	--	--	--	--	--	--	--	--	--	--	--	--
Total HMW PAHs	<1	<1	--	--	--	--	--	--	<1	--	--	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (V												
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans												
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--	--	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Northern Surface Water Feature (Transitional, soil/se														
Inorganics - Metals														
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	**3.8**	**2.1**	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	<1	<1	--	--	<1	--	--	--	**2.4**	<1	--	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	<1	<1	--	--
Selenium	**3.5**	**1.2**	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	<1	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	**1.7**	--	--	--	--	--	<1	--	<1	--	<1	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics														
Cyanide	--	--	--	--	--	--	<1	--	<1	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	<1	<1	--	--	--	--	--	--	**5.0**	<1	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Total LMW PAHs	--	--	--	--	--	--	<1	--	--	--	<1	--	--	--
Total HMW PAHs	--	--	<1	--	--	--	**1.6**	<1	<1	--	**4.5**	<1	<1	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	<1	--	--	--	--	--	--	--	<1	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans														
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--	<1	--	--	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
diment)												
Inorganics - Metals												
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	1.3	--
Silver	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics - Other Inorganics												
Cyanide	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	<1	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Total LMW PAHs	--	--	--	--	--	--	--	--	--	--	--	--
Total HMW PAHs	<1	<1	--	--	--	--	--	--	<1	--	--	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (V												
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans												
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--	--	--

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Flathead River Area (Surface Water/Sediment)														
Inorganics - Metals														
Aluminum	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Antimony	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Arsenic	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Barium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Beryllium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Cadmium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Chromium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Cobalt	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Copper	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Lead	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Manganese	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Mercury	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Nickel	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Selenium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Silver	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Thallium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Vanadium	**2.0**	--	NE	NE	**1.5**	--	NE	NE	NE	NE	NE	NE	NE	NE
Zinc	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Inorganics - Other Inorganics														
Cyanide	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Fluoride	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Aroclor 1254	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Polycyclic Aromatic Hydrocarbons (PAHs)														
Total LMW PAHs	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Total HMW PAHs	**1.4**	--	NE	NE	**1.6**	--	NE	NE	NE	NE	NE	NE	NE	NE
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
2,3,4,6-Tetrachlorophenol	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
2-Chloronaphthalene	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Biphenyl (Diphenyl)	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Bis(2-ethylhexyl)phthalate	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Butylbenzylphthalate	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Dibenzofuran	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Di-n-butyl phthalate	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Di-n-octyl phthalate	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Hexachlorobenzene	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Hexachlorobutadiene	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Hexachloroethane	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Pentachlorophenol	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Dioxin/Furans														
Total Dioxins/Furans	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Inorganics - Metals												
Aluminum	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Antimony	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Arsenic	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Barium	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Beryllium	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Cadmium	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Chromium	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Cobalt	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Copper	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Lead	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Manganese	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Mercury	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Nickel	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Selenium	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Silver	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Thallium	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Vanadium	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Zinc	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Inorganics - Other Inorganics												
Cyanide	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Fluoride	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Aroclor 1254	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Polycyclic Aromatic Hydrocarbons (PAHs)												
Total LMW PAHs	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Total HMW PAHs	NE	NE	NE	NE	NE	NE	**1.5**	--	NE	NE	NE	NE
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
2,3,4,6-Tetrachlorophenol	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
2-Chloronaphthalene	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Biphenyl (Diphenyl)	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Bis(2-ethylhexyl)phthalate	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Butylbenzylphthalate	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Dibenzofuran	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Di-n-butyl phthalate	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Di-n-octyl phthalate	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Hexachlorobenzene	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Hexachlorobutadiene	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Hexachloroethane	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Pentachlorophenol	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Volatile Organic Compounds (V												
Methylcyclohexane	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Dioxin/Furans												
Total Dioxins/Furans	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Yellow-Billed Cuckoo		Canada Lynx	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Cedar Creek Area (Surface Water/Sediment)														
Inorganics - Metals														
Aluminum	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Antimony	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Arsenic	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Barium	1.1	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Beryllium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Cadmium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Chromium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Cobalt	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Copper	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Lead	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Manganese	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Mercury	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Nickel	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Selenium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Silver	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Thallium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Vanadium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Zinc	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Inorganics - Other Inorganics														
Cyanide	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Fluoride	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Aroclor 1254	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Polycyclic Aromatic Hydrocarbons (PAHs)														
Total LMW PAHs	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Total HMW PAHs	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
2,3,4,6-Tetrachlorophenol	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
2-Chloronaphthalene	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Biphenyl (Diphenyl)	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Bis(2-ethylhexyl)phthalate	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Butylbenzylphthalate	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Dibenzofuran	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Di-n-butyl phthalate	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Di-n-octyl phthalate	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Hexachlorobenzene	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Hexachlorobutadiene	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Hexachloroethane	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Pentachlorophenol	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE
Dioxin/Furans														
Total Dioxins/Furans	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		North American Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics - Metals												
Aluminum	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Antimony	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Arsenic	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Barium	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Beryllium	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Cadmium	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Chromium	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Cobalt	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Copper	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Lead	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Manganese	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Mercury	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Nickel	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Selenium	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Silver	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Thallium	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Vanadium	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Zinc	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Inorganics - Other Inorganics												
Cyanide	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Fluoride	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Aroclor 1254	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Polycyclic Aromatic Hydrocarbons (PAHs)												
Total LMW PAHs	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Total HMW PAHs	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
2,3,4,6-Tetrachlorophenol	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
2-Chloronaphthalene	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Biphenyl (Diphenyl)	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Bis(2-ethylhexyl)phthalate	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Butylbenzylphthalate	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Dibenzofuran	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Di-n-butyl phthalate	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Di-n-octyl phthalate	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Hexachlorobenzene	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Hexachlorobutadiene	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Hexachloroethane	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Pentachlorophenol	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Volatile Organic Compounds (V												
Methylcyclohexane	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Dioxin/Furans												
Total Dioxins/Furans	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE

Table 6-58
Summary of Area-Weighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

--, HQ is negligible. Chemical was either not a COPEC, or had minimal HQs (i.e., <1) for all relevant exposure areas. Full ingestion model results are presented in Appendix H2.
HMW, High molecular weight
HQ, Hazard quotient
$HQ_{LOAEL,}$ Hazard quotient calculated using the lowest-observable-adverse-effect toxicity reference value.
$HQ_{NOAEL,}$ Hazard quotient calculated using the no-observable-adverse-effect toxicity reference value.
LMW, Low molecular weight
LOAEL: Lowest Observed Adverse Effects Level
NE: Receptor was not evaluated for the exposure area
NOAEL: No Observed Adverse Effects Level
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
VOC, Volatile Organic Compound

Shading key:
= indicates LOAEL results for endangered species, which are evaluated based on their NOAEL results only.
= HQ greater than 1, less than 10
= HQ greater than 10, less than 100
= HQ greater than 100

Table 6-59
Summary of Unweighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Main Plant Area (Soil)																										
Inorganics - Metals																										
Aluminum	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Antimony	NE	NE	--	--	NE	NE	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Arsenic	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Barium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Beryllium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Cadmium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Chromium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Cobalt	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Copper	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Lead	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Manganese	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Mercury	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Nickel	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	**1.1**	<1
Selenium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Silver	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Thallium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Vanadium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Zinc	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Inorganics - Other Inorganics																										
Cyanide	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Fluoride	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Aroclor 1254	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	**1.0**	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Total HMW PAHs	NE	NE	**13.9**	**1.4**	NE	NE	**2.5**	<1	<1	<1	**19.7**	**2.0**	<1	<1	**2.2**	<1	<1	<1	**3.6**	<1	NE	NE	<1	<1	**22.8**	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
2,3,4,6-Tetrachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
2-Chloronaphthalene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Biphenyl (Diphenyl)	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Bis(2-ethylhexyl)phthalate	NE	NE	**2.8**	<1	NE	NE	<1	<1	<1	<1	**4.2**	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Butylbenzylphthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Dibenzofuran	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-butyl phthalate	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Di-n-octyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobutadiene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachloroethane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Pentachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Dioxin/Furans																										
Total Dioxins/Furans	NE	NE	**1.8**	<1	NE	NE	<1	<1	<1	<1	**2.7**	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	**3.4**	<1

Table 6-59
Summary of Unweighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Central Landfills Area (Soil)																										
Inorganics - Metals																										
Aluminum	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Antimony	NE	NE	--	--	NE	NE	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Arsenic	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Barium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Beryllium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Cadmium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Chromium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Cobalt	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Copper	NE	NE	**11.3**	**1.3**	NE	NE	**2.1**	<1	<1	<1	**14.5**	**1.7**	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	**2.4**	<1
Lead	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Manganese	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Mercury	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Nickel	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	**3.7**	<1
Selenium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Silver	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Thallium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Vanadium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Zinc	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Inorganics - Other Inorganics																										
Cyanide	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Fluoride	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Aroclor 1254	NE	NE	**20.7**	**2.1**	NE	NE	<1	<1	<1	<1	**30.9**	**3.1**	<1	<1	**1.7**	<1	<1	<1	<1	<1	NE	NE	<1	<1	**5.9**	<1
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	**1.4**	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Total HMW PAHs	NE	NE	**9.7**	<1	NE	NE	**1.6**	<1	<1	<1	**13.8**	**1.4**	<1	<1	**1.5**	<1	<1	<1	**5.0**	<1	NE	NE	<1	<1	**33.4**	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
2,3,4,6-Tetrachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
2-Chloronaphthalene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Biphenyl (Diphenyl)	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Bis(2-ethylhexyl)phthalate	NE	NE	**1.5**	<1	NE	NE	<1	<1	<1	<1	**2.2**	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Butylbenzylphthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Dibenzofuran	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-butyl phthalate	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Di-n-octyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobutadiene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachloroethane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Pentachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Dioxin/Furans																										
Total Dioxins/Furans	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	**1.1**	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	**2.9**	<1

Table 6-59
Summary of Unweighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Industrial Landfills Area (Soil)																										
Inorganics - Metals																										
Aluminum	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Antimony	NE	NE	--	--	NE	NE	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	**6.6**	<1
Arsenic	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Barium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Beryllium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Cadmium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	**1.6**	<1
Chromium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Cobalt	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Copper	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	**1.0**	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	**6.7**	<1
Lead	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Manganese	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Mercury	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Nickel	NE	NE	**5.7**	**2.1**	NE	NE	<1	<1	<1	<1	**7.7**	**2.8**	<1	<1	<1	<1	<1	<1	**1.4**	<1	NE	NE	<1	<1	**28.1**	**3.2**
Selenium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Silver	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Thallium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Vanadium	NE	NE	**5.9**	**1.2**	NE	NE	**3.7**	<1	**1.4**	<1	**3.0**	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Zinc	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Inorganics - Other Inorganics																										
Cyanide	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Fluoride	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Aroclor 1254	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	NE	NE	**1.9**	<1	NE	NE	<1	<1	<1	<1	**2.7**	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Total HMW PAHs	NE	NE	**35.4**	**3.5**	NE	NE	**7.1**	<1	<1	<1	**50.1**	**5.0**	<1	<1	**6.0**	<1	<1	<1	**6.9**	<1	NE	NE	<1	<1	**38.2**	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
2,3,4,6-Tetrachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
2-Chloronaphthalene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Biphenyl (Diphenyl)	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Bis(2-ethylhexyl)phthalate	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Butylbenzylphthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Dibenzofuran	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-butyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-octyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobutadiene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachloroethane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Pentachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Dioxin/Furans																										
Total Dioxins/Furans	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--

Table 6-59
Summary of Unweighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Eastern Undeveloped Area (Soil)																										
Inorganics - Metals																										
Aluminum	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Antimony	NE	NE	--	--	NE	NE	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Arsenic	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Barium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Beryllium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Cadmium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Chromium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Cobalt	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Copper	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Lead	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Manganese	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Mercury	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Nickel	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	**1.0**	<1
Selenium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Silver	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Thallium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Vanadium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Zinc	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Inorganics - Other Inorganics																										
Cyanide	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Fluoride	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Aroclor 1254	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Total HMW PAHs	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
2,3,4,6-Tetrachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
2-Chloronaphthalene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Biphenyl (Diphenyl)	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Bis(2-ethylhexyl)phthalate	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	**1.2**	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Butylbenzylphthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Dibenzofuran	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-butyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-octyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobutadiene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachloroethane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Pentachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Dioxin/Furans																										
Total Dioxins/Furans	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--

Table 6-59
Summary of Unweighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
North-Central Undeveloped Area (Soil)																										
Inorganics - Metals																										
Aluminum	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Antimony	NE	NE	--	--	NE	NE	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Arsenic	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Barium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Beryllium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Cadmium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Chromium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Cobalt	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Copper	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Lead	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Manganese	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Mercury	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Nickel	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Selenium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Silver	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Thallium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Vanadium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Zinc	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Inorganics - Other Inorganics																										
Cyanide	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Fluoride	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Aroclor 1254	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Total HMW PAHs	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
2,3,4,6-Tetrachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
2-Chloronaphthalene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Biphenyl (Diphenyl)	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Bis(2-ethylhexyl)phthalate	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Butylbenzylphthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Dibenzofuran	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-butyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-octyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobutadiene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachloroethane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Pentachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Dioxin/Furans																										
Total Dioxins/Furans	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--

Table 6-59
Summary of Unweighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Western Undeveloped Area (Soil)																										
Inorganics - Metals																										
Aluminum	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Antimony	NE	NE	--	--	NE	NE	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Arsenic	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Barium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Beryllium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Cadmium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Chromium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Cobalt	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Copper	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Lead	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Manganese	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Mercury	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Nickel	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Selenium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Silver	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Thallium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Vanadium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Zinc	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Inorganics - Other Inorganics																										
Cyanide	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Fluoride	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Aroclor 1254	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Total HMW PAHs	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
2,3,4,6-Tetrachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
2-Chloronaphthalene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Biphenyl (Diphenyl)	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Bis(2-ethylhexyl)phthalate	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Butylbenzylphthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Dibenzofuran	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-butyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-octyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobutadiene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachloroethane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Pentachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Dioxin/Furans																										
Total Dioxins/Furans	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	**1.1**	<1

Table 6-59
Summary of Unweighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Flathead River Riparian Area (Soil)																										
Inorganics - Metals																										
Aluminum	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Antimony	NE	NE	--	--	NE	NE	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Arsenic	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Barium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Beryllium	NE	NE	--	--	NE	NE	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Cadmium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Chromium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Cobalt	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Copper	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Lead	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Manganese	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Mercury	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Nickel	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Selenium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Silver	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Thallium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Vanadium	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Zinc	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Inorganics - Other Inorganics																										
Cyanide	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Fluoride	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Aroclor 1254	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Total HMW PAHs	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
2,3,4,6-Tetrachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
2-Chloronaphthalene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Biphenyl (Diphenyl)	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Bis(2-ethylhexyl)phthalate	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Butylbenzylphthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Dibenzofuran	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Di-n-butyl phthalate	NE	NE	<1	<1	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE	<1	<1	<1	<1
Di-n-octyl phthalate	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobenzene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachlorobutadiene	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Hexachloroethane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Pentachlorophenol	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--
Dioxin/Furans																										
Total Dioxins/Furans	NE	NE	--	--	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NE	NE	--	--	--	--

Table 6-59
Summary of Unweighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
North Percolation Pond (Transitional, soil/sediment)																										
Inorganics - Metals																										
Aluminum	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	1.4	<1
Arsenic	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Barium	1.6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cadmium	<1	<1	1.7	<1	<1	<1	<1	<1	<1	<1	2.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	3.5	<1
Chromium	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Cobalt	--	--	<1	<1	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Copper	1.2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Lead	1.1	<1	3.0	<1	<1	<1	<1	<1	<1	<1	3.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	<1	<1	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Nickel	1.4	<1	4.9	1.8	<1	<1	<1	<1	<1	<1	6.6	2.4	<1	<1	<1	<1	<1	<1	1.1	<1	<1	<1	<1	<1	20.3	2.3
Selenium	3.9	1.4	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Silver	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Vanadium	14.4	2.9	4.3	<1	1.3	<1	2.7	<1	1.0	<1	2.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Zinc	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.4	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Inorganics - Other Inorganics																										
Cyanide	3.4	<1	9.1	<1	<1	<1	8.0	<1	2.2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Fluoride	2.2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	119.7	12.0	54.5	5.5	11.3	<1	9.9	<1	<1	<1	78.1	7.8	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	5.1	<1
Total HMW PAHs	2835.7	283.6	1034.3	103.4	268.2	26.8	200.9	20.1	9.6	<1	1465.0	146.5	12.8	<1	172.8	2.8	4.3	<1	230.5	3.7	<1	<1	4.3	<1	1438.8	23.0
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	<1	<1	--	--	<1	<1	<1	<1	1.4	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	1.8	<1
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans																										
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 6-59
Summary of Unweighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
South Percolation Pond (Transitional, soil/sediment)																										
Inorganics - Metals																										
Aluminum	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	**4.1**	**2.3**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	**1.3**	<1	--	--	<1	<1	<1	<1	**1.8**	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	**2.3**	<1
Chromium	--	--	<1	<1	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Copper	**5.7**	<1	**3.2**	<1	<1	<1	<1	<1	<1	<1	**4.1**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	**2.4**	<1
Lead	<1	<1	**1.1**	<1	<1	<1	<1	<1	<1	<1	**1.4**	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Manganese	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Mercury	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Nickel	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	**1.0**	<1
Selenium	--	--	<1	<1	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Silver	--	--	<1	<1	--	--	**1.0**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	**1.5**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Zinc	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Inorganics - Other Inorganics																										
Cyanide	<1	<1	**1.1**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	<1	<1	--	--	<1	<1	<1	<1	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Total HMW PAHs	**1.4**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	**11.5**	**1.2**	--	--	<1	<1	<1	<1	**17.2**	**1.7**	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	<1	<1	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans																										
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 6-59
Summary of Unweighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Cedar Creek Reservoir Overflow Ditch (Transitional, soil/sediment)																										
Inorganics - Metals																										
Aluminum	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	<1	<1	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Barium	**1.8**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	<1	<1	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Lead	--	--	<1	<1	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Manganese	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	**2.0**	<1
Selenium	--	--	<1	<1	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Silver	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	**1.9**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Zinc	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Inorganics - Other Inorganics																										
Cyanide	<1	<1	<1	<1	--	--	<1	<1	<1	<1	--	--	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	<1	<1	--	--	<1	<1	<1	<1	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Total HMW PAHs	**2.3**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	<1	<1	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	<1	<1	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans																										
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 6-59
Summary of Unweighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Northern Surface Water Feature (Transitional, soil/sediment)																										
Inorganics - Metals																										
Aluminum	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Barium	**3.8**	**2.1**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Lead	--	--	<1	<1	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Manganese	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	**3.5**	**1.2**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	**1.3**	<1
Silver	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	**1.7**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Zinc	--	--	<1	<1	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Inorganics - Other Inorganics																										
Cyanide	<1	<1	<1	<1	--	--	<1	<1	<1	<1	--	--	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	<1	<1	--	--	<1	<1	<1	<1	--	--	--	--	--	--	<1	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1
Total HMW PAHs	<1	<1	--	--	<1	<1	--	--	--	--	--	--	--	--	<1	<1	--	--	--	--	--	--	--	--	--	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin/Furans																										
Total Dioxins/Furans	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 6-59
Summary of Unweighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Flathead River Area (Surface Water/Sediment)																										
Inorganics - Metals																										
Aluminum	<1	<1	NE	NE	<1	<1	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Antimony	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Arsenic	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Barium	<1	<1	NE	NE	<1	<1	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	<1	<1	NE	NE	NE	NE
Beryllium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Cadmium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Chromium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Cobalt	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Copper	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Lead	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Manganese	<1	<1	NE	NE	<1	<1	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	<1	<1	NE	NE	NE	NE
Mercury	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Nickel	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Selenium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Silver	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Thallium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Vanadium	**2.0**	<1	NE	NE	**1.5**	<1	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	<1	<1	NE	NE	NE	NE
Zinc	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Inorganics - Other Inorganics																										
Cyanide	<1	<1	NE	NE	<1	<1	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	<1	<1	NE	NE	NE	NE
Fluoride	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Aroclor 1254	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	<1	<1	NE	NE	<1	<1	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	<1	<1	NE	NE	NE	NE
Total HMW PAHs	**1.4**	<1	NE	NE	**1.6**	<1	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	**1.5**	<1	NE	NE	NE	NE
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
2,3,4,6-Tetrachlorophenol	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
2-Chloronaphthalene	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Biphenyl (Diphenyl)	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Bis(2-ethylhexyl)phthalate	<1	<1	NE	NE	<1	<1	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	<1	<1	NE	NE	NE	NE
Butylbenzylphthalate	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Dibenzofuran	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Di-n-butyl phthalate	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Di-n-octyl phthalate	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Hexachlorobenzene	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Hexachlorobutadiene	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Hexachloroethane	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Pentachlorophenol	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Dioxin/Furans																										
Total Dioxins/Furans	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE

Table 6-59
Summary of Unweighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Receptor	American Dipper		American Woodcock		Belted Kingfisher		Mourning Dove		Red-Tailed Hawk		Cuckoo		Canada Lynx		Grizzly Bear		Long-tailed Weasel		Meadow Vole		Mink		Wolverine		Short-tailed Shrew	
Constituent HQ Criteria	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Cedar Creek Area (Surface Water/Sediment)																										
Inorganics - Metals																										
Aluminum	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Antimony	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Arsenic	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Barium	**1.1**	<1	NE	NE	<1	<1	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	<1	<1	NE	NE	NE	NE
Beryllium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Cadmium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Chromium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Cobalt	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Copper	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Lead	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Manganese	<1	<1	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Mercury	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Nickel	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Selenium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Silver	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Thallium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Vanadium	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Zinc	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Inorganics - Other Inorganics																										
Cyanide	<1	<1	NE	NE	<1	<1	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	<1	<1	NE	NE	NE	NE
Fluoride	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Polychlorinated Biphenyls (PCBs)																										
Aroclor 1248	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Aroclor 1254	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Polycyclic Aromatic Hydrocarbons (PAHs)																										
Total LMW PAHs	<1	<1	NE	NE	<1	<1	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	<1	<1	NE	NE	NE	NE
Total HMW PAHs	<1	<1	NE	NE	<1	<1	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	<1	<1	NE	NE	NE	NE
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs																										
1,2,4,5-Tetrachlorobenzene	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
2,3,4,6-Tetrachlorophenol	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
2-Chloronaphthalene	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Biphenyl (Diphenyl)	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Bis(2-ethylhexyl)phthalate	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Butylbenzylphthalate	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Dibenzofuran	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Di-n-butyl phthalate	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Di-n-octyl phthalate	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Hexachlorobenzene	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Hexachlorobutadiene	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Hexachloroethane	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Pentachlorophenol	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Volatile Organic Compounds (VOCs)																										
Methylcyclohexane	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE
Dioxin/Furans																										
Total Dioxins/Furans	--	--	NE	NE	--	--	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	--	NE	NE	NE	NE

Table 6-59
Summary of Area-UnWeighted Wildlife Hazard Quotients Calculated using Refined EPCs
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

--, HQ is negligible. Chemical was either not a COPEC, or had minimal HQs (i.e., <1) for all relevant exposure areas. Full ingestion model results are presented in Appendix H2.
HMW, High molecular weight
HQ, Hazard quotient
$HQ_{LOAEL,}$ Hazard quotient calculated using the lowest-observable-adverse-effect toxicity reference value.
$HQ_{NOAEL,}$ Hazard quotient calculated using the no-observable-adverse-effect toxicity reference value.
LMW, Low molecular weight
LOAEL: Lowest Observed Adverse Effects Level
NE: Receptor was not evaluated for the exposure area
NOAEL: No Observed Adverse Effects Level
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
VOC, Volatile Organic Compound

Shading key:
= indicates LOAEL results for endangered species, which are evaluated based on their NOAEL results only.
= HQ greater than 1, less than 10
= HQ greater than 10, less than 100
= HQ greater than 100

Table 6-60
Effect of Flathead River Areas and Discharge (Q) on
Fluoride, Cyanide, Aluminum, and Barium Surface Water Concentrations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Term	*df*	*SS*	*MS*	Statistic	*p* Value
Fluoride One-Way ANOVA - Downstream Portion of Flathead River					
Q Percentile	4	207,969	51,992	5.1	***0.004***
Residuals	22	222,525	10,115	NA	NA
Fluoride One-Way ANOVA - Backwater Area of Flathead River					
Q Percentile	6	12,975,755	2,162,626	4.1	***0.010***
Residuals	17	8,955,814	526,813	NA	NA
Fluoride One-Way ANOVA - Riparian Area of Flathead River					
Q Percentile	2	849,720	424,860	1.8	0.213
Residuals	12	2,886,240	240,520	NA	NA
Fluoride Two-Way ANOVA					
Area	2	49,805,550	24,902,775	105.3	***0.000***
Q Percentile	7	9,594,178	1,370,597	5.8	***0.000***
Area*Q Percentile	5	4,439,266	887,853	3.8	***0.006***
Residuals	51	12,064,579	236,560	NA	NA
Cyanide (Total) One-Way ANOVA - Downstream Portion of Flathead River					
Q Percentile	4	1,503	376	4.8	***0.005***
Residuals	25	1,954	78	NA	NA
Cyanide (Total) One-Way ANOVA - Backwater Area of Flathead River					
Q Percentile	6	210,462	35,077	3.7	***0.012***
Residuals	20	188,485	9,424	NA	NA
Cyanide (Total) One-Way ANOVA - Riparian Area of Flathead River					
Q Percentile	2	332,815	166,407	17.8	***0.000***
Residuals	17	159,201	9,365	NA	NA
Cyanide (Total) Two-Way ANOVA					
Area	2	337,607	168,804	29.9	***0.000***
Q Percentile	7	254,729	36,390	6.5	***0.000***
Area*Q Percentile	5	290,052	58,010	10.3	***0.000***
Residuals	62	349,641	5,639	NA	NA
Unfiltered Aluminum One-Way ANOVA - Downstream Portion of Flathead River					
Q Percentile	4	275,869	68,967	1.0	0.416
Residuals	20	1,337,574	66,879	NA	NA
Unfiltered Aluminum One-Way ANOVA - Backwater Area of Flathead River					
Q Percentile	6	927,948	154,658	1.6	0.217
Residuals	14	1,345,890	96,135	NA	NA
Unfiltered Aluminum One-Way ANOVA - Riparian Area of Flathead River					
Q Percentile	2	311,319,667	155,659,834	2.7	0.107
Residuals	12	688,059,460	57,338,288	NA	NA
Unfiltered Aluminum Two-Way ANOVA					
Area	2	121,627,291	60,813,645	4.0	***0.024***
Q Percentile	7	161,012,235	23,001,748	1.5	0.181
Area*Q Percentile	5	151,511,249	30,302,250	2.0	0.094
Residuals	46	690,742,925	15,016,151	NA	NA
Filtered Aluminum One-Way ANOVA - Downstream Portion of Flathead River					
Q Percentile	3	92.8	30.9	0.1	0.956
Residuals	15	4,456.9	297.1	NA	NA

Table 6-60
Effect of Flathead River Areas and Discharge (Q) on
Fluoride, Cyanide, Aluminum, and Barium Surface Water Concentrations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Term	*df*	*SS*	*MS*	Statistic	*p* Value
Filtered Aluminum One-Way ANOVA - Backwater Area of Flathead River					
Q Percentile	3	84.6	28.2	0.5	0.665
Residuals	8	413.3	51.7	NA	NA
Filtered Aluminum One-Way ANOVA - Riparian Area of Flathead River					
Q Percentile	2	195,670	97,835	2.2	0.158
Residuals	12	543,843	45,320	NA	NA
Filtered Aluminum Two-Way ANOVA					
Area	2	271,883	135,941	8.7	***0.001***
Q Percentile	4	100,798	25,200	1.6	0.194
Area*Q Percentile	4	95,049	23,762	1.5	0.219
Residuals	35	548,713	15,678	NA	NA
Unfiltered Barium One-Way ANOVA - Downstream Portion of Flathead River					
Q Percentile	4	6,636	1,659	14.9	***0.000***
Residuals	20	2,221	111	NA	NA
Unfiltered Barium One-Way ANOVA - Backwater Area of Flathead River					
Q Percentile	6	27,564	4,594	6.2	***0.002***
Residuals	14	10,316	737	NA	NA
Unfiltered Barium One-Way ANOVA - Riparian Area of Flathead River					
Q Percentile	2	306,036	153,018	2.7	0.109
Residuals	12	684,548	57,046	NA	NA
Unfiltered Barium Two-Way ANOVA					
Area	2	518,216	259,108	17.1	***0.000***
Q Percentile	7	212,396	30,342	2.0	0.075
Area*Q Percentile	5	127,840	25,568	1.7	0.157
Residuals	46	697,086	15,154	NA	NA
Filtered Barium One-Way ANOVA - Downstream Portion of Flathead River					
Q Percentile	3	9,093	3,031	41.5	***0.000***
Residuals	15	1,095	73	NA	NA
Filtered Barium One-Way ANOVA - Backwater Area of Flathead River					
Q Percentile	3	19,849	6,616	11.0	***0.003***
Residuals	8	4,814	602	NA	NA
Filtered Barium One-Way ANOVA - Riparian Area of Flathead River					
Q Percentile	2	15,236	7,618	1.2	0.337
Residuals	12	76,638	6,386	NA	NA
Filtered Barium Two-Way ANOVA					
Area	2	168,507	84,253	35.7	***0.000***
Q Percentile	4	38,403	9,601	4.1	***0.008***
Area*Q Percentile	4	5,775	1,444	0.6	0.657
Residuals	35	82,546	2,358	NA	NA

Notes:
ANOVA - Analysis of variance
df - Degrees of freedom
SS - Sum of squares error
MS - Mean squares error

Table 6-61
Summary of Whole Effluent Toxicity (WET) Testing Results in the Backwater Seeps Sampling Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Test Organism	Test Duration	Dilution (% of Effluent)	Percent Survival of Test Organisms																	
			2014	2015				2016				2017				2018				2019
			Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Daphnid (*Ceriodaphnia dubia*)	48 hours	0%	95	100	100	95	95	100	95	90	100	95	100	100	100	100	100	100	100	100
		6.25%	95	90	100	95	100	100	100	100	100	95	95	100	100	100	100	100	100	100
		12.5%	100	100	100	100	95	95	100	100	100	100	100	95	95	100	100	100	100	100
		25%	100	95	100	100	95	100	100	100	100	90	95	95	95	100	100	100	100	100
		50%	95	90	95	95	95	95	100	95	95	90	85	100	100	95	100	100	100	100
		100%	100	80	85	90	85	80	100	85	95	100	95	90	95	75	100	90	100	100
Fathead minnow (*Pimephales promelas*)	96 hours	0%	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	95
		6.25%	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		12.5%	100	100	95	100	100	95	100	100	100	100	100	100	100	100	100	100	100	100
		25%	100	100	100	100	100	95	100	100	100	100	100	100	100	100	100	100	100	100
		50%	100	100	100	100	100	85	100	100	100	100	100	100	100	95	100	100	100	100
		100%	100	100	100	100	100	80	100	100	100	100	100	100	100	100	100	100	100	100

Table 6-62
Results of One-Way ANOVA Between Percent Effluent and Percent Survival
in WET Testing in the Backwater Seep Sampling Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Table 6-61a. Results of One-Way Analysis of Variance of the Effect of Percent Effluent on Test Organism Survival

Factor	Sum of Squares	DF	F Statistic	p-value
Daphnid (*Ceriodaphnia dubia*)				
Percent Effluent	721	5	7.38	***<0.001***
Residuals	1994	102	--	--
Fathead minnow (*Pimephales promelas*)				
Percent Effluent	19.4	5	0.57	0.72
Residuals	697	102	--	--

Notes:
Response variable was percent survival of the test organism
-- Not applicable
DF - Degrees of Freedom

Table 6-61b. P-values from post hoc Tukey's Honestly Signficant Difference Test of the Effect of Percent Effluent on *Ceriodaphnia dubia*

Percent Effluent	0 (Control)	6.25	12.5	25	50	100
0 (Control)	---					
6.25	1	---				
12.5	1	1	---			
25	1	1	1	---		
50	0.7	0.5	0.3	0.7	---	
100	***<0.001***	***<0.001***	***<0.001***	***<0.001***	***<0.05***	---

Notes:
P-values indicating significant differences in mean survival ($p<0.05$) are presented in bold italics.

Table 6-61c. Difference in Mean Survival Between Effect of Percent Effluent on *Ceriodaphnia dubia*

Percent Effluent	0 (Control)	6.25	12.5	25	50	100
0 (Control)	---					
6.25	-0.3	---				
12.5	-0.8	-0.6	---			
25	0	0.3	0.8	---		
50	2.2	2.5	3.1	2.2	---	
100	***6.7***	***6.9***	***7.5***	***6.7***	***4.4***	---

Notes:
Significant differences in mean survival are presented in bold italics.

Table 7-1
Range of Exposure Point Concentration Estimates
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Mean EPC Estimates			Maximum EPC Estimates		
				Lower	Measured	Upper	Lower	Measured	Upper
TAL Metals (mg/kg)									
Aluminum	7429-90-5	86	86	19649	20499	21350	35935	37700	39465
Antimony	7440-36-0	86	75	0.379	0.588	0.796	6.19	8.60	11.0
Arsenic	7440-38-2	86	86	5.76	6.39	7.02	27.0	31.3	35.6
Barium	7440-39-3	86	86	141	150	159	281	302	330
Beryllium	7440-41-7	86	86	0.796	0.839	0.882	3.47	3.70	3.93
Cadmium	7440-43-9	86	86	0.257	0.291	0.325	1.36	1.60	1.84
Chromium, Total	7440-47-3	86	86	19.5	21.3	23.1	50.2	54.4	58.6
Chromium, Hexavalent	18540-29-9	86	86	0.522	0.571	0.619	1.34	1.46	1.57
Chromium, Trivalent	16065-83-1	86	86	19.0	20.7	22.5	48.8	52.9	57.0
Cobalt	7440-48-4	86	86	6.31	6.48	6.64	13.0	13.5	14.0
Copper	7440-50-8	86	86	57.9	63.7	69.5	778	887	996
Iron	7439-89-6	86	86	18386	18893	19400	64433	66700	68967
Lead	7439-92-1	86	86	24.0	35.2	46.5	253	406	603
Manganese	7439-96-5	86	86	465	494	522	902	902	902
Mercury	7439-97-6	86	60	0.018	0.028	0.037	0.140	0.140	0.140
Nickel	7440-02-0	86	86	26.9	30.1	33.4	121	142	163
Selenium	7782-49-2	86	86	1.21	1.48	1.74	10.6	13.3	16.0
Silver	7440-22-4	86	86	0.107	0.118	0.128	1.18	1.30	1.42
Thallium	7440-28-0	86	86	0.110	0.122	0.133	0.387	0.400	0.457
Vanadium	7440-62-2	86	86	17.8	19.0	20.1	52.3	54.5	59.5
Zinc	7440-66-6	86	86	103	114	125	1501	1720	1939
Other Inorganic Parameters (mg/kg unless otherwise noted)									
Cyanide	57-12-5	86	84	0.671	0.928	1.18	10.9	18.2	25.5
Fluoride	16984-48-8	86	86	212	272	333	781	976	1218
Essential Nutrients (mg/kg)									
Calcium	7440-70-2	86	86	16847	19082	21316	40825	45700	50575
Magnesium	7439-95-4	86	86	10374	10612	10849	13010	13300	13590
Potassium	7440-09-7	86	86	1379	1464	1549	3069	3080	3272
Sodium	7440-23-5	86	82	836	1084	1332	6298	9000	11767

Table 7-1
Range of Exposure Point Concentration Estimates
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Mean EPC Estimates			Maximum EPC Estimates		
				Lower	Measured	Upper	Lower	Measured	Upper
Pesticides (mg/kg)									
Aldrin	309-00-2	43	0	---	---	---	---	---	---
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	43	0	---	---	---	---	---	---
Alpha Endosulfan	959-98-8	43	0	---	---	---	---	---	---
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	43	0	---	---	---	---	---	---
Beta Endosulfan	33213-65-9	43	0	---	---	---	---	---	---
cis-Chlordane	5103-71-9	43	0	---	---	---	---	---	---
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	43	0	---	---	---	---	---	---
Dieldrin	60-57-1	43	0	---	---	---	---	---	---
Endosulfan Sulfate	1031-07-8	43	0	---	---	---	---	---	---
Endrin	72-20-8	43	0	---	---	---	---	---	---
Endrin Aldehyde	7421-93-4	43	0	---	---	---	---	---	---
Endrin Ketone	53494-70-5	43	0	---	---	---	---	---	---
Gamma Bhc (Lindane)	58-89-9	43	0	---	---	---	---	---	---
Heptachlor	76-44-8	43	0	---	---	---	---	---	---
Heptachlor Epoxide	1024-57-3	43	0	---	---	---	---	---	---
Methoxychlor	72-43-5	43	0	---	---	---	---	---	---
P,P'-DDD	72-54-8	43	0	---	---	---	---	---	---
P,P'-DDE	72-55-9	43	0	---	---	---	---	---	---
P,P'-DDT	50-29-3	43	0	---	---	---	---	---	---
Toxaphene	8001-35-2	43	0	---	---	---	---	---	---
trans-Chlordane	5103-74-2	43	0	---	---	---	---	---	---
Polychlorinated Biphenyls (PCBs) (mg/kg)									
PCB-1016 (Aroclor 1016)	12674-11-2	86	0	---	---	---	---	---	---
PCB-1221 (Aroclor 1221)	11104-28-2	86	0	---	---	---	---	---	---
PCB-1232 (Aroclor 1232)	11141-16-5	86	0	---	---	---	---	---	---
PCB-1242 (Aroclor 1242)	53469-21-9	86	0	---	---	---	---	---	---
PCB-1248 (Aroclor 1248)[1]	12672-29-6	86	1	0.200	0.200	0.200	0.200	0.200	0.200
PCB-1254 (Aroclor 1254)	11097-69-1	86	14	0.194	0.310	0.426	1.73	1.73	1.73
PCB-1260 (Aroclor 1260)	11096-82-5	86	0	---	---	---	---	---	---
PCB-1262 (Aroclor 1262)	37324-23-5	86	0	---	---	---	---	---	---
PCB-1268 (Aroclor 1268)	11100-14-4	86	0	---	---	---	---	---	---
Polychlorinated Biphenyl (PCBs)	1336-36-3	86	15	0.176	0.303	0.430	1.73	1.73	1.73

Table 7-1
Range of Exposure Point Concentration Estimates
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Mean EPC Estimates			Maximum EPC Estimates		
				Lower	Measured	Upper	Lower	Measured	Upper
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)									
2-Methylnaphthalene	91-57-6	86	72	0.373	0.706	1.04	14.1	27.0	39.9
Acenaphthene	83-32-9	86	84	0.897	2.78	4.66	22.0	110	199
Acenaphthylene	208-96-8	86	26	0.148	0.288	0.427	1.92	3.10	5.05
Anthracene	120-12-7	86	80	1.74	4.86	7.98	44.3	150	274
Fluoranthene	206-44-0	86	86	9.09	19.1	29.0	188	440	754
Fluorene	86-73-7	86	83	0.897	2.37	3.85	24.3	94.0	164
Naphthalene	91-20-3	86	76	1.05	1.55	2.05	48.4	68.0	87.6
Phenanthrene	85-01-8	86	86	6.94	16.3	25.6	186	450	801
Total LMW PAHs - 1/2MDL	---	86	86	20.4	46.9	73.3	474	1342	2339
Total LMW PAHs - MDL	---	86	86	20.4	46.9	73.3	475	1342	2339
Total LMW PAHs - Zero	---	86	86	20.4	46.8	73.3	474	1342	2339
Benzo(A)Pyrene	50-32-8	86	85	5.67	11.2	16.7	83.0	240	401
Benzo(A)Anthracene	56-55-3	86	84	5.79	11.1	16.4	95.1	240	405
Benzo(B)Fluoranthene	205-99-2	86	86	8.49	14.2	20.0	108	270	432
Benzo(G,H,I)Perylene	191-24-2	86	85	5.67	9.94	14.2	86.3	220	354
Benzo(K)Fluoranthene	207-08-9	86	85	2.98	5.45	7.92	46.1	130	214
Chrysene	218-01-9	86	86	7.17	12.9	18.6	103	250	407
Dibenz(A,H)Anthracene	53-70-3	86	82	1.41	2.70	3.98	18.4	51.0	83.6
Indeno(1,2,3-C,D)Pyrene	193-39-5	86	84	5.20	9.07	12.9	68.9	170	275
Pyrene	129-00-0	86	86	8.47	18.2	27.9	176	410	708
Total HMW PAHs - 1/2MDL	---	86	86	53.7	93.5	133	828	1981	3263
Total HMW PAHs - MDL	---	86	86	53.7	93.5	133	828	1981	3263
Total HMW PAHs - Zero	---	86	86	53.7	93.5	133	828	1981	3263
Total PAHs - 1/2MDL	---	86	86	65.9	126	185	1205	3026	5094
Total PAHs - MDL	---	86	86	65.9	126	185	1205	3026	5094
Total PAHs - Zero	---	86	86	65.8	126	185	1205	3026	5094
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)									
1,2,4,5-Tetrachlorobenzene	95-94-3	86	0	---	---	---	---	---	---
1,4-Dioxane (P-Dioxane)	123-91-1	86	0	---	---	---	---	---	---
2,3,4,6-Tetrachlorophenol	58-90-2	86	0	---	---	---	---	---	---
2,4,5-Trichlorophenol	95-95-4	86	0	---	---	---	---	---	---
2,4,6-Trichlorophenol	88-06-2	86	0	---	---	---	---	---	---
2,4-Dichlorophenol	120-83-2	86	0	---	---	---	---	---	---
2,4-Dimethylphenol[1]	105-67-9	86	2	0.480	0.480	0.480	0.710	0.710	0.710
2,4-Dinitrophenol	51-28-5	86	0	---	---	---	---	---	---
2,4-Dinitrotoluene	121-14-2	86	0	---	---	---	---	---	---
2,6-Dinitrotoluene	606-20-2	86	0	---	---	---	---	---	---
2-Chloronaphthalene	91-58-7	86	0	---	---	---	---	---	---
2-Chlorophenol	95-57-8	86	0	---	---	---	---	---	---
2-Methylphenol (O-Cresol)	95-48-7	86	0	---	---	---	---	---	---
2-Nitroaniline	88-74-4	86	0	---	---	---	---	---	---
2-Nitrophenol	88-75-5	86	0	---	---	---	---	---	---

Table 7-1
Range of Exposure Point Concentration Estimates
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Mean EPC Estimates			Maximum EPC Estimates		
				Lower	Measured	Upper	Lower	Measured	Upper
3- And 4- Methylphenol (Total)[1]	106445	62	2	0.014	0.014	0.014	0.017	0.017	0.017
3,3'-Dichlorobenzidine	91-94-1	86	0	---	---	---	---	---	---
3-Nitroaniline	99-09-2	86	0	---	---	---	---	---	---
4,6-Dinitro-2-Methylphenol	534-52-1	86	0	---	---	---	---	---	---
4-Bromophenyl Phenyl Ether	101-55-3	86	0	---	---	---	---	---	---
4-Chloro-3-Methylphenol	59-50-7	86	0	---	---	---	---	---	---
4-Chloroaniline	106-47-8	86	0	---	---	---	---	---	---
4-Chlorophenyl Phenyl Ether	7005-72-3	86	0	---	---	---	---	---	---
4-Nitroaniline	100-01-6	86	0	---	---	---	---	---	---
4-Nitrophenol	100-02-7	86	0	---	---	---	---	---	---
Acetophenone	98-86-2	86	21	0.009	0.015	0.021	0.017	0.030	0.043
Atrazine	1912-24-9	86	0	---	---	---	---	---	---
Benzaldehyde[1]	100-52-7	86	8	0.026	0.026	0.026	0.051	0.051	0.051
Benzyl Butyl Phthalate	85-68-7	86	16	0.227	0.230	0.233	1.40	1.40	1.40
Biphenyl (Diphenyl)	92-52-4	86	20	0.089	0.632	1.18	1.06	7.10	14.1
Bis(2-Chloroethoxy) Methane	111-91-1	86	0	---	---	---	---	---	---
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	86	0	---	---	---	---	---	---
Bis(2-Chloroisopropyl) Ether	108-60-1	86	0	---	---	---	---	---	---
Bis(2-Ethylhexyl) Phthalate[1]	117-81-7	86	16	0.115	0.115	0.115	0.810	0.810	0.810
Caprolactam	105-60-2	86	0	---	---	---	---	---	---
Carbazole	86-74-8	86	84	1.13	2.61	4.09	26.4	78.0	137
Dibenzofuran	132-64-9	86	78	0.584	1.44	2.30	16.5	55.0	93.5
Diethyl Phthalate[1]	84-66-2	86	2	0.015	0.015	0.015	0.015	0.015	0.015
Dimethyl Phthalate	131-11-3	86	0	---	---	---	---	---	---
Di-N-Butyl Phthalate[1]	84-74-2	86	22	0.025	0.025	0.025	0.067	0.067	0.067
Di-N-Octylphthalate	117-84-0	86	0	---	---	---	---	---	---
Hexachlorobenzene	118-74-1	86	0	---	---	---	---	---	---
Hexachlorobutadiene	87-68-3	86	0	---	---	---	---	---	---
Hexachlorocyclopentadiene	77-47-4	86	0	---	---	---	---	---	---
Hexachloroethane	67-72-1	86	0	---	---	---	---	---	---
Isophorone	78-59-1	86	13	0.041	0.048	0.055	0.099	0.110	0.146
Nitrobenzene	98-95-3	86	0	---	---	---	---	---	---
N-Nitrosodi-N-Propylamine	621-64-7	86	0	---	---	---	---	---	---
N-Nitrosodiphenylamine	86-30-6	86	0	---	---	---	---	---	---
Pentachlorophenol[1]	87-86-5	86	1	0.100	0.100	0.100	0.100	0.100	0.100
Phenol[1]	108-95-2	86	9	0.018	0.018	0.018	0.033	0.033	0.033

Table 7-1
Range of Exposure Point Concentration Estimates
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Mean EPC Estimates			Maximum EPC Estimates		
				Lower	Measured	Upper	Lower	Measured	Upper
Physicochemical Parameters (mg/kg)									
Total Organic Carbon	7440440	24	23	13592	17340	21089	30142	38800	64145

Notes:

[1,] No RSD adjustment or UCL substitution due to no detected results in replicate samples. Measured results used instead.
---, Not applicable.
EPC, Exposure point concentration
HMW, High molecular weight
LMW, Low molecular weight
mg/kg, milligrams per kilogram
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
TAL, Target Analyte List
TCL, Target Compound List
TEC, Toxic Equivalency Concentration

Table 7-2
Comparison of Concentrations Between Incremental and Discrete Soil Samples
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Cas Number	Incremental Samples					Discrete Samples				
		Number of Samples	Number of Detections	Minimum Result	Mean Result	Maximum Result	Number of Samples	Number of Detections	Minimum Result	Mean Result	Maximum Result
Main Plant Area											
TAL Metals (mg/kg)											
Aluminum	7429-90-5	28	28	14600	20904	36200	10	10	6780	13363	31200
Antimony	7440-36-0	28	28	0.110	0.989	8.60	10	1	0.150	0.252	0.610
Arsenic	7440-38-2	28	28	4.10	7.36	31.3	10	10	2.70	4.77	7.60
Cadmium	7440-43-9	28	28	0.082	0.380	1.60	10	1	0.150	0.211	0.600
Chromium, Total	7440-47-3	28	28	12.9	20.5	36.8	12	12	7.50	18.4	80.8
Copper	7440-50-8	28	28	15.4	91.1	887	10	10	10.6	19.0	34.5
Lead	7439-92-1	28	28	10.3	34.2	144	10	10	7.80	16.2	31.5
Mercury	7439-97-6	28	12	0.007	0.017	0.058	10	9	0.005	0.017	0.030
Nickel	7440-02-0	28	28	13.4	28.1	62.8	10	10	10.0	21.5	75.0
Selenium	7782-49-2	28	28	0.730	1.33	2.60	10	2	0.150	0.241	0.460
Vanadium	7440-62-2	28	28	12.3	18.6	44.5	10	10	7.40	12.1	20.2
Zinc	7440-66-6	28	28	44.8	205	1720	10	10	31.2	56.1	96.1
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	28	28	0.021	0.348	1.20	10	10	0.048	0.165	0.620
Fluoride	16984-48-8	28	28	56.3	264	709	10	10	23.7	104	277
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
Total LMW PAHs - 1/2MDL	--	28	28	0.461	18.7	194	10	10	0.088	12.8	61.7
Total HMW PAHs - 1/2MDL	--	28	28	1.05	72.1	823	10	10	0.253	56.5	288
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
Bis(2-Ethylhexyl) Phthalate	117-81-7	28	3	0.006	0.026	0.160	10	1	0.007	0.125	0.950
Diethyl Phthalate	84-66-2	28	0	0.005	0.015	0.115	10	0	0.005	0.036	0.265
Central Landfills Area											
TAL Metals (mg/kg)											
Arsenic	7440-38-2	58	58	4.20	5.72	12.3	36	36	3.70	5.42	9.00
Barium	7440-39-3	58	58	59.4	133	293	36	36	40.7	111	264
Beryllium	7440-41-7	58	58	0.400	0.847	3.70	36	36	0.270	0.548	1.50
Chromium, Total	7440-47-3	58	58	13.6	21.1	54.4	44	43	0.290	12.1	84.8
Copper	7440-50-8	58	58	14.1	49.9	721	36	36	8.80	16.2	60.0
Lead	7439-92-1	58	58	8.60	31.4	406	36	36	7.60	13.6	48.0
Manganese	7439-96-5	58	58	341	481	657	36	36	218	481	1050
Nickel	7440-02-0	58	58	12.3	29.9	142	36	36	7.40	18.0	80.5
Selenium	7782-49-2	58	58	0.180	1.46	13.3	36	7	0.120	0.274	1.20
Thallium	7440-28-0	58	58	0.060	0.117	0.400	36	10	0.050	0.088	0.150
Vanadium	7440-62-2	58	58	8.60	18.8	54.5	36	36	5.70	13.5	24.2
Zinc	7440-66-6	58	58	44.4	68.1	214	36	36	28.9	54.0	114
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	58	56	0.017	0.953	18.2	36	33	0.008	1.04	13.0
Fluoride	16984-48-8	58	58	16.6	268	976	36	36	9.45	118	796
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1254 (Aroclor 1254)	11097-69-1	58	14	4.60E-05	0.070	1.30	42	6	0.005	0.072	1.20
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
Total LMW PAHs - 1/2MDL	--	58	58	0.068	59.2	1342	36	36	0.021	33.6	596
Total HMW PAHs - 1/2MDL	--	58	58	0.135	101	1981	36	36	0.048	50.3	789

Table 7-2
Comparison of Concentrations Between Incremental and Discrete Soil Samples
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Cas Number	Incremental Samples					Discrete Samples				
		Number of Samples	Number of Detections	Minimum Result	Mean Result	Maximum Result	Number of Samples	Number of Detections	Minimum Result	Mean Result	Maximum Result
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
Bis(2-Ethylhexyl) Phthalate	117-81-7	58	13	0.006	0.246	3.55	36	5	0.007	0.046	0.360
Dibenzofuran	132-64-9	58	53	0.005	1.85	55.0	36	20	8.00E-04	0.723	15.0
Di-N-Butyl Phthalate	84-74-2	58	10	0.005	0.096	1.45	36	2	0.005	0.027	0.275

Notes:

Constituents shown are chemicals of potential ecological concern for the two exposure areas.

Discrete sample data are for grab soil samples that occur within the incremental sample decision units that overlap the specific exposure area.

Incremental sample data represent the 95 percent upper confidence limit of the mean for decision units where triplicate samples were collected, or the measured (i.e., unadjusted) concentration for decision units lacking replication.

Half the quantitation limit substituted for non-detected results.

Shaded/bolded results indicate the mean of the incremental samples was greater than the mean of the discrete samples.

---, Not applicable.

HMW, High molecular weight

LMW, Low molecular weight

MDL, Method detection limit

mg/kg, milligrams per kilogram

PAH, Polycyclic Aromatic Hydrocarbon

PCB, Polychlorinated Biphenyl

PCE, Tetrachloroethylene

SVOC, Semi-Volatile Organic Compound

TAL, Target Analyte List

TCL, Target Compound List

Table 8-1
Summary of BERA Findings - Terrestrial Exposure Areas
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Exposure Area	Direct Contact Exposure Summary			Wildlife Exposure Summary			Preliminary Conclusions and Recommendations
	Soil Invertebrates	Terrestrial Plant Community	Overall Direct Contact Risk	Birds	Mammals	Overall Wildlife Risk	
Main Plant Area	Minimal Risk. Localized risk to soil invertebrates due to PAH exposure. Maximum EPCs > NOECs for LMW PAHs (HQ_{NOEC}=19) and HMW PAHs (HQ_{NOEC}=35.7). LOECs not identified for LMW and HMW PAHs. Refined EPCs > NOEC for LMW PAHs (HQ_{LOEC}=2.2) and HMW PAHs (HQ_{LOEC}=4.3). Negligible risk to other COPECs (maximum exposure < LOEC)	Negligible risk; maximum exposure < LOEC.	**Minimal**	**Maximum scenario:** Moderate Risk. Potential for adverse effects to birds exposed to HMW PAHs (HQ_{LOAEL}=11.5 to 16.3) and BEHP (HQ_{LOAEL}=3.0 to 4.5) if foraging exclusively at maximum EPC. **Refined scenario:** Moderate Risk.Limited potential for adverse effects to brids exposed to HMW PAHs (HQ_{LOAEL}=1.4 to 2.0)	**Maximum scenario:** Low potential for adverse effects for mammals foraging exclusively within the exposure area; maximum short-tailed shrew exposure HMW PAHs exceeds LOAEL (HQ_{NOAEL}=2.9); all other COPEC/receptors HQ_{LOAEL}<1. **Refined scenario:** Negligible risk foraging exclusively within the exposure area; Refined HQ_{LOAEL}<1. **Small Ranging Receptors:** Potential for adverse effects greatest for small mammals in northern portion of Main Plant within the Operational Area footprint; short-tailed shrew exposure > LOAEL at 5 of 90 stations and meadow vole exposure > LOAEL at 9 of 90 stations.	**Moderate**	Local impacts to soil invertebrate communities due to direct contact possible but localized. Possible impacts to birds foraging on terrestrial invertebrates (earthworms) in exposure area. Localized impacts to small-range mammalian receptors possible. Ecological expsure pathways limited under current, developed conditions; however, further evaluation of exposure may be warranted if future site conditions return these areas to a more naturalized habitat condition that supports ecological receptor populations.
Central Landfills Area	Negligible risk; Maximum EPCs < LOEC, except for copper (HQ_{LOEC}=13.7). Maximum EPCs > NOECs for LMW PAHs (HQ_{NOEC}=33) and HMW PAHs (HQ_{NOEC}=27). LOECs not identified for LMW and HMW PAHs. Refined EPC for copper (HQ_{LOEC}=1.4). Refined EPCs > NOEC for LMW PAHs (HQ_{LOEC}=3.0) and HMW PAHs (HQ_{LOEC}=3.0).	Negligible risk; maximum exposure < LOEC, except for copper; refined exposure estimate indicates slight exceedance of copper LOEC (HQ_{LOEC}=1.5).	**Minimal**	**Maximum scenario:** Moderate Risk. Potential for adverse effects to birds exposed to copper, nickel, LMW PAHs, HMW PAHs, Aroclor 1254 and BEHP (HQ_{LOAEL}=1.3 to 17.0) if foraging exclusively at maximum EPC. **Refined scenario:** Moderate Risk. Potential for adverse effects to birds exposed to copper, HMW PAHs, and Aroclor 1254 (HQ_{LOAEL}=1.3 to 3.1) if foraging exclusively at refined EPC.	**Maximum scenario:** Negligible Risk. Low potential for adverse effects for mammals foraging exclusively within the exposure area; maximum short-tailed shrew exposure exceeds LOAEL for copper, nickel, PCB1254, HMW PAHs and meadow vole for selenium (HQ_{NOAEL}=1.6 to 5.7); all other COPEC/receptors HQ_{LOAEL}<1. **Refined scenario:** Negligible risk foraging exclusively within the exposure area; Refined HQ_{LOAEL}<1. **Small Ranging Receptors:** Minimal Risk. Potential for adverse effects greatest for small mammals in northern portion of Main Plant within the Operational Area footprint; short tailed shrew exposure > LOAEL at 6 of 67 stations and meadow vole exposure < LOAEL.	**Moderate**	Possible impacts to birds foraging on terrestrial invertebrates (earthworms) in exposure area. Localized impacts to small-range mammalian receptors possible. Ecological expsure pathways limited under current, disturbed conditions; however, further evaluation of exposure may be warranted if future site conditions return these areas to a more naturalized habitat condition that supports ecological receptor populations.
Industrial Landfill Area	Minimal Risk. Limited risk due to PAH exposure. Maximum EPCs < LOECs for metals; maximum EPCs > NOECs for LMW PAHs (HQ_{NOEC}=7.0) and HMW PAHs (HQ_{NOEC}=13.4); LOECs not identified for LMW and HMW PAHs. Refined EPCs < LOECs for metals; refined EPCs > NOECs for for LMW PAHs (HQ_{NOEC}=6.5) and HMW PAHs (HQ_{NOEC}=12.9).	Negligible risk. Maximum EPCs < LOEC, except for slight exceedances of nickel (HQ_{LOEC}=1.7) and vanadium (HQ_{LOEC}=2.1). Refined exposure estimate indicates slight exceedances of LOECs for nickel (HQ_{LOEC}=1.5) and vanadium (HQ_{LOEC}=1.9).	**Minimal**	**Maximum scenario:** Moderate Risk. Potential for adverse effects to birds exposed to nickel and HMW PAHs (HQ_{LOAEL}=1.3 to 5.2) if foraging at maximum exposure exclusively within the Industrial Landfill Area. **Refined scenario:** Moderate Risk. Limited potential for adverse effects to birds exposued to refined EPCs for nickel and HMW PAHs (HQ_{LOAEL}=2.1 to 5.0).	**Maximum scenario:** Moderate Risk. nickel, vanadium, and HMW PAHs had HQ_{NOAEL} and HQ_{LOAEL} values greater than 1. **Refined scenario:** Moderate Risk. Nickel has HQ_{LOAEL} value > 1, but below 5. **Small Ranging Receptors:** Moderate risk. Two of the 6 sample locations exceeded the LOAEL benchmarks for the short-tailed shrew (nickel and PAHs).	**Moderate**	Possible impacts to birds foraging on terrestrial invertebrates (earthworms) in exposure area. Localized impacts to small-range mammalian receptors possible. Ecological expsure pathways limited under current, disturbed conditions; however, further evaluation of exposure may be warranted if future site conditions return these areas to a more naturalized habitat condition that supports ecological receptor populations.

Table 8-1
Summary of BERA Findings - Terrestrial Exposure Areas
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Exposure Area	Direct Contact Exposure Summary			Wildlife Exposure Summary			Preliminary Conclusions and Recommendations
	Soil Invertebrates	Terrestrial Plant Community	Overall Direct Contact Risk	Birds	Mammals	Overall Wildlife Risk	
Eastern Undeveloped Area	Negligible risk; maximum exposure < LOEC.	Negligible risk. Maximum EPCs < LOEC, except for barium (HQ_{LOEC}=4.1) and manganese (HQ_{LOEC}=3.6). Refined EPCs slightly exceed LOECs for barium (HQ_{LOEC}=2.2) and manganese (HQ_{LOEC}=1.3). Manganese comparable to background.	**Negligible**	**Maximum scenario:** Negligible risk to birds foraging exclusively within the exposure area; maximum HQ_{LOAEL}<1; maximum cyanide HQ_{NOAEL}=1.0-1.4 (lead, nickel, vanadium, zinc, cyanide, and bis(2-ethylhexyl)phthalate) **Refined scenario:** Negligible risk to birds foraging exclusively within the exposure area; Refined HQ_{LOAEL}<1; refined EPCs < NOAEL, except for BEHP expsoure to yellow-billed cuckoo (HQ_{NOAEL}=1.2).	**Maximum scenario:** Negligible risk foraging exclusively within the exposure area; maximum short tailed short-tailed shrew exposure to nickel (HQ_{NOAEL}=1.7); other COPEC/receptors HQ_{NOAEL}<1 **Refined scenario:** Negligible risk foraging exclusively within the exposure area; Refined HQ_{LOAEL}<1; refined EPCs < NOAEL, except for nickel exposure to short-tailed shrew (HQ_{NOAEL}=1.0). **Small Ranging Receptors:** Negligible risk; < NOAEL for meadow vole for all constituents at 21 of 22 stations and < NOAEL for short-tailed shrew at 10 of 21 stations (max nickel HQ_{NOAEL}=1.7; HQ_{LOAEL} <1 for all other COPEC/receptors	**Negligible**	No further evaluation on the basis of terrestrial exposure.
North-Central Undeveloped Area	Negligible risk; maximum exposure < LOEC.	Negligible risk; Maximum EPCs < LOEC, except for barium (HQ_{LOEC}=1.9) and manganese (HQLOEC=2.4). Refined EPCs slightly exceed LOECs for barium (HQ_{LOEC}=1.1) and manganese (HQ_{LOEC}=1.0). Manganese comparable to background.	**Negligible**	**Maximum scenario:** Negligible risk to birds foraging exclusively within the exposure area; maximum HQ_{LOAEL}<1; maximum cyanide HQ_{NOAEL}=1.2 to 1.5 and bis(2-ethylhexyl)phthalate (HQ_{NOAEL}=3.5 to 5.2). **Refined scenario:** Negligible risk to birds foraging exclusively within the exposure area; Refined HQ_{NOAEL}<1 .	**Maximum scenario:** Negligible risk to mammals foraging exclusively within the exposure area; maximum HQ_{NOAEL} <1 for all receptors/COPECs. **Refined scenario:** Negligible risk to mammals foraging exclusively within the exposure area; Refined HQ_{NOAEL}<1. **Small Ranging Receptors:** Negligible risk; < NOAEL for all stations for meadow vole and short-tailed shrew for refined COPECs.	**Negligible**	No further evaluation on the basis of terrestrial exposure.
Western Undeveloped Area	Negligible risk; maximum exposure < LOEC.	Negligible risk. Maximum EPCs < LOEC, except for barium (HQ_{LOEC}=2.1) and manganese (HQ_{LOEC}=2.0). Refined EPCs < LOEC, except for slight exceedance for barium (HQ_{LOEC}=1.2).	**Negligible**	**Maximum scenario:** Negligible risk to birds foraging exclusively within the exposure area; maximum HQ_{LOAEL}<1; maximum HQ_{NOAEL}=1.2 to 2.7. **Refined scenario:** Negligible risk to birds foraging exclusively within the exposure area; Refined HQ_{NOAEL}<1.	**Maximum scenario:** Negligible risk to mammals foraging exclusively within the exposure area; maximum HQ_{NOAEL}=1.3 for short-tailed shrew $TEC_{2,3,7,8\text{-TCDD}}$; all other COPEC/receptors HQ_{NOAEL}<1. **Refined scenario:** Negligible risk to mammals foraging exclusively within the exposure area; maximum HQ_{NOAEL}=1.1 for short-tailed shrew $TEC_{2,3,7,8\text{-TCDD}}$; all other COPEC/receptors HQ_{NOAEL}<1. **Small Ranging Receptors:** Negligible risk; < NOAEL for all locations for meadow vole and short-tailed shrew, except $TEC_{2,3,7,8\text{-TCDD}}$ for short-tailed shrew (HQ_{NOAEL}=1.1; HQ_{LOAEL} <1)	**Negligible**	No further evaluation on the basis of terrestrial exposure.

Table 8-1
Summary of BERA Findings - Terrestrial Exposure Areas
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Exposure Area	Direct Contact Exposure Summary			Wildlife Exposure Summary			Preliminary Conclusions and Recommendations
	Soil Invertebrates	Terrestrial Plant Community	Overall Direct Contact Risk	Birds	Mammals	Overall Wildlife Risk	
Flathead River Riparian Area	Negligible risk; maximum exposure < LOEC.	Negligible risk; maximum exposure < LOEC.	**Negligible**	**Maximum scenario:** Negligible risk to birds foraging exclusively within the exposure area; maximum HQ_{LOAEL}<1; maximum cyanide HQ_{NOAEL}=1.5. **Refined scenario:** Negligible risk to birds foraging exclusively within the exposure area; Refined HQ_{NOAEL}<1.	**Maximum scenario:** Negligible risk to mammals foraging exclusively within the exposure area; maximum HQ_{NOAEL}<1 for modeled COPEC/receptors **Refined scenario:** Negligible risk to mammals foraging exclusively within the exposure area; Refined HQ_{NOAEL}<1. **Small Ranging Receptors:** Negligible risk; < NOAEL for all locations for meadow vole and short-tailed shrew.	**Negligible**	No further evaluation on the basis of terrestrial exposure.
Incremental Soil Sampling (ISS) Area	Moderate risk. Limited risk to soil invertebrates. Maximum EPCs > LOEC for copper (HQ_{LOEC}=1.7) and zinc HQ_{LOEC}=1.8). Maximum EPCs > NOECs for LMW PAHs (HQ_{NOEC}=74.6) and HMW PAHs (HQ_{NOEC}=68.3); LOECs not identified for LMW and HMW PAHs. Refined EPC > LOEC for copper (HQ_{LOEC}=1.4); refined EPCs > NOECs for LMW PAHs (HQ_{NOEC}=3.0) and HMW PAHs (HQ_{NOEC}=4.3); LOECs not identified for LMW and HMW PAHs.	Negligible risk; Maximum EPC slightly exceeds LOEC for barium (HQ_{LOEC}=1.2), copper (HQ_{LOEC}=1.8), selenium (HQ_{LOEC}=4.4), and zinc (HQ_{LOEC}=2.1). Refined EPCs < LOEC, except slight exceedance of copper (HQ_{LOEC}=1.5).	**Moderate**	Exposure evaluated as part of Central Landfills Area and Main Plant Area evaluations.	**Small Ranging Receptors:** Potential for adverse effects greatest for small mammals in northern portion of Main Plant within the Operational Area footprint; short-tailed shrew exposure > LOAEL at 10 of 43 grids and meadow vole exposure > LOAEL at 1 of 43 grids.	**Moderate**	Impacts from PAHs and metals to local terrestrial plant and invertebrate communities via direct contact and small-ranging mammalian populations via direct and indirect ingestion possible. Ecological exposure pathways limited under current, disturbed conditions; however, further evaluation of exposure may be warranted if future site conditions return these areas to a more naturalized habitat condition that supports ecological receptor populations.

Notes:
COPEC, Constituent of potential ecological concern.
EPC, Exposure point concentrations
HMW PAHs, High molecular weight polycyclic aromatic hydrocarbons
HQ, Hazard quotient; ratio of direct contact EPC to NOEC/LOEC or estimated daily dose to NOAEL/LOAEL.
LMW PAHs, Low molecular weight polycyclic aromatic hydrocarbons
LOAEL, Lowest observed adverse effect level dose.
LOEC, Lowest observed effect concentration.
NOAEL, No observed adverse effect level dose.
NOEC, No observed effect concentration.
Maximum scenario, Represents worst case exposure scenario by assuming maximum concentrations as EPCs in direct contact evaluation or inputs to EDD doses for wildlife ingestion pathways.
Refined scenario, Represents conservative estimate of average exposure scenario by assuming upper confidence limit of the mean (UCL_{mean}) concentrations as EPCs in direct contact evaluation or inputs to EDD doses for ingestion pathways.

Table 8-2
Summary of BERA Findings - Transitional Exposure Areas - Terrestrial Scenario
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Exposure Area	Direct Contact Exposure Summary		Overall Direct Contact Risk	Wildlife Exposure Summary		Overall Wildlife Risk	Preliminary Conclusions and Recommendations
	Soil Invertebrates	Terrestrial Plant Community		Birds	Mammals		
North Percolation Ponds	High Risk. Maximum EPCs > NOEC for LMW PAHs (HQ_{NOEC}=307 to 311) and HMW PAHs (HQ_{NOEC}=763); maximum EPCs for cyanide, fluoride, and metals < LOEC. Refined EPCs result in HQ_{NOEC} > 100 for LMW and HMW PAHs.	High Risk. HQ_{LOEC} > 1 based on maximum exposure to 7 metals, with HQ_{LOEC} values from 1.1 (zinc and selenium) to 9.2 (thallium). Refined EPCs > LOEC for nickel (HQ_{LOEC}=1.3), thallium (HQ_{LOEC}=3.8), and vanadium (HQ_{LOEC}=1.4). Exposure to LMW and HMW PAHs is uncertain due to lack of NOEC/LOEC benchmarks.	**High**	**Maximum scenario:** High Risk**.** Potential for adverse effects to birds exposed to cyanide, barium, nickel, selenium, vanadium, LMW PAHs, HMW PAHs, (HQ_{LOAEL}=1.1 to 704) if foraging at maximum exposure exclusively within the North Percolation Pond **Refined scenario:** High Risk. Potential for adverse effects to all avian receptors exposed to nickel, selenium, vanadium, LMW PAHs, and HMW PAHs based on exclusive foraging at refined EPCs (HQ_{LOAEL}=1.8 to 146.5).	**Maximum scenario:** High Risk. Potential for adverse effects to mammals exposed to nickel, LMW PAHs, HMW PAHs, (HQ_{LOAEL}=2.3 to 65) if foraging at maximum exposure exclusively within the North Percolation Pond **Refined scenario:** High Risk. Potential for adverse effects to the Canada lynx, grizzly bear, meadow vole, and short-tailed shrew exposed to nickel and HMW PAHs based on exclusive foraging at refined EPCs (HQ_{LOAEL}=2.3 to 23). HQ_{LOAEL} values below 1 for all receptors except the meadow vole (HMW PAHs) and short-tailed shrew (nickel and HMW PAHs) when area use factor included.	**High**	Greatest potential for adverse effects is associated with exposure to PAHs and metals, particularly in the North-East Pond. Risk due to direct contact and direct and indirect ingestion pathways is high. Further risk assessment may not be beneficial, particularly in the North-East Pond; evaluate future use of North Percolation Pond prior to developing ERA recommendations.
South Percolation Ponds	Negligible risk; Maximum EPCs < LOEC, except for copper (HQ_{LOEC}=1.3) and mercury (HQ_{LOEC}=2.8). Refined EPCs < LOEC.	Negligible risk; Maximum EPCs < LOEC, except for barium (HQ_{LOEC}=3.7) and copper (HQ_{LOEC}=1.4). Refined EPCs < LOEC, except for barium (HQ_{LOEC}=2.5).	**Negligible**	**Maximum scenario:** Minimal Risk**.** Low potential for adverse effects to birds exposed to copper and BEHP (HQ_{LOAEL}=1.6 to 1.7) if foraging at maximum exposure exclusively within the South Percolation Pond; all other COPEC/receptors HQ_{LOAEL}<1 **Refined scenario:** Minimal Risk. Low potential for adverse effects to American woodcock (HQ_{LOAEL}=1.2) and yellow-billed cuckoo (HQ_{NOAEL}=1.7) foraging at refined EPCs; all other COPEC HQ_{LOAEL}<1.	**Maximum scenario:** Negligible risk to mammals foraging exclusively within the exposure area; maximum HQ_{LOAEL}<1 **Refined scenario:** Negligible risk to mammals foraging exclusively within the exposure area; short-tailed shrew had HQNOAEL > 1 for cadmium, copper, and nickel, but all HQ_{LOAEL}<1 based on refined EPCs.	**Minimal**	No further evaluation on the basis of terrestrial exposure.
Cedar Creek Reservoir Overflow Ditch	Negligible risk; maximum exposure < LOEC.	Negligible risk; maximum exposure < LOEC, except for slight exceedances of barium (HQ_{LOEC}=1.1) and manganese (HQ_{LOEC}=1.5).	**Negligible**	**Maximum scenario:** Negligible risk to birds foraging exclusively within the exposure area; maximum HQ_{NOAEL}=1 (zinc for yellow-billed cuckoo). **Refined scenario:** Negligible risk; < LOAEL for all receptors/COPECs based on refined EPCs.	**Maximum scenario:** Negligible risk. Mammals foraging exclusively within the exposure area; maximum HQ_{LOAEL}<1. **Refined scenario:** Negligible risk; HQ_{LOAEL}<1 for all receptor/COPECs.	**Negligible**	No further evaluation on the basis of terrestrial exposure.
Northern Surface Water Feature	Negligible risk; maximum exposure < LOEC.	Negligible risk; maximum exposure < LOEC, except for slight exceedances of barium (HQ_{LOEC}=2.3).	**Negligible**	**Maximum scenario:** Negligible potential for adverse effects to terrestrial birds. All HQ_{LOAEL}<1 based on maximum EPCs. **Refined scenario:** Negligible risk; < LOAEL for all receptors/COPECs based on refined EPCs..	**Maximum scenario:** Negligible risk. Mammals foraging exclusively within the exposure area; maximum HQ_{LOAEL}<1. **Refined scenario:** Negligible risk; HQ_{LOAEL}<1 for all receptor/COPECs.	**Negligible**	No further evaluation on the basis of terrestrial exposure.

Table 8-2
Summary of BERA Findings - Transitional Exposure Areas - Terrestrial Scenario
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:
COPEC, Constituent of potential ecological concern.
EPC, Exposure point concentrations
HMW PAHs, High molecular weight polycyclic aromatic hydrocarbons
HQ, Hazard quotient; ratio of direct contact EPC to NOEC/LOEC or estimated daily dose to NOAEL/LOAEL.
LMW PAHs, Low molecular weight polycyclic aromatic hydrocarbons
LOAEL, Lowest observed adverse effect level dose.
LOEC, Lowest observed effect concentration.
NOAEL, No observed adverse effect level dose.
NOEC, No observed effect concentration.
Maximum scenario, Represents worst case exposure scenario by assuming maximum concentrations as EPCs in direct contact evaluation or inputs to EDD doses for wildlife ingestion pathways.
Refined scenario, Represents conservative estimate of average exposure scenario by assuming upper confidence limit of the mean (UCL_{mean}) concentrations as EPCs in direct contact evaluation or inputs to EDD doses for ingestion pathways.

Table 8-3
Summary of BERA Findings - Transitional Exposure Areas - Aquatic Scenario
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Exposure Area	Direct Contact Exposure Summary			Overall Direct Contact Risk	Wildlife Exposure Summary		Overall Wildlife Risk	Preliminary Conclusions and Recommendations
	Benthic/Pelagic Invertebrate Communities	Aquatic Plant Community	Fish/Herptiles		Birds	Mammals		
North Percolation Ponds	**Surface Water:** High Risk. Maximum fluoride exceed LOEC for invertebrates (HQ_{LOEC}=5.2 to 5.5) and fish/amphibian communities (HQ_{LOEC}=3.6 to 3.7); maximum metals concentrations exceed LOEC for aluminum, barium, cadmium, copper, zinc [HQ_{LOEC}=2.3 to 785 (unfiltered Al)]; maximum concentrations of 7 PAH compounds exceed NOEC (FCV) with HQ_{NOEC}=1.3-14.8. **Sediment:** High Risk. PAH $ESBTU_{34}$>1 at 24 of 30 stations; PAH $ESBTU_{34}$>10 at 13 of 30; Maximum EPCs exceed LOECs for cyanide (HQ_{LOEC}=137) and several metals, with HQ_{LOEC} values ranging from 1.2 (selenium) to 26.0 (nickel). Refined EPCs > LOEC for cyanide (HQ_{LOEC}=41.2) and lead (HQ_{LOEC}=7.5).			**High**	**Maximum scenario:** High Risk. Potential for adverse effects to birds exposed to cyanide, barium, nickel, selenium, vanadium, LMW PAHs, HMW PAHs, (HQ_{LOAEL}=1.1 to 704) if foraging at maximum exposure exclusively within the North Percolation Pond **Refined scenario:** High Risk. Potential for adverse effects to American dipper exposed to selenium, vanadium, LMW PAHs, and HMW PAHs and belted kingfisher exposed to HMW PAHs based on exclusive foraging at refined EPCs (HQ_{LOAEL}=1.4 to 284).	**Maximum scenario:** Negligible risk to mink foraging exclusively within the exposure area at maximum EPCs (HQ_{NOAEL}<1) **Refined scenario:** Negligible risk to mink foraging exclusively within the exposure area at refined EPCs (HQ_{NOAEL}<1)	**High**	Greatest potential for adverse effects via direct contact exposure to fluoride, metals, and PAHs in surface water and sediment, particularly in the North-East Pond. High risk associated with birds foraging in exposure area. Further risk assessment may not be beneficial, particularly in the North-East Pond; evaluate future use of North Percolation Pond prior to developing ERA recommendations.
South Percolation Ponds	**Surface Water:** Moderate Risk. Maximum EPCs > LOEC for total cyanide (HQ_{LOEC}=3.1 to 6.3), aluminum, barium (HQ_{LOEC}=8.0 to 20.2), copper, and iron (HQ_{LOEC}=2.3); sample-specific LOEC exceeded in for aluminum in 2/17 filtered samples (HQ_{LOEC}=1.0-3.1), aluminum in 2/26 unfiltered samples (HQ_{LOEC}=1.2 to 11.7), filtered copper in 1/17 samples (HQ_{LOEC}=1.1-1.2), unfiltered copper in 1/26 samples (HQ_{LOEC}=1.1). Refined EPCs > LOEC for cyanide (HQ_{LOEC}=2.4) and barium (HQ_{LOEC}=8.0 to 20.2). **Sediment:** Moderate Risk. Maximum EPCs > LOEC for cyanide (HQ_{LOEC}=16.4) and several metals (HQ_{LOEC}=1.1 to 5.0); Refined EPCs > LOEC for cyanide (HQ_{LOEC}=4.4), barium (HQ_{LOEC}=2.1), and copper (HQ_{LOEC}=1.4). AVS-SEM/f_{oc} not indicative of adverse effects to metals; **Pore water:** Moderate Risk. Aluminum and copper < LOEC in pore water samples; maximum EPC for barium exceeds LOEC (HQ_{LOEC}=10.8).			**Moderate**	**Maximum scenario:** Minimal Risk. Low potential for adverse effects to birds exposed to barium and copper (HQ_{LOAEL}=2.3 to 3.5) if foraging at maximum exposure exclusively within the South Percolation Pond; all other COPEC/receptors HQ_{LOAEL}<1 **Refined scenario:** Minimal Risk. Low potential for adverse effects to American dipper exposed to barium (HQ_{LOAEL}=2.3) foraging at refined EPCs; all other COPEC HQ_{LOAEL}<1 for American dipper and belted kingfisher.	**Maximum scenario:** Negligible risk to mammals foraging exclusively within the exposure area; maximum HQ_{NOAEL}<1 **Refined scenario:** Negligible risk to mammals foraging exclusively within the exposure area; H_{QNOAEL}<1 based on refined EPCs.	**Minimal**	Greatest potential for adverse effects via direct contact exposure to cyanide, metals, and PAHs in surface water. Evaluate potential for minimizing stormwater discharge with elevated concentrations of cyanide, aluminum, and other COPECs to the South Percolation Ponds.
Cedar Creek Reservoir Overflow Ditch	**Surface Water:** Negligible risk. Maximum EPCs > LOEC for aluminum, barium (HQ_{LOEC}= 5.4 to 5.6), and manganese (HQ_{LOEC}= 1.6). Aluminum LOEC (NRWQC CMC) exceeded in 1 of 27 samples (HQ_{LOEC}=6.5); filtered aluminum < NOEC. Refined exposure to barium results in HQ_{LOEC}= 2.6 to 2.7. Barium concentrations consistent upstream to downstream across site, with the exception of Oct 2018 result at CFSWP-039, indicating potential upgradient conditions. **Sediment:** Minimal Risk. Limited potential for adverse effects to benthic invertebrates associated with exposure to cyanide, manganese, and PAHs. Maximum EPCs > LOEC for cyanide (HQ_{LOEC} = 1.5), manganese (HQ_{LOEC} = 1.5), and PAHs (ESBTU = 7.7 to 21.2) . PAH $ESBTU_{34}$ < 1 for all stations except CFSB-284 (tPAHs=7.4; low TOC=0.006%). Refined EPCs < 1 for all COPECs, except manganese (HQ_{LOEC} = 1.2).			**Minimal**	**Maximum scenario:** Negligible risk to birds foraging exclusively within the exposure area; maximum HQ_{LOAEL}=1.1 (barium for American dipper). **Refined scenario:** Negligible risk; < LOAEL for all receptors/COPECs based on refined EPCs.	**Maximum scenario:** Negligible risk. Mammals foraging exclusively within the exposure area; maximum HQ_{LOAEL}<1. **Refined scenario:** Negligible risk; HQ_{LOAEL}<1 for all receptor/COPECs.	**Negligible**	No further evaluation on the basis of aquatic exposure.

Table 8-3
Summary of BERA Findings - Transitional Exposure Areas - Aquatic Scenario
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Exposure Area	Direct Contact Exposure Summary			Overall Direct Contact Risk	Wildlife Exposure Summary		Overall Wildlife Risk	Preliminary Conclusions and Recommendations
	Benthic/Pelagic Invertebrate Communities	Aquatic Plant Community	Fish/Herptiles		Birds	Mammals		
Northern Surface Water Feature	**Surface Water:** Minimal Risk. Maximum EPCs > LOEC for aluminum and barium (HQ_{LOEC}=5.9 to 6.3); Aluminum LOEC (NRWQC CMC) exceeded in 2 of 16 samples (HQ_{LOEC}=1.2 to 1.9); filtered aluminum < NOEC. Refined EPC > LOEC for barium (HQ_{LOEC} = 3.8). **Sediment:** Minimal Risk. Maximum EPCsv > LOEC for barium (HQ_{LOEC} = 3.0) and manganese (HQ_{LOEC} = 1.5); maximum EPCs < LOEC for other COPECs. Refined EPC for barium > LOEC (HQ_{LOEC} = 2.0). PAH $ESBTU_{34}$ < 1 for all stations. **Pore water:** Minimal Risk. Maximum barium EPC > LOEC (HQ_{LOEC}=8.0); maximum EPCs > LOEC for other COPECs.			**Minimal**	**Maximum scenario:** Limited potential for adverse effects to American dipper foraging exclusively at maximum EPCs for barium (HQ_{LOAEL}=3.3) and selenium (HQ_{LOAEL}=3.4). HQ_{LOAEL}<1 for other receptors/COPECs based on maximum EPCs. **Refined scenario:** Limited potential for adverse effects to American dipper foraging exclusively at refined EPCs for barium (HQ_{LOAEL}=2.1)and selenium (HQ_{LOAEL}=1.2); HQ_{LOAEL}<1 for other receptors/COPECs based on refined EPCs.	**Maximum scenario:** Negligible risk. Mammals foraging exclusively within the exposure area; maximum HQ_{LOAEL}<1. **Refined scenario:** Negligible risk; HQ_{LOAEL}<1 for all receptor/COPECs.	**Minimal**	No further evaluation on the basis of aquatic exposure.

Notes:
COPEC, Constituent of potential ecological concern.
EPC, Exposure point concentrations
HMW PAHs, High molecular weight polycyclic aromatic hydrocarbons
HQ, Hazard quotient; ratio of direct contact EPC to NOEC/LOEC or estimated daily dose to NOAEL/LOAEL.
LMW PAHs, Low molecular weight polycyclic aromatic hydrocarbons
LOAEL, Lowest observed adverse effect level dose.
LOEC, Lowest observed effect concentration.
NOAEL, No observed adverse effect level dose.
NOEC, No observed effect concentration.
Maximum scenario, Represents worst case exposure scenario by assuming maximum concentrations as EPCs in direct contact evaluation or inputs to EDD doses for wildlife ingestion pathways.
Refined scenario, Represents conservative estimate of average exposure scenario by assuming upper confidence limit of the mean (UCL_{mean}) concentrations as EPCs in direct contact evaluation or inputs to EDD doses for ingestion pathways.

Table 8-4
Summary of BERA Findings - Aquatic Exposure Areas
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

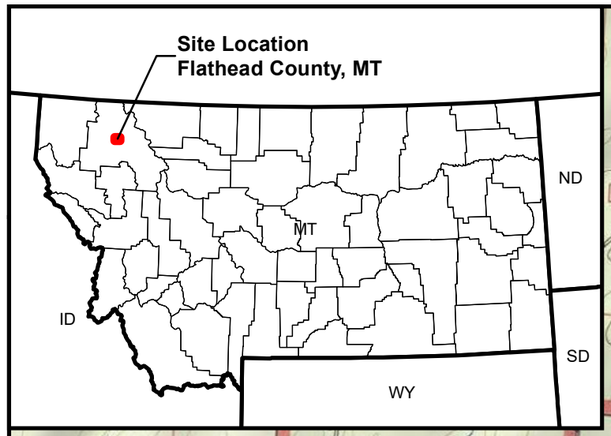
Exposure Area	Direct Contact Exposure Summary			Overall Direct Contact Risk	Wildlife Exposure Summary		Overall Wildlife Risk	Preliminary Conclusions and Recommendations
	Benthic/Pelagic Invertebrate Communities	Aquatic Plant Community	Fish/Herptiles		Birds	Mammals		
Flathead River	**Surface Water:** Moderate risk. Total cyanide exceeds LOEC (acute) in maximum and refined exposure scenarios; free cyanide concentrations result in HQ_{LOEC} 1.1 to 1.2 based on refined exposure scenario. Refined exposure estimate for barium results in HQ_{LOEC}=2.7-3.0. Aluminum LOEC (NRWQC CMC) exceeded in 8 of 76 samples (HQ_{LOEC}=1.6 to 17.7); filtered aluminum < NOEC. **Sediment:** Minimal Risk. Potential exposure to cyanide associated with aqueous exposure to pore water; potential exposure to tPAHs primarily associated with sampling stations in the Backwater Seep Sampling Area with $ESBTU_{34}$ values < 1, except for CFSDP-036 on the Flathead River that had tPAH = 1.35 mg/kg with low TOC (0.01 %) **Pore water:** Moderate Risk. Maximum cyanide (free) exposure in Backwater Seep Sampling Area sampling stations exceed NOEC and LOEC (acute), with HQ_{NOEC} and HQ_{LOEC} of 12.0 and 2.8, respectively. Maximum exposure to barium results in HQLOEC=6.7. Negligible exposure to fluoride (maximum HQ_{NOEC}=1.7; HQ_{LOEC}<1).			**Moderate**	**Maximum scenario:** Negligible risk to birds foraging exclusively within the exposure area at maximum EPCs; maximum HQ_{LOAEL}<1. **Refined scenario:** Negligible risk to birds foraging exclusively within the exposure area; HQ_{LOAEL}<1 based on refined EPCs.	**Maximum scenario:** Negligible risk to mammals foraging exclusively within the exposure area; maximum HQ_{LOAEL}<1 for all receptors/COPECs. Maximum EPC for HMW PAHs > NOAEL (HQ_{NOAEL}= 6.7). **Refined scenario:** Negligible risk based on refined EPCs; HQ_{NOAEL} for HMW PAHs = 1.5 for mink, but HQ_{LOAEL}<1.	**Negligible**	Greatest potential for adverse effects via direct contact exposure is associated with exposure to cyanide, aluminum, and barium in surface water and pore water at stations in the Backwater Seep Sampling Area. Further evaluation of chronic, direct contact exposure to cyanide in surface water and pore water may be warranted.
Flathead River Excluding Backwater Seep Area	**Surface Water:** Minimal Risk. No exceedances of NOEC for total cyanide or free cyanide. Unfiltered aluminum exceeds LOEC (NRWQC CMC) in 3 of 40 samples (HQ_{LOEC}=3.5 to 17.7); filtered aluminum < NOEC. Refined exposure estimate for barium results in HQ_{LOEC}=2.1-2.4. **Sediment:** Minimal Risk. Potential exposure to tPAHs with $ESBTU_{34}$ values > 1 limited to CFSDP-036 (tPAH = 1.35 mg/kg; TOC 0.01 %); AVS-SEM/f_{oc} not indicative of adverse effects to metals; cyanide (free and total) < NOEC. **Pore water:** Minimal Risk. Maximum exposure to barium results in HQ_{LOEC}=6.7; barium concentrations consistent upgradient to downgradient, indicating concentrations are representative of upgradient/background conditions. Cyanide (free and total) < NOEC.			**Minimal**	**Maximum scenario:** Negligible risk to birds foraging exclusively within the exposure area at maximum EPCs; maximum HQ_{LOAEL}<1. **Refined scenario:** Negligible risk to birds foraging exclusively within the exposure area; HQ_{LOAEL}<1 based on refined EPCs.	**Maximum scenario:** Negligible risk to mammals foraging exclusively within the exposure area; maximum HQ_{LOAEL}<1 for all receptors/COPECs. Maximum EPC for HMW PAHs > NOAEL (HQ_{NOAEL}= 6.7). **Refined scenario:** Negligible risk based on refined EPCs (HQ_{NOAEL}<1).	**Negligible**	Potential for adverse effects is substantially lower in Flathead River sampling stations outside of the Backwater Seep Sampling Area. No further evaluation on the basis of ecological risk for the Flathead River outside of the Backwater Seep Sampling Area.
Flathead River Riparian Channel	**Surface Water:** Moderate Risk. Total cyanide exceeds LOEC (NRWQC CMC) in maximum and refined exposure scenarios; free cyanide concentrations result in HQ_{LOEC} 2.0 to 2.8 based on refined exposure scenario. Refined exposure estimate for barium results in HQ_{LOEC}=6.9-16.1. Aluminum NOEC (NRWQC CCC) exceeded in 6 of 15 samples (HQ_{NOEC}=1.2-41.6); Aluminum LOEC (NRWQC CMC) exceeded in 3 of 15 samples (HQ_{LOEC}=1.8-10.7); filtered aluminum < LOEC. Unfiltered copper > NOEC and LOEC in 2 of 15 samples (HQ_{LOEC}=1.0-2.0); filtered copper < NOEC. **Sediment:** Minimal Risk. Potential exposure to cyanide associated with aqueous exposure to pore water; potential exposure to tPAHs primarily associated with CFSDP-029 nearest the Backwater Seep Sampling Area ($ESBTU_{34}$ = 4.0); $ESBTU_{34}$ values < 1 at other stations. **Pore water:** Moderate Risk.Cyanide (free) exceed LOEC (NRWQC CMC) in 3 of 6 samples (max HQ_{LOEC}=7.4 at CFSDP-029); Free cyanide exceeds NOEC in 4 of 6; Maximum barium EPC results in HQ_{LOEC}=10.1. Other COPECs < LOEC; PAHs < NOEC. Aluminum not identified as as refined COPEC.			**Moderate**	Not evaluated as a separate wildlife exposure area.	Not evaluated as a separate wildlife exposure area.	**Not Applicable**	Greatest potential for adverse effects via direct contact exposure is associated with exposure to cyanide, aluminum, and barium in surface water and pore water. Further evaluation of chronic, direct contact exposure to cyanide in surface water and pore water may be warranted.

Table 8-4
Summary of BERA Findings - Aquatic Exposure Areas
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Exposure Area	Direct Contact Exposure Summary			Overall Direct Contact Risk	Wildlife Exposure Summary		Overall Wildlife Risk	Preliminary Conclusions and Recommendations
	Benthic/Pelagic Invertebrate Communities	Aquatic Plant Community	Fish/Herptiles		Birds	Mammals		
Cedar Creek	**Surface Water:** Negligible risk; Refined exposure estimate results in barium HQ_{LOEC}=2.7-2.8; however, barium concentrations consistent with background. Maximum cyanide EPC < LOEC. No other refined COPECs. **Sediment:** Negligible risk; Maximum exposure to cyanide, barium, manganese, and ESBTUs < LOEC; HQ_{NOEC} values range from 1.2 (manganese) to 2.4 (cyanide). **Pore water:**-Negligible risk; Maximum exposure to resulting in HQ_{LOEC} values of 6.9 and 1.2 for barium and manganese, respectively; however, barium concentrations consistent with upgradient/background conditions.			**Negligible**	**Maximum scenario:** Negligible risk to birds foraging exclusively within the exposure area; maximum HQ_{LOAEL}=1.3 (selenium) **Refined scenario:** Negligible risk to birds foraging exclusively within the exposure area; HQ_{LOAEL}<1 based on refined EPCs.	**Maximum scenario:** Negligible risk to mammals foraging exclusively within the exposure area; maximum exposure to cadmium and selenium > NOAEL (HQ_{NOAEL}=2.0-2.4); maximum HQ_{LOAEL}<1. **Refined scenario**: Negligible risk based on refined EPCs (HQ_{NOAEL}<1).	**Negligible**	No further evaluation on the basis of ecological risk.

Notes:
COPEC, Constituent of potential ecological concern.
EPC, Exposure point concentrations
HMW PAHs, High molecular weight polycyclic aromatic hydrocarbons
HQ, Hazard quotient; ratio of direct contact EPC to NOEC/LOEC or estimated daily dose to NOAEL/LOAEL.
LMW PAHs, Low molecular weight polycyclic aromatic hydrocarbons
LOAEL, Lowest observed adverse effect level dose.
LOEC, Lowest observed effect concentration.
NOAEL, No observed adverse effect level dose.
NOEC, No observed effect concentration.
Maximum scenario, Represents worst case exposure scenario by assuming maximum concentrations as EPCs in direct contact evaluation or inputs to EDD doses for wildlife ingestion pathways.
Refined scenario, Represents conservative estimate of average exposure scenario by assuming upper confidence limit of the mean (UCL_{mean}) concentrations as EPCs in direct contact evaluation or inputs to EDD doses for ingestion pathways.

Figures



Legend

- Site Boundary
- Flathead National Forest

Scale In Feet: 2,000 1,000 0 2,000

Site Location Map

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

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FIGURE 2-1

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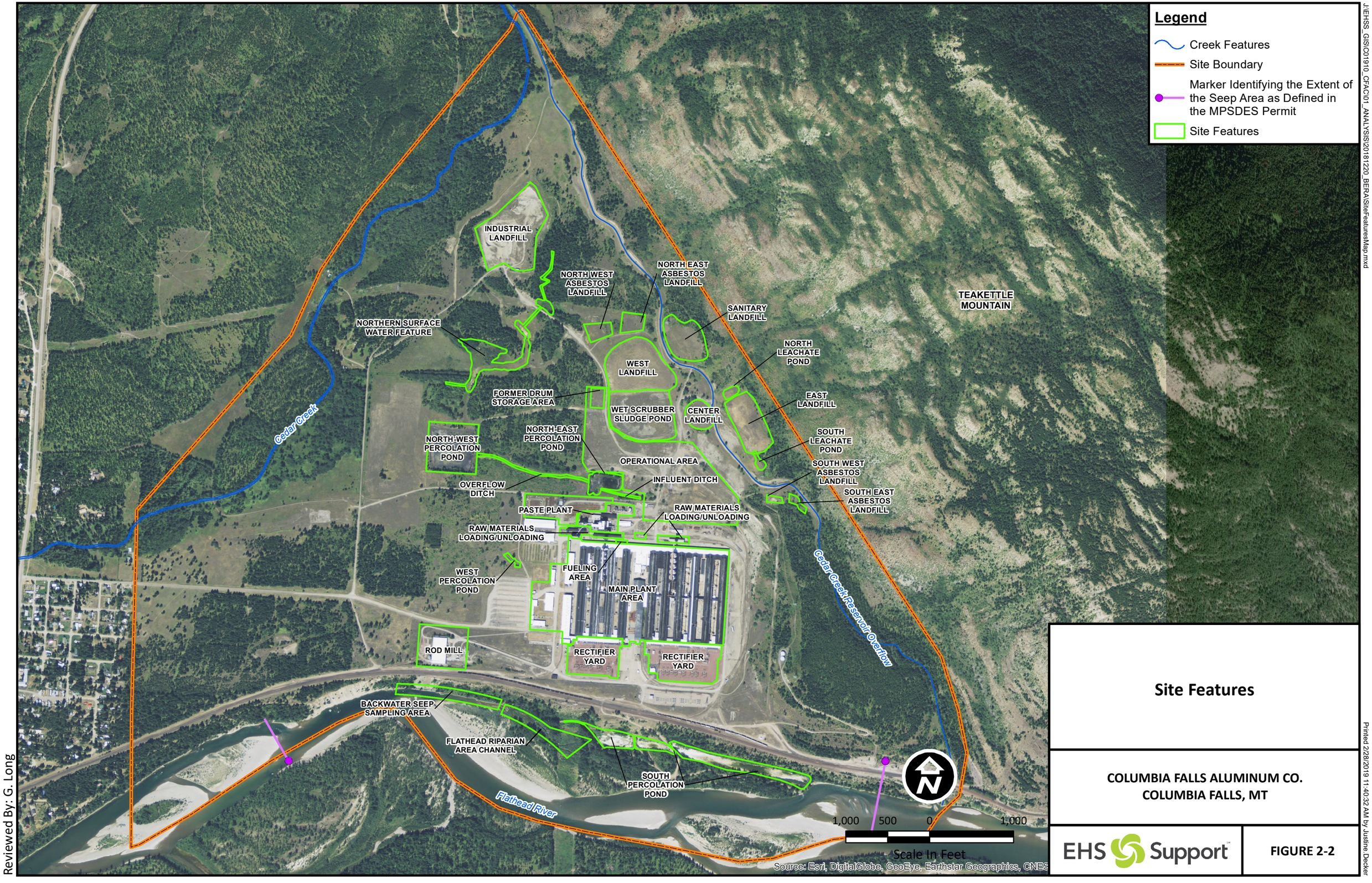

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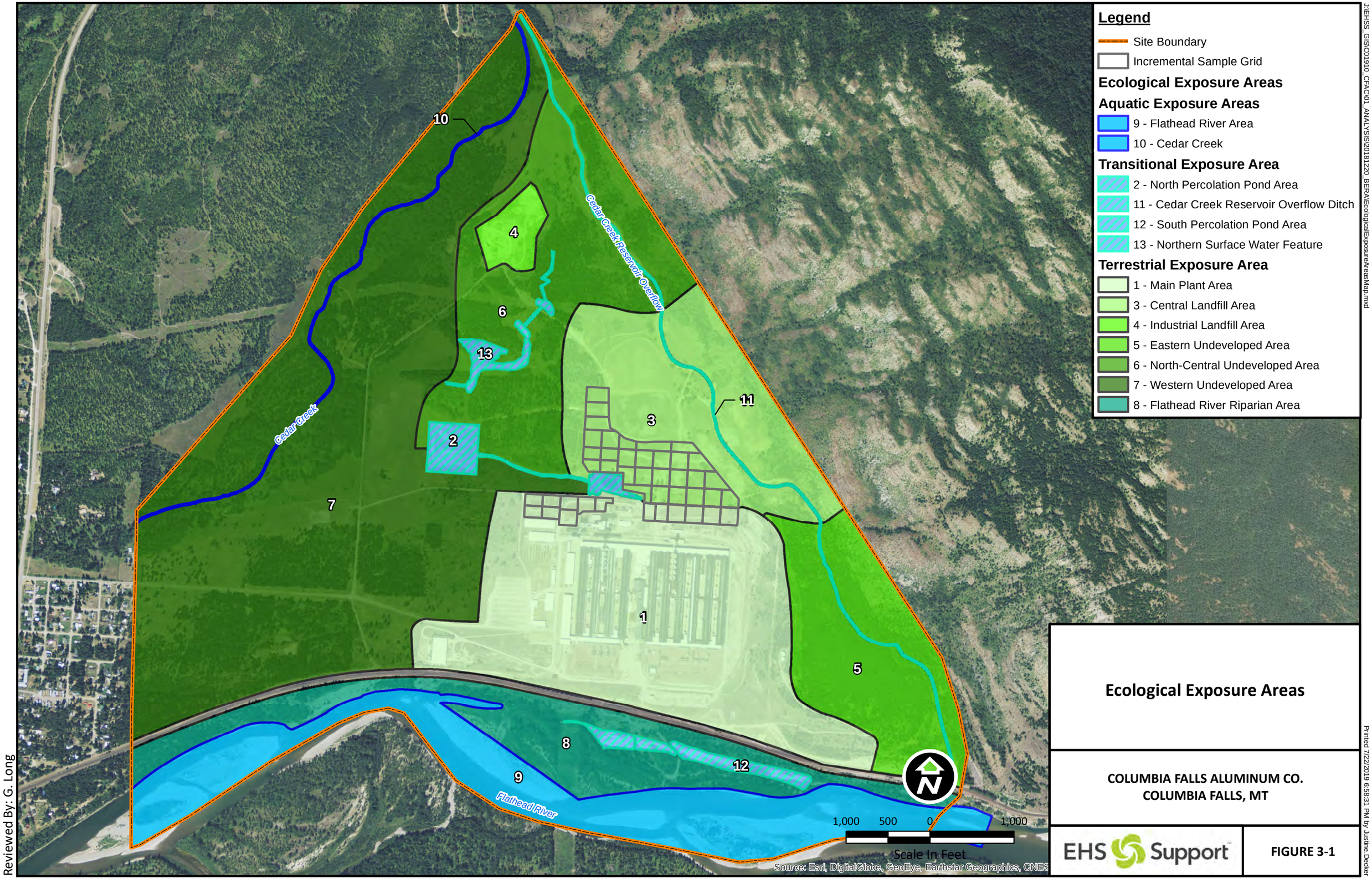
Site Features

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 2-2



Legend

- Site Boundary
- Incremental Sample Grid

Ecological Exposure Areas

Aquatic Exposure Areas

- 9 - Flathead River Area
- 10 - Cedar Creek

Transitional Exposure Area

- 2 - North Percolation Pond Area
- 11 - Cedar Creek Reservoir Overflow Ditch
- 12 - South Percolation Pond Area
- 13 - Northern Surface Water Feature

Terrestrial Exposure Area

- 1 - Main Plant Area
- 3 - Central Landfill Area
- 4 - Industrial Landfill Area
- 5 - Eastern Undeveloped Area
- 6 - North-Central Undeveloped Area
- 7 - Western Undeveloped Area
- 8 - Flathead River Riparian Area

Ecological Exposure Areas

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support

FIGURE 3-1

Reviewed By: G. Long

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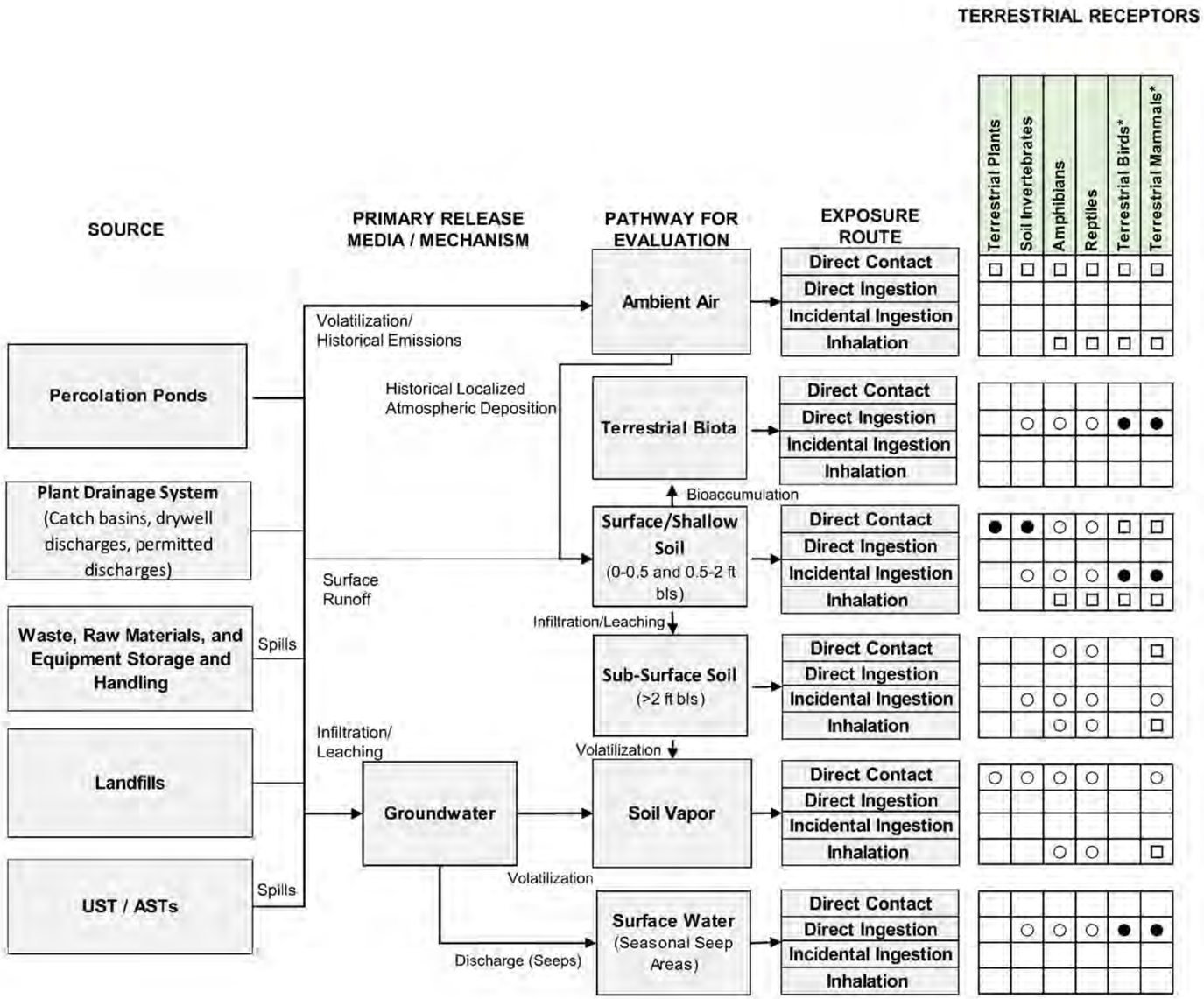


Notes:
Solid circles (●) represent exposure pathways that are considered potentially complete.
Open circles (○) represent potential exposure pathways that are not quantifiable.
Open squares (□) represent potential exposure pathways that are likely insignificant.
*Includes semi-aquatic birds and mammals, where applicable.

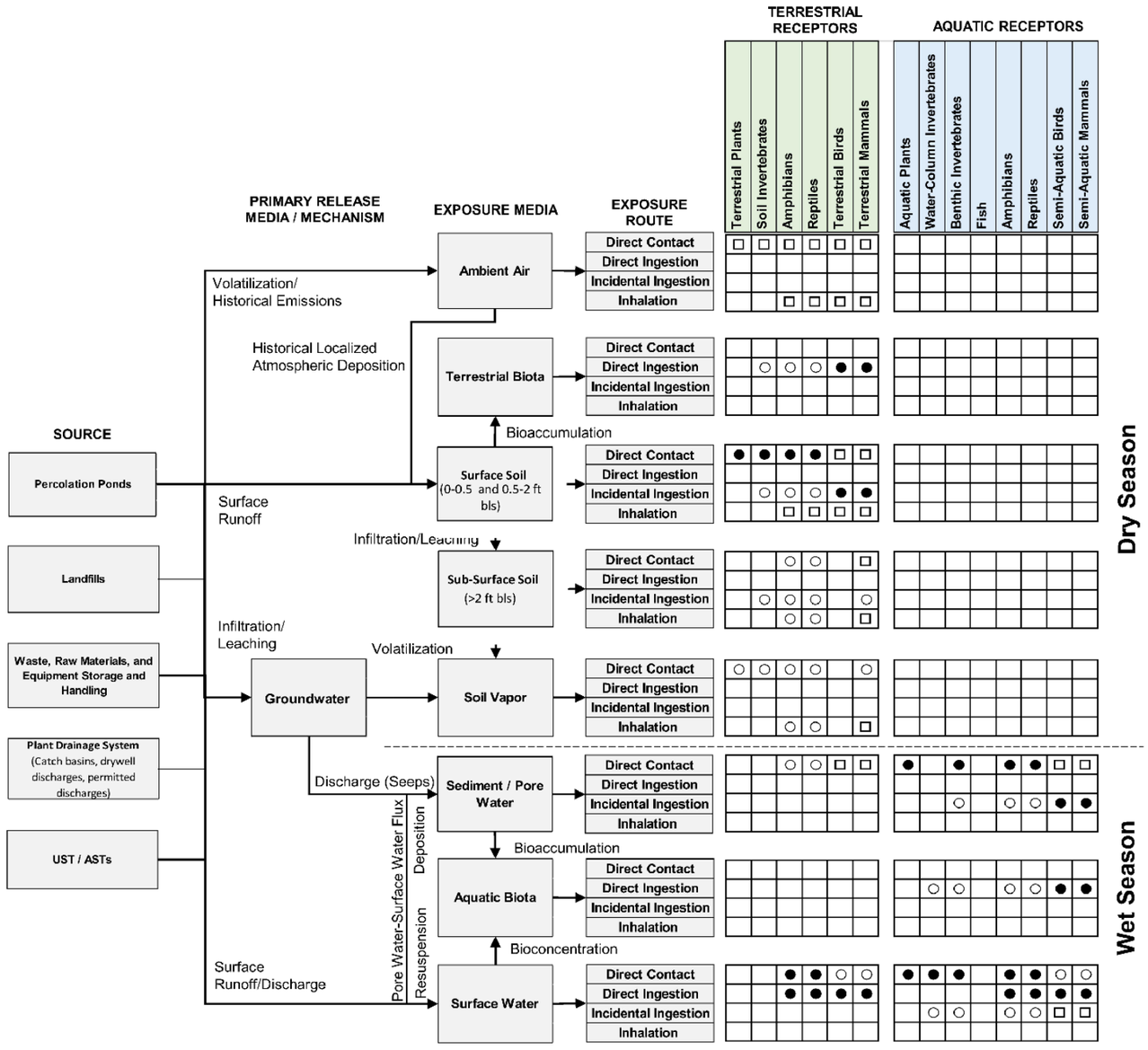
ECSM: Terrestrial Exposure Areas

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support

FIGURE 3-2

Reviewed By: G. Long



Notes:
Solid circles (●) represent exposure pathways that are considered potentially complete.
Open circles (❍) represent potential exposure pathways that are not quantifiable.
Open squares (□) represent potential exposure pathways that are likely insignificant.
Permanent aquatic communities (e.g., fish communities) are not likely to be established in transitional exposure areas.

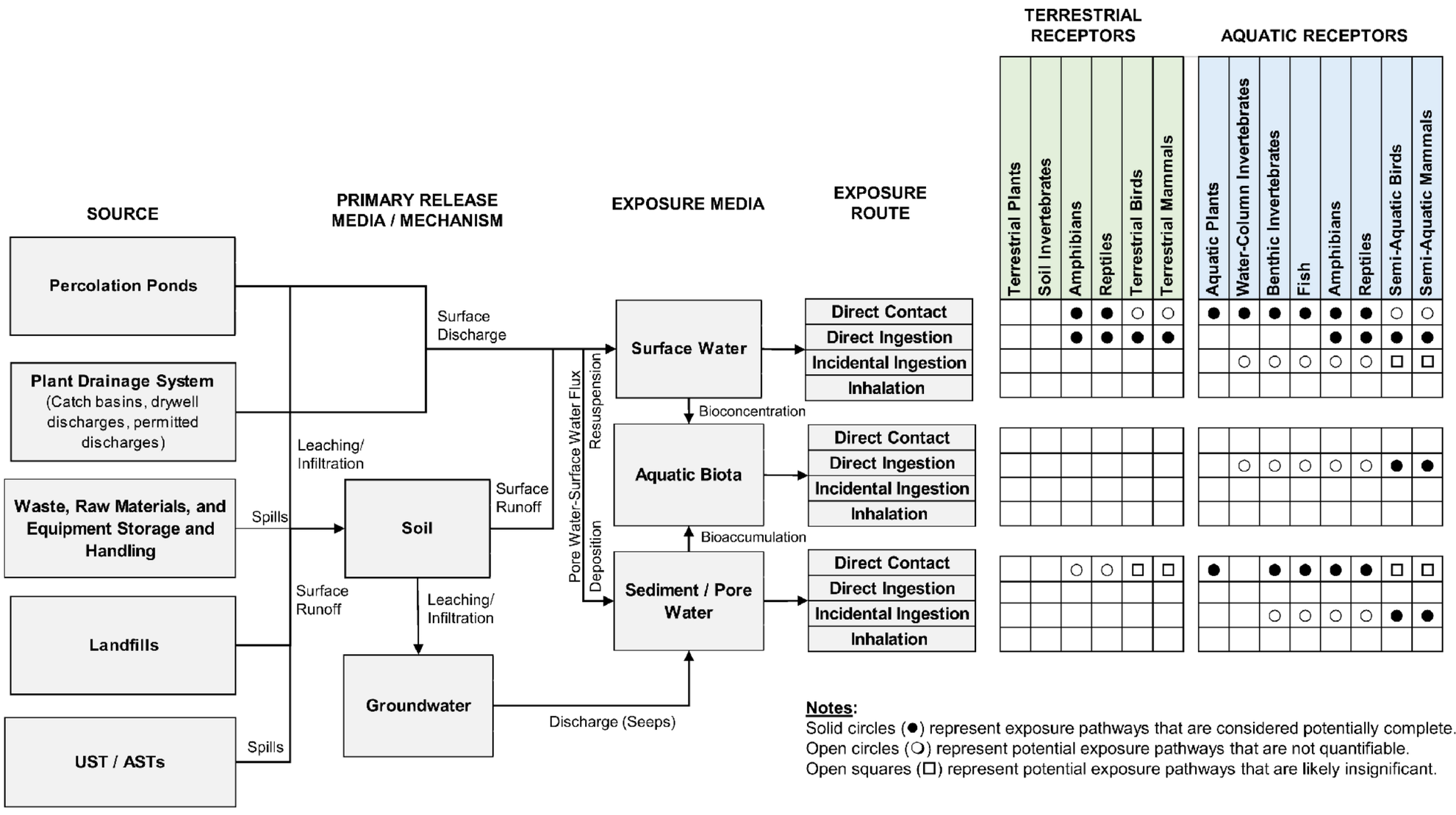
Reviewed By: G. Long

ECSM: Transitional Exposure Areas

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support

FIGURE 3-3



Notes:
Solid circles (●) represent exposure pathways that are considered potentially complete.
Open circles (○) represent potential exposure pathways that are not quantifiable.
Open squares (□) represent potential exposure pathways that are likely insignificant.

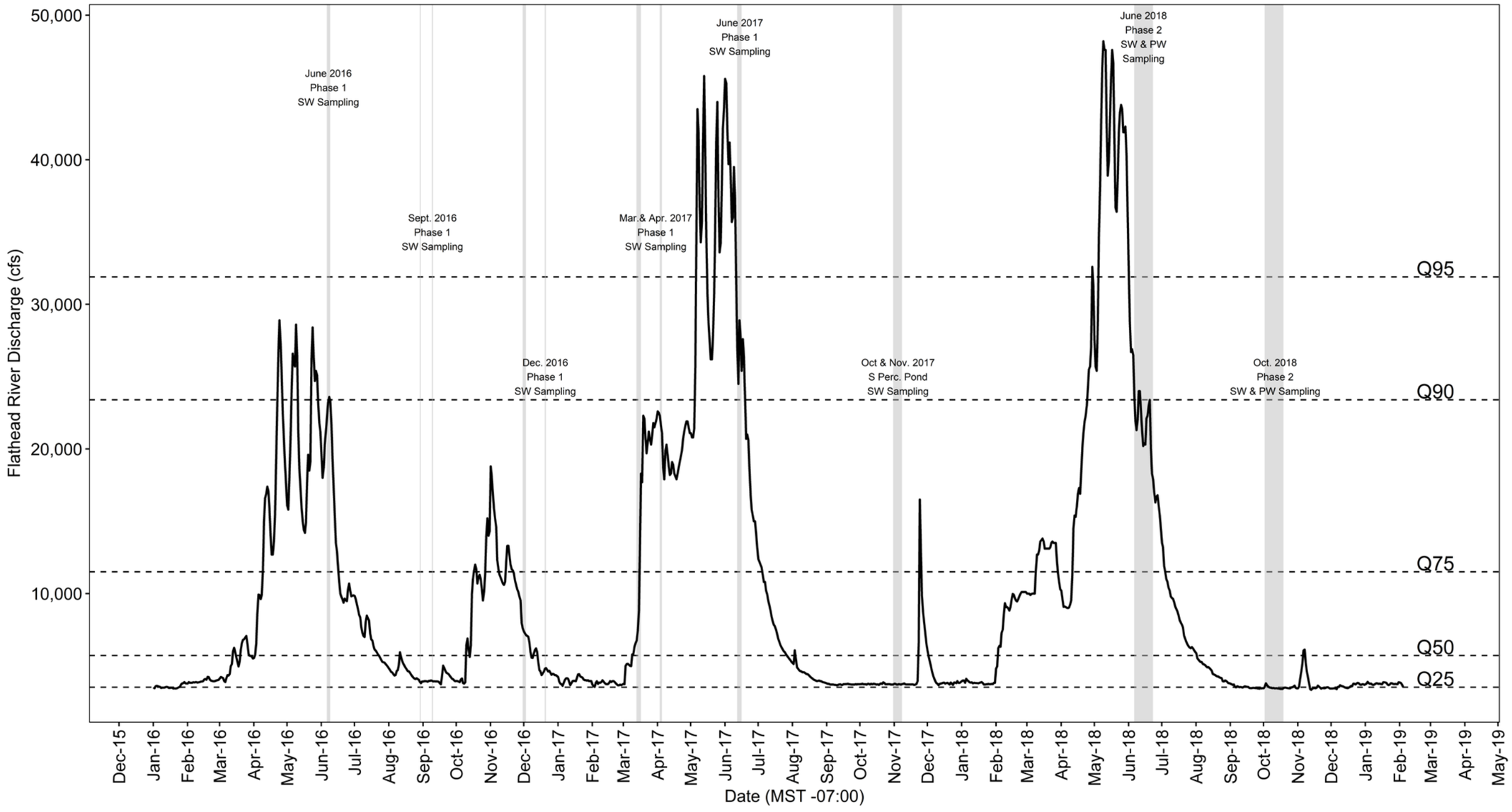
Reviewed By: G. Long

ECSM: Aquatic Exposure Areas

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

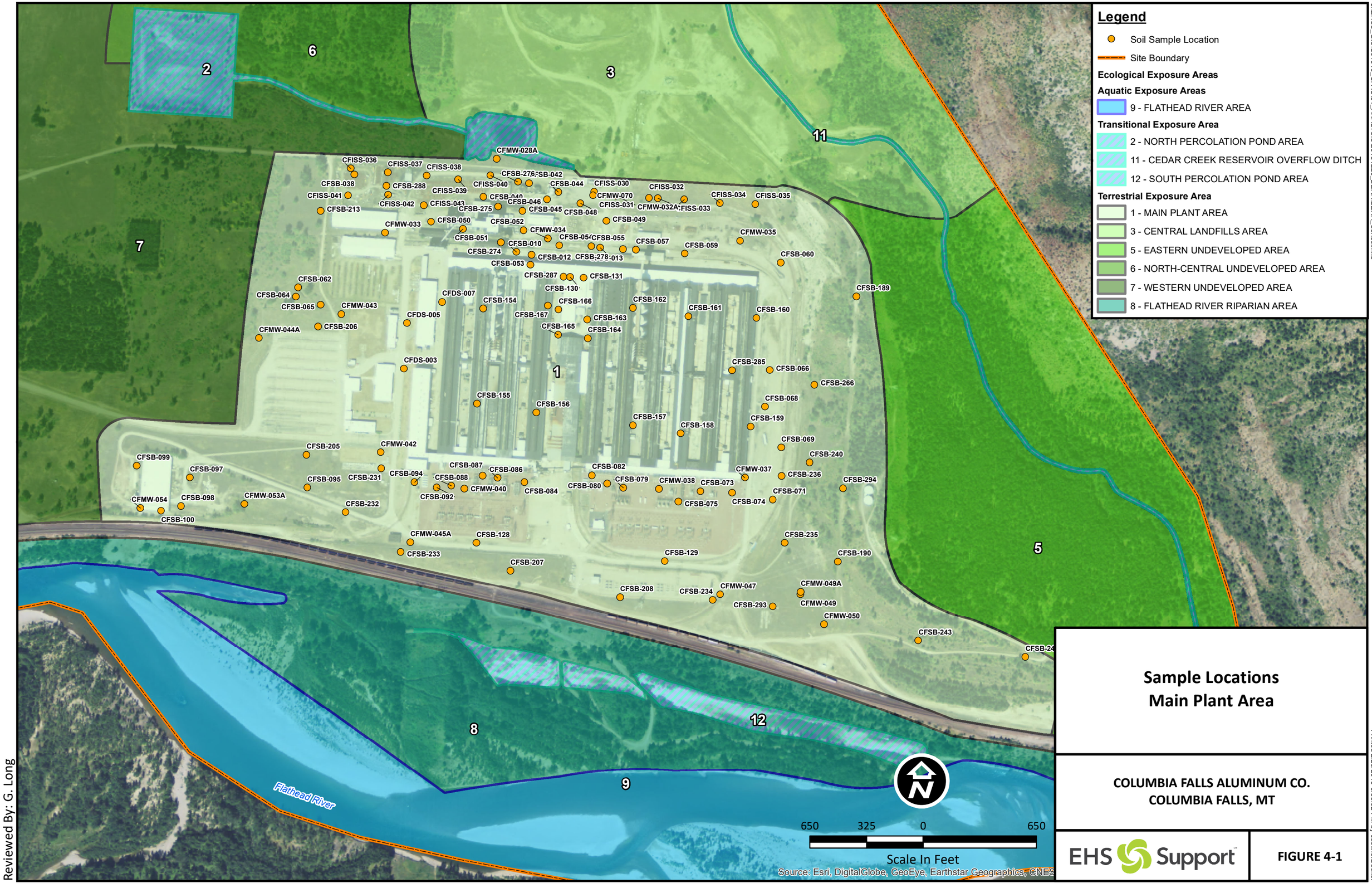
FIGURE 3-4



Legend

- Surface Water or Pore Water Sampling Period
- Flathead River Discharge
- Discharge (Q) Percentile

FIGURE 3-5	EHS Support
FLATHEAD RIVER DISCHARGE AND LONG-TERM FLOW STATISTICS	
Prepared by: S. Parker	Checked by: S. Parker
Project: CFAC - BERA	Date: February 6, 2019



Sample Locations
Main Plant Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 4-1

Reviewed By: G. Long

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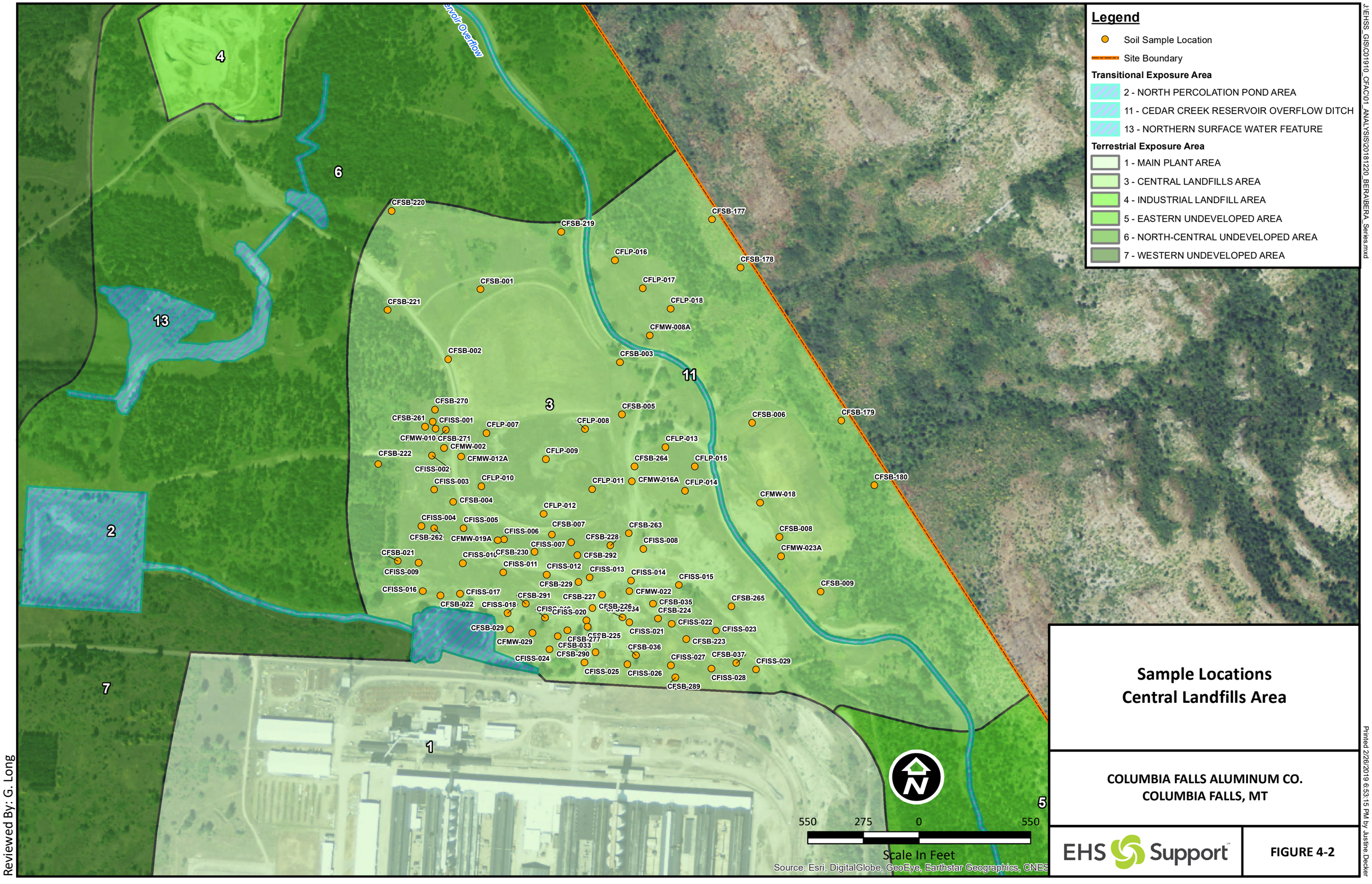

Sample Locations
Central Landfills Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support

FIGURE 4-2

Reviewed By: G. Long

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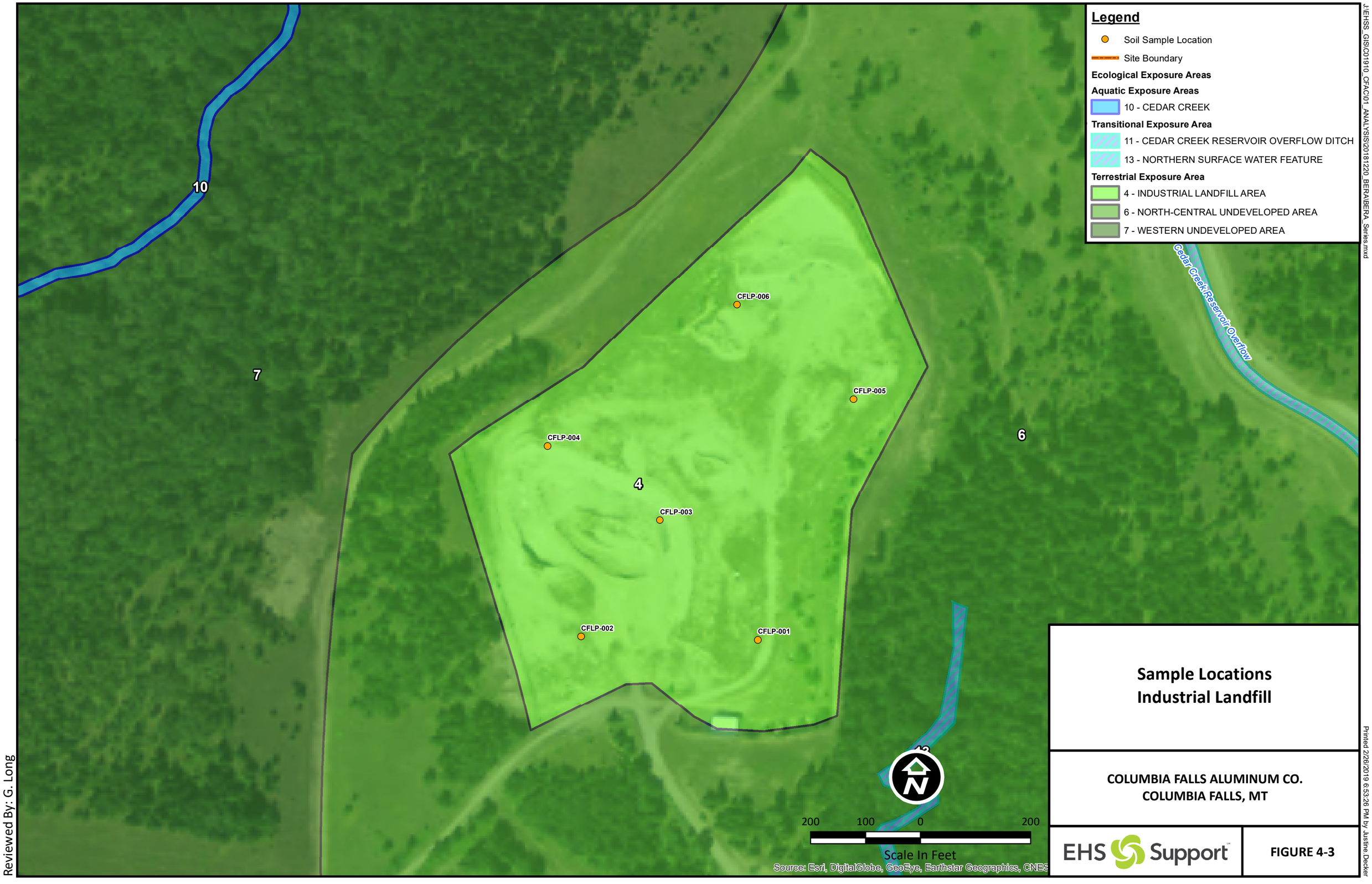

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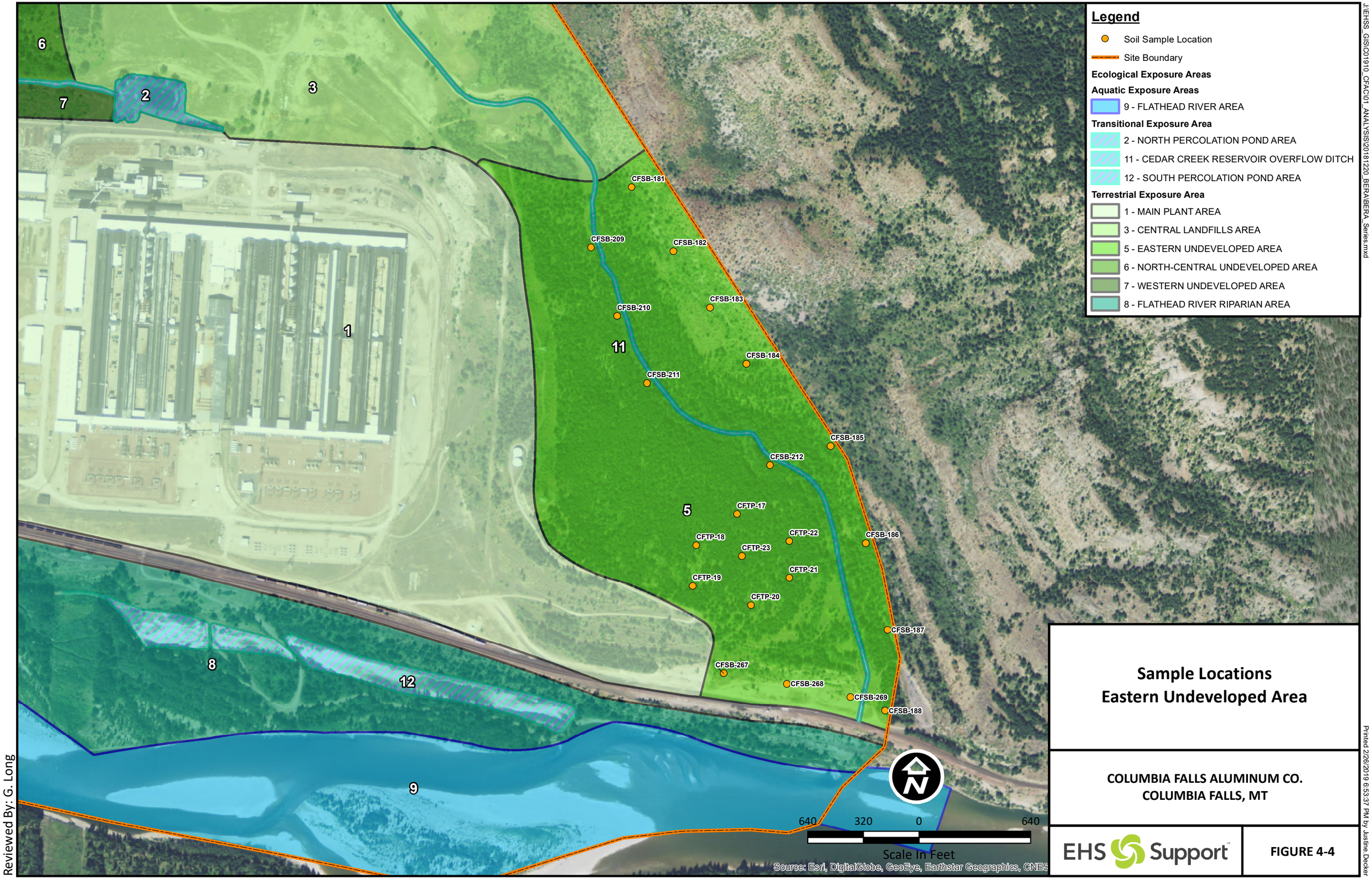
Sample Locations
Industrial Landfill

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 4-3



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Reviewed By: G. Long

Sample Locations
Eastern Undeveloped Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 4-4

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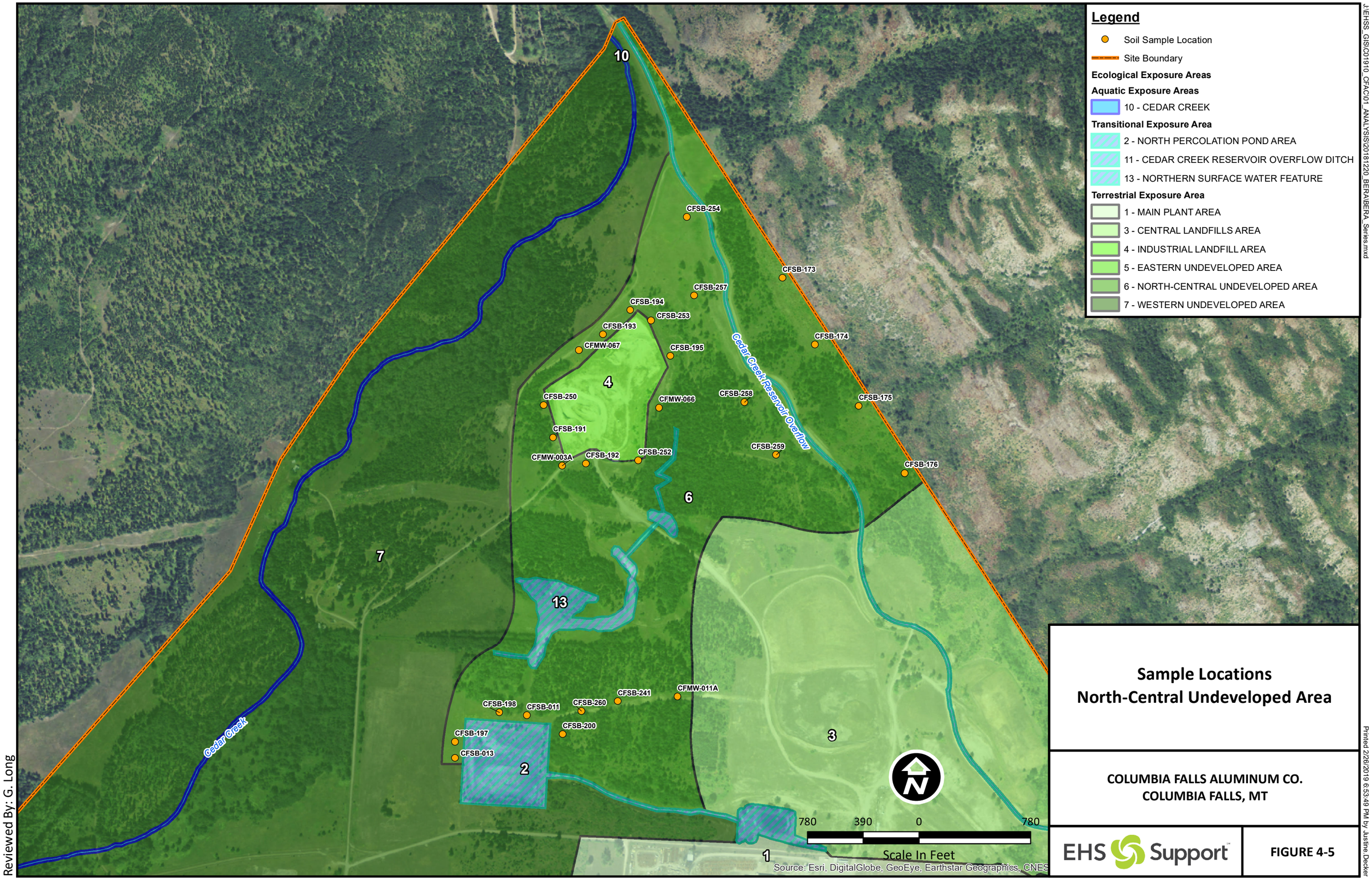

Sample Locations
North-Central Undeveloped Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support

FIGURE 4-5

Reviewed By: G. Long

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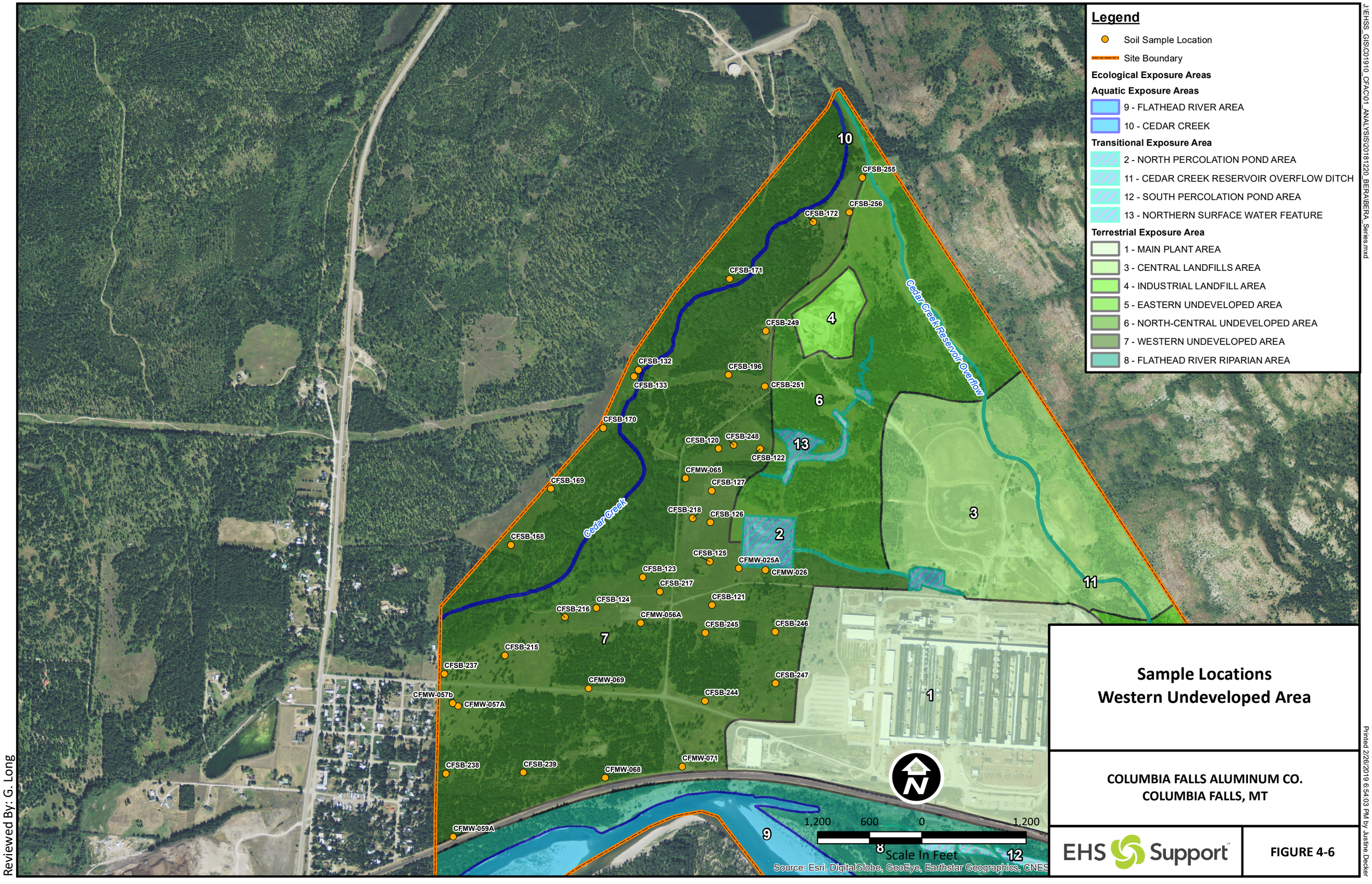

Legend

- Soil Sample Location
- Site Boundary

Ecological Exposure Areas

Aquatic Exposure Areas

- 9 - FLATHEAD RIVER AREA
- 10 - CEDAR CREEK

Transitional Exposure Area

- 2 - NORTH PERCOLATION POND AREA
- 11 - CEDAR CREEK RESERVOIR OVERFLOW DITCH
- 12 - SOUTH PERCOLATION POND AREA
- 13 - NORTHERN SURFACE WATER FEATURE

Terrestrial Exposure Area

- 1 - MAIN PLANT AREA
- 3 - CENTRAL LANDFILLS AREA
- 4 - INDUSTRIAL LANDFILL AREA
- 5 - EASTERN UNDEVELOPED AREA
- 6 - NORTH-CENTRAL UNDEVELOPED AREA
- 7 - WESTERN UNDEVELOPED AREA
- 8 - FLATHEAD RIVER RIPARIAN AREA

Sample Locations
Western Undeveloped Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 4-6

Reviewed By: G. Long

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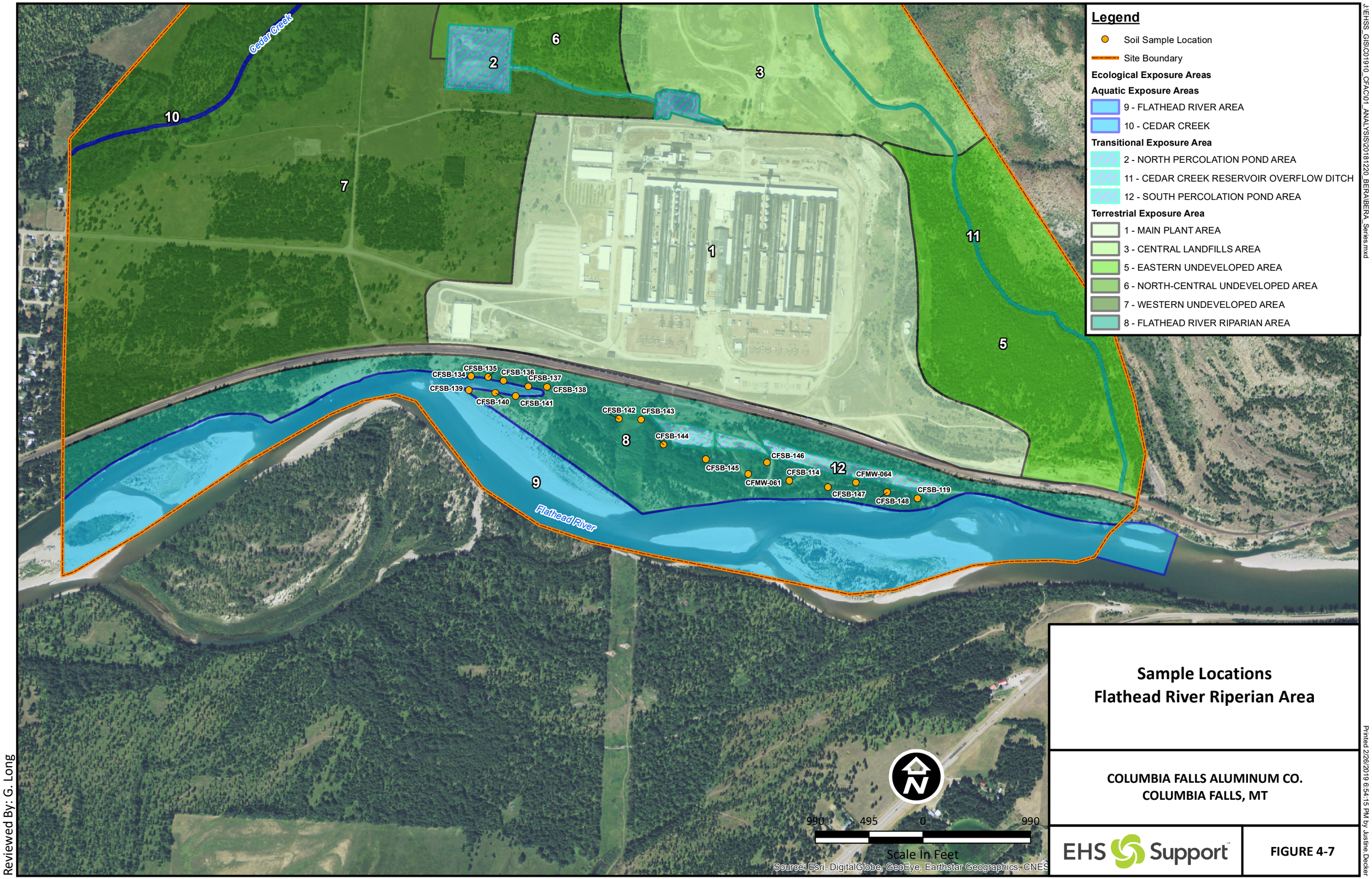

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Reviewed By: G. Long

Sample Locations
Flathead River Riperian Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support

FIGURE 4-7

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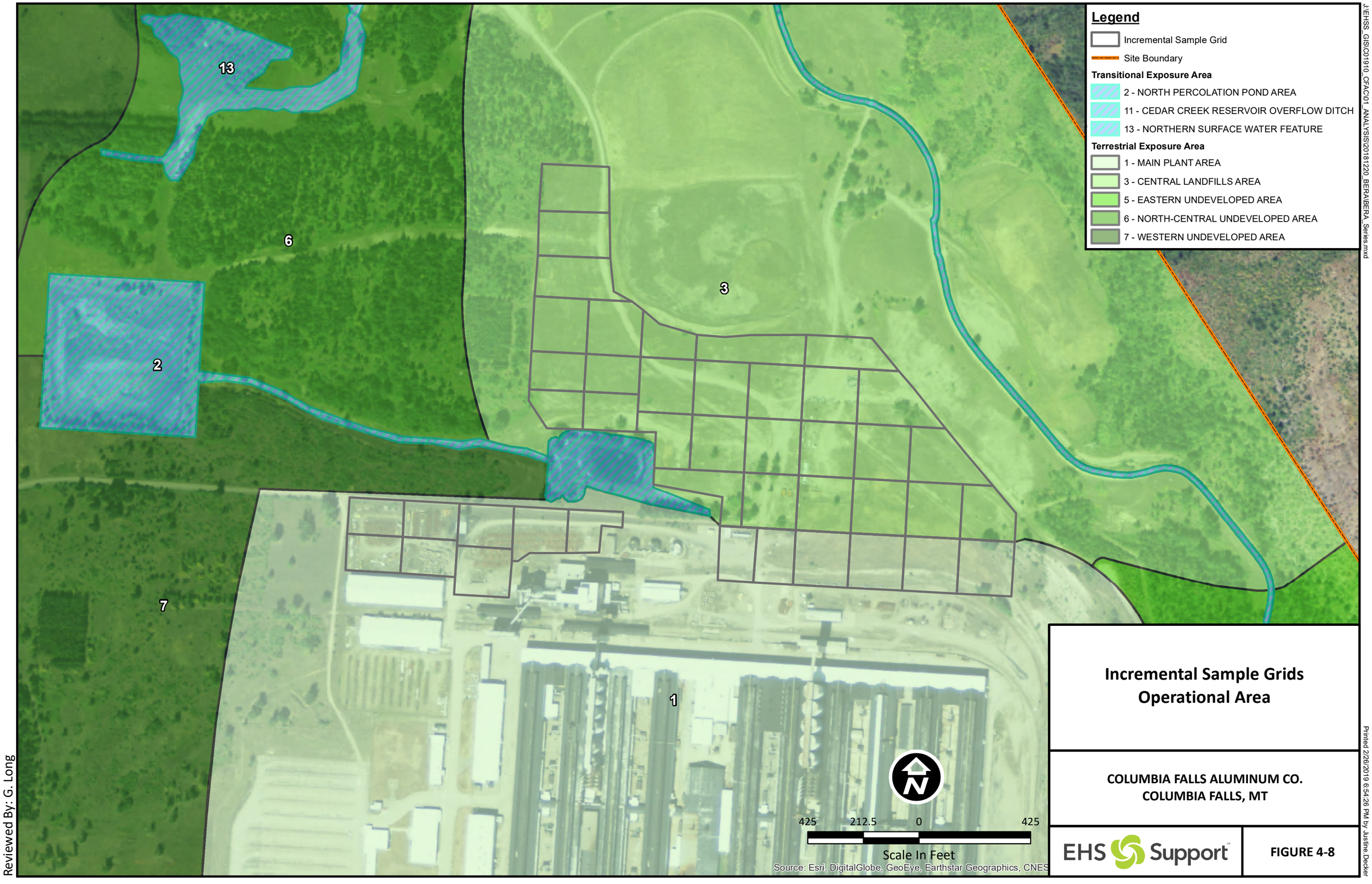

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Reviewed By: G. Long

Incremental Sample Grids Operational Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 4-8

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Sample Locations
North Percolation Pond Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 4-9

Reviewed By: G. Long

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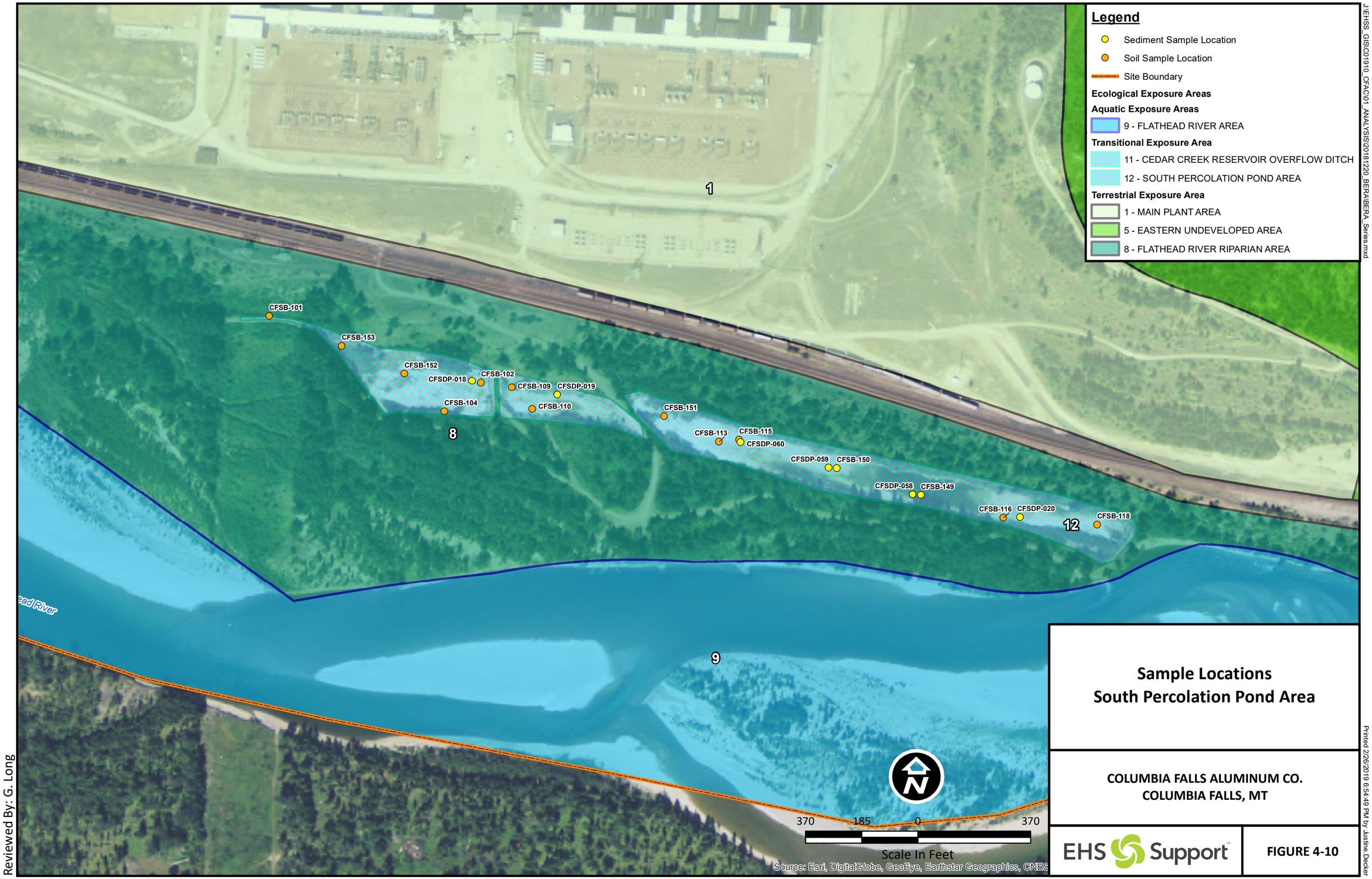

Sample Locations
South Percolation Pond Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support

FIGURE 4-10

Reviewed By: G. Long

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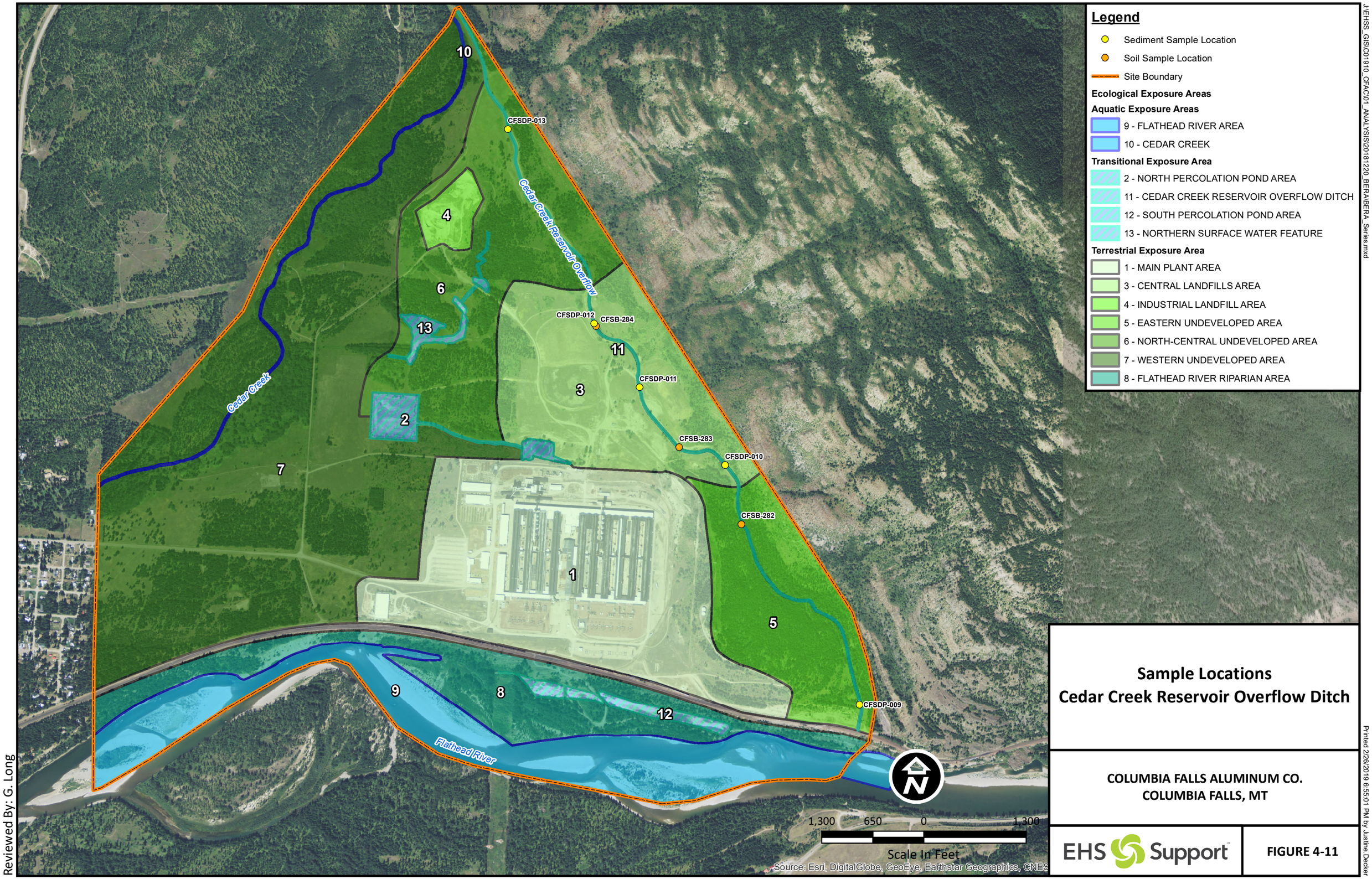

Legend

- Sediment Sample Location
- Soil Sample Location
- Site Boundary

Ecological Exposure Areas

Aquatic Exposure Areas

- 9 - FLATHEAD RIVER AREA
- 10 - CEDAR CREEK

Transitional Exposure Area

- 2 - NORTH PERCOLATION POND AREA
- 11 - CEDAR CREEK RESERVOIR OVERFLOW DITCH
- 12 - SOUTH PERCOLATION POND AREA
- 13 - NORTHERN SURFACE WATER FEATURE

Terrestrial Exposure Area

- 1 - MAIN PLANT AREA
- 3 - CENTRAL LANDFILLS AREA
- 4 - INDUSTRIAL LANDFILL AREA
- 5 - EASTERN UNDEVELOPED AREA
- 6 - NORTH-CENTRAL UNDEVELOPED AREA
- 7 - WESTERN UNDEVELOPED AREA
- 8 - FLATHEAD RIVER RIPARIAN AREA

Sample Locations
Cedar Creek Reservoir Overflow Ditch

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 4-11

Reviewed By: G. Long

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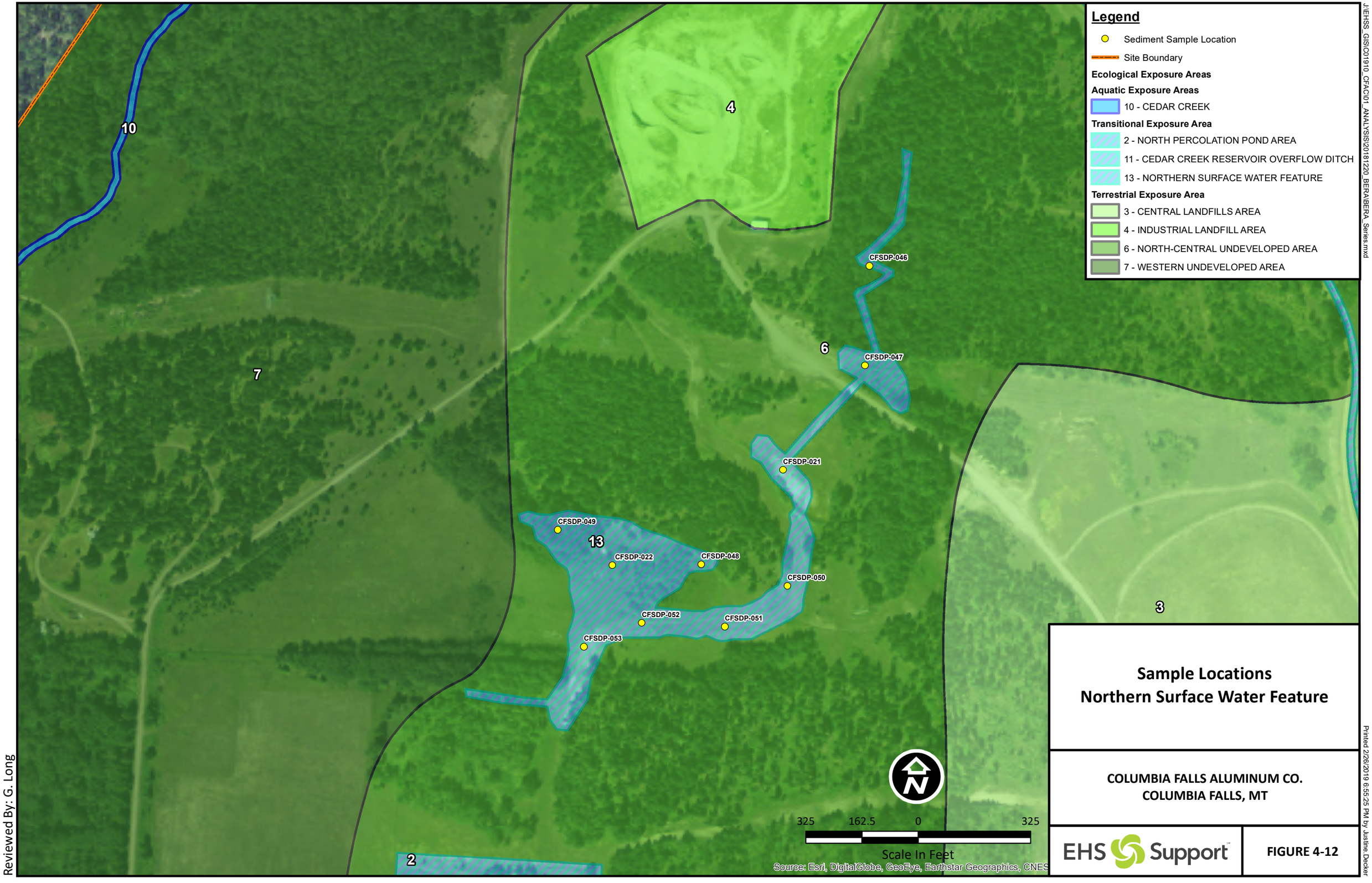

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Reviewed By: G. Long

Sample Locations
Northern Surface Water Feature

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 4-12

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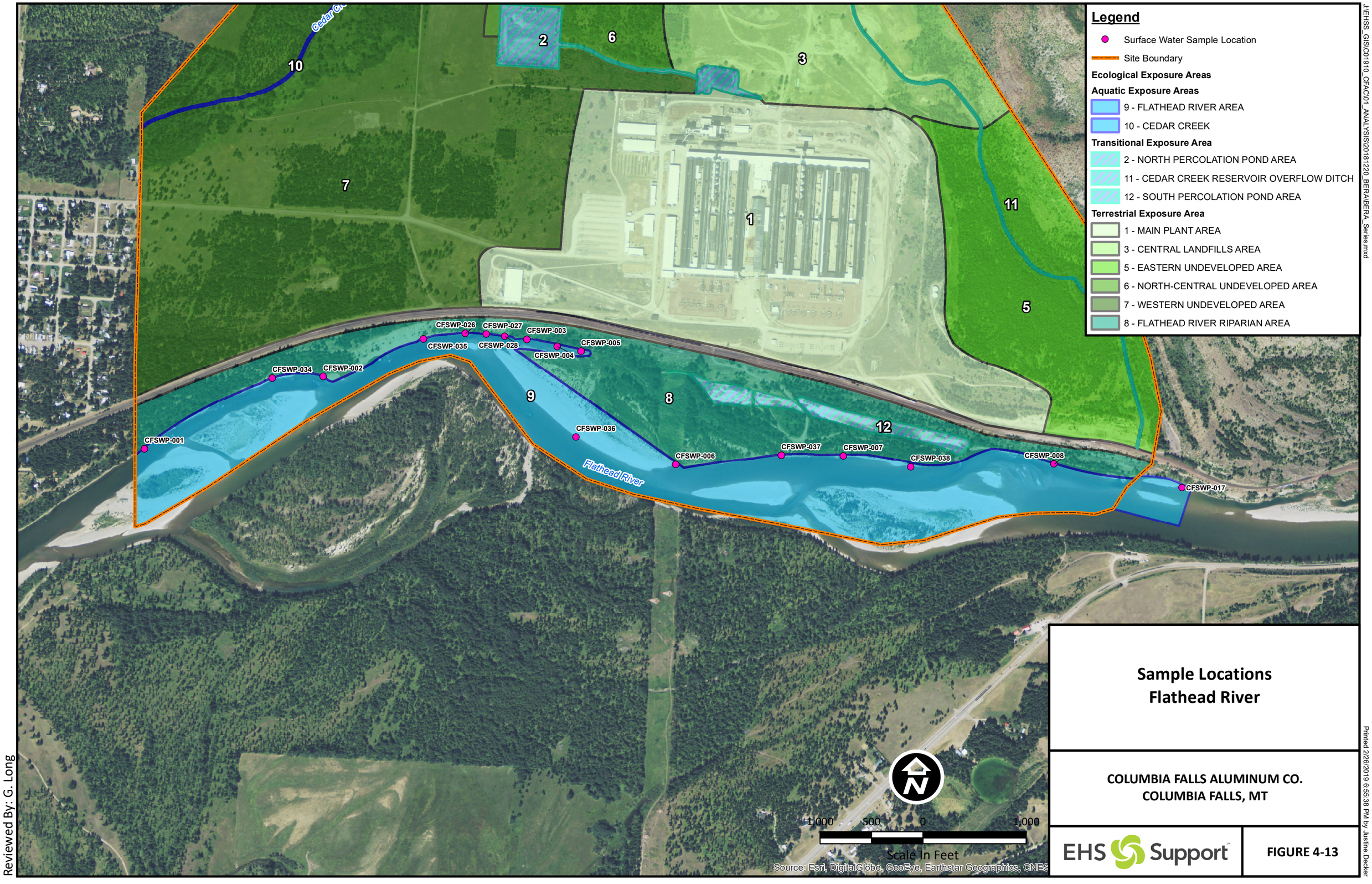

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Reviewed By: G. Long

Sample Locations
Flathead River

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support

FIGURE 4-13

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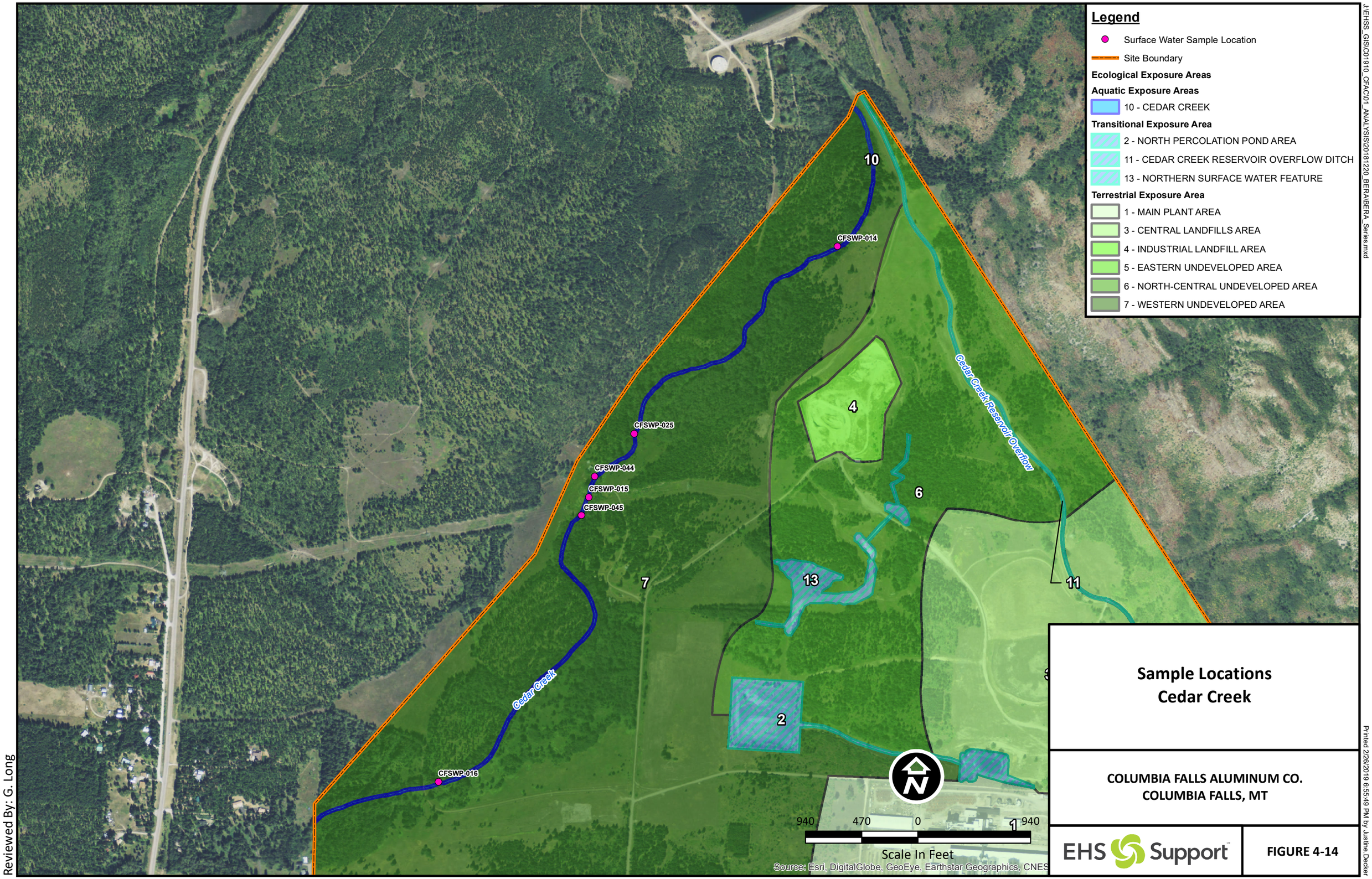

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Reviewed By: G. Long

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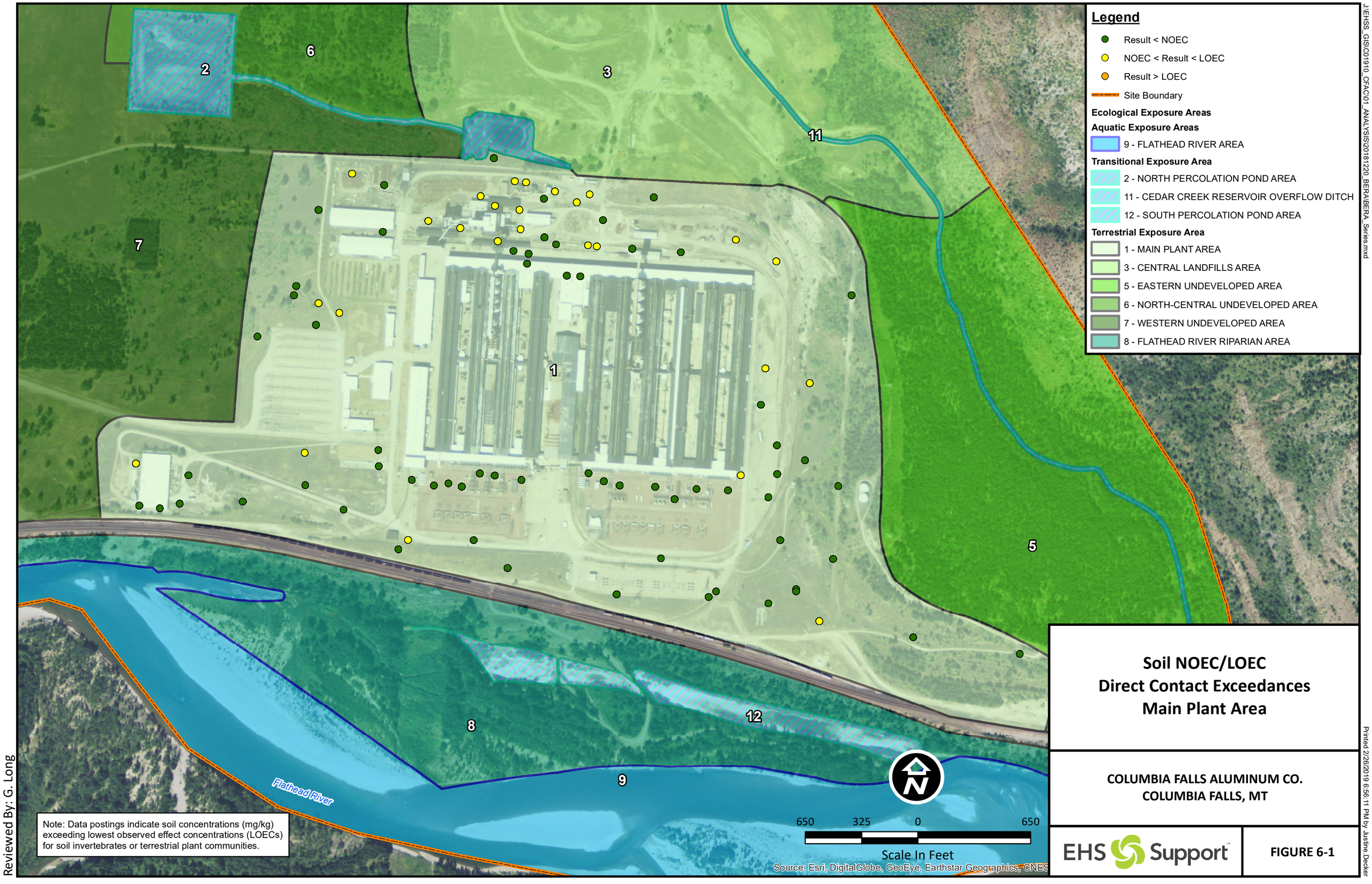
Sample Locations
Cedar Creek

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 4-14



Note: Data postings indicate soil concentrations (mg/kg) exceeding lowest observed effect concentrations (LOECs) for soil invertebrates or terrestrial plant communities.

Reviewed By: G. Long

Soil NOEC/LOEC Direct Contact Exceedances Main Plant Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support

FIGURE 6-1

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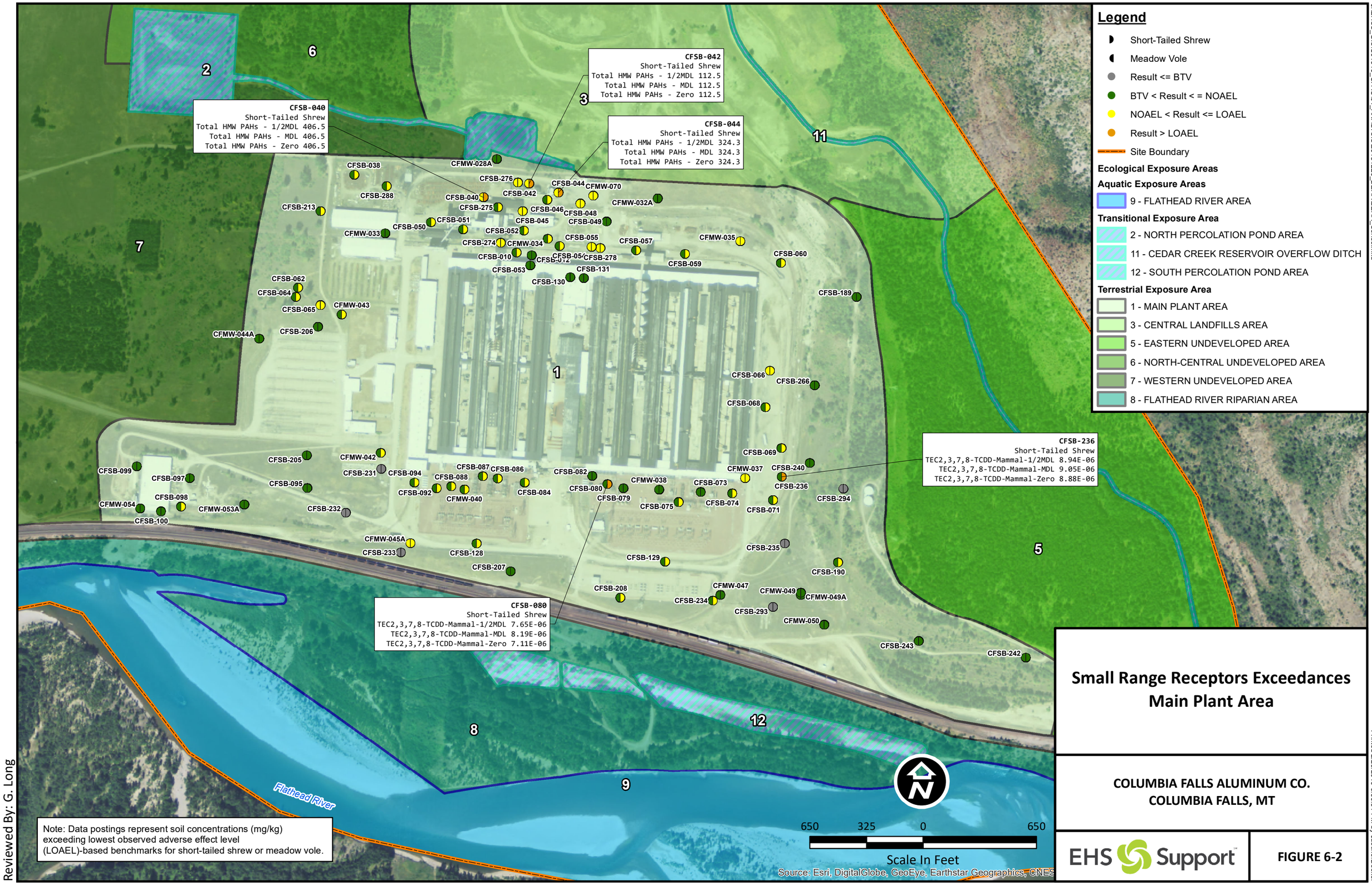

Note: Data postings represent soil concentrations (mg/kg) exceeding lowest observed adverse effect level (LOAEL)-based benchmarks for short-tailed shrew or meadow vole.

Reviewed By: G. Long

Small Range Receptors Exceedances Main Plant Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-2

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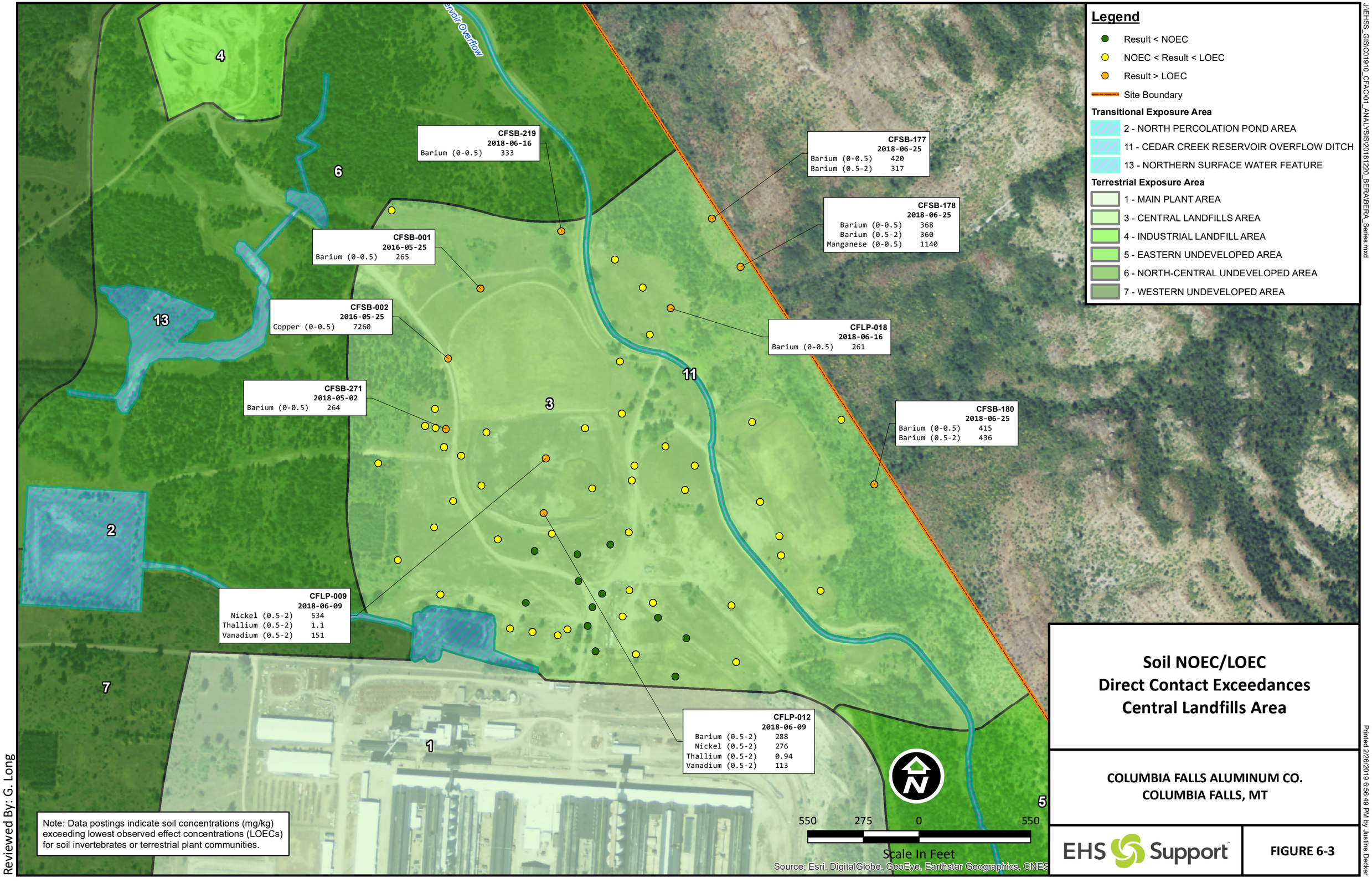

Soil NOEC/LOEC
Direct Contact Exceedances
Central Landfills Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-3

Reviewed By: G. Long

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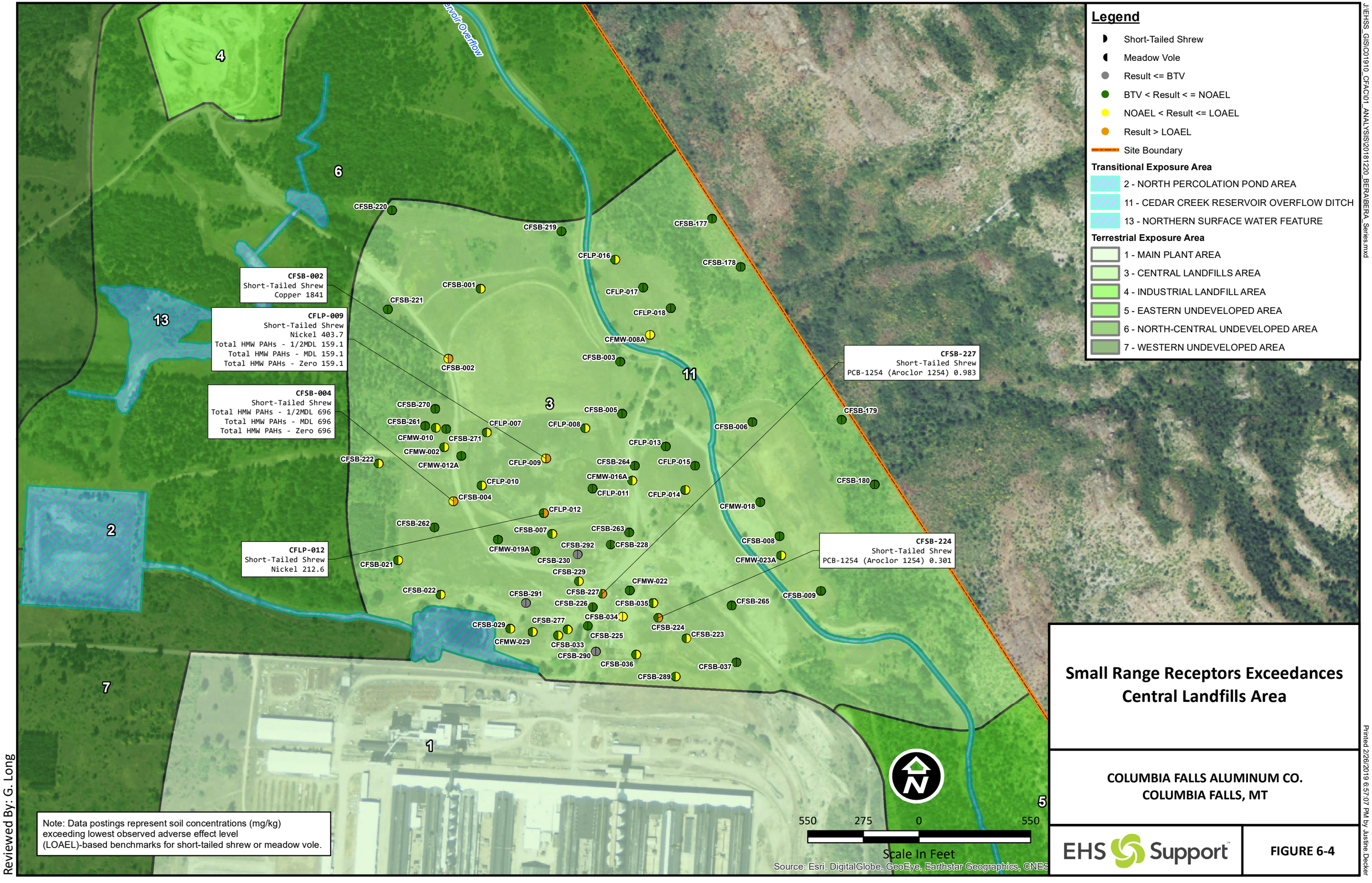
Legend
Short-Tailed Shrew
Meadow Vole
Result <= BTV
BTV < Result < = NOAEL
NOAEL < Result <= LOAEL
Result > LOAEL
Site Boundary
Transitional Exposure Area
2 - NORTH PERCOLATION POND AREA
11 - CEDAR CREEK RESERVOIR OVERFLOW DITCH
13 - NORTHERN SURFACE WATER FEATURE
Terrestrial Exposure Area
1 - MAIN PLANT AREA
3 - CENTRAL LANDFILLS AREA
4 - INDUSTRIAL LANDFILL AREA
5 - EASTERN UNDEVELOPED AREA
6 - NORTH-CENTRAL UNDEVELOPED AREA
7 - WESTERN UNDEVELOPED AREA
CFSB-002
Short-Tailed Shrew
Copper 1841
CFLP-009
Short-Tailed Shrew
Nickel 403.7
Total HMW PAHs - 1/2MDL 159.1
Total HMW PAHs - MDL 159.1
Total HMW PAHs - Zero 159.1
CFSB-004
Short-Tailed Shrew
Total HMW PAHs - 1/2MDL 696
Total HMW PAHs - MDL 696
Total HMW PAHs - Zero 696
CFLP-012
Short-Tailed Shrew
Nickel 212.6
CFSB-227
Short-Tailed Shrew
PCB-1254 (Aroclor 1254) 0.983
CFSB-224
Short-Tailed Shrew
PCB-1254 (Aroclor 1254) 0.301
Note: Data postings represent soil concentrations (mg/kg) exceeding lowest observed adverse effect level (LOAEL)-based benchmarks for short-tailed shrew or meadow vole.
550 275 0 550
Scale In Feet
Source: Esri, DigitalBoge, GeoEye, Earthstar Geographics, CNES
Small Range Receptors Exceedances
Central Landfills Area
COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT
EHS Support
FIGURE 6-4
Reviewed By: G. Long
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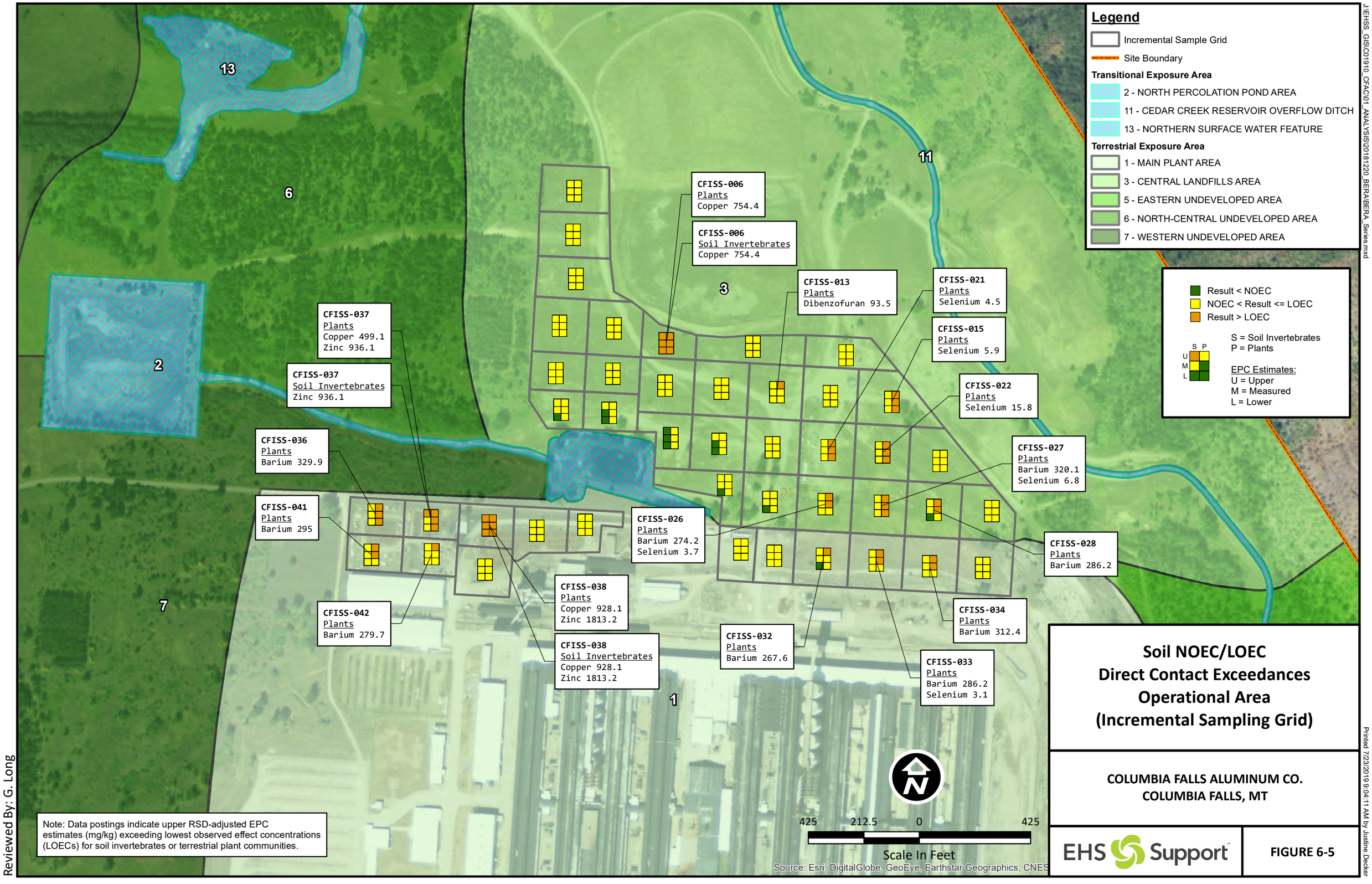

Note: Data postings indicate upper RSD-adjusted EPC estimates (mg/kg) exceeding lowest observed effect concentrations (LOECs) for soil invertebrates or terrestrial plant communities.

Soil NOEC/LOEC Direct Contact Exceedances Operational Area (Incremental Sampling Grid)

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-5

Reviewed By: G. Long

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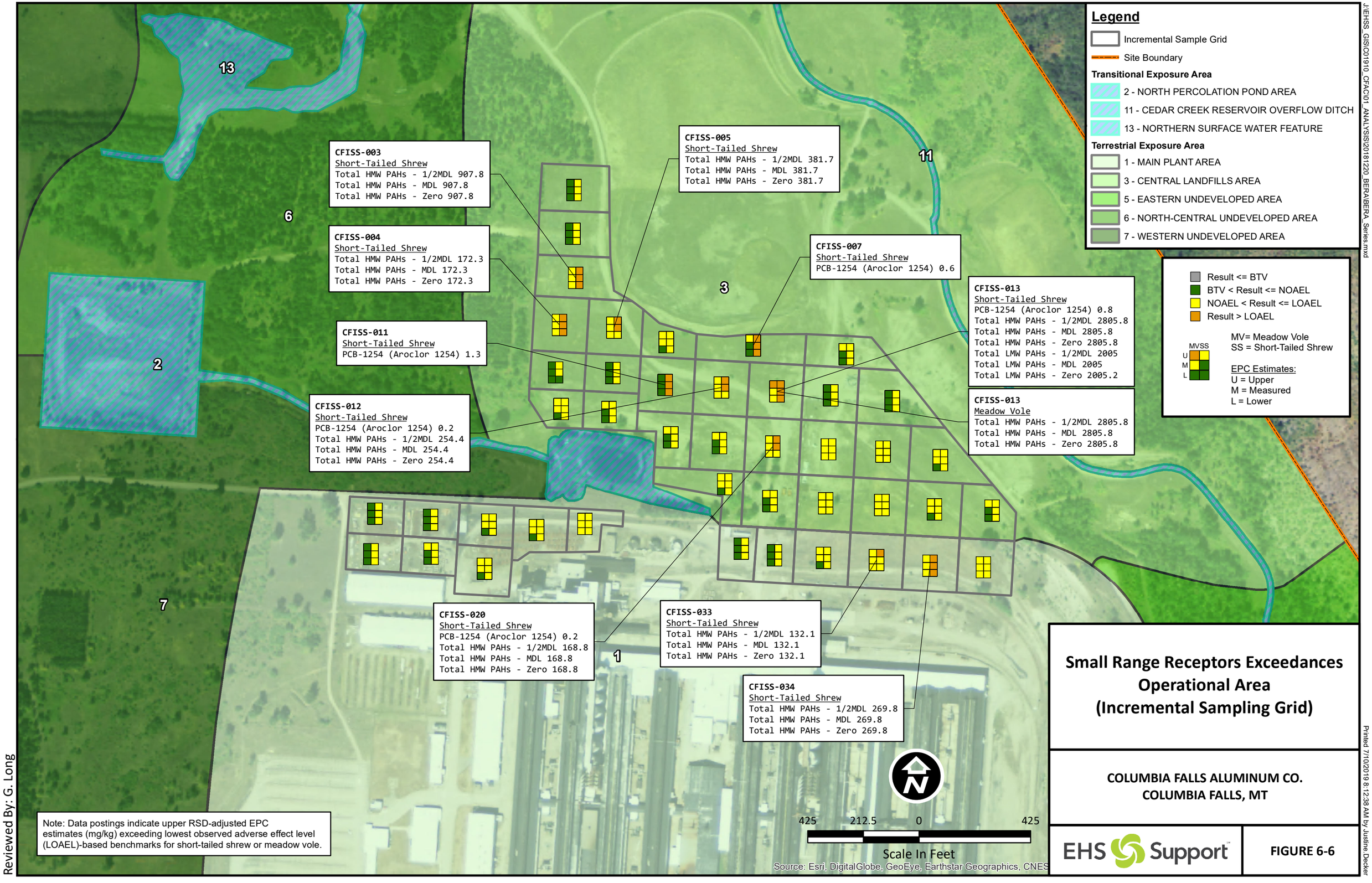

Note: Data postings indicate upper RSD-adjusted EPC estimates (mg/kg) exceeding lowest observed adverse effect level (LOAEL)-based benchmarks for short-tailed shrew or meadow vole.

Small Range Receptors Exceedances Operational Area (Incremental Sampling Grid)

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-6

Reviewed By: G. Long

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Note: Data postings indicate soil concentrations (mg/kg) exceeding lowest observed effect concentrations (LOECs) for soil invertebrates or terrestrial plant communities.

Reviewed By: G. Long

Soil NOEC/LOEC
Direct Contact Exceedances
Industrial Landfill

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-7

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Note: Data postings represent soil concentrations (mg/kg) exceeding lowest observed adverse effect level (LOAEL)-based benchmarks for short-tailed shrew or meadow vole.

Reviewed By: G. Long

Small Range Receptors Exceedances Industrial Landfill

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-8

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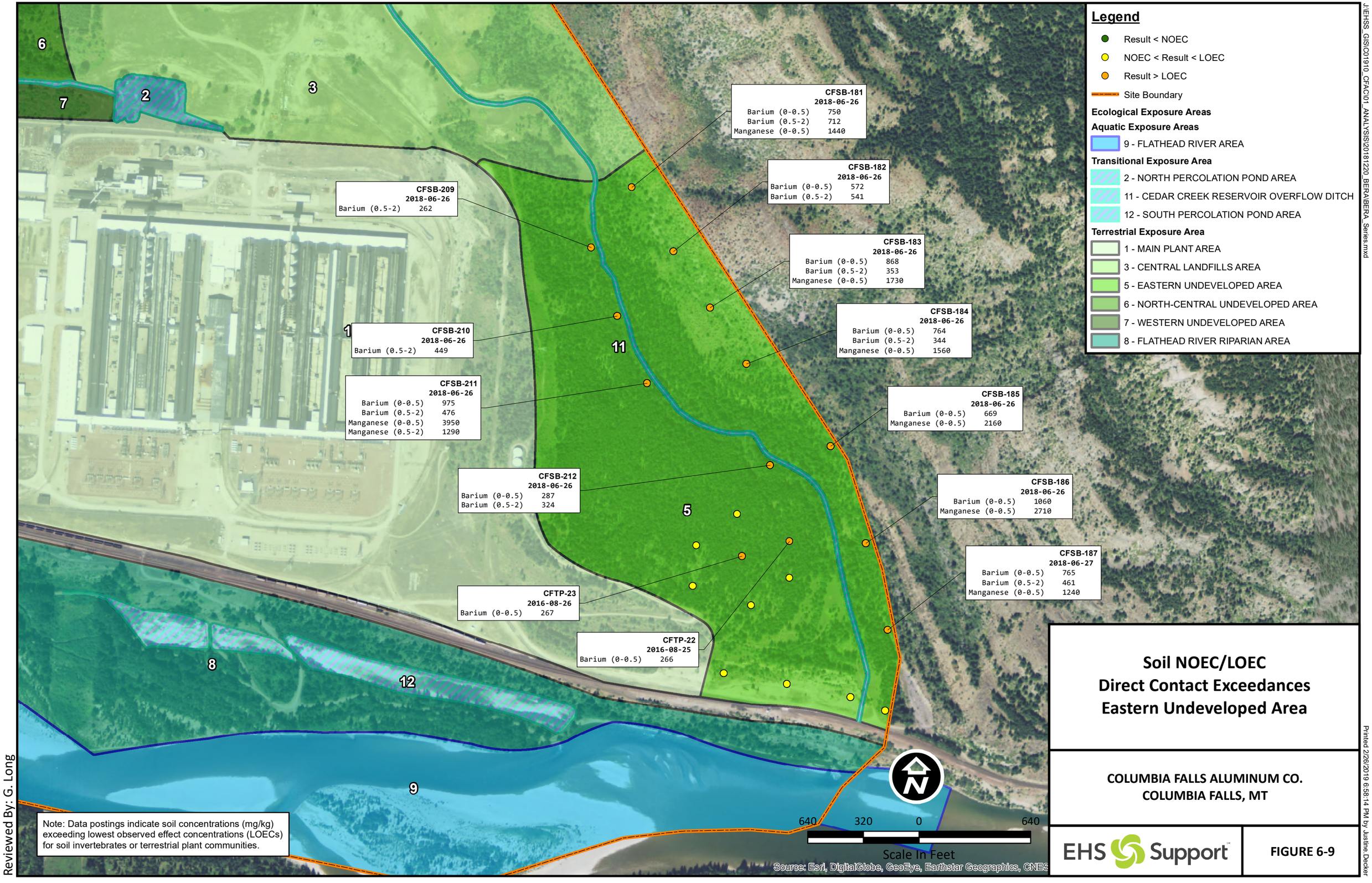

Soil NOEC/LOEC
Direct Contact Exceedances
Eastern Undeveloped Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-9

Reviewed By: G. Long

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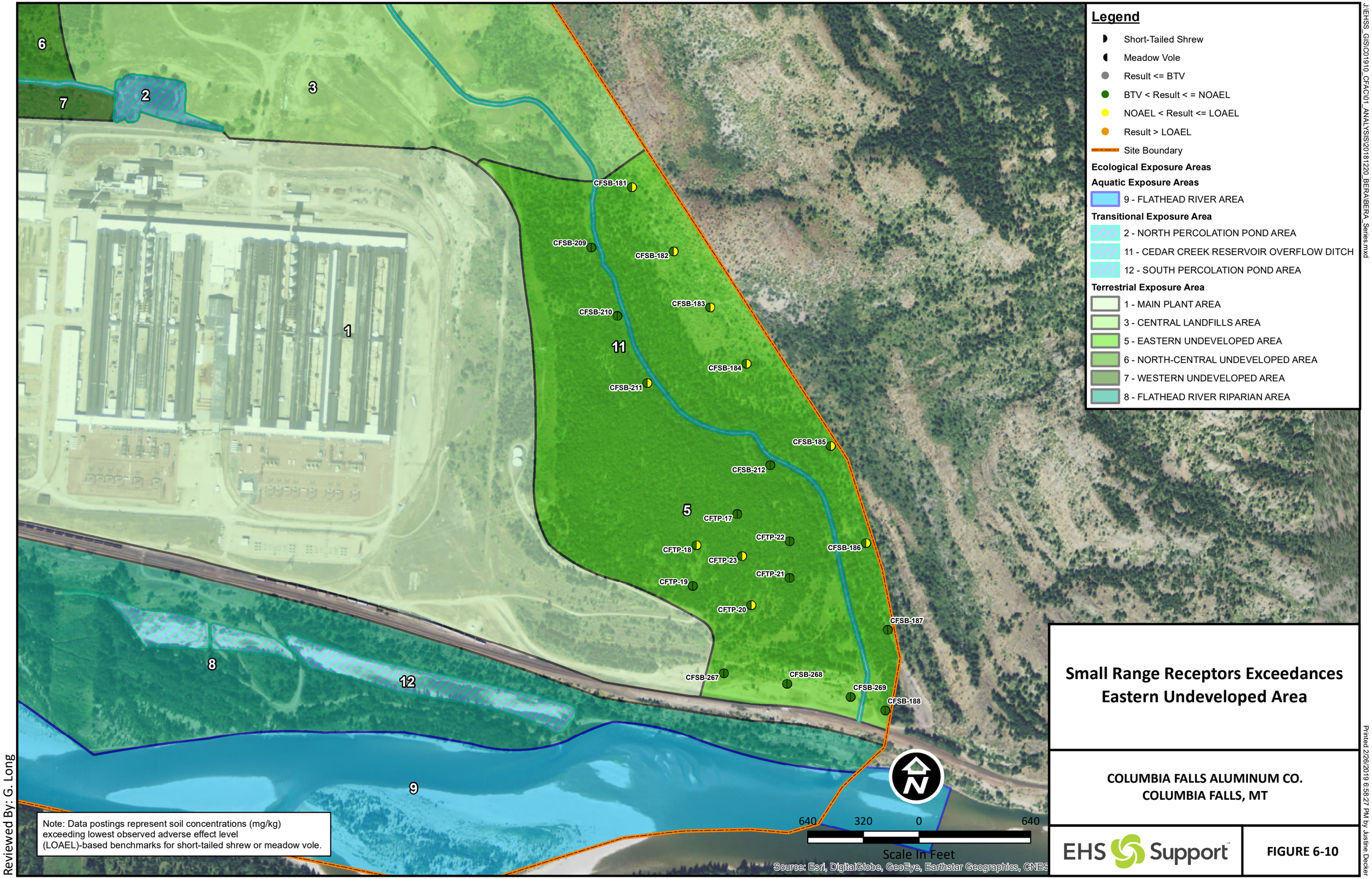

Note: Data postings represent soil concentrations (mg/kg) exceeding lowest observed adverse effect level (LOAEL)-based benchmarks for short-tailed shrew or meadow vole.

Reviewed By: G. Long

Small Range Receptors Exceedances Eastern Undeveloped Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-10

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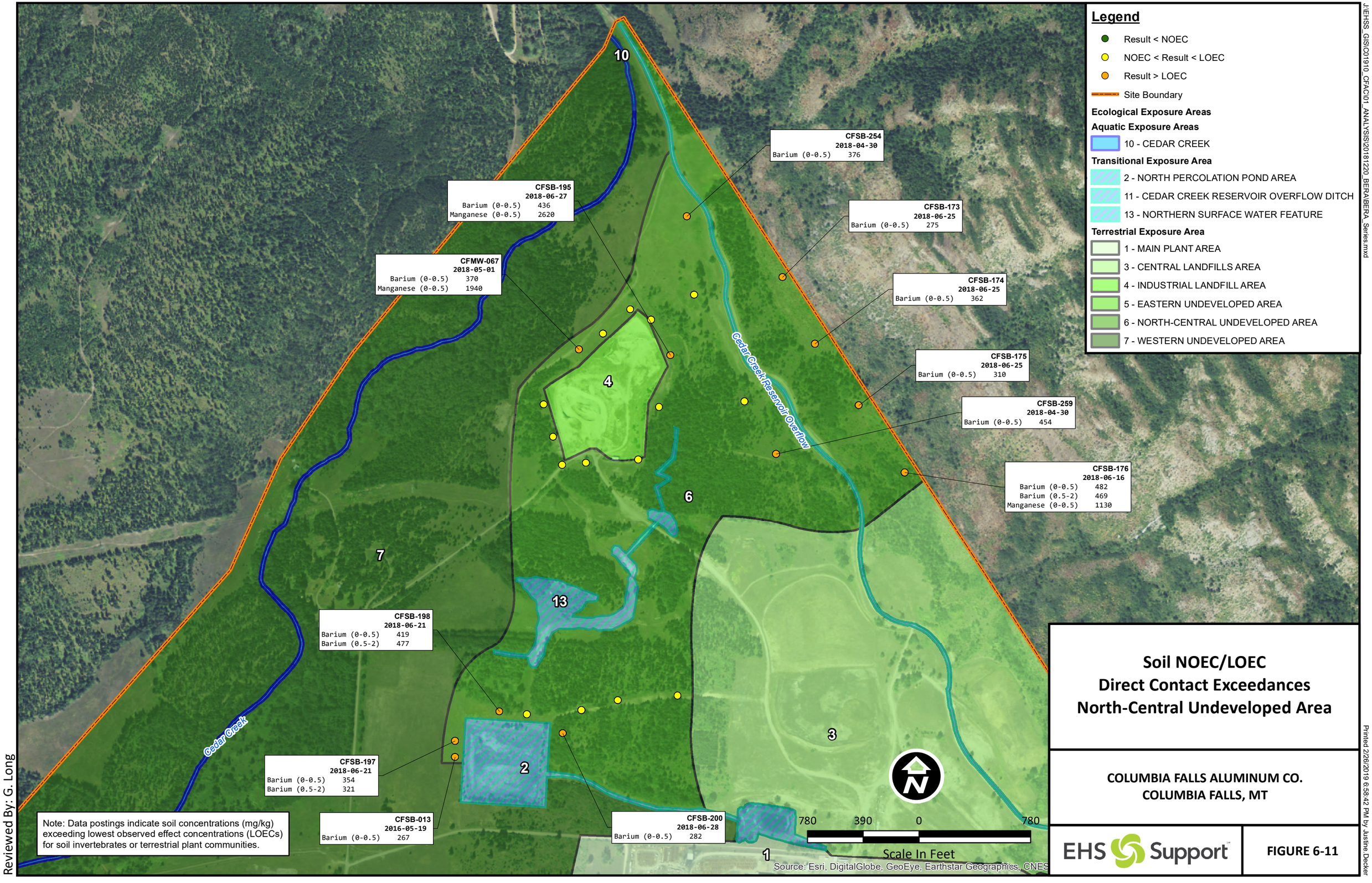

Note: Data postings indicate soil concentrations (mg/kg) exceeding lowest observed effect concentrations (LOECs) for soil invertebrates or terrestrial plant communities.

Reviewed By: G. Long

Soil NOEC/LOEC
Direct Contact Exceedances
North-Central Undeveloped Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-11

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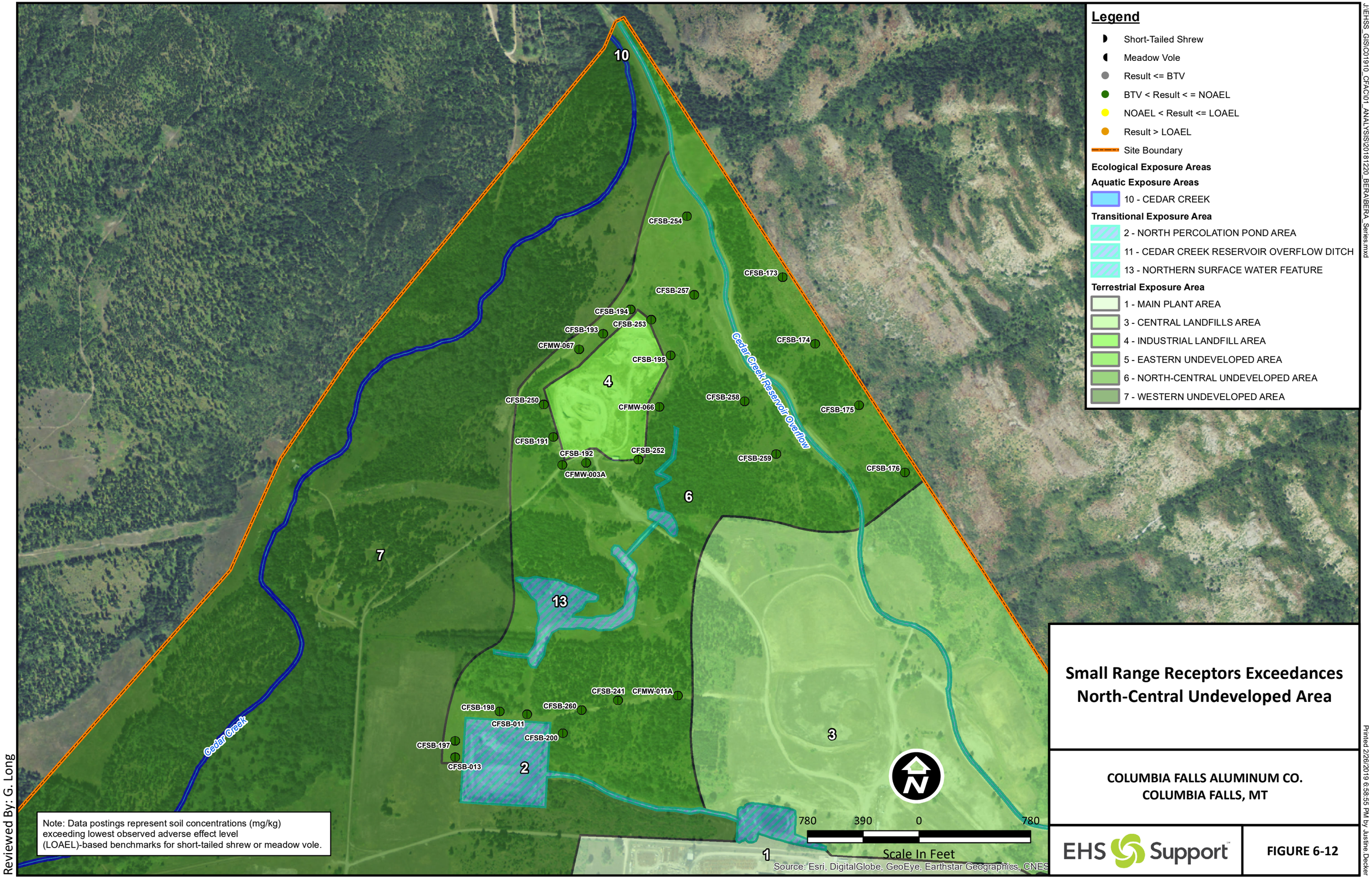

Legend

- Short-Tailed Shrew
- Meadow Vole
- Result <= BTV
- BTV < Result < = NOAEL
- NOAEL < Result <= LOAEL
- Result > LOAEL
- Site Boundary

Ecological Exposure Areas

Aquatic Exposure Areas

- 10 - CEDAR CREEK

Transitional Exposure Area

- 2 - NORTH PERCOLATION POND AREA
- 11 - CEDAR CREEK RESERVOIR OVERFLOW DITCH
- 13 - NORTHERN SURFACE WATER FEATURE

Terrestrial Exposure Area

- 1 - MAIN PLANT AREA
- 3 - CENTRAL LANDFILLS AREA
- 4 - INDUSTRIAL LANDFILL AREA
- 5 - EASTERN UNDEVELOPED AREA
- 6 - NORTH-CENTRAL UNDEVELOPED AREA
- 7 - WESTERN UNDEVELOPED AREA

Note: Data postings represent soil concentrations (mg/kg) exceeding lowest observed adverse effect level (LOAEL)-based benchmarks for short-tailed shrew or meadow vole.

Small Range Receptors Exceedances North-Central Undeveloped Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

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FIGURE 6-12

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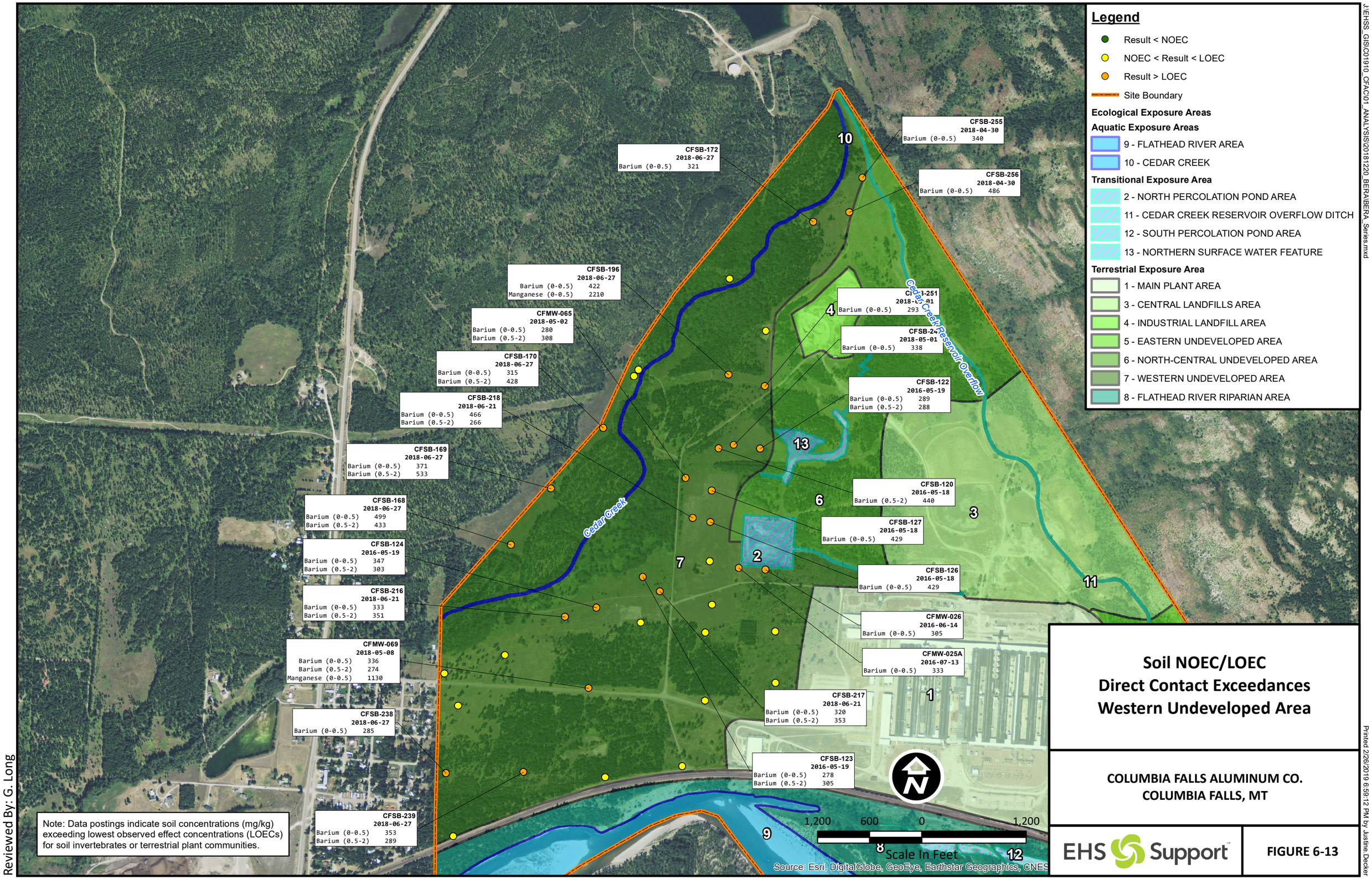

Legend

- Result < NOEC
- NOEC < Result < LOEC
- Result > LOEC
- Site Boundary

Ecological Exposure Areas

Aquatic Exposure Areas

- 9 - FLATHEAD RIVER AREA
- 10 - CEDAR CREEK

Transitional Exposure Area

- 2 - NORTH PERCOLATION POND AREA
- 11 - CEDAR CREEK RESERVOIR OVERFLOW DITCH
- 12 - SOUTH PERCOLATION POND AREA
- 13 - NORTHERN SURFACE WATER FEATURE

Terrestrial Exposure Area

- 1 - MAIN PLANT AREA
- 3 - CENTRAL LANDFILLS AREA
- 4 - INDUSTRIAL LANDFILL AREA
- 5 - EASTERN UNDEVELOPED AREA
- 6 - NORTH-CENTRAL UNDEVELOPED AREA
- 7 - WESTERN UNDEVELOPED AREA
- 8 - FLATHEAD RIVER RIPARIAN AREA

Note: Data postings indicate soil concentrations (mg/kg) exceeding lowest observed effect concentrations (LOECs) for soil invertebrates or terrestrial plant communities.

Soil NOEC/LOEC
Direct Contact Exceedances
Western Undeveloped Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

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FIGURE 6-13

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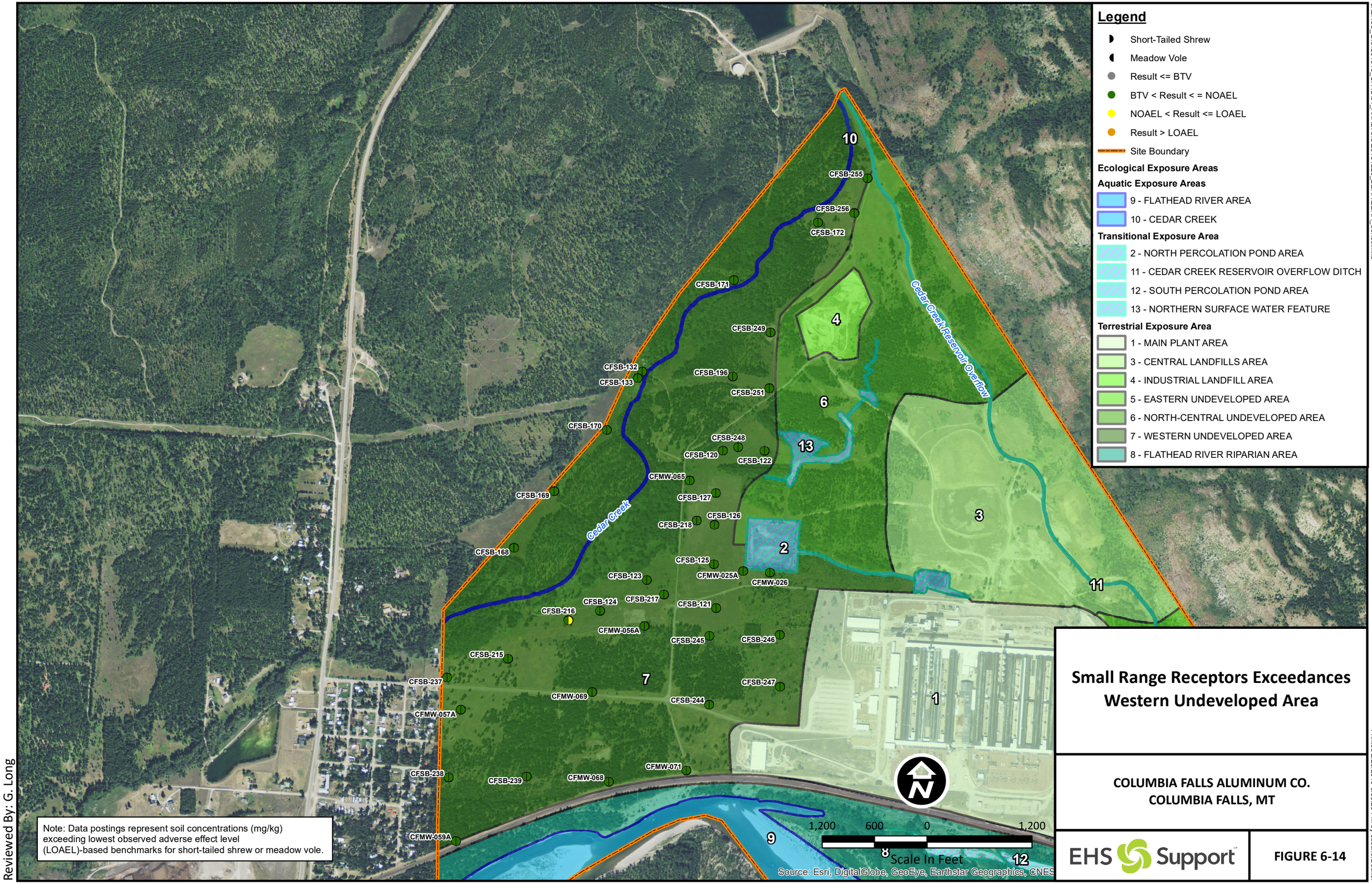

Legend

- Short-Tailed Shrew
- Meadow Vole
- Result <= BTV
- BTV < Result < = NOAEL
- NOAEL < Result <= LOAEL
- Result > LOAEL
- Site Boundary

Ecological Exposure Areas

Aquatic Exposure Areas

- 9 - FLATHEAD RIVER AREA
- 10 - CEDAR CREEK

Transitional Exposure Area

- 2 - NORTH PERCOLATION POND AREA
- 11 - CEDAR CREEK RESERVOIR OVERFLOW DITCH
- 12 - SOUTH PERCOLATION POND AREA
- 13 - NORTHERN SURFACE WATER FEATURE

Terrestrial Exposure Area

- 1 - MAIN PLANT AREA
- 3 - CENTRAL LANDFILLS AREA
- 4 - INDUSTRIAL LANDFILL AREA
- 5 - EASTERN UNDEVELOPED AREA
- 6 - NORTH-CENTRAL UNDEVELOPED AREA
- 7 - WESTERN UNDEVELOPED AREA
- 8 - FLATHEAD RIVER RIPARIAN AREA

Note: Data postings represent soil concentrations (mg/kg) exceeding lowest observed adverse effect level (LOAEL)-based benchmarks for short-tailed shrew or meadow vole.

Small Range Receptors Exceedances Western Undeveloped Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

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FIGURE 6-14

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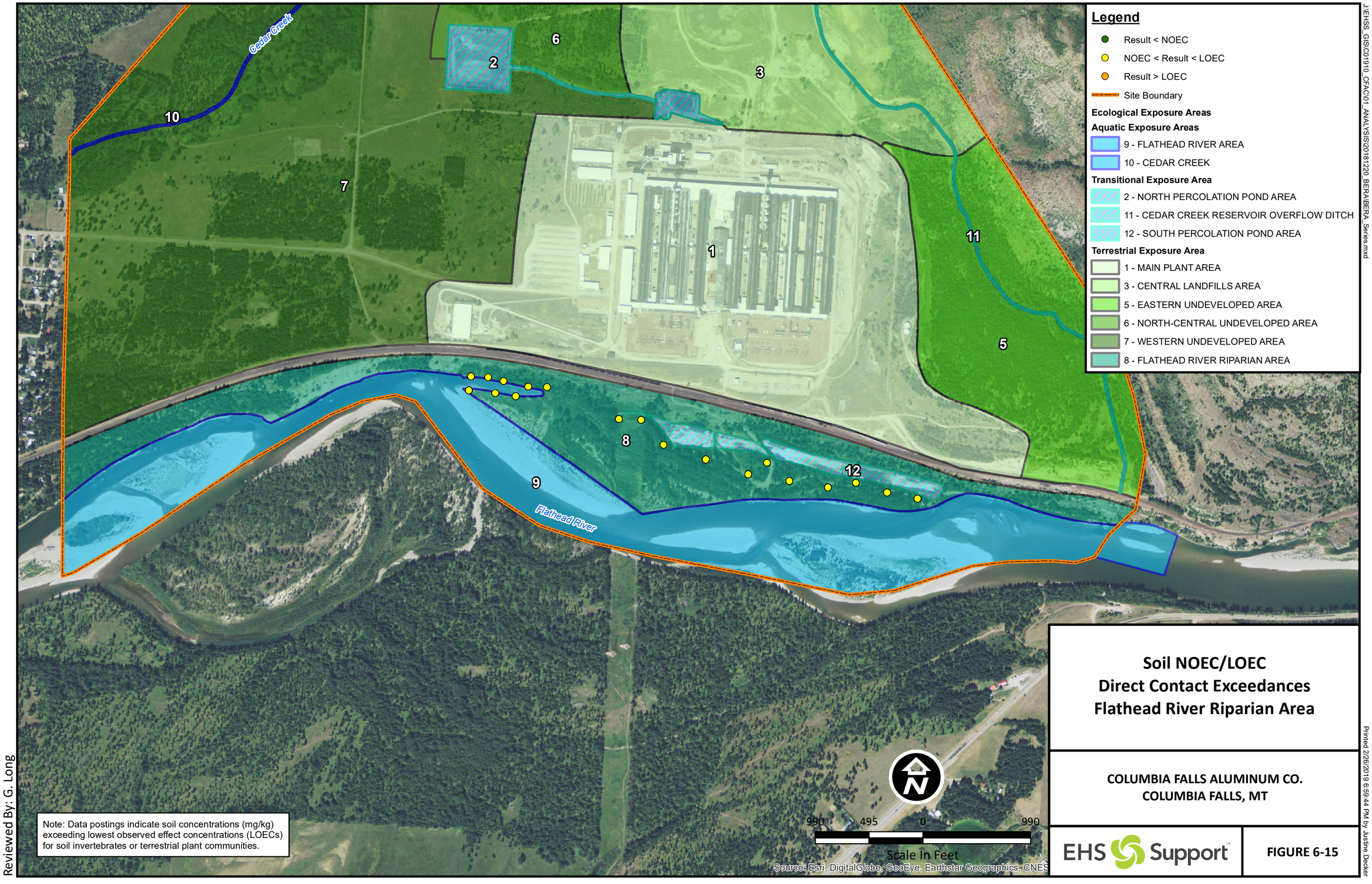

Note: Data postings indicate soil concentrations (mg/kg) exceeding lowest observed effect concentrations (LOECs) for soil invertebrates or terrestrial plant communities.

Soil NOEC/LOEC
Direct Contact Exceedances
Flathead River Riparian Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

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FIGURE 6-15

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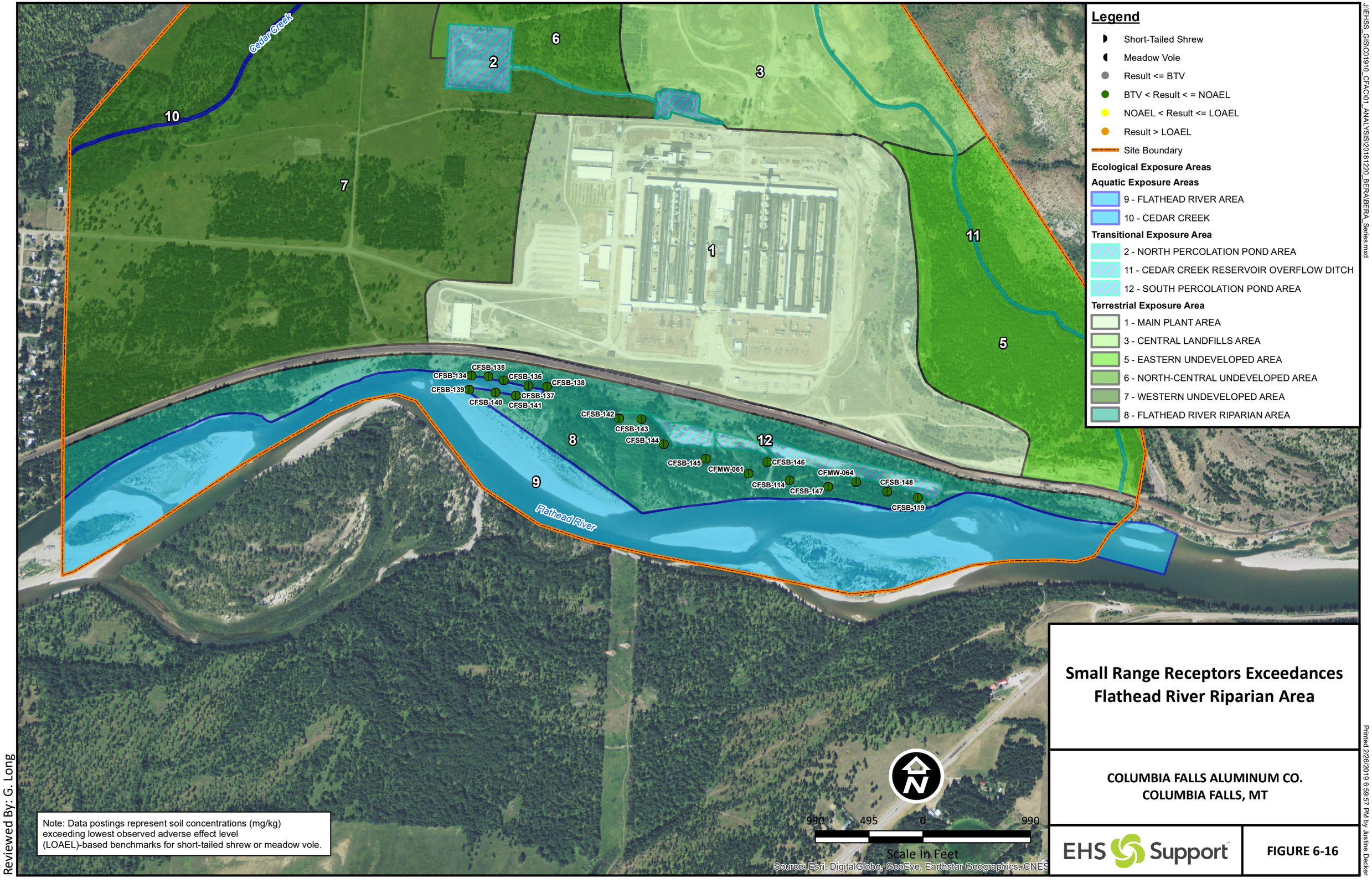

Note: Data postings represent soil concentrations (mg/kg) exceeding lowest observed adverse effect level (LOAEL)-based benchmarks for short-tailed shrew or meadow vole.

Small Range Receptors Exceedances Flathead River Riparian Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

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FIGURE 6-16

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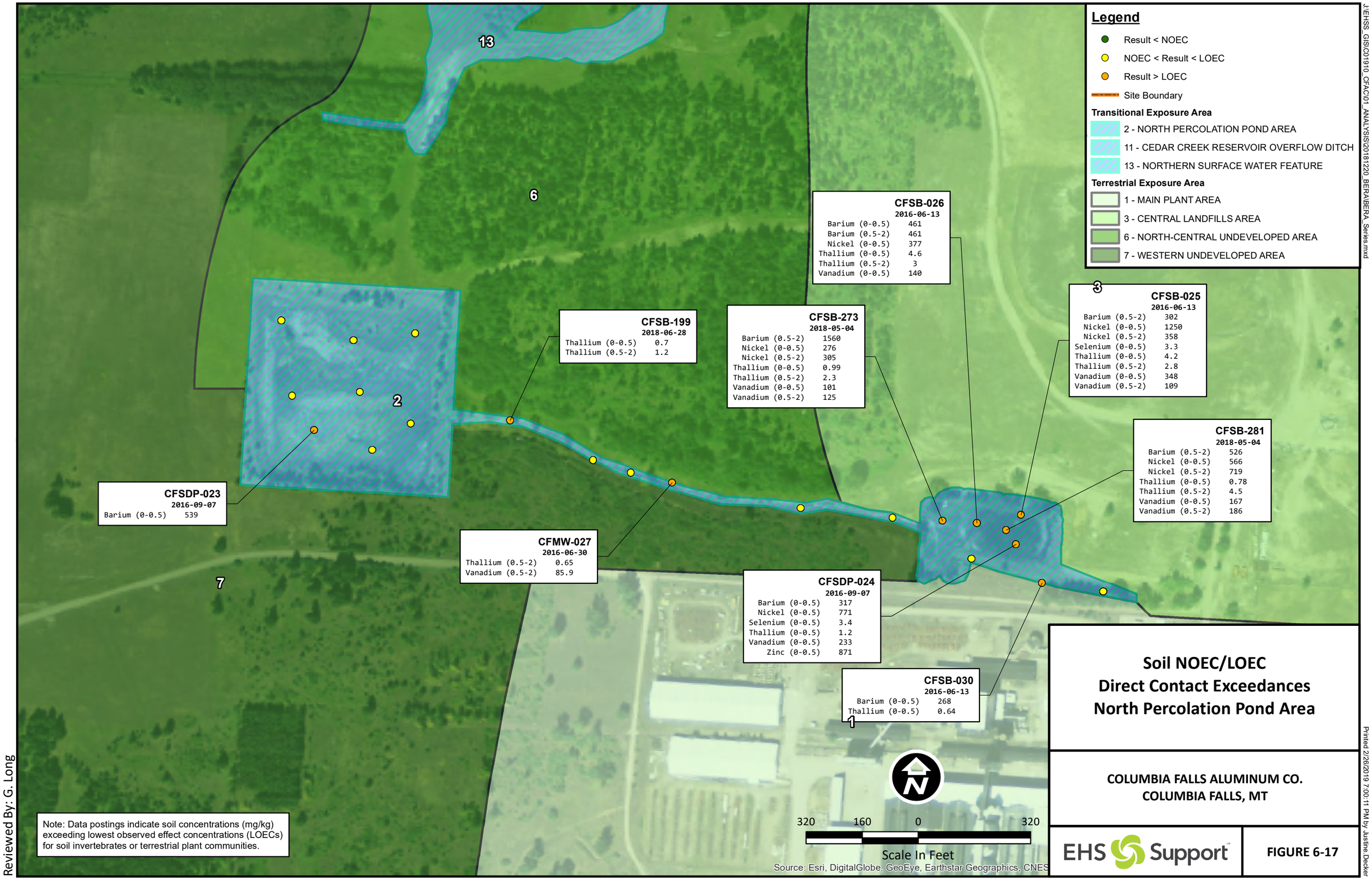

Note: Data postings indicate soil concentrations (mg/kg) exceeding lowest observed effect concentrations (LOECs) for soil invertebrates or terrestrial plant communities.

Soil NOEC/LOEC
Direct Contact Exceedances
North Percolation Pond Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

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FIGURE 6-17

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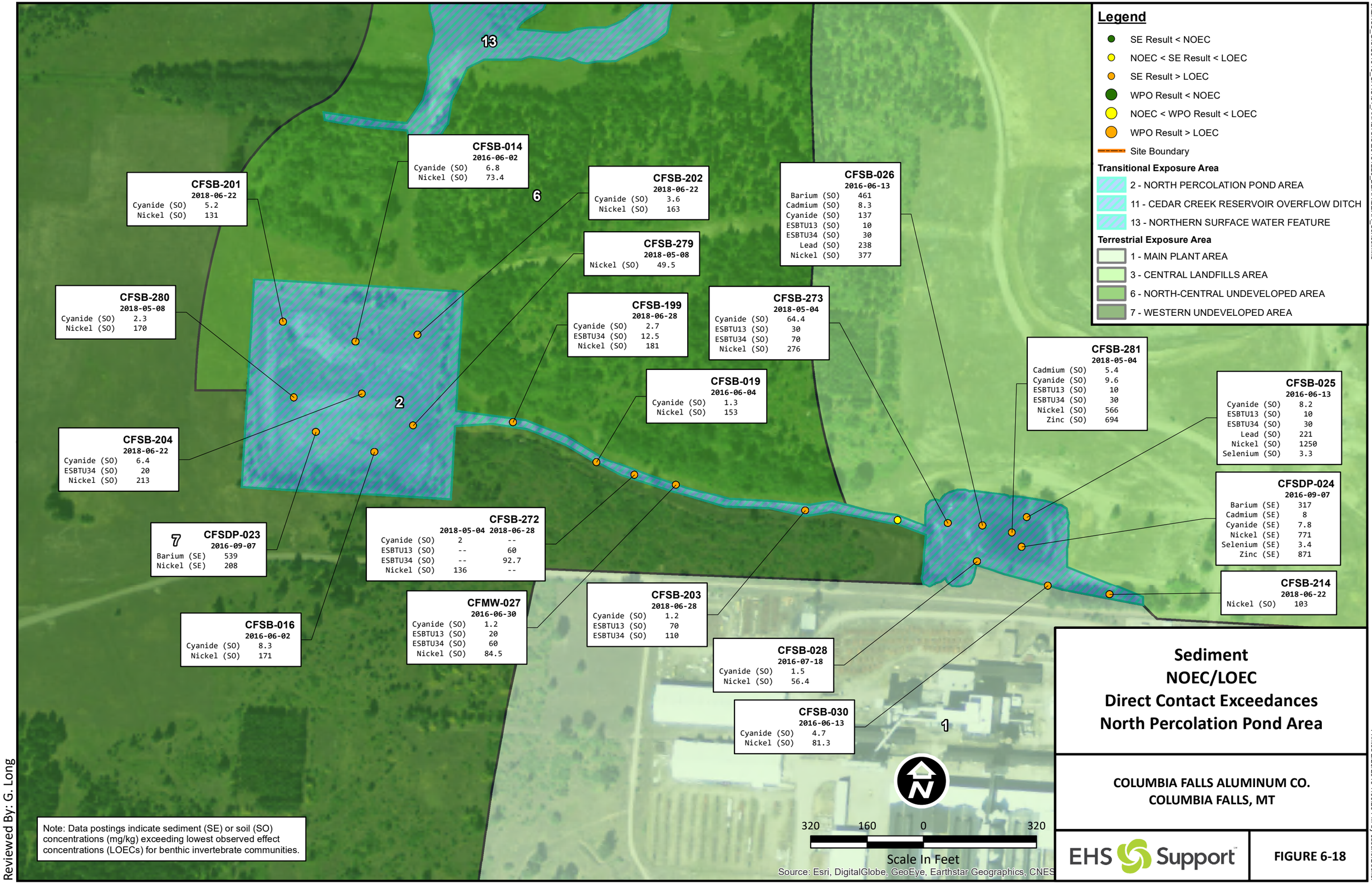

Note: Data postings indicate sediment (SE) or soil (SO) concentrations (mg/kg) exceeding lowest observed effect concentrations (LOECs) for benthic invertebrate communities.

Sediment NOEC/LOEC Direct Contact Exceedances North Percolation Pond Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

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FIGURE 6-18

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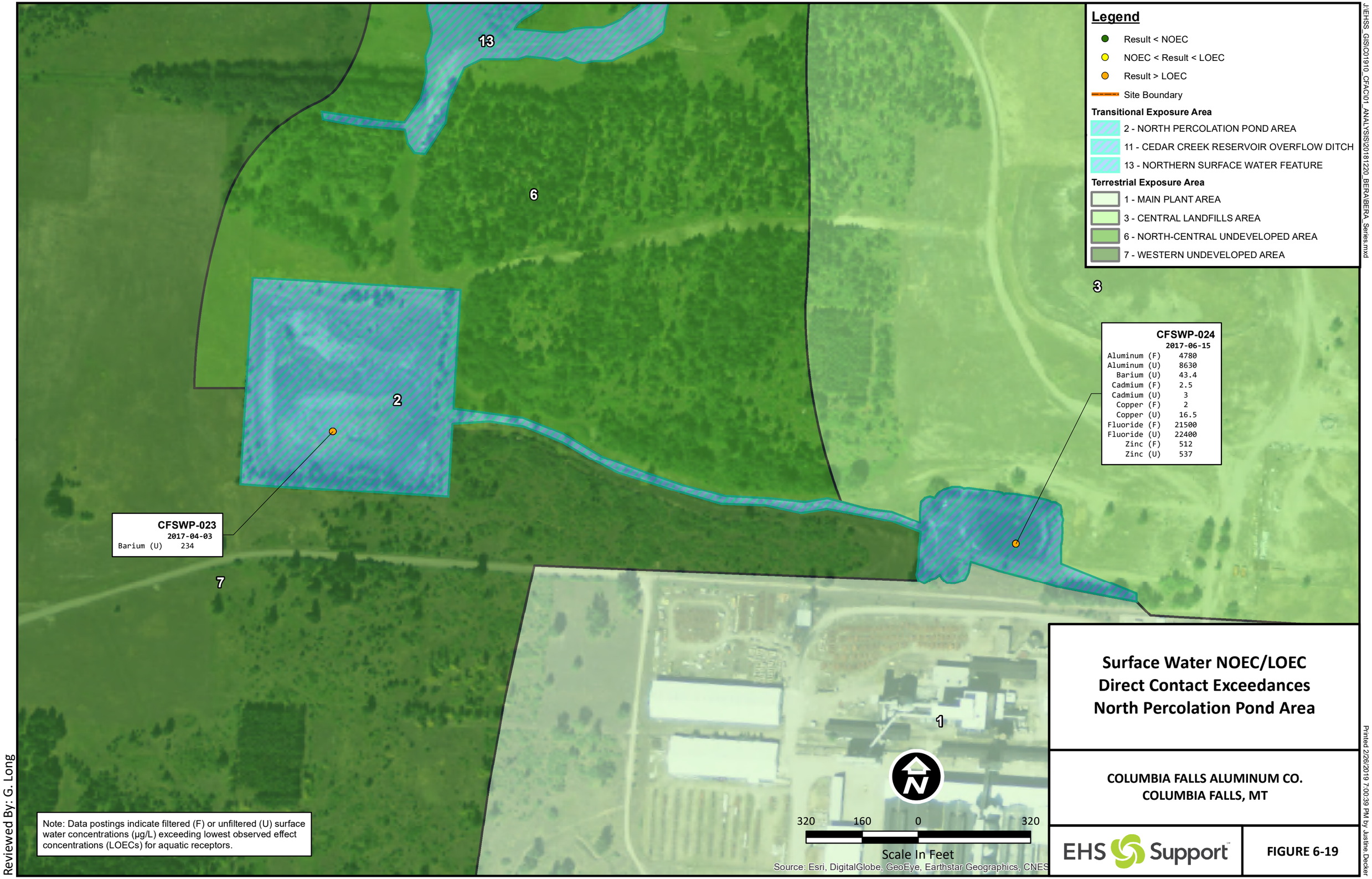

Note: Data postings indicate filtered (F) or unfiltered (U) surface water concentrations (µg/L) exceeding lowest observed effect concentrations (LOECs) for aquatic receptors.

Surface Water NOEC/LOEC Direct Contact Exceedances North Percolation Pond Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

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FIGURE 6-19

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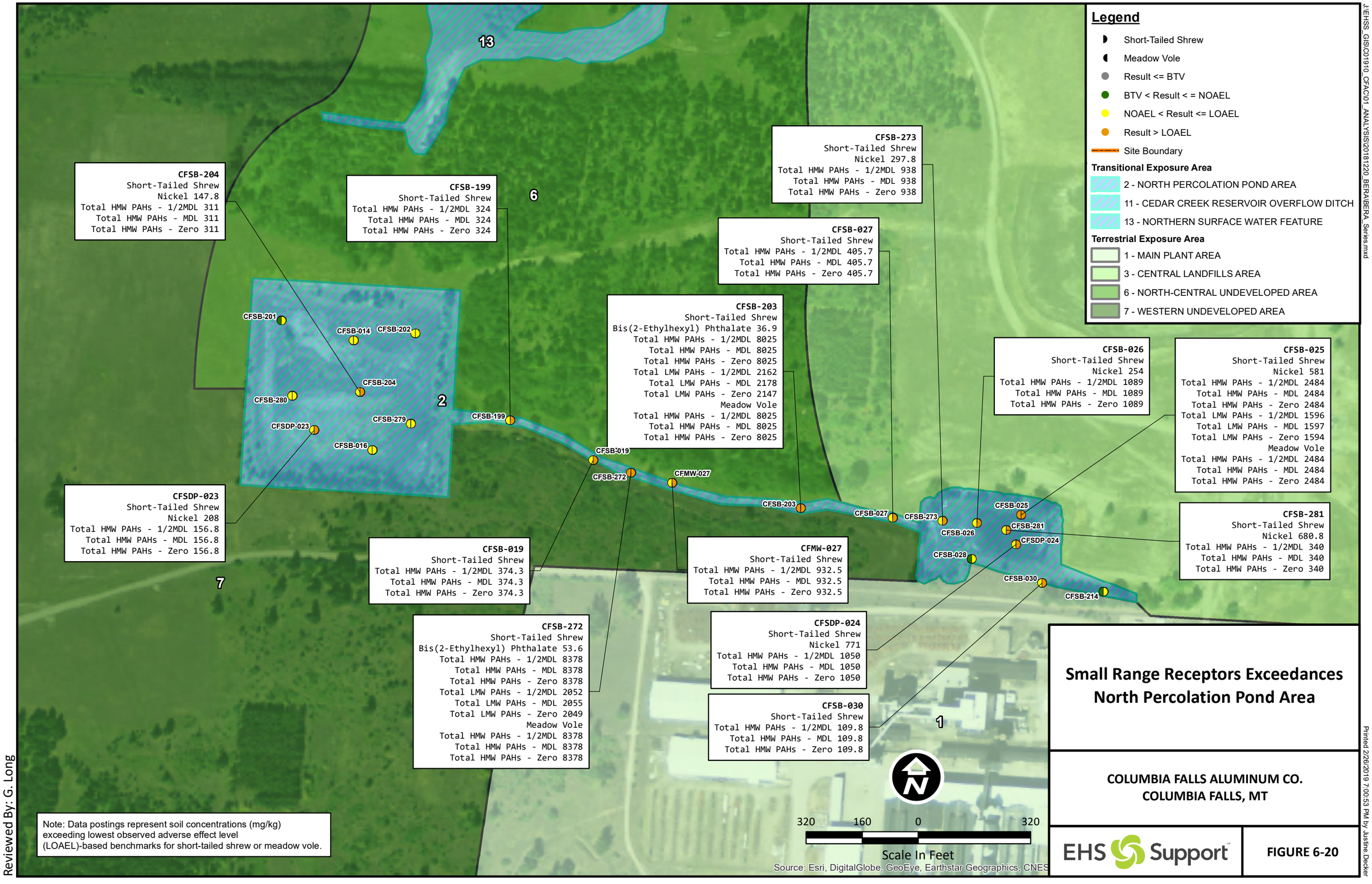

Note: Data postings represent soil concentrations (mg/kg) exceeding lowest observed adverse effect level (LOAEL)-based benchmarks for short-tailed shrew or meadow vole.

Small Range Receptors Exceedances North Percolation Pond Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-20

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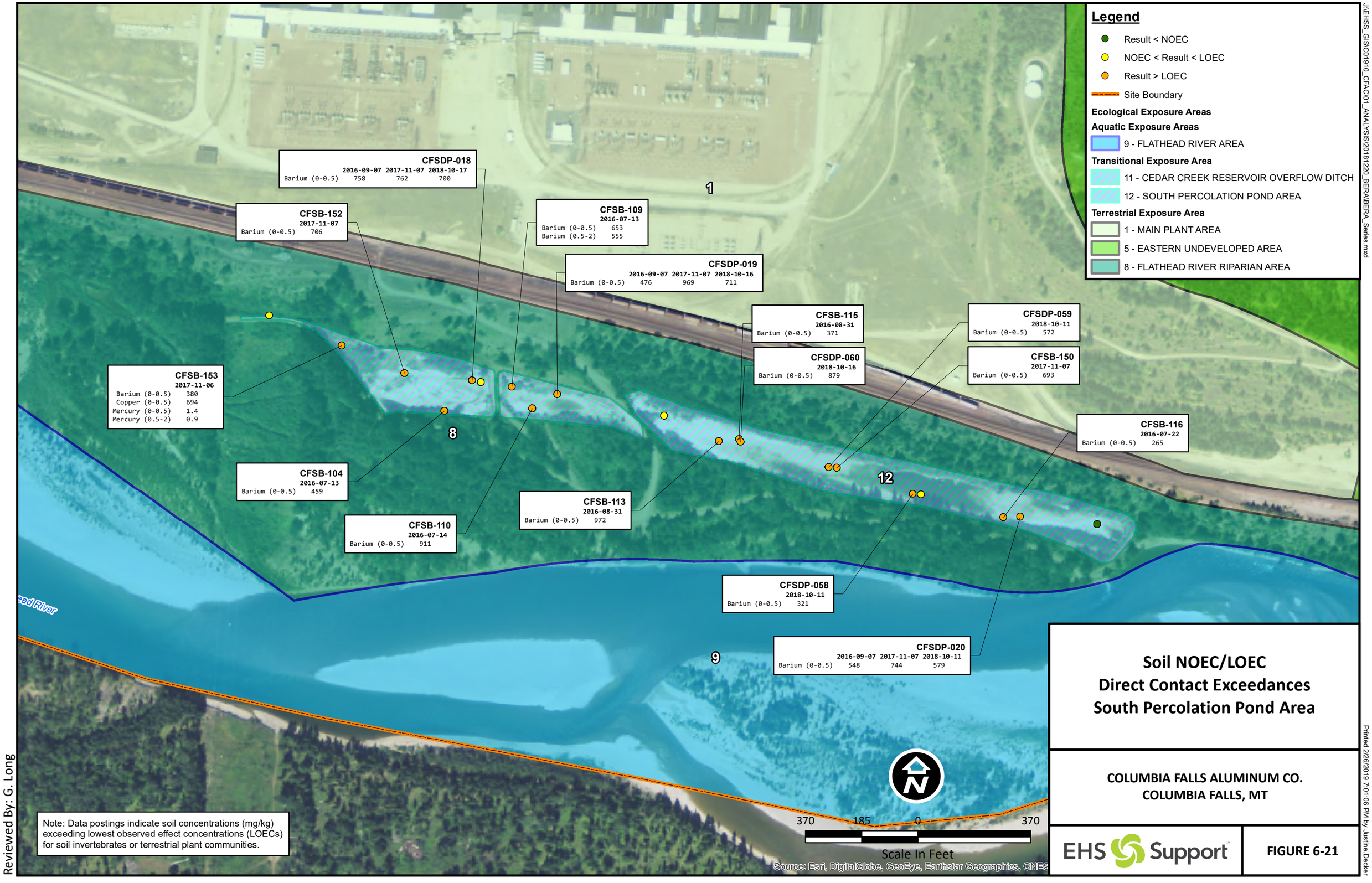
CFSDP-018
2016-09-07 2017-11-07 2018-10-17
Barium (0-0.5) 758 762 700
CFSB-152
2017-11-07
Barium (0-0.5) 706
CFSB-109
2016-07-13
Barium (0-0.5) 653
Barium (0.5-2) 555
CFSDP-019
2016-09-07 2017-11-07 2018-10-16
Barium (0-0.5) 476 969 711
CFSB-115
2016-08-31
Barium (0-0.5) 371
CFSDP-059
2018-10-11
Barium (0-0.5) 572
CFSDP-060
2018-10-16
Barium (0-0.5) 879
CFSB-150
2017-11-07
Barium (0-0.5) 693
CFSB-153
2017-11-06
Barium (0-0.5) 380
Copper (0-0.5) 694
Mercury (0-0.5) 1.4
Mercury (0.5-2) 0.9
CFSB-116
2016-07-22
Barium (0-0.5) 265
CFSB-104
2016-07-13
Barium (0-0.5) 459
CFSB-113
2016-08-31
Barium (0-0.5) 972
CFSB-110
2016-07-14
Barium (0-0.5) 911
CFSDP-058
2018-10-11
Barium (0-0.5) 321
CFSDP-020
2016-09-07 2017-11-07 2018-10-11
Barium (0-0.5) 548 744 579
1
8
9
12
ead River
370 185 0 370
Scale In Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES
Legend
Result < NOEC
NOEC < Result < LOEC
Result > LOEC
Site Boundary
Ecological Exposure Areas
Aquatic Exposure Areas
9 - FLATHEAD RIVER AREA
Transitional Exposure Area
11 - CEDAR CREEK RESERVOIR OVERFLOW DITCH
12 - SOUTH PERCOLATION POND AREA
Terrestrial Exposure Area
1 - MAIN PLANT AREA
5 - EASTERN UNDEVELOPED AREA
8 - FLATHEAD RIVER RIPARIAN AREA
Note: Data postings indicate soil concentrations (mg/kg) exceeding lowest observed effect concentrations (LOECs) for soil invertebrates or terrestrial plant communities.
Soil NOEC/LOEC
Direct Contact Exceedances
South Percolation Pond Area
COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT
EHS Support
FIGURE 6-21
Reviewed By: G. Long
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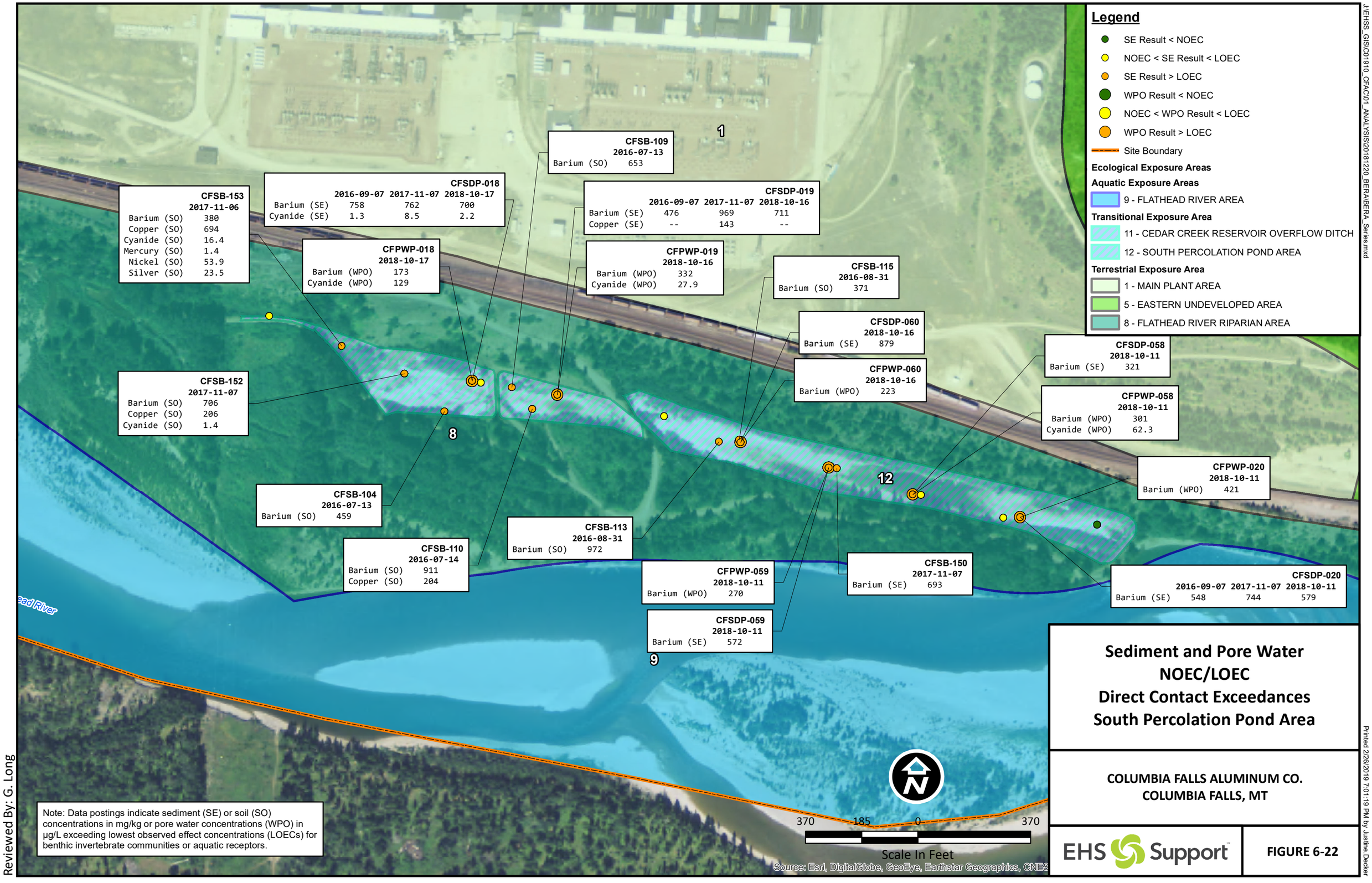

Note: Data postings indicate sediment (SE) or soil (SO) concentrations in mg/kg or pore water concentrations (WPO) in µg/L exceeding lowest observed effect concentrations (LOECs) for benthic invertebrate communities or aquatic receptors.

Sediment and Pore Water NOEC/LOEC Direct Contact Exceedances South Percolation Pond Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

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FIGURE 6-22

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	CFSWP-018					
	2016-06-06	2016-12-01	2017-04-03	2017-06-15	2018-06-21	2018-10-17
Barium (F)	--	--	--	194	183	148
Barium (U)	268	225	237	237	186	262
Cyanide (F)	--	--	--	68.2	--	--
Cyanide (U)	--	--	--	77.2	139	--

	CFSWP-019						
	2016-06-06	2016-12-01	2017-04-03	2017-06-15	2017-11-07	2018-06-21	2018-10-16
Aluminum (F)	--	--	--	--	2360	--	--
Aluminum (U)	--	--	--	--	4330	--	--
Barium (F)	--	--	--	248	527	265	127
Barium (U)	265	156	244	250	713	273	213
Copper (F)	--	--	--	--	33.4	--	--
Copper (U)	--	--	--	--	75.9	--	--

	CFSWP-059	
	2018-06-22	2018-10-11
Barium (F)	267	257
Barium (U)	286	283

	CFSWP-058	
	2018-06-21	2018-10-11
Aluminum (F)	--	752
Barium (F)	261	452
Barium (U)	263	358
Cyanide (U)	--	30.8

	CFSWP-060	
	2018-06-22	2018-10-16
Barium (F)	263	234
Barium (U)	264	272

	CFSWP-020						
	2016-06-06	2016-12-01	2017-03-16	2017-06-15	2017-11-07	2018-06-21	2018-10-11
Aluminum (U)	--	--	--	--	24500	--	--
Barium (F)	--	--	--	270	334	257	119
Barium (U)	305	424	239	275	2710	255	172
Cyanide (F)	--	--	--	--	58.8	--	--
Cyanide (U)	--	--	--	--	57.2	--	--
Iron (U)	--	--	--	--	22500	--	--

Legend

- Result < NOEC
- NOEC < Result < LOEC
- Result > LOEC
- Site Boundary

Ecological Exposure Areas

Aquatic Exposure Areas

- 9 - FLATHEAD RIVER AREA

Transitional Exposure Area

- 11 - CEDAR CREEK RESERVOIR OVERFLOW DITCH
- 12 - SOUTH PERCOLATION POND AREA

Terrestrial Exposure Area

- 1 - MAIN PLANT AREA
- 5 - EASTERN UNDEVELOPED AREA
- 8 - FLATHEAD RIVER RIPARIAN AREA

1

8

12

9

ead River

Note: Data postings indicate filtered (F) or unfiltered (U) surface water concentrations (µg/L) exceeding lowest observed effect concentrations (LOECs) for aquatic receptors.

370 185 0 370

Scale In Feet

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES

Surface Water NOEC/LOEC Direct Contact Exceedances South Percolation Pond Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-23

Reviewed By: G. Long

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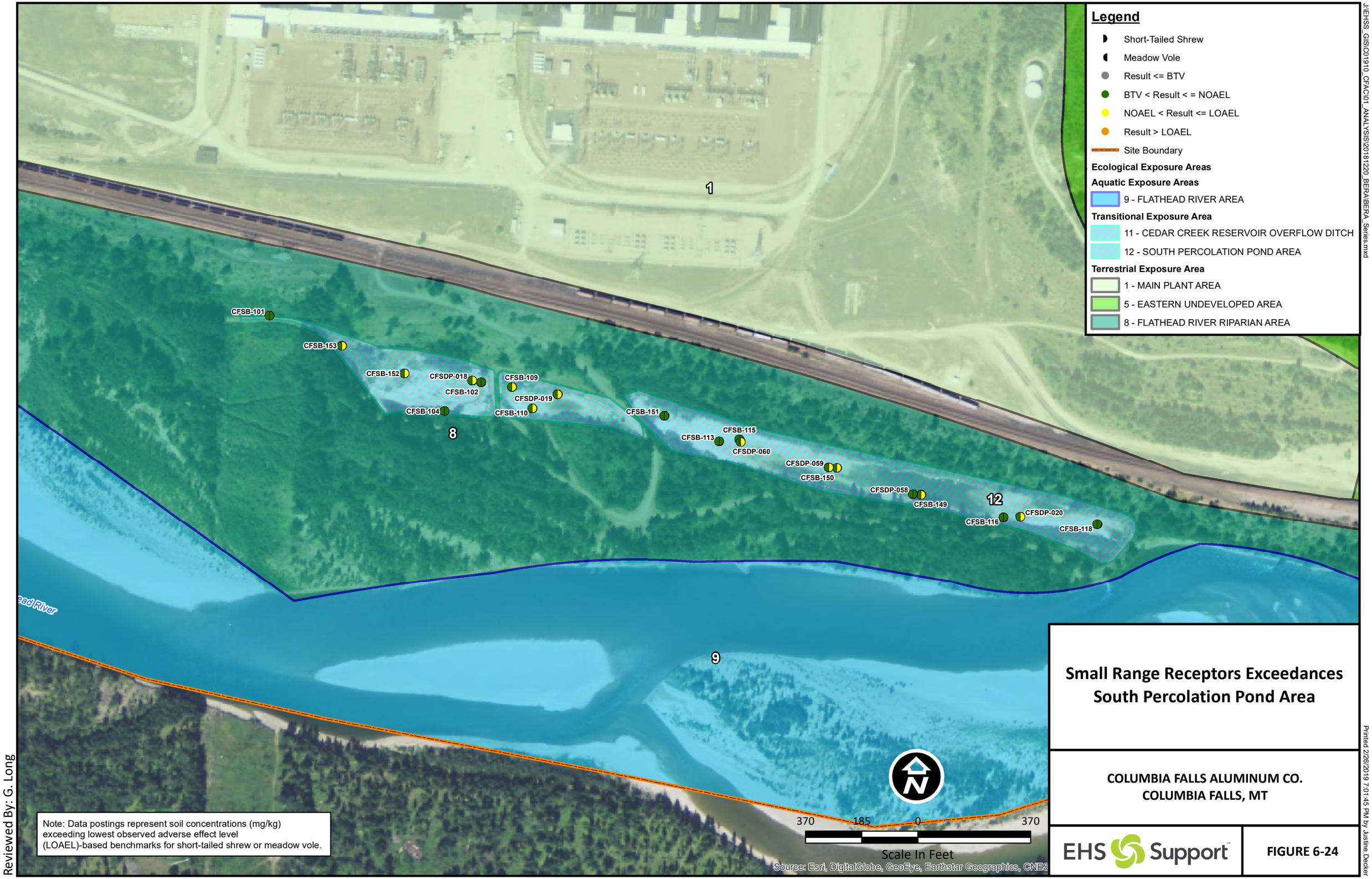

Note: Data postings represent soil concentrations (mg/kg) exceeding lowest observed adverse effect level (LOAEL)-based benchmarks for short-tailed shrew or meadow vole.

Small Range Receptors Exceedances South Percolation Pond Area

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-24

Reviewed By: G. Long

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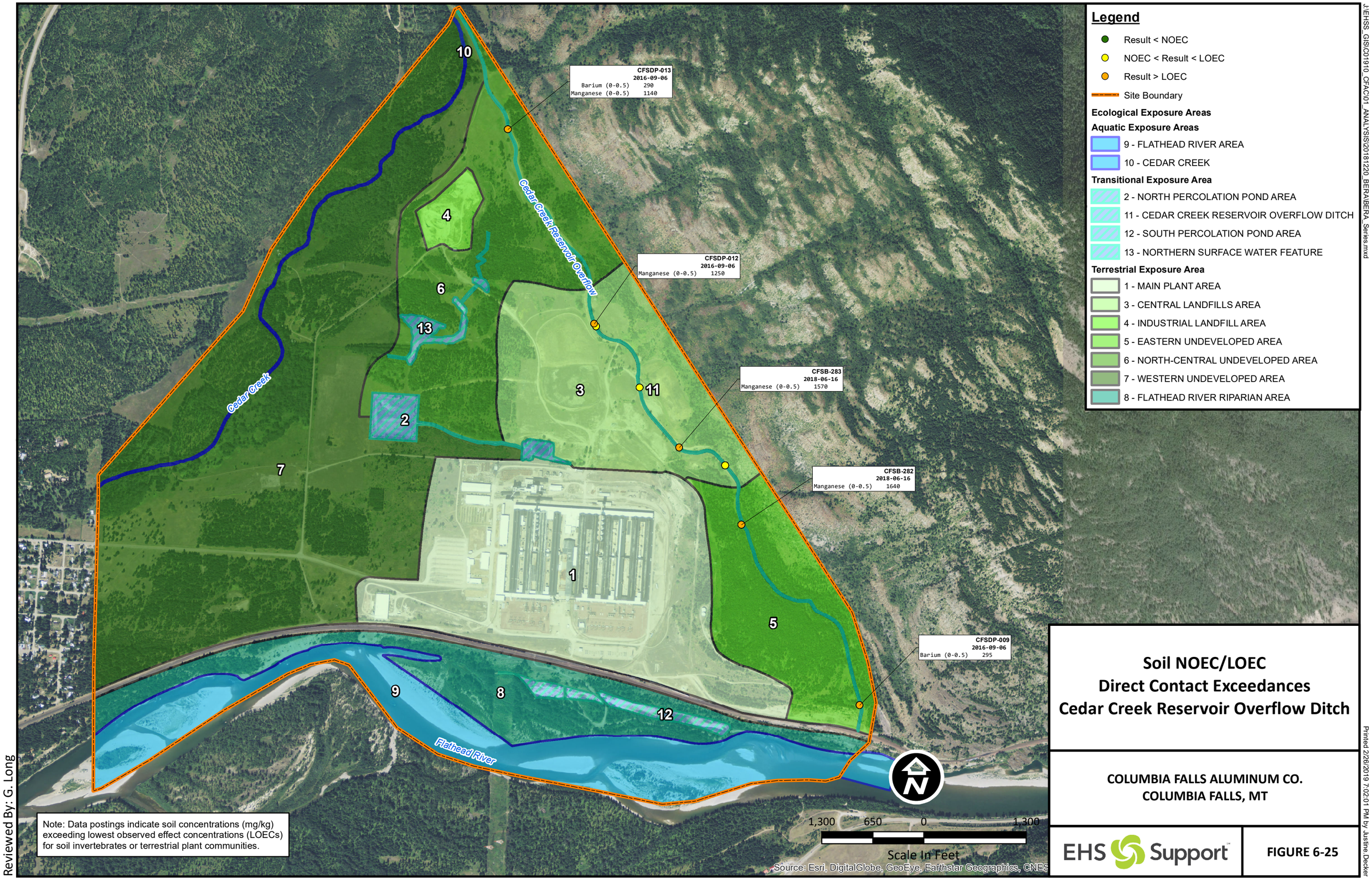

Legend

- Result < NOEC
- NOEC < Result < LOEC
- Result > LOEC
- Site Boundary

Ecological Exposure Areas

Aquatic Exposure Areas

- 9 - FLATHEAD RIVER AREA
- 10 - CEDAR CREEK

Transitional Exposure Area

- 2 - NORTH PERCOLATION POND AREA
- 11 - CEDAR CREEK RESERVOIR OVERFLOW DITCH
- 12 - SOUTH PERCOLATION POND AREA
- 13 - NORTHERN SURFACE WATER FEATURE

Terrestrial Exposure Area

- 1 - MAIN PLANT AREA
- 3 - CENTRAL LANDFILLS AREA
- 4 - INDUSTRIAL LANDFILL AREA
- 5 - EASTERN UNDEVELOPED AREA
- 6 - NORTH-CENTRAL UNDEVELOPED AREA
- 7 - WESTERN UNDEVELOPED AREA
- 8 - FLATHEAD RIVER RIPARIAN AREA

Note: Data postings indicate soil concentrations (mg/kg) exceeding lowest observed effect concentrations (LOECs) for soil invertebrates or terrestrial plant communities.

Soil NOEC/LOEC
Direct Contact Exceedances
Cedar Creek Reservoir Overflow Ditch

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

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FIGURE 6-25

Reviewed By: G. Long

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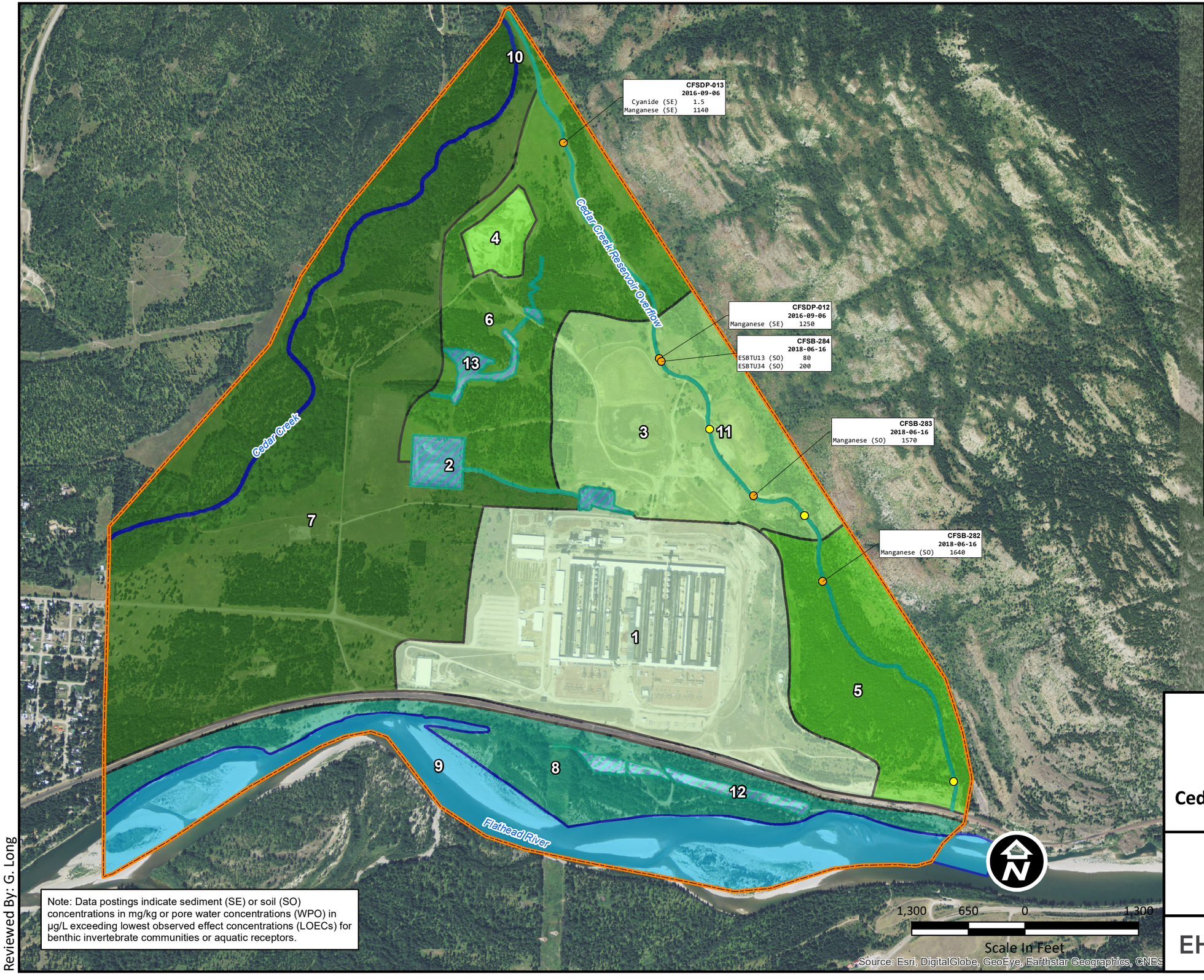

Legend

- SE Result < NOEC
- NOEC < SE Result < LOEC
- SE Result > LOEC
- WPO Result < NOEC
- NOEC < WPO Result < LOEC
- WPO Result > LOEC
- Site Boundary

Ecological Exposure Areas

Aquatic Exposure Areas

- 9 - FLATHEAD RIVER AREA
- 10 - CEDAR CREEK

Transitional Exposure Area

- 2 - NORTH PERCOLATION POND AREA
- 11 - CEDAR CREEK RESERVOIR OVERFLOW DITCH
- 12 - SOUTH PERCOLATION POND AREA
- 13 - NORTHERN SURFACE WATER FEATURE

Terrestrial Exposure Area

- 1 - MAIN PLANT AREA
- 3 - CENTRAL LANDFILLS AREA
- 4 - INDUSTRIAL LANDFILL AREA
- 5 - EASTERN UNDEVELOPED AREA
- 6 - NORTH-CENTRAL UNDEVELOPED AREA
- 7 - WESTERN UNDEVELOPED AREA
- 8 - FLATHEAD RIVER RIPARIAN AREA

Note: Data postings indicate sediment (SE) or soil (SO) concentrations in mg/kg or pore water concentrations (WPO) in µg/L exceeding lowest observed effect concentrations (LOECs) for benthic invertebrate communities or aquatic receptors.

Sediment and Pore Water NOEC/LOEC Direct Contact Exceedances Cedar Creek Reservoir Overflow Ditch

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support

FIGURE 6-26

Reviewed By: G. Long

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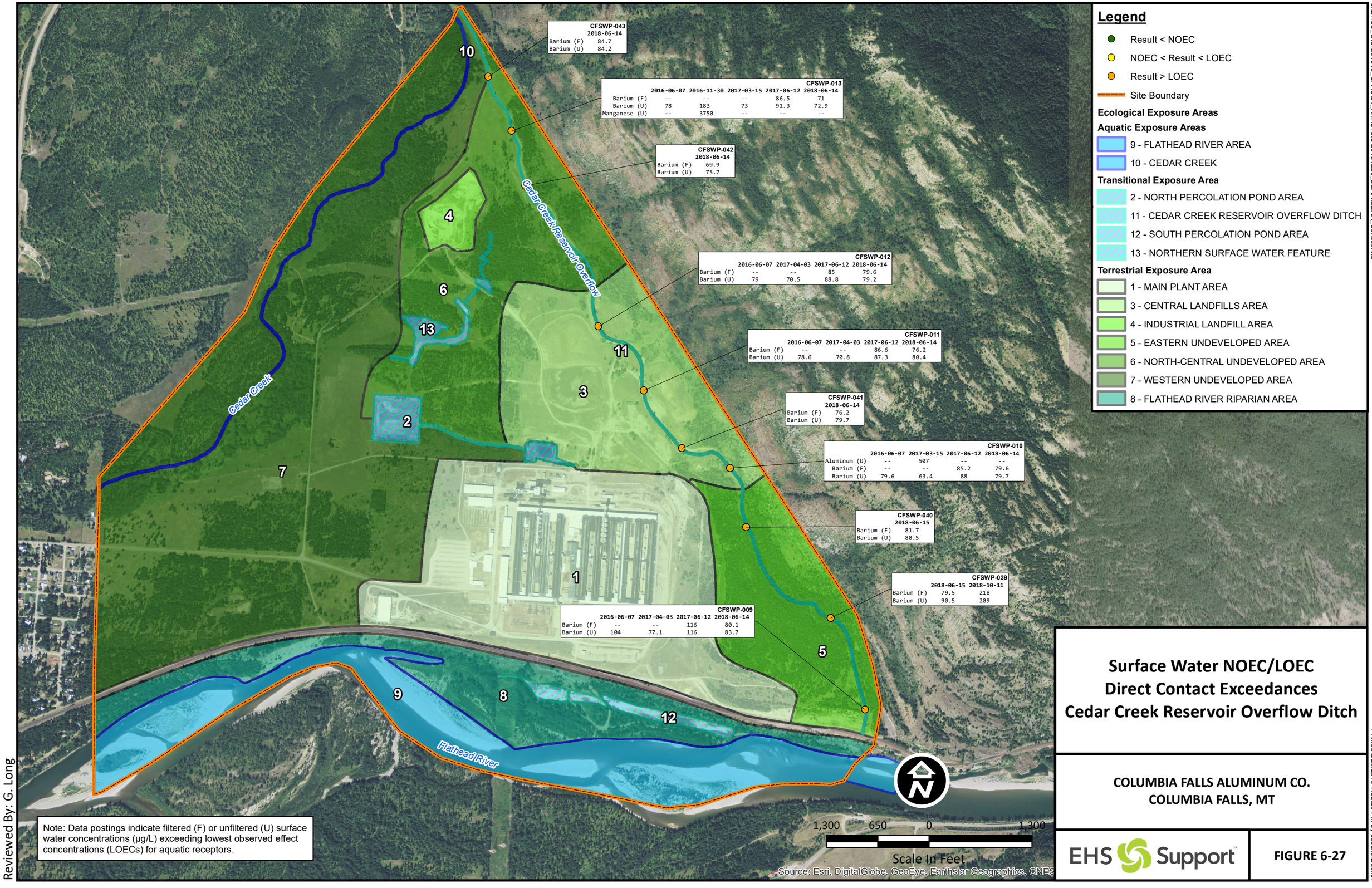

Legend

- Result < NOEC
- NOEC < Result < LOEC
- Result > LOEC
- Site Boundary

Ecological Exposure Areas

Aquatic Exposure Areas

- 9 - FLATHEAD RIVER AREA
- 10 - CEDAR CREEK

Transitional Exposure Area

- 2 - NORTH PERCOLATION POND AREA
- 11 - CEDAR CREEK RESERVOIR OVERFLOW DITCH
- 12 - SOUTH PERCOLATION POND AREA
- 13 - NORTHERN SURFACE WATER FEATURE

Terrestrial Exposure Area

- 1 - MAIN PLANT AREA
- 3 - CENTRAL LANDFILLS AREA
- 4 - INDUSTRIAL LANDFILL AREA
- 5 - EASTERN UNDEVELOPED AREA
- 6 - NORTH-CENTRAL UNDEVELOPED AREA
- 7 - WESTERN UNDEVELOPED AREA
- 8 - FLATHEAD RIVER RIPARIAN AREA

Note: Data postings indicate filtered (F) or unfiltered (U) surface water concentrations (µg/L) exceeding lowest observed effect concentrations (LOECs) for aquatic receptors.

Surface Water NOEC/LOEC Direct Contact Exceedances Cedar Creek Reservoir Overflow Ditch

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-27

Reviewed By: G. Long

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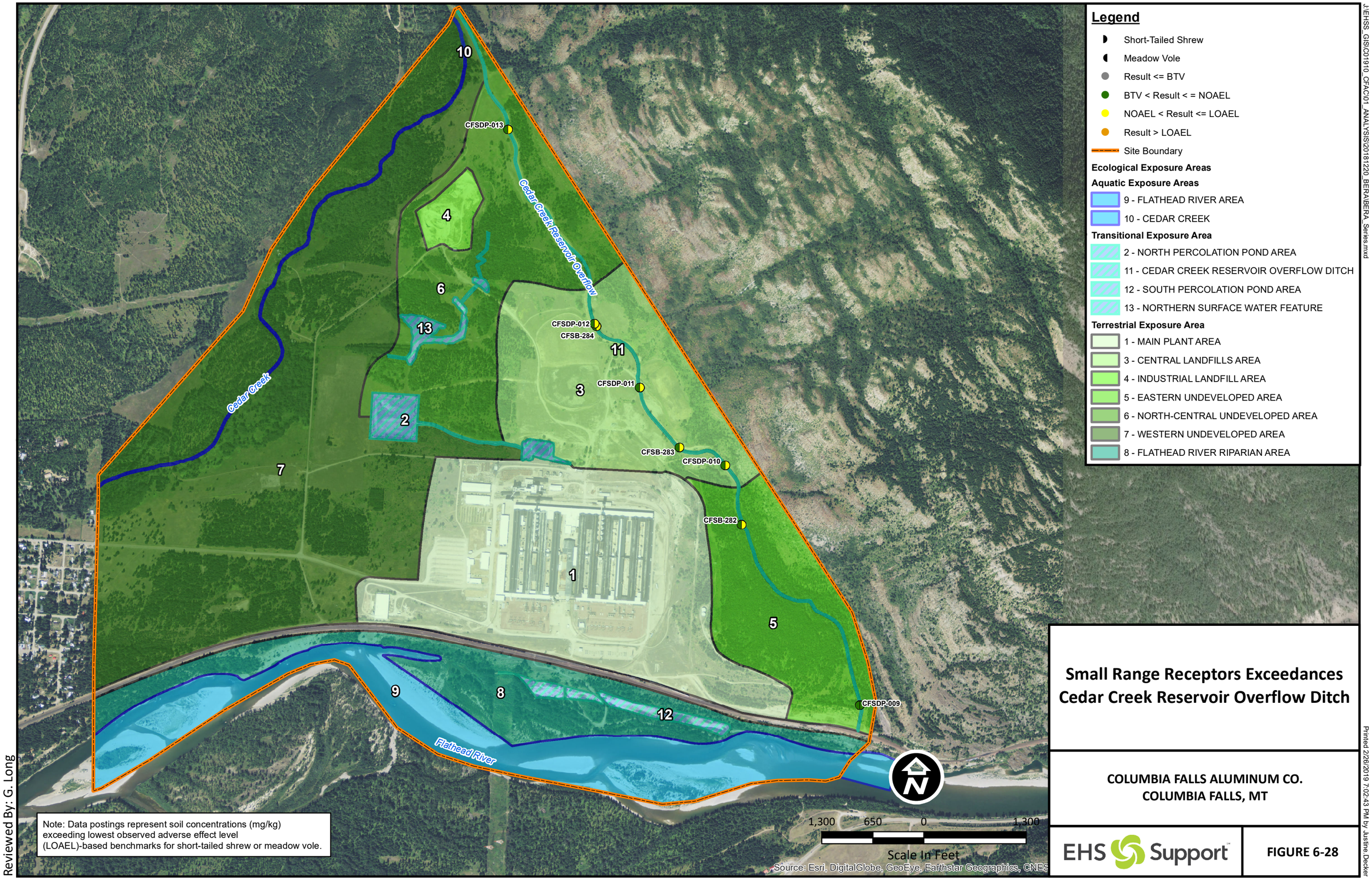

Legend

- Short-Tailed Shrew
- Meadow Vole
- Result <= BTV
- BTV < Result < = NOAEL
- NOAEL < Result <= LOAEL
- Result > LOAEL
- Site Boundary

Ecological Exposure Areas

Aquatic Exposure Areas

- 9 - FLATHEAD RIVER AREA
- 10 - CEDAR CREEK

Transitional Exposure Area

- 2 - NORTH PERCOLATION POND AREA
- 11 - CEDAR CREEK RESERVOIR OVERFLOW DITCH
- 12 - SOUTH PERCOLATION POND AREA
- 13 - NORTHERN SURFACE WATER FEATURE

Terrestrial Exposure Area

- 1 - MAIN PLANT AREA
- 3 - CENTRAL LANDFILLS AREA
- 4 - INDUSTRIAL LANDFILL AREA
- 5 - EASTERN UNDEVELOPED AREA
- 6 - NORTH-CENTRAL UNDEVELOPED AREA
- 7 - WESTERN UNDEVELOPED AREA
- 8 - FLATHEAD RIVER RIPARIAN AREA

Note: Data postings represent soil concentrations (mg/kg) exceeding lowest observed adverse effect level (LOAEL)-based benchmarks for short-tailed shrew or meadow vole.

Small Range Receptors Exceedances Cedar Creek Reservoir Overflow Ditch

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-28

Reviewed By: G. Long

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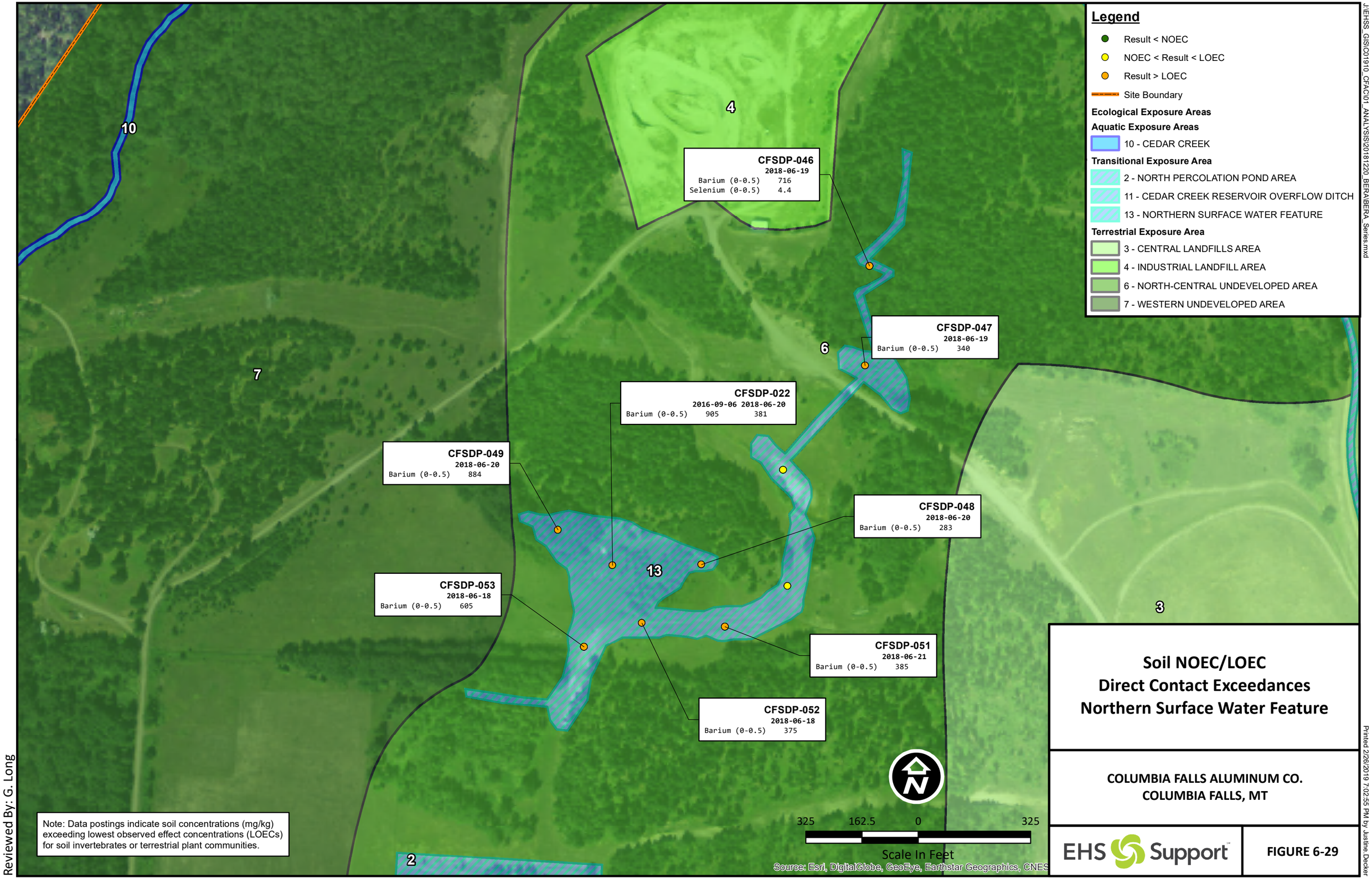

Note: Data postings indicate soil concentrations (mg/kg) exceeding lowest observed effect concentrations (LOECs) for soil invertebrates or terrestrial plant communities.

Soil NOEC/LOEC
Direct Contact Exceedances
Northern Surface Water Feature

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-29

Reviewed By: G. Long

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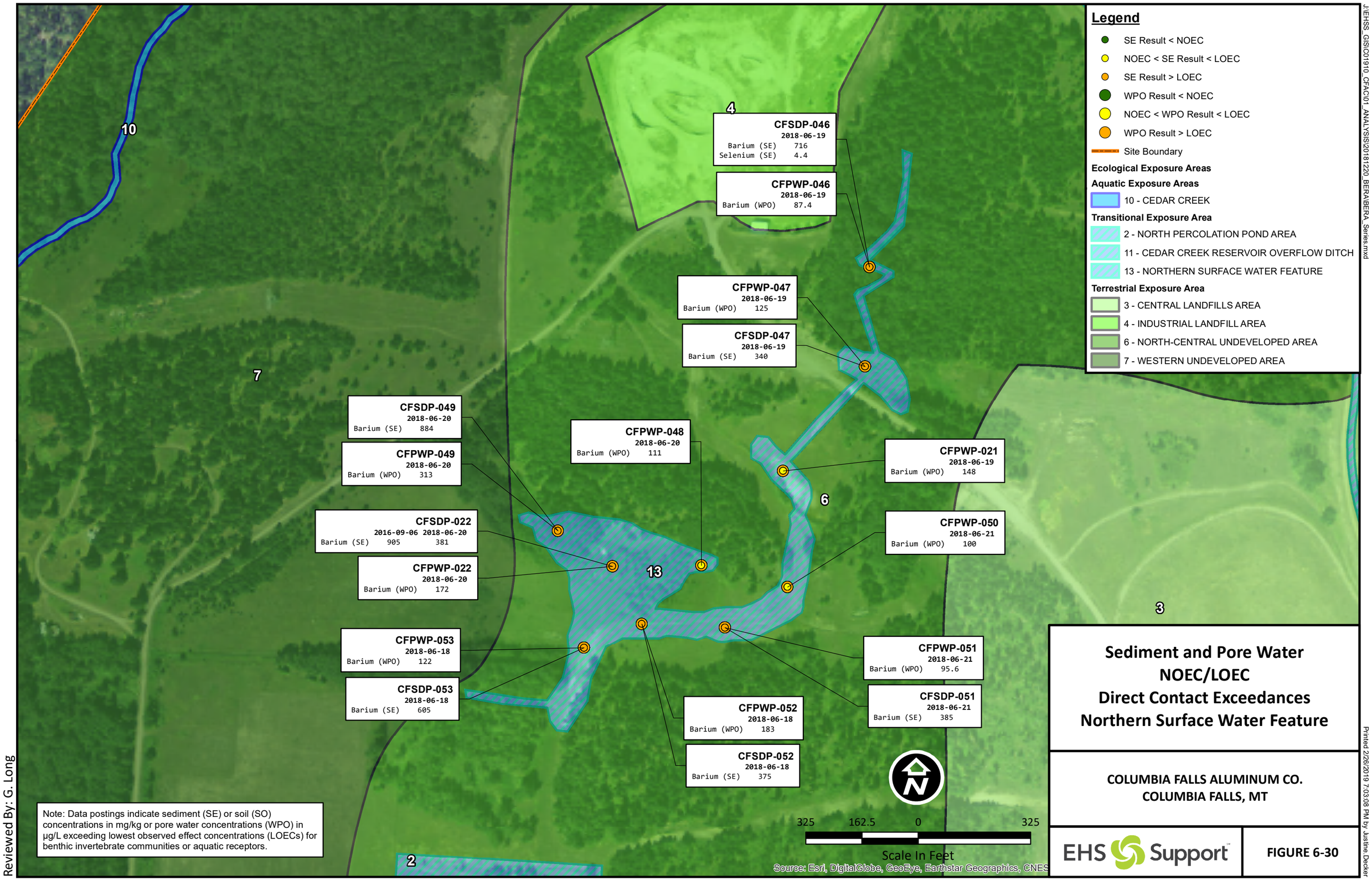

Note: Data postings indicate sediment (SE) or soil (SO) concentrations in mg/kg or pore water concentrations (WPO) in µg/L exceeding lowest observed effect concentrations (LOECs) for benthic invertebrate communities or aquatic receptors.

Sediment and Pore Water NOEC/LOEC Direct Contact Exceedances Northern Surface Water Feature

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

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FIGURE 6-30

Reviewed By: G. Long

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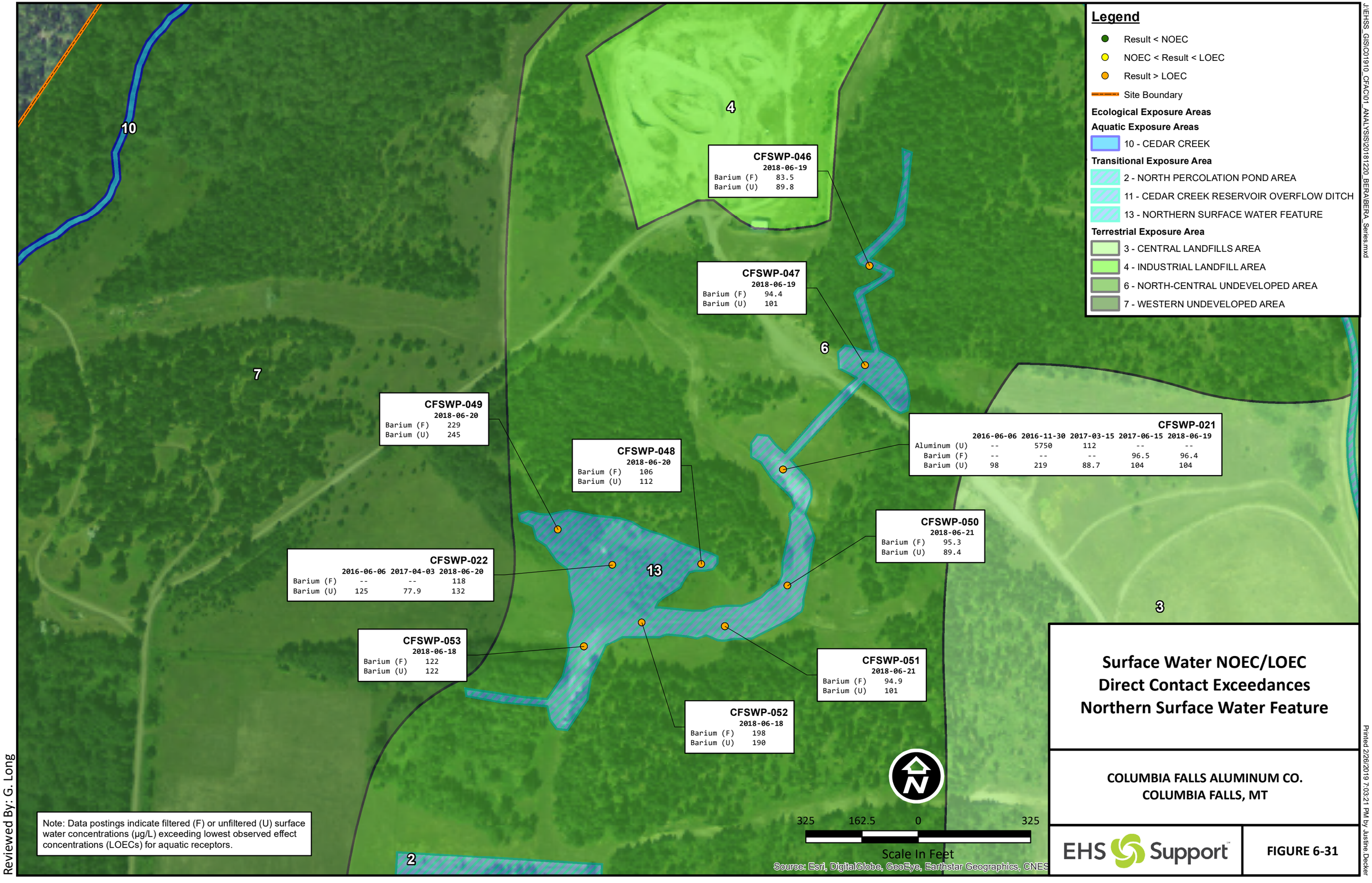

Note: Data postings indicate filtered (F) or unfiltered (U) surface water concentrations (µg/L) exceeding lowest observed effect concentrations (LOECs) for aquatic receptors.

Reviewed By: G. Long

Surface Water NOEC/LOEC Direct Contact Exceedances Northern Surface Water Feature

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-31

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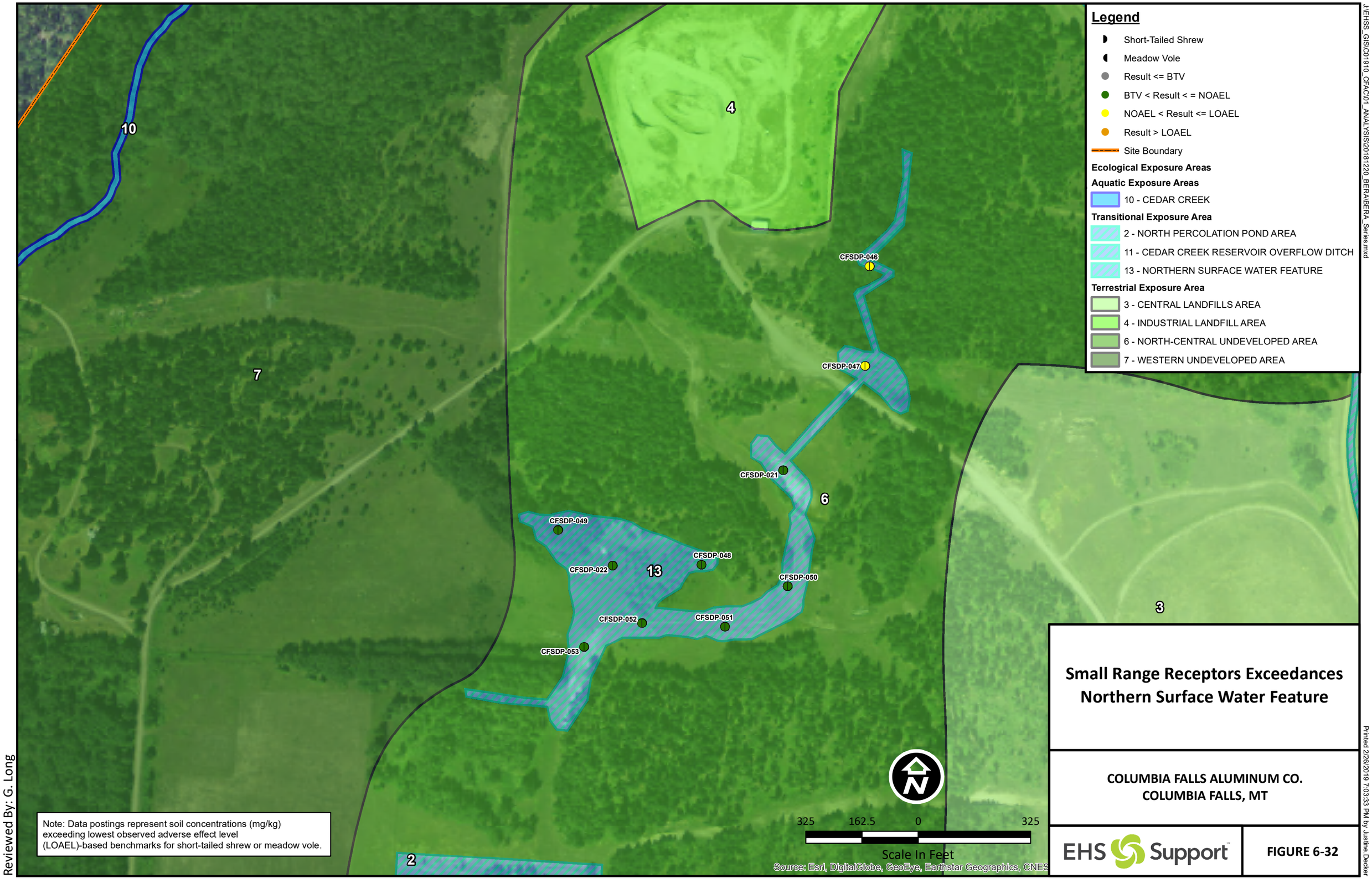

Note: Data postings represent soil concentrations (mg/kg) exceeding lowest observed adverse effect level (LOAEL)-based benchmarks for short-tailed shrew or meadow vole.

Reviewed By: G. Long

Small Range Receptors Exceedances Northern Surface Water Feature

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-32

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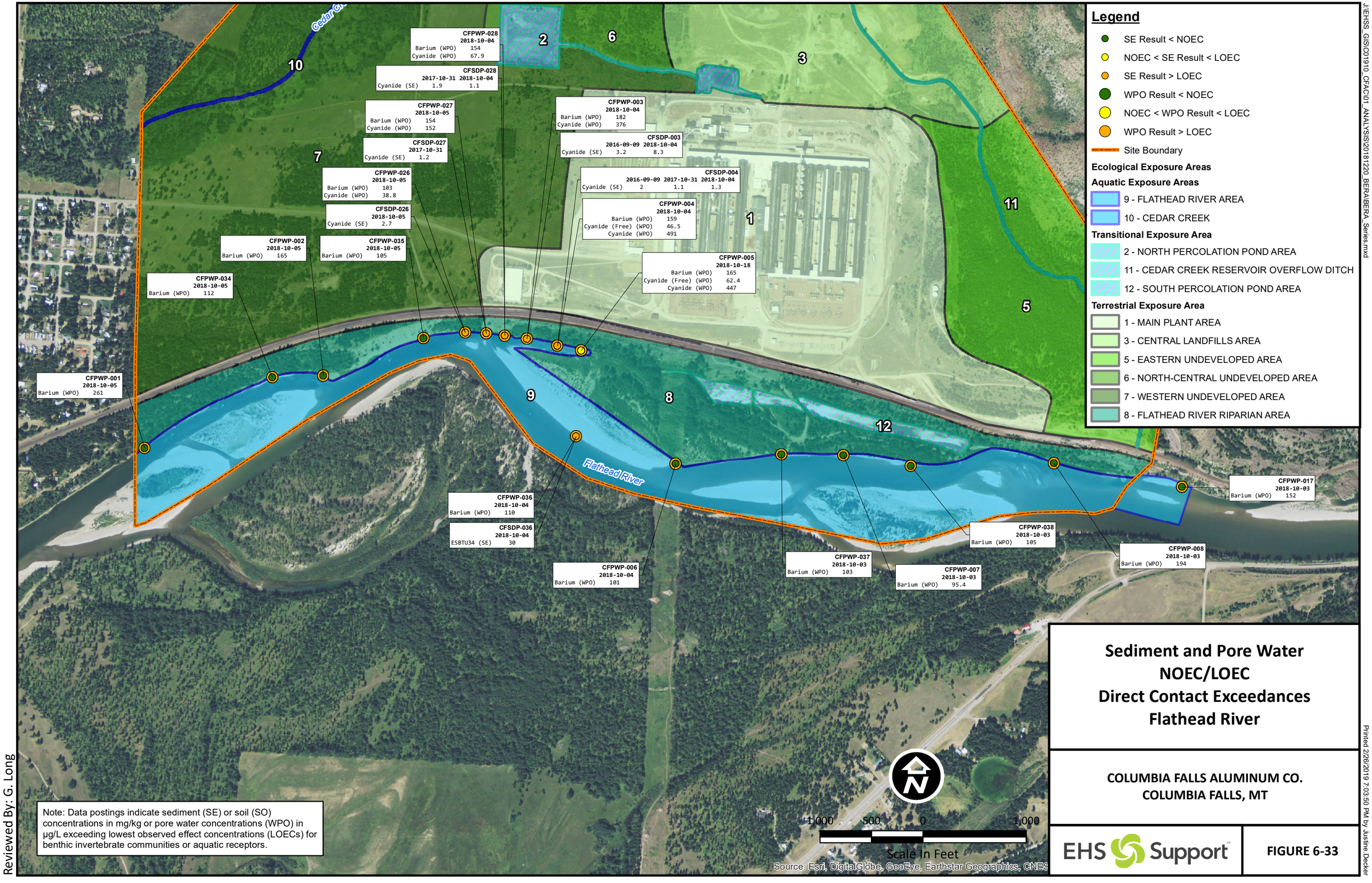

Legend

- SE Result < NOEC
- NOEC < SE Result < LOEC
- SE Result > LOEC
- WPO Result < NOEC
- NOEC < WPO Result < LOEC
- WPO Result > LOEC
- Site Boundary

Ecological Exposure Areas

Aquatic Exposure Areas

- 9 - FLATHEAD RIVER AREA
- 10 - CEDAR CREEK

Transitional Exposure Area

- 2 - NORTH PERCOLATION POND AREA
- 11 - CEDAR CREEK RESERVOIR OVERFLOW DITCH
- 12 - SOUTH PERCOLATION POND AREA

Terrestrial Exposure Area

- 1 - MAIN PLANT AREA
- 3 - CENTRAL LANDFILLS AREA
- 5 - EASTERN UNDEVELOPED AREA
- 6 - NORTH-CENTRAL UNDEVELOPED AREA
- 7 - WESTERN UNDEVELOPED AREA
- 8 - FLATHEAD RIVER RIPARIAN AREA

Note: Data postings indicate sediment (SE) or soil (SO) concentrations in mg/kg or pore water concentrations (WPO) in µg/L exceeding lowest observed effect concentrations (LOECs) for benthic invertebrate communities or aquatic receptors.

Sediment and Pore Water NOEC/LOEC Direct Contact Exceedances Flathead River

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-33

Reviewed By: G. Long

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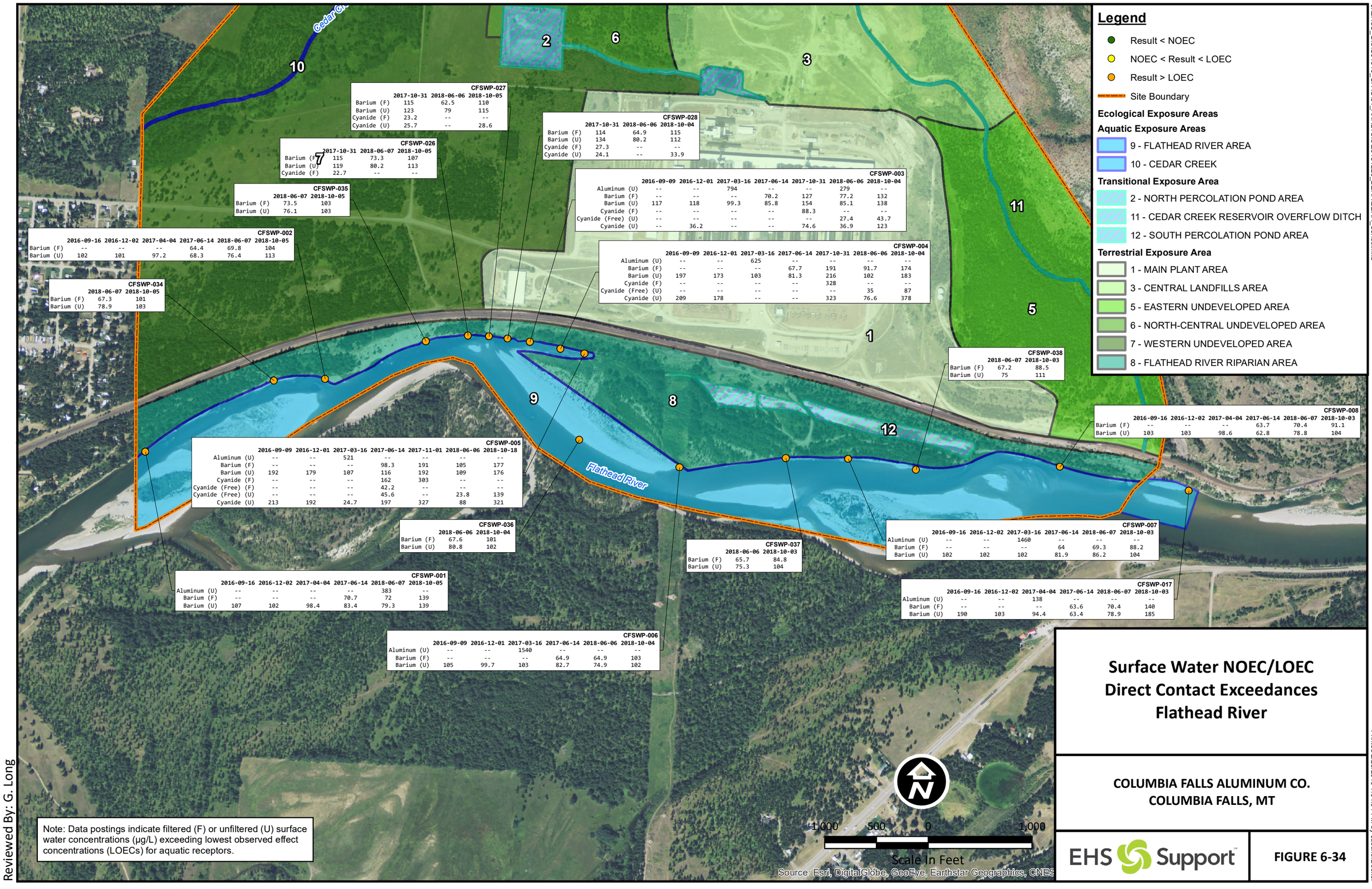

Note: Data postings indicate filtered (F) or unfiltered (U) surface water concentrations (µg/L) exceeding lowest observed effect concentrations (LOECs) for aquatic receptors.

Surface Water NOEC/LOEC Direct Contact Exceedances Flathead River

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-34

Reviewed By: G. Long

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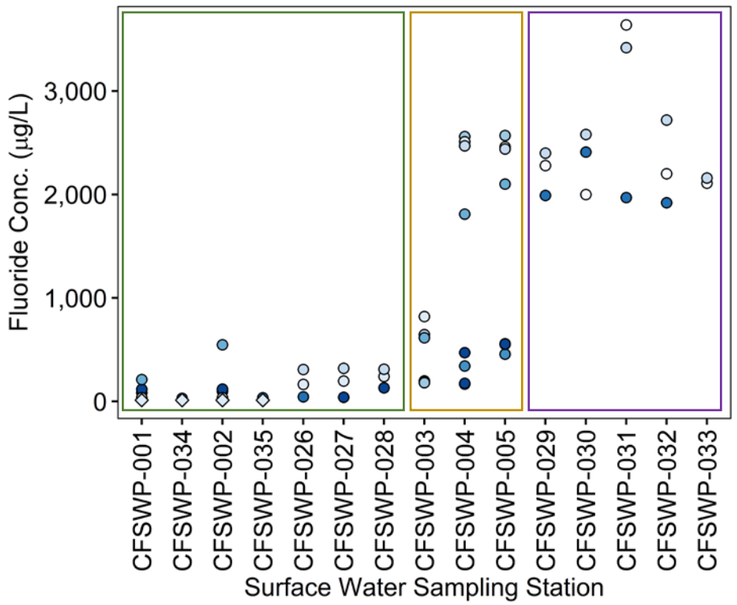
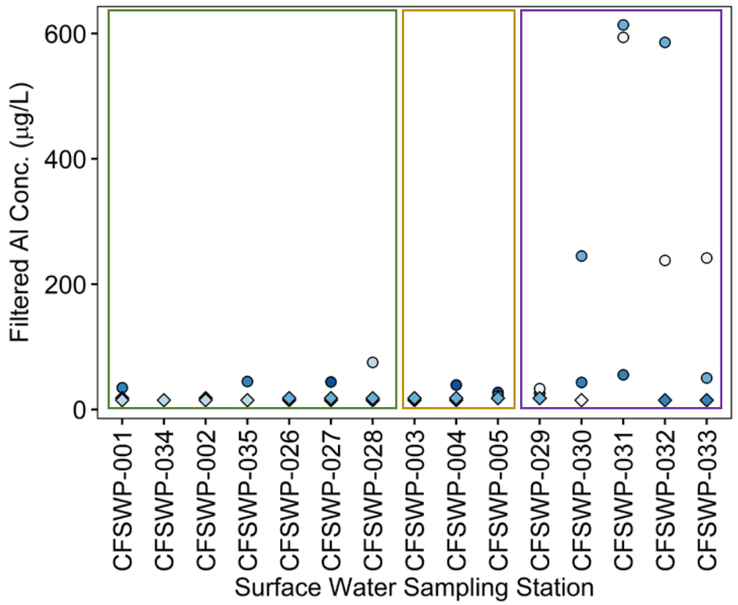
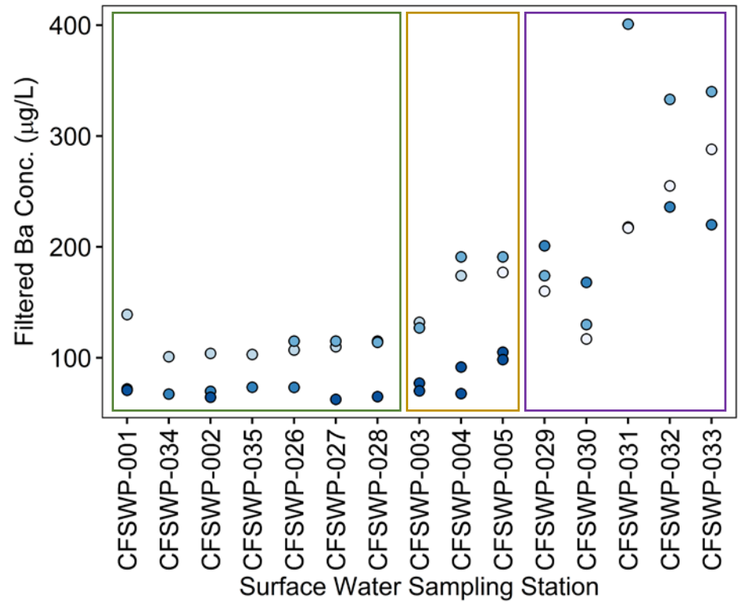
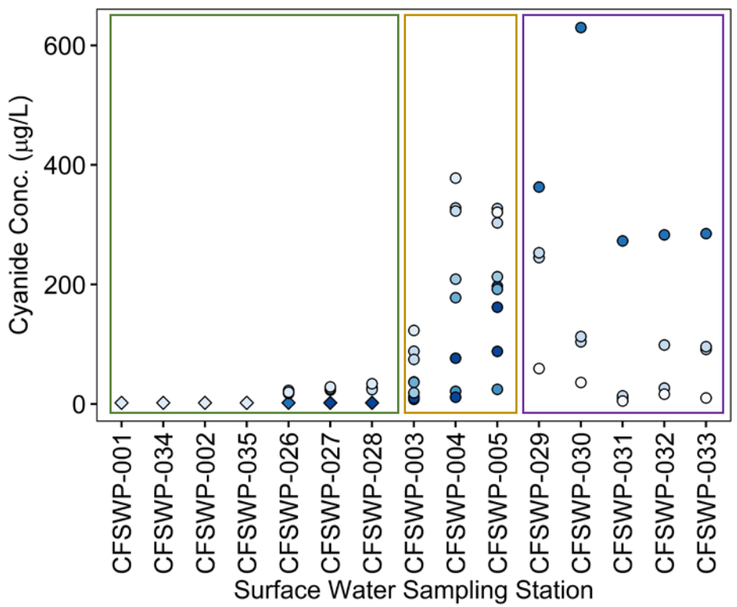
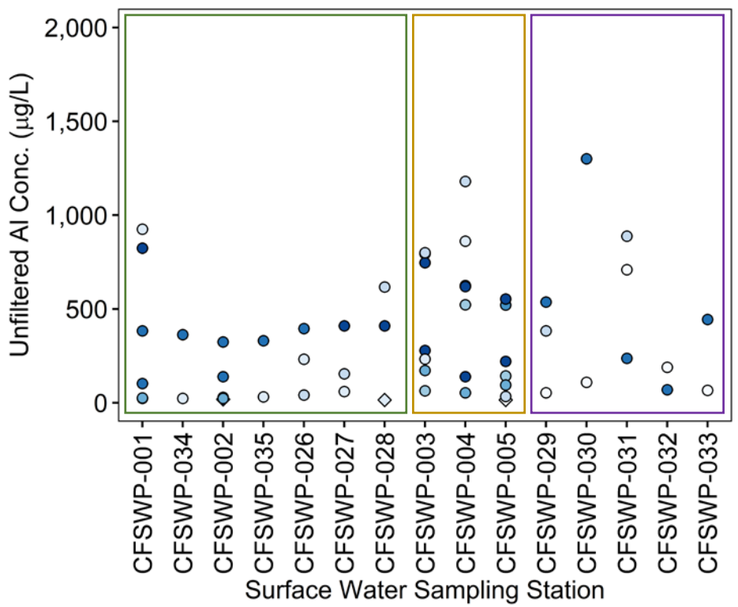
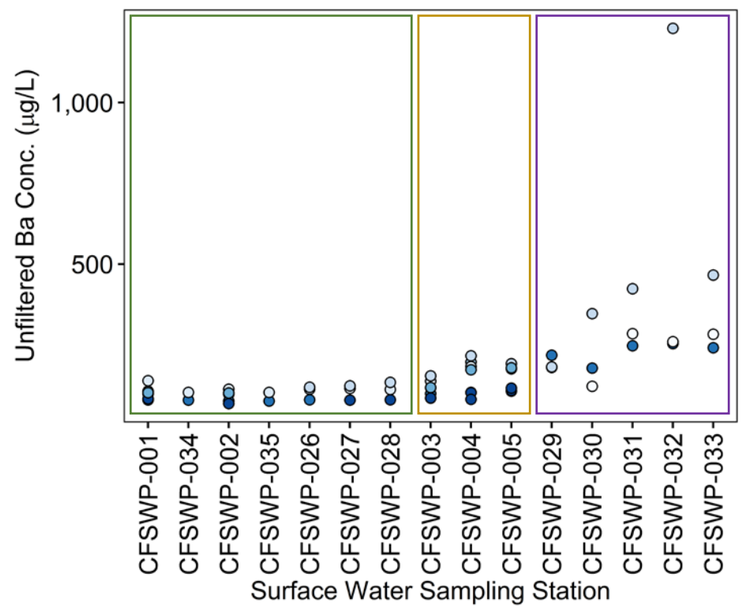












Legend

Discharge Percentile

- Q20-Q25 (3,060-3,520 cfs)
- Q25-Q30 (3,520-3,710 cfs)
- Q30-Q35 (3,710-3,870 cfs)
- Q35-Q40 (3,870-4,200 cfs)
- Q55-Q60 (6,720-7,790 cfs)
- Q75-Q80 (11,500-14,000 cfs)
- Q85-Q90 (18,000-23,300 cfs)
- Q90-Q95 (23,300-31,800 cfs)

- Downstream Portion of Flathead River
- Backwater Seep Area of Flathead River
- Riparian Area of Flathead River

Notes

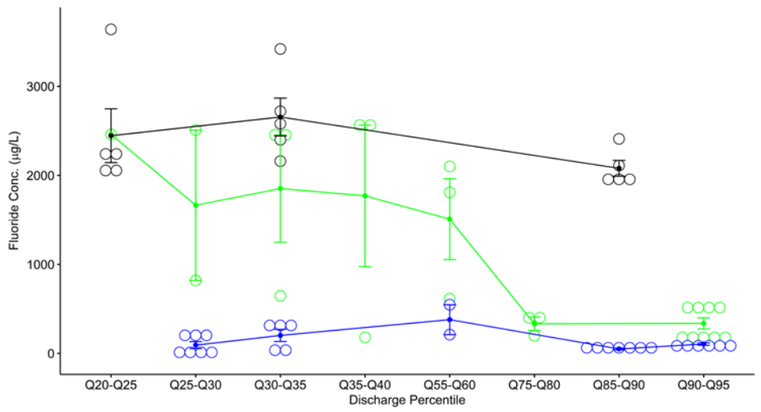
- Three outliers are not pictured in unfiltered aluminum plot: CFSWP-030 = 11,800 µg/L; CFSWP-032 = 32,000 µg/L; and, CFSWP-033 = 5,090 µg/L;

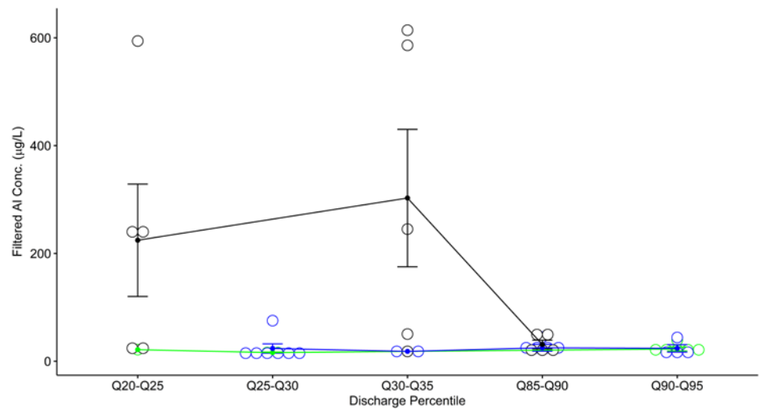
FIGURE 6-35

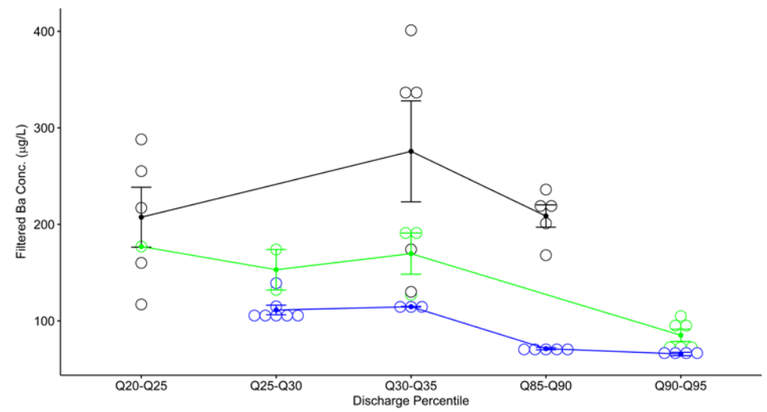
EHS Support

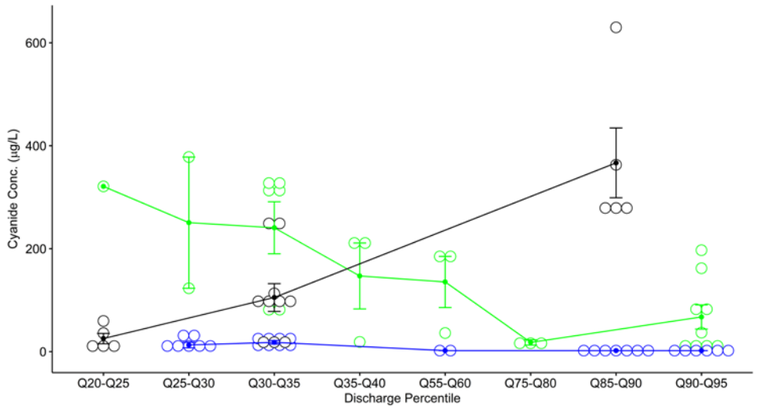
FLUORIDE, CYANIDE, ALUMINUM, AND BARIUM SURFACE WATER CONCENTRATION BY STATION AND DISCHARGE PERCENTILE

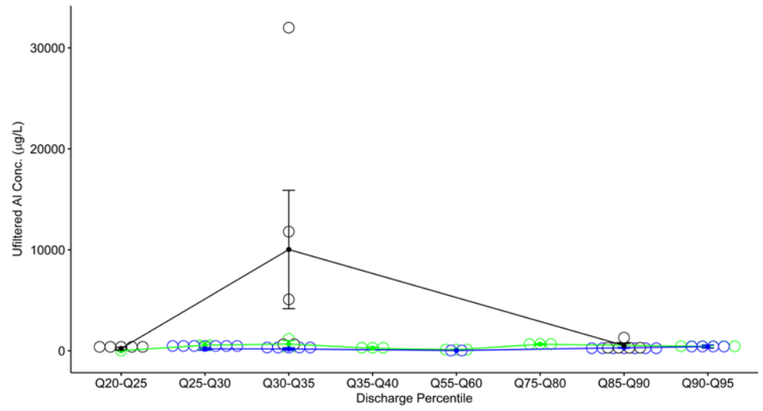
Prepared by: S. Parker	Checked by: S. Parker
Project: CFAC - BERA	Date: February 6, 2019

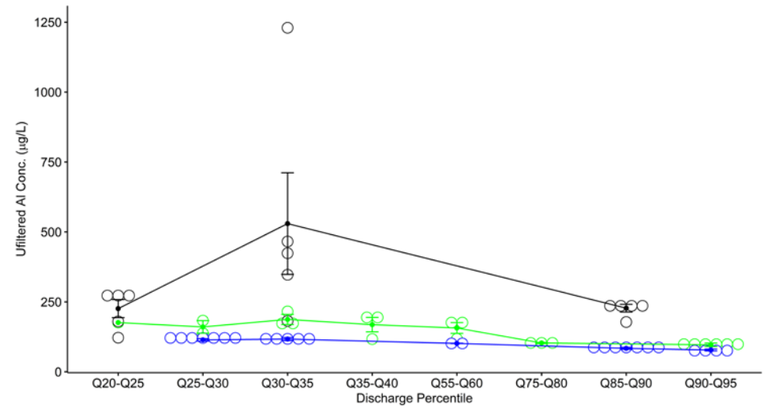












Legend

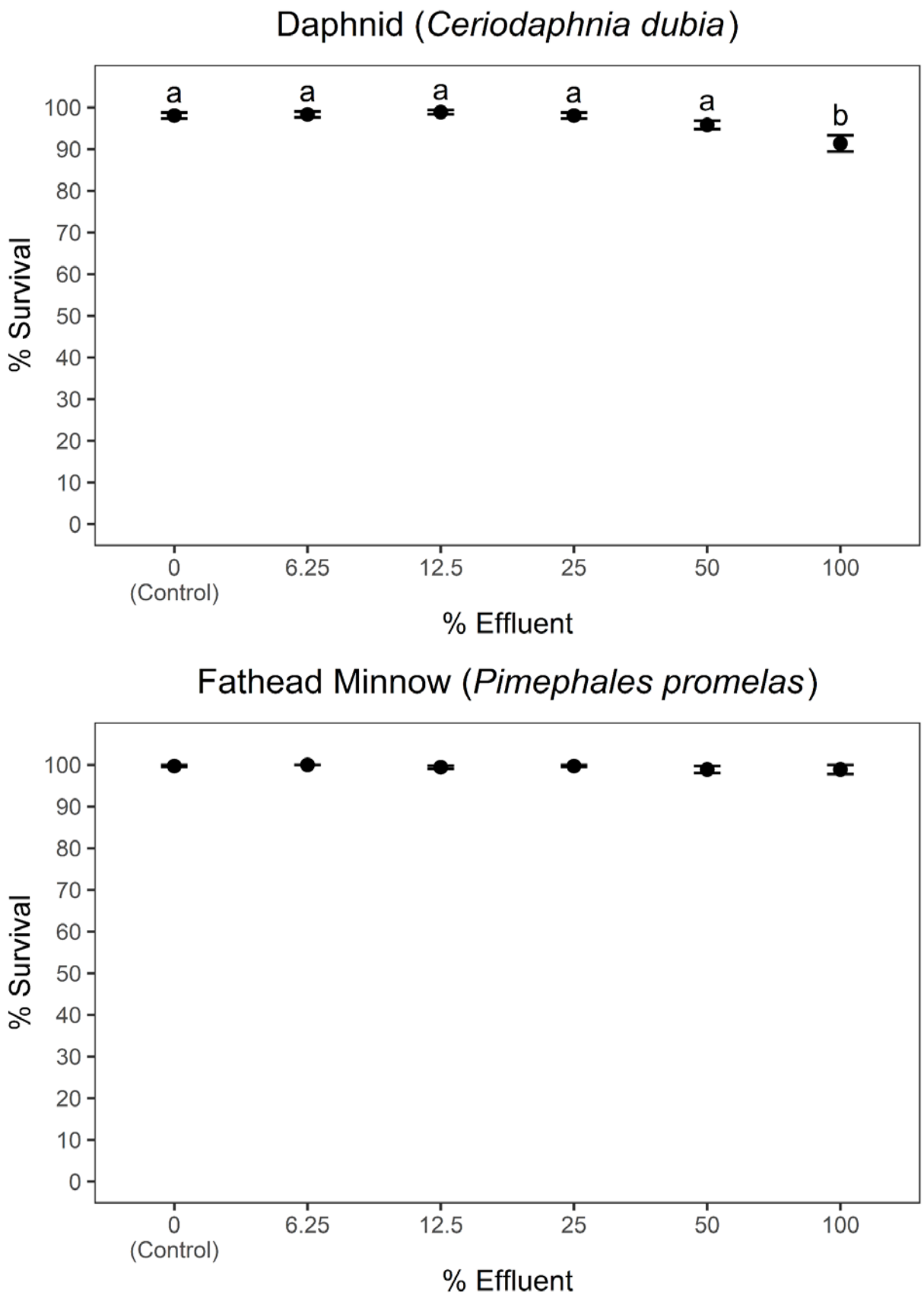
- Backwater Seep Flathead River
- Riparian Area Flathead River
- Downgradient Flathead River

FIGURE 6-36

EHS Support

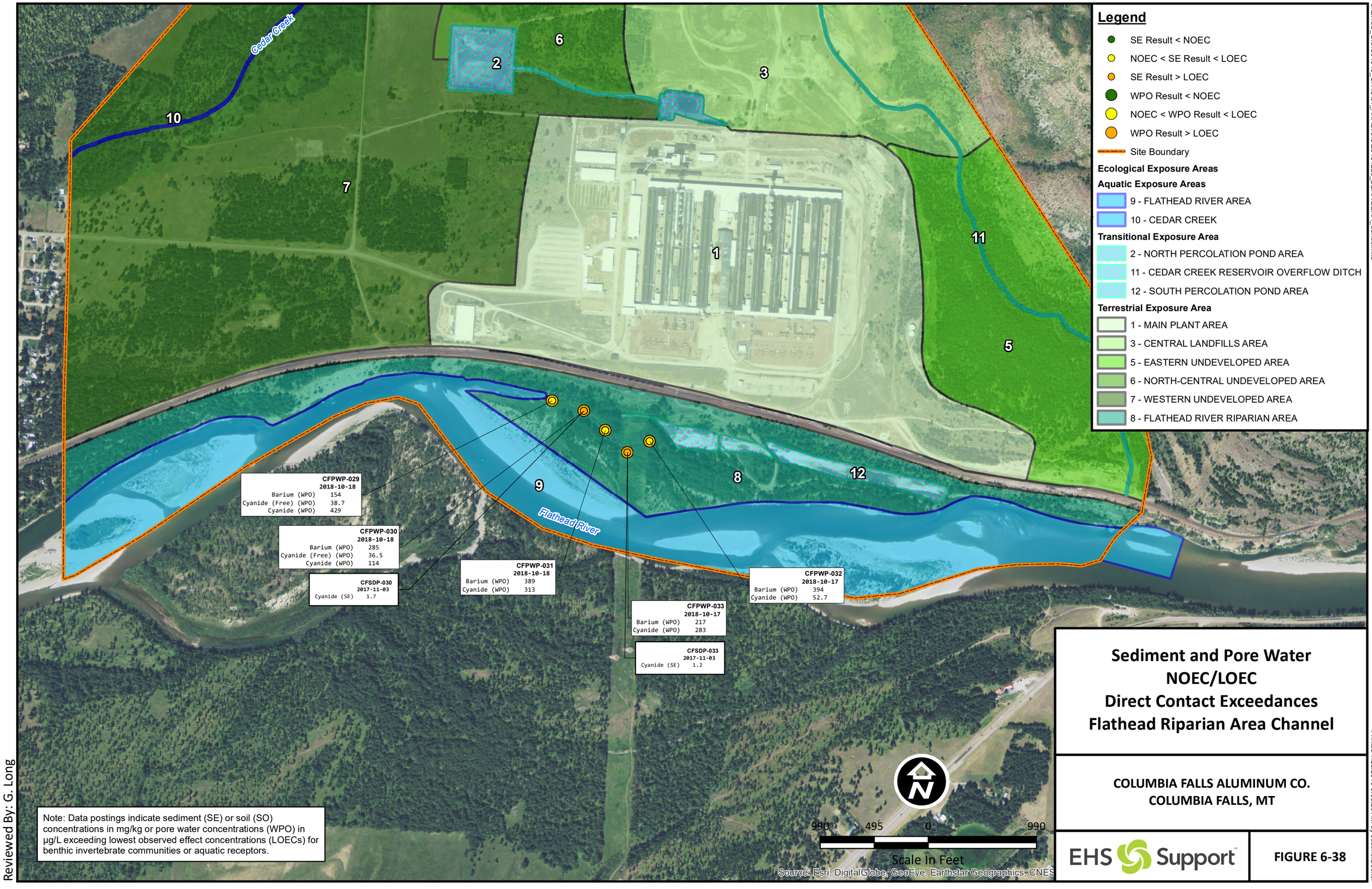
FLUORIDE, CYANIDE, ALUMINUM, AND BARIUM SURFACE WATER CONCENTRATION BY AREA AND DISCHARGE PERCENTILE

Prepared by: S. Parker	Checked by: S. Parker
Project: CFAC - BERA	Date: February 6, 2019



Note:
Different letters indicate statistically significant differences ($p<0.05$) in mean *Ceriodaphnia dubia* survival; there was no significant effect ($p>0.05$) of the percent effluent on the percent survival of Fathead Minnow

EHS Support	**COLUMBIA FALLS ALUMINUM CO. COLUMBIA FALLS, MT**	**Mean Survival (± Standard Error) of *Ceriodaphnia dubia* and Fathead Minnow (*Pimephales promelas*) in Whole Effluent Toxicity (WET) Testing**	**FIGURE 6-37**



Note: Data postings indicate sediment (SE) or soil (SO) concentrations in mg/kg or pore water concentrations (WPO) in µg/L exceeding lowest observed effect concentrations (LOECs) for benthic invertebrate communities or aquatic receptors.

Sediment and Pore Water NOEC/LOEC Direct Contact Exceedances Flathead Riparian Area Channel

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-38

Reviewed By: G. Long

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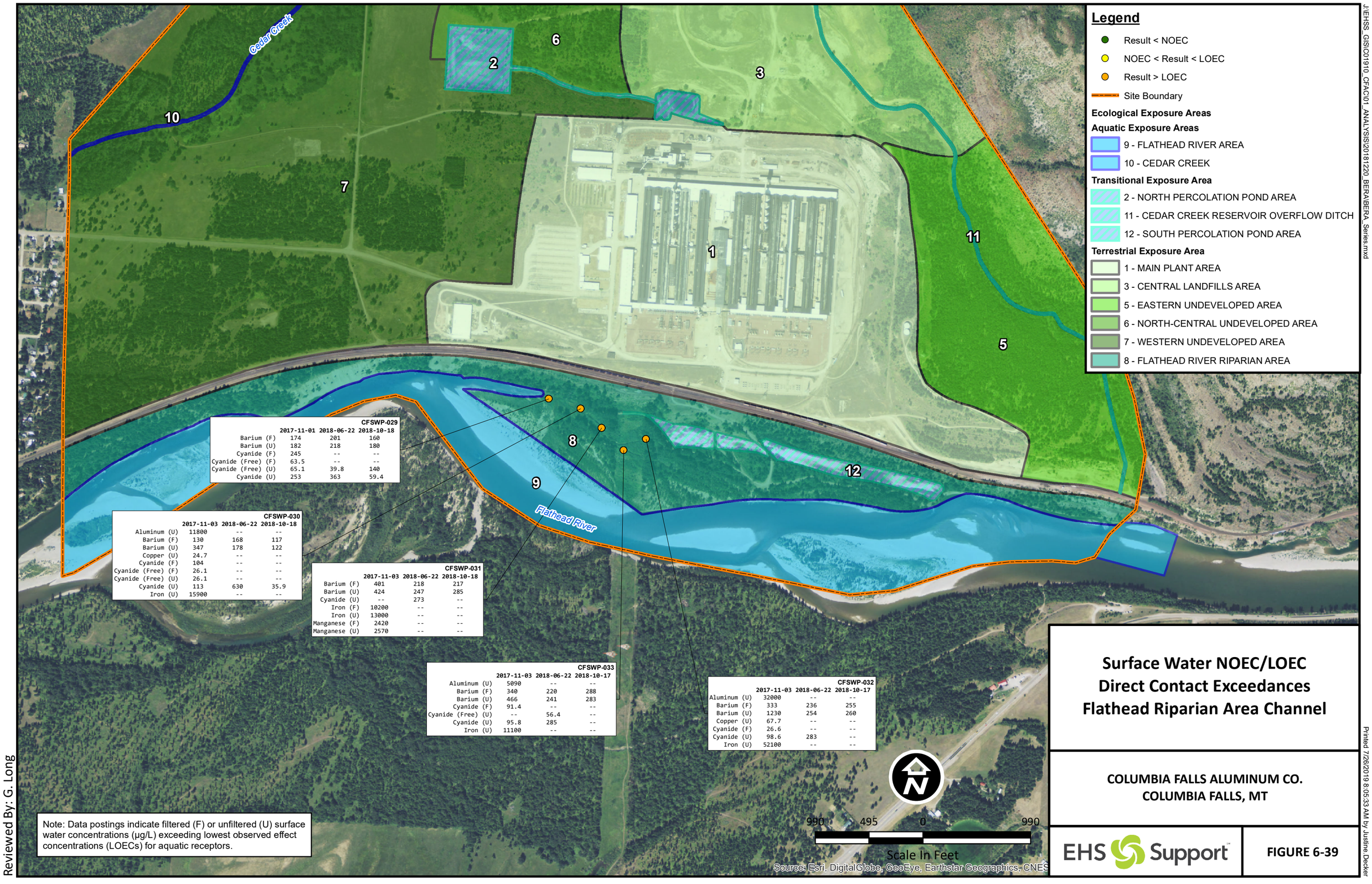

Note: Data postings indicate filtered (F) or unfiltered (U) surface water concentrations (µg/L) exceeding lowest observed effect concentrations (LOECs) for aquatic receptors.

Surface Water NOEC/LOEC Direct Contact Exceedances Flathead Riparian Area Channel

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-39

Reviewed By: G. Long

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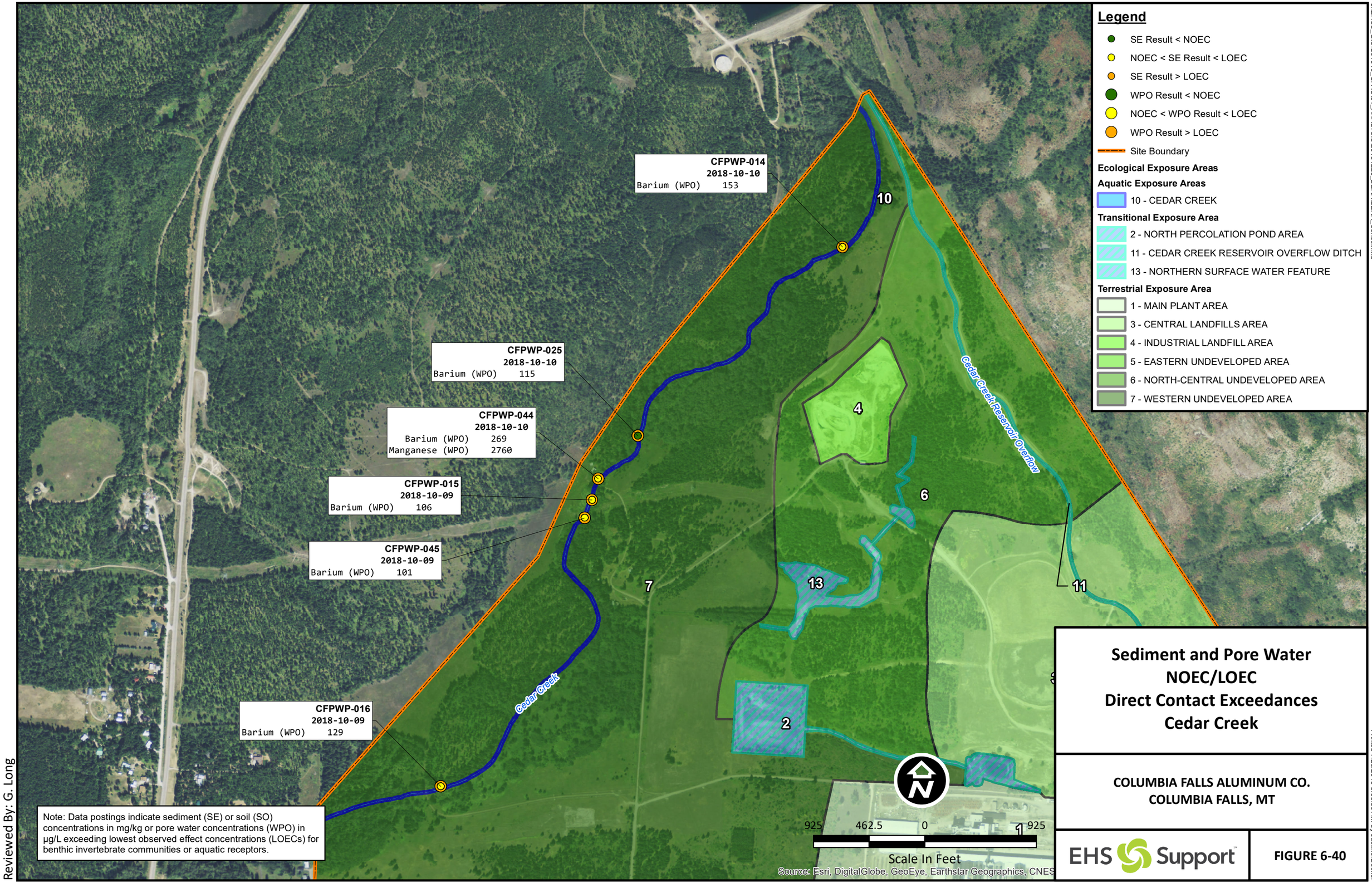

Note: Data postings indicate sediment (SE) or soil (SO) concentrations in mg/kg or pore water concentrations (WPO) in µg/L exceeding lowest observed effect concentrations (LOECs) for benthic invertebrate communities or aquatic receptors.

Sediment and Pore Water NOEC/LOEC Direct Contact Exceedances Cedar Creek

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-40

Reviewed By: G. Long

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CFSWP-014

	2016-08-29	2016-11-30	2017-03-13	2017-06-13	2018-06-11	2018-10-10
Barium (F)	--	--	--	88.5	85.9	108
Barium (U)	98.1	101	109	94.4	85.9	115

CFSWP-025

	2016-12-20	2017-03-13	2017-06-13	2018-06-12	2018-10-10
Barium (F)	--	--	93.3	93.4	117
Barium (U)	122	110	94.7	91.9	130

CFSWP-044

	2018-06-11	2018-10-10
Barium (F)	89.8	116
Barium (U)	91	119

CFSWP-015

	2016-08-29	2016-11-30	2016-12-20	2017-03-13	2017-06-13	2018-06-11	2018-10-09
Barium (F)	--	--	--	--	93	92.1	113
Barium (U)	103	106	118	107	97.5	95.7	114

CFSWP-045

	2018-06-11	2018-10-09
Barium (F)	92.3	113
Barium (U)	93.6	115

CFSWP-016

	2016-08-29	2016-11-30	2017-03-13	2017-06-12	2018-06-12	2018-10-09
Barium (F)	--	--	--	93.5	92.9	113
Barium (U)	99.5	105	106	98.8	94.1	116

Note: Data postings indicate filtered (F) or unfiltered (U) surface water concentrations (µg/L) exceeding lowest observed effect concentrations (LOECs) for aquatic receptors.

Legend

- Result < NOEC
- NOEC < Result < LOEC
- Result > LOEC
- Site Boundary

Ecological Exposure Areas

Aquatic Exposure Areas

- 10 - CEDAR CREEK

Transitional Exposure Area

- 2 - NORTH PERCOLATION POND AREA
- 11 - CEDAR CREEK RESERVOIR OVERFLOW DITCH
- 13 - NORTHERN SURFACE WATER FEATURE

Terrestrial Exposure Area

- 1 - MAIN PLANT AREA
- 3 - CENTRAL LANDFILLS AREA
- 4 - INDUSTRIAL LANDFILL AREA
- 5 - EASTERN UNDEVELOPED AREA
- 6 - NORTH-CENTRAL UNDEVELOPED AREA
- 7 - WESTERN UNDEVELOPED AREA

10 4 Cedar Creek Reservoir Overflow 6 11 13 7 2 Cedar Creek

925 462.5 0 1 925

Scale In Feet

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES

Surface Water NOEC/LOEC Direct Contact Exceedances Cedar Creek

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support™

FIGURE 6-41

Reviewed By: G. Long

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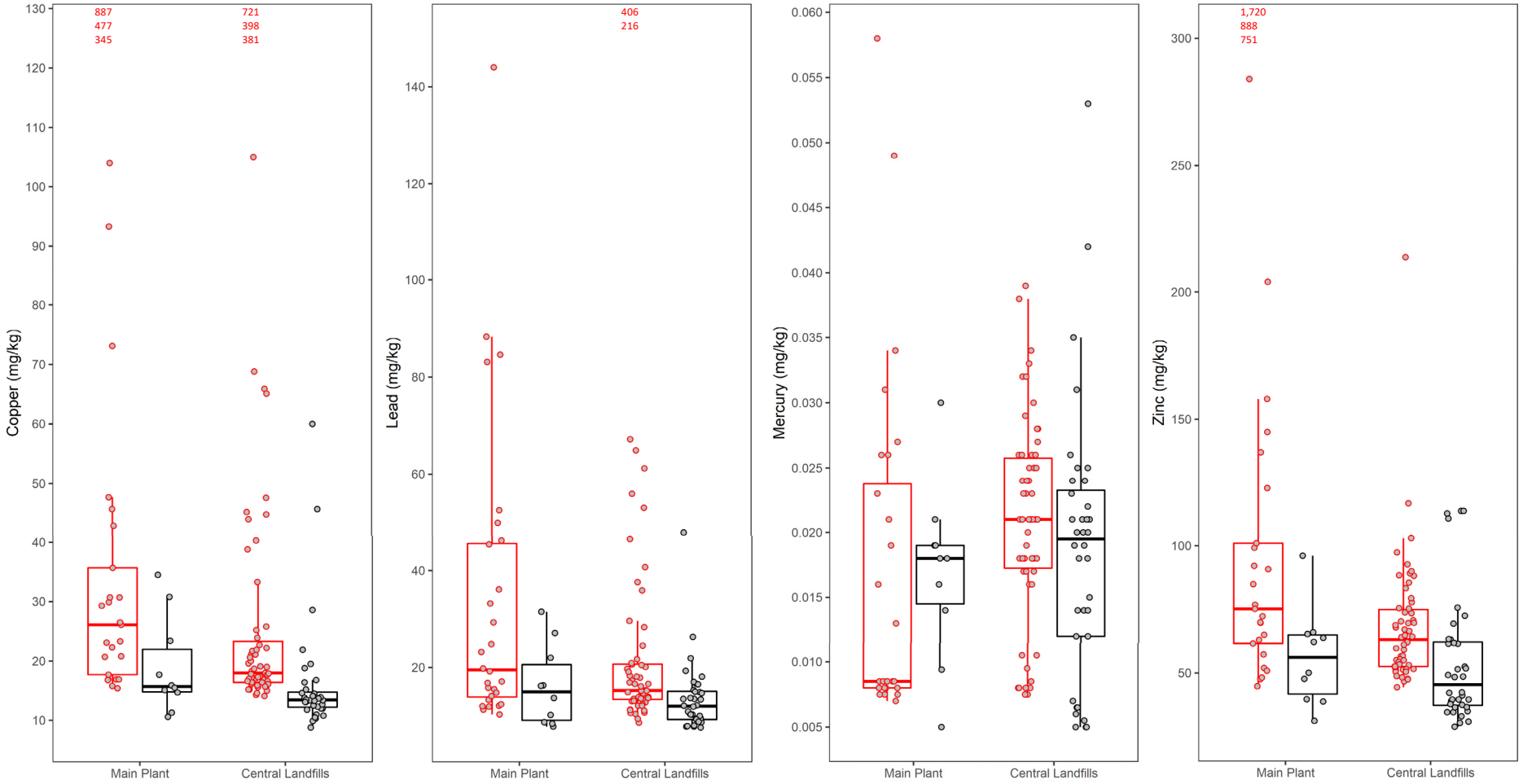


Legend

ISS Sample

Discrete Sample

Notes

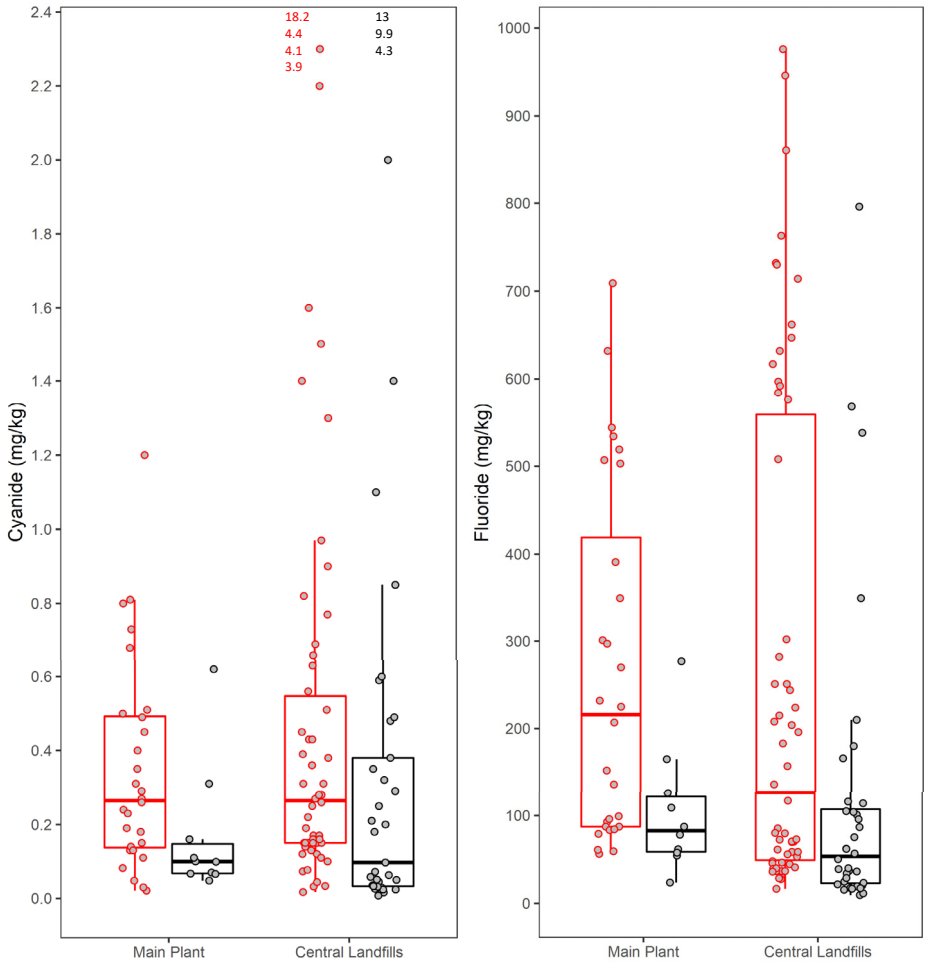
- Non-detects replaced with ½ the MDL.
- High outlier values listed above their respective distribution of results.

FIGURE 7-1

EHS Support

COMPARISON OF SELECT ISS AND DISCRETE SAMPLE RESULTS - METALS

Prepared by: R. Sleeper	Checked by: R. Sleeper
Project: CFAC - BERA	Date: July 19, 2019



Legend

ISS Sample

Discrete Sample

Notes

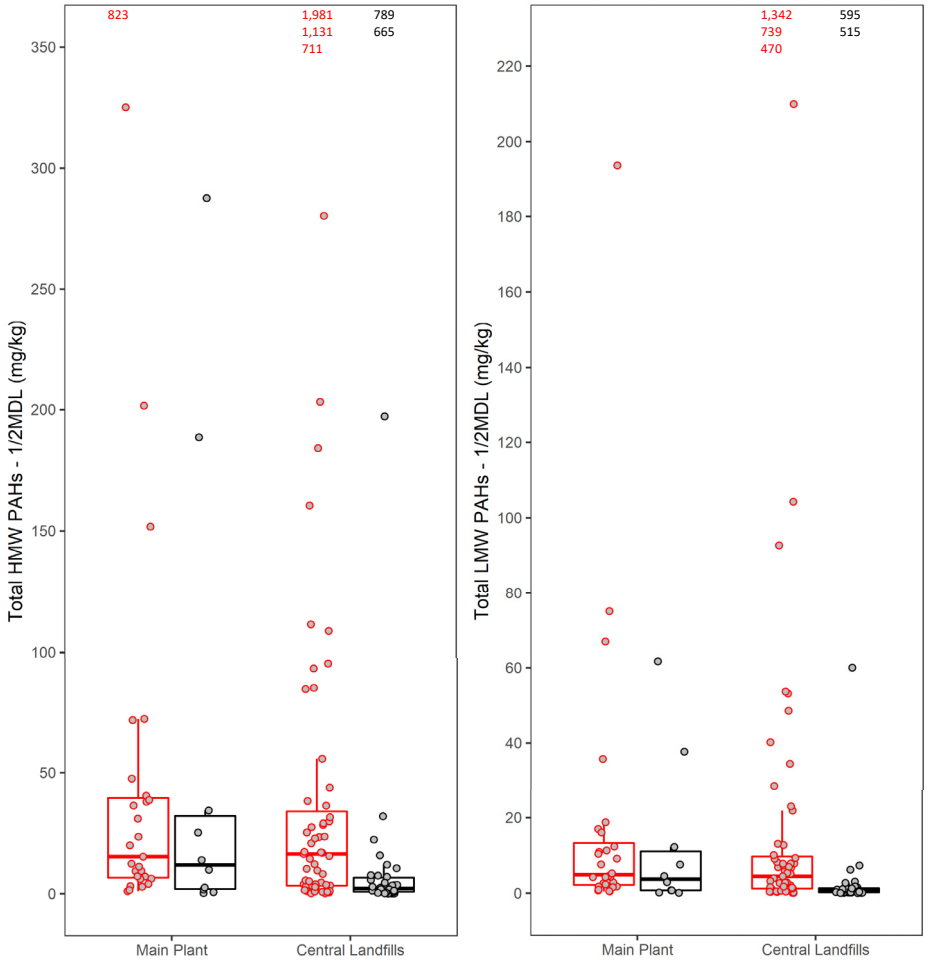
- Non-detects replaced with ½ the MDL.
- High outlier values listed above their respective distribution of results.

FIGURE 7-2

EHS Support

COMPARISON OF SELECT ISS AND DISCRETE SAMPLE RESULTS – OTHER INORGANICS

Prepared by: R. Sleeper	Checked by: R. Sleeper
Project: CFAC - BERA	Date: July 19, 2019



Legend

- ISS Sample
- Discrete Sample

Notes

- Non-detects replaced with ½ the MDL.
- High outlier values listed above their respective distribution of results.
- HMW: High molecular weight PAHs
- LMW Low molecular weight PAHs
- PAHs: Polycyclic Aromatic Hydrocarbons

FIGURE 7-3

EHS Support

COMPARISON OF SELECT ISS AND DISCRETE SAMPLE RESULTS - PAHs

Prepared by: R. Sleeper	Checked by: R. Sleeper
Project: CFAC - BERA	Date: July 19, 2019

Baseline Ecological Risk Assessment

Columbia Falls Aluminum Company

2000 Aluminum Drive
Columbia Falls, Flathead County, Montana

Prepared for:

Columbia Falls Aluminum Company, LLC

Prepared by:

EHS Support

July 29, 2019

Volume II of II

Appendices

Appendix A	Baseline Ecological Risk Assessment Work Plan Interim Deliverable Technical Memoranda
Appendix A1	Technical Memorandum: Proposed Refined Ecological Screening Values (ESVs) to Support the Baseline Ecological Risk Assessment at the Columbia Falls Superfund Site
Appendix A2	Technical Memorandum: Proposed Wildlife Exposure Modeling Approach to Support the Baseline Ecological Risk at the Columbia Falls Superfund Site
Appendix B	Screening-Level COPEC Identification Tables
Appendix C	Calculated Dioxin Toxicity Equivalence Concentrations
Appendix D	Calculated Ecological Screening Values for Hardness and pH Dependent Constituents
Appendix E	Refined COPEC Identification Tables
Appendix F	Equilibrium Partitioning Sediment Benchmark Calculations for Certain Non-ionic Organic Constituents
Appendix G	Equilibrium Partitioning Sediment Benchmark Toxicity Units Calculations for Polycyclic Aromatic Hydrocarbons
Appendix H	Food Chain Models for Calculating Doses to Representative Ecological Receptors
Appendix H0	Food Chain Model Parameters
Appendix H1	Screening Level Food Chain Models
Appendix H2	Refined Food Chain Models
Appendix I	ProUCL Output
Appendix J	Incremental Soil Sampling Exposure Point Concentrations
Appendix J1	Calculation of Exposure Point Concentrations in the Operational Area Based on Incremental Soil Sampling (ISS) Data
Appendix J2	Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples

Appendix A Baseline Ecological Risk Assessment Work Plan Interim Deliverable Technical Memoranda

Appendix A1 Technical Memorandum: Proposed Refined Ecological Screening Values (ESVs) to Support the Baseline Ecological Risk Assessment at the Columbia Falls Superfund Site

MEMORANDUM

Date: February 21, 2019

To: Mike Cirian, USEPA

From: Laura Jensen, Roux

CC: John Stroiazzo, Glencore
Steve Wright, CFAC
Dick Sloan, MDEQ
Andrew Baris, Roux
Michael Ritorto, Roux
Gary Long, EHS Support, LLC

Subject: **Technical Memorandum: Proposed Refined Ecological Screening Values to Support the Baseline Ecological Risk Assessment at the Columbia Falls Superfund Site**
Former Columbia Falls Aluminum Company Aluminum Reduction Facility
Columbia Falls, Montana

On behalf of Columbia Falls Aluminum Company, LLC (CFAC), Roux Environmental Engineering and Geology, D.P.C. (Roux) and EHS Support, LLC prepared the attached Technical Memorandum for Proposed Refined Ecological Screening Values (ESVs) to Support the Baseline Ecological Risk Assessment (BERA) for the CFAC Superfund Site in Columbia Falls, Montana. This memorandum has been prepared as part of the ongoing Remedial Investigation/Feasibility Study (RI/FS) being conducted pursuant to the Administrative Settlement Agreement and Order on Consent (AOC) dated November 30, 2015 between CFAC and the United States Environmental Protection Agency (USEPA) (CERCLA Docket No. 08-2016-0002).

Should there be any questions or comments on this submission, please do not hesitate to contact me at (631) 230-2300.

Sincerely,

Laura Jensen

Laura Jensen, P.G. (NY)
Senior Hydrogeologist

MEMO

To: Andrew Baris, Roux

From: Gary Long

CC: Michael Ritorto, Roux
Laura Jensen, Roux
Tom Biksey, EHS Support

Date: February 21, 2019

Re: *Technical Memorandum: Proposed Refined Ecological Screening Values (ESVs) to Support the Baseline Ecological Risk Assessment at the Columbia Falls Superfund Site*
Former Columbia Falls Aluminum Company Aluminum Reduction Facility
Columbia Falls, Montana

Introduction

This technical memorandum describes the approach for developing refined ecological screening values (ESVs) to support the selection of constituents of potential ecological concern (COPECs) in the Baseline Ecological Risk Assessment (BERA) for the Columbia Falls Aluminum Company (CFAC) Superfund Site in Columbia Falls, Montana. This technical memorandum was prepared as an interim deliverable to supplement the general risk assessment framework provided in the *Baseline Ecological Risk Assessment Work Plan* (BERA WP) submitted to the United States Environmental Protection Agency (USEPA) and Montana Department of Environmental Quality (MDEQ) in November 2017 and revised in May 2018 (EHS Support, 2018a).

As stated in the BERA WP, refinement of COPECs identified in the Screening-Level Ecological Risk Assessment (SLERA) will be performed as part of the BERA Problem Formulation (EHS Support, 2018a). COPEC refinement in the BERA Problem Formulation is consistent with USEPA *The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessment* (USEPA, 2001). The refinement of COPECs identified in the SLERA is a fundamental step in the BERA Problem Formulation to focus BERA analyses on COPECs that are most likely to drive risk management decision-making for the Site. The intent of the refinement is to focus and streamline the overall Ecological Risk Assessment Guidance for Superfund (ERAGS) process by considering additional components early in the BERA process.

COPEC refinement will be performed on the combined datasets from the Phase I and Phase II Site Characterization sampling for ecological exposure media (EHS Support, 2018a). Screening of constituents using the combined Phase I and Phase II datasets for each exposure area and exposure medium will be based on a tiered approach:

1) Maximum exposure point concentrations (EPCs) of constituents in Phase I and Phase II Site Characterization datasets for each ecological exposure area will be initially compared to minimum ESVs presented in the SLERA.
2) Constituents identified as COPECs in the initial screening will be refined based on the re-screening of COPECs using comparisons of maximum EPCs to refined ESVs.

The technical memorandum presents the rationale for selecting refined ESVs to support the COPEC refinement process in the BERA. The comparisons of maximum exposure concentrations to minimum ESVs, consistent with Step 1 of the COPEC refinement process, have a low probability of resulting in false negatives in the screening process (i.e., eliminating COPECs that may cause adverse effects due to exposure). However, the minimum ESVs applied in Step 1 of the screening do not represent the range of no observed effect concentration (NOEC) endpoints that are protective of chronic exposure. Therefore, these comparisons cannot be used to conclude that exposure to a COPEC is likely to result in adverse effects. The findings of Step 1 of the screening process only indicate that certain COPECs and associated exposure pathways require further evaluation. Refined ESVs were identified to represent values that are protective of chronic exposure but represent a broader range of NOEC endpoints that will be used to focus the list of COPECs requiring further evaluation in the BERA.

Refined ESVs are identified in this technical memorandum for the list of COPECs identified for soil, sediment, and surface water in the SLERA based on the screening of Phase I Site Characterization data and additional COPECs identified in the BERA WP based on detected constituents lacking ESVs. If additional COPECs are identified during Tier 1 screening once the Phase I and Phase II Site Characterization datasets are combined, the selection of refined ESVs for the Tier 2 screening will follow the approach outlined in this technical memorandum for additional COPECs. The following sections describe the technical rationale for the selection of refined soil, sediment, and surface water ESVs in the COPEC refinement process in the BERA Problem Formulation.

Refined Soil ESVs

Refined soil ESVs will be based on peer-reviewed, multi-trophic level soil screening criteria, consistent with the USEPA approach for deriving Ecological Soil Screening Levels (Eco-SSLs). Eco-SSLs were derived as risk-based soil screening levels through a peer review process for the protection of multiple terrestrial receptor categories (USEPA, 2005):

- Terrestrial plants
- Soil invertebrates
- Birds
- Mammals

Like Eco-SSLs, the Los Alamos National Laboratory (LANL) ECORISK Database (Release 4.1) presents conservative screening values based on modeled exposure for receptors in various trophic levels (LANL, 2017). Consistent with the Eco-SSL approach, the ECORISK Database used geometric mean concentrations of NOEC endpoints as screening criteria for each terrestrial receptor category. These LANL screening values were used to supplement the Eco-SSL values to develop refined ESVs. Screening values for the various terrestrial trophic level receptors evaluated in both the ECORISK Database and the Eco-SSL guidance were pooled, and the minimum screening criterion for each COPEC was identified as the refined soil ESV (**Table 1**).

Refined ESVs for chemicals lacking screening values in the LANL and/or Eco-SSL datasets were identified from other available sources in the literature. USEPA Region 5 ecological screening levels (ESLs) (USEPA, 2003a) were preferentially used for this purpose. ESLs provide protective benchmarks for contaminants in soil, and consider direct, as well as indirect (i.e., food-chain) exposure pathways. If ESLs were not available, other accepted sources for soil benchmarks were also considered (e.g., Efroymson et al., 1997a; Efroymson et al., 1997b).

Given that refined ESVs are protective of direct contact and indirect ingestion exposure pathways, constituents with maximum EPCs lower than the refined ESVs will not be evaluated further in the BERA. In the absence of sufficient data to refine soil ESVs, the conservative minimum ESV used in the SLERA will be retained. However, further literature review may be conducted to refine ESVs for these COPECs in the BERA Problem Formulation. Refined soil ESVs for the initial COPECs identified in the SLERA and BERA Work Plan are presented in **Table 1**; the rationale for the selection of refined ESVs is presented in the following sections.

Inorganic COPECs

With one exception, the lowest screening value from the LANL ECORISK Database or the USEPA Eco-SSLs will be used as refined ESVs for metal and other inorganic COPECs (**Table 1**). The refined ESV for chromium was the only metal for which the lowest screening value from the two primary sources was not selected.

Refined ESVs for chromium will be identified from toxicity studies conducted based on exposure to the corresponding form of chromium measured in soils at the Site. Chromium is present primarily in the trivalent [Cr(III)] oxidation state under typical soil conditions (USEPA, 2008a). Hexavalent chromium [Cr(VI)] is only stable in oxidizing soils at moderate pH levels, whereas the Cr(III) is the dominant species under moderately oxidizing to reducing conditions. Additionally, the reduction-oxidation transformations between the two valence states are not fully reversible. Cr(VI) will reduce to Cr(III) in a reducing environment, but once reduced, Cr(III) will not readily re-oxidize to Cr(VI) under oxidizing conditions.

A select number of soil borings will be analyzed for Cr(VI) and total chromium in the Phase II Site Characterization to reduce uncertainty in the risk assessment of chromium in site soils (Roux Associates, 2018a). Cr(III) concentrations will be estimated as the difference in concentrations between total chromium and Cr(VI) results. Estimated concentrations of Cr(III) and measured concentrations of Cr(VI) will be used to develop a site-specific ratio of Cr(III):Cr(VI). The site-specific Cr(III):Cr(VI) ratio will be applied to Phase I and Phase II samples analyzed only for total chromium to estimate the relative concentration of Cr(III) and Cr(VI) in the sample. Refined ESVs derived based on Cr(VI) toxicity studies will be applied to the measured or estimated Cr(VI) concentrations in soil; refined ESVs for Cr(III) or total chromium will be applied to estimated concentrations of Cr(III) in soil (**Table 1**).

Numeric ESVs were not identified for aluminum and iron in soil in the Eco-SSL or LANL ECORISK database. USEPA Eco-SSL guidance indicates that total aluminum measurements are not considered suitable or reliable for the prediction of potential toxicity and bioaccumulation of aluminum in soils (USEPA, 2003b). The Eco-SSL guidance indicates that potential ecological risks associated with aluminum are based on soil pH, with aluminum being identified as a COPEC only at sites where soil pH is less than

5.5 (USEPA, 2003b). Therefore, the screening of aluminum as a COPEC in site soils will be based on measured soil pH values as an indication of the potential bioavailability and toxicity of aluminum concentrations. Like aluminum, numeric Eco-SSLs were not derived for iron because its bioavailability and toxicity are dependent upon site-specific conditions, including soil pH. In well-aerated soils with pH values between 5 and 8, iron is not expected to be toxic to plants (USEPA, 2003c). Consistent with Eco-SSL guidance, the potential bioavailability and toxicity of iron will be based on site-specific measurements of soil pH.

For metal COPECs, mean concentrations representative of unimpacted soils analyzed as part of the Montana State Background Investigation (MSBI; Hydrometrics, 2013) were presented in the BERA Work Plan to provide regional context to concentrations of inorganic chemicals detected in soil. Further characterization of background conditions is proposed as part of the Phase II Site Characterization (Roux Associates, 2018b; Roux Associates, 2018c). Site-specific background data collected as part of the Phase II Site Characterization will supplant MSBI regional soil data in the COPEC refinement process conducted as part of the BERA Problem Formulation. In addition to comparisons to refined ESVs, concentrations of metals in soil will also be compared to representative, site-specific background concentrations to evaluate whether detected concentrations are consistent with naturally occurring concentrations.

As stated in the BERA Work Plan and consistent with *The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments* (USEPA, 2001), representative background concentrations calculated from Phase II Site Characterization background data will be used as the refined ESV to evaluate the need for further consideration of essential nutrients in the BERA. Because the soil background data from the Phase II Site Characterization sampling have not been compiled and representative background concentrations for each metal have not yet been calculated or approved, only the refined ESVs based on toxicological effects are presented in this interim deliverable.

Organic COPECs

LANL and/or USEPA Eco-SSLs values were available for many organic COPECs (**Table 1**). For the organic COPECs lacking LANL or Eco-SSL values, refined ESVs will be based on USEPA Region 5 ESLs (USEPA, 2003a) for 16 non-polycyclic aromatic hydrocarbons (PAH) organic compounds and based on an Oak Ridge National Laboratory (ORNL) benchmark for 4-nitrophenol in soil (Efroymson et al., 1997a). As shown in **Table 1**, the minimum ESV used in the SLERA was retained for organic COPECs lacking refined ESVs from these sources.

Exposure to the mixture of 17 dioxin/furan compounds analyzed in surficial (0-0.5 ft) and shallow (0.5-2 ft) soil samples will be evaluated relative to the toxicity of 2,3,7,8-tetrachlorinated dibenzo-p-dioxin (2,3,7,8-TCDD) using toxicity equivalency factors (TEFs) developed for birds and mammals by the World Health Organization (Van den Berg et al., 2006; Van den Berg et al., 1998; USEPA, 2008b). For dioxin/furan screening, measured concentrations of the 17 dioxin/furan compounds in surface and shallow soil samples will be multiplied by compound-specific TEFs to calculate toxicity equivalence concentrations to 2,3,7,8-TCDD ($TEC_{2,3,7,8\text{-}TCDD}$) for each compound, assuming consistent bioaccumulation for the 17 dioxin/furan compounds. The summed $TEC_{2,3,7,8\text{-}TCDD}$ values for each sample will be compared to the refined ESV for 2,3,7,8-TCDD, which is identified in **Table 1** as 0.00000029 mg/kg based on the protection of mammalian wildlife in the LANL ECORISK database. Multiple options are available for addressing surrogate values for nondetect congener results (USEPA, 2008b). The CFAC BERA will use 0,

0.5 x the method detection limit (MDL) and the MDL as three scenarios to bracket the range of possible concentrations owing to contributions of results that are nondetect. The MDL represents the lower limit of concentrations detectable by the analytical method. Therefore, any concentrations above the MDL are typically detectable values, and are recorded at the concentration reported by the laboratory. Thus, the MDL represents a conservative upper limit for the potential concentration of dioxin in a sample producing a nondetect result. In some cases, dioxin congener results that had a reported laboratory value were flagged with a laboratory qualifier "B" (indicating blank contamination) and a validation qualifier of "U" (indicating that the influence of the blank contamination compromised the confidence of determining if the constituent was present in the sample at all). In such cases, the reported laboratory value will conservatively be used as the surrogate value for the nondetect rather than the MDL. All reported and surrogate values will then be multiplied by the appropriate bird or mammal TEF, and the TEF-adjusted concentrations will then be summed to develop the $TEC_{2,3,7,8\text{-}TCDD}$.

Given that some organic COPECs in soils may be derived from regional sources unrelated to site activities (e.g., PAHs), representative background concentrations derived from the background investigation that will be conducted as part of the Phase II Site Characterization sampling will be compared to measured concentrations in site datasets to further refine the list of organic COPECs for evaluation in the BERA (Roux Associates, 2018c).

Refined Sediment ESVs

Refined ESVs for sediment will be based primarily on consensus-based criteria and equilibrium partitioning (EqP)-based criteria protective of direct contact toxicity pathways to benthic organisms. Given that sediment ESVs are not derived for the protection of indirect exposure through ingestion (e.g., bioaccumulation/biomagnification pathways), potential ingestion exposure pathways for detected bioaccumulative COPECs will be evaluated consistent with the approach outlined in the *Technical Memorandum: Proposed Wildlife Exposure Modeling Approach to Support the Baseline Ecological Risk Assessment at the Columbia Falls Superfund Site* (EHS Support, 2018b).

Refined ESVs for sediment COPECs identified in the SLERA and BERA Work Plan are provided in **Table 2**; the rationale for the selection of refined ESVs is presented in the sections below. In the absence of sufficient data to refine sediment ESVs, the conservative minimum ESV used in the SLERA will be retained. However, further literature review may be conducted to refine ESVs for these COPECs in the BERA Problem Formulation.

Inorganic COPECs

Refined sediment ESVs for metal COPECs will be using the consensus-based threshold effects concentrations (TEC) approach (MacDonald et al., 2000), as available. In the absence of consensus-based TECs, refined ESVs will be selected from sources in the following order of preference:

- USEPA Region 5 ESLs
- USEPA Region 3 Biological Technical Assistance Group (BTAG) Freshwater Sediment Screening Benchmarks
- Threshold Effect Levels (TELs) for *Hyalella azteca* (USEPA, 1996; Ingersoll et al., 1996)

The refined ESV for total cyanide of 0.1 mg/kg will be based on the USEPA Region 3 BTAG screening value, which was adopted from Persaud et al. (1993). The minimum ESV previously used in the SLERA (0.0001 mg/kg) was based on the USEPA Region 5 ESL for total cyanide, which also cited Persaud et al. (1993) as a source. However, USEPA Region 5 erroneously presented the Persaud et al. (1993) value as 0.0001 mg/kg. Therefore, the correct value of 0.1 mg/kg from Persaud et al. (1993) will be used as the refined ESV for total cyanide in sediment.

Inorganic COPECs in sediment will also be evaluated relative to site-specific background data collected as part of the Phase II Site Characterization to further refine sediment COPECs in the BERA (Roux Associates, 2018c). As stated in the BERA Work Plan and consistent with USEPA (2001), representative background concentrations calculated from Phase II Site Characterization background data will be used as the refined ESV to evaluate the need for further consideration of essential nutrients in the BERA (**Table 2**).

Organic COPECs

Refined ESVs for organic COPECs in sediment will be based primarily on EqP-based criteria protective of direct contact toxicity pathways to benthic organisms. Refined ESVs for PAHs in sediment will be based on USEPA *Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures* (USEPA, 2003d). Exposure to PAH mixtures in sediment will be evaluated for potential additive narcotic effects to benthic organisms based on the sum of equilibrium partitioning sediment benchmark toxic units (∑ESBTUs) calculated from individual PAH compounds:

$$\sum ESBTU_{FCV,Total} = \sum_{i=1}^{16} \frac{C_{oc,PAHi}}{C_{oc,PAHi,FCVi}} \times UF$$

where:

$\sum ESBTU_{FCV,Total}$	= Sum of ESBTUs for the PAH mixture based on 34 PAH compounds (unitless)
$C_{oc,PAHi}$	= Organic carbon normalized concentration of PAH *i* ($\mu g/g_{oc}$)
$C_{oc,PAHi,FCVi}$	= Organic carbon normalized critical concentration of PAH *i* based on the final chronic value (FCV; $\mu g/g_{oc}$)
UF	= Uncertainty factor to estimate the toxicity of total PAHs (based on 34 PAHs – 18 parent and 16 alkylated compounds)

∑ESBTU values less than or equal to 1.0 are considered acceptable for the protection of benthic invertebrate receptors; values exceeding 1.0 indicate a potential for narcotic effects in benthic receptors (USEPA, 2003d).

Sediment samples collected in the Phase I Site Characterization were analyzed for 16 of the 34 PAH compounds included in the USEPA ESB model[1]; therefore, for the Phase I data, a site-specific uncertainty

[1] Analyzed PAH compounds include: naphthalene, acenaphthylene, acenaphthene, fluorene, anthracene, phenanthrene, pyrene, fluoranthene, benz(a)anthracene, chrysene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene.

factor (UF) or site-specific relationship will be applied to the ∑ESBTU values calculated based on 16 compounds ($\sum ESBTU_{FCV,16}$) to estimate $\sum ESBTU_{FCV,Total}$. Sediment samples collected from select stations in the Phase II Site Characterization sampling will be analyzed for the 34 PAH compounds included in the USEPA ESB model; therefore, $\sum ESBTU_{FCV,Total}$ values will be calculated directly based on the concentrations of the 34 PAH compounds measured in these samples.

Site-specific relationships will be developed to estimate the potential toxicity of unmeasured PAHs in the ∑ESBTU calculation in samples where only 16 compounds were analyzed. Site-specific relationships will be evaluated between ∑ESBTU values calculated based on 34 compounds ($\sum ESBTU_{FCV,34} = \sum ESBTU_{FCV,Total}$) and 16 compounds ($\sum ESBTU_{FCV,16}$). Site-specific ratios of $\sum ESBTU_{FCV,34}$:$\sum ESBTU_{FCV,16}$ may be developed as UFs to account for unmeasured PAHs in samples analyzed for 16 PAH compounds. The development of UFs based on $\sum ESBTU_{FCV,34}$:$\sum ESBTU_{FCV,16}$ ratios is consistent with the estimation of UFs in USEPA (2003d); however, the use of site-specific ratios provides more relevant UFs for PAH mixtures at the Site. Alternatively, $\sum ESBTU_{FCV,Total}$ values may be estimated using site-specific linear regression models developed based on paired $\sum ESBTU_{FCV,16}$ and $\sum ESBTU_{FCV,34}$ values at stations where 34 PAH compounds are analyzed, provided a significant linear relationship can be derived. The use of site-specific relationships to predict $\sum ESBTU_{FCV,34}$ from $\sum ESBTU_{FCV,16}$ in historical samples is intended to reduce the uncertainty of applying generic UFs provided in USEPA (2003d) to account for the potential toxicity of unmeasured PAHs in the ∑ESBTU calculation.

The availability of ESVs for non-PAH semi-volatile organic compound (SVOC) COPECs is limited (**Table 2**). An EqP-based sediment benchmark provided in USEPA (2008c) will be used as a refined ESV for dibenzofuran. An EqP-based sediment benchmark for 4-methylphenol adopted by USEPA Region 5 as an ESL will be used as a refined ESV for 3- & 4-methylphenol. The EqP-based sediment benchmark for 4-methylphenol was lower than the USEPA Region 5 EqP-based sediment benchmark for 3-methylphenol; therefore, the refined ESV will be conservative based on the assumption that the 3- & 4-methylphenol concentration consists entirely of 4-methylphenol.

ESVs were not identified for other non-PAH SVOC COPECs. However, refined ESVs may be calculated using an EqP model if the review of the combined Phase I and Phase II Site Characterization data indicates frequent detection of these non-PAH SVOC COPECs (greater than 5 percent of samples[2]). For select nonionic organic constituents, refined ESVs will be based on sediment quality benchmarks (SQBs) calculated using an EqP model (USEPA, 2008c). SQBs represent concentrations in bulk sediment that, at equilibrium, would result in partitioning to sediment pore water at concentrations equivalent to NOEC water quality benchmarks (WQB_{NOEC}) based on constituent-specific organic carbon-water partitioning coefficients (K_{oc}):

$$SQB_{NOEC} = (f_{oc} \times K_{oc} \times WQB_{NOEC})$$

where:

[2] USEPA (2001) provides for the refinement of COPECs based on frequency and magnitude of detection. Assuming the Phase I and Phase II Site Characterization data provide adequate coverage, a frequency of detection of less than 5 percent in site datasets will be used to refine COPECs from further consideration in the BERA, as proposed in the BERA WP (EHS Support, 2018a).

SQB_{NOEC}	= Sediment quality benchmark based on NOEC aqueous toxicity data (µg/kg dry weight sediment)
f_{oc}	= fraction of organic carbon (kg OC/kg sediment)
K_{oc}	= organic carbon-water partitioning coefficient (L/kg)
WQB_{NOEC}	= water quality benchmark based on a chronic NOEC (µg/L)

For select nonionic organic constituents, refined ESVs will be based on SQBs calculated assuming minimum f_{oc} within the exposure area and WQB_{NOEC} values based on surface water quality benchmarks derived for the general protection of aquatic life. Exposure estimates for COPECs exceeding SQBs calculated assuming minimum f_{oc} within the exposure area will be further evaluated based on sample-specific f_{oc} in the BERA exposure assessment. In the absence of sufficient data to refine sediment ESVs based on EqP approaches, the conservative minimum ESV used in the SLERA will be retained.

Refined Surface Water ESVs

Refined ESVs for surface water will be primarily based on USEPA National Recommended Water Quality Criteria (NRWQC) or MDEQ chronic surface water quality for the protection of aquatic life (**Table 3**). Chronic aquatic life surface water criteria are derived for the protection of 95 percent of aquatic species. Therefore, these criteria are considered adequately protective to identify COPEC concentrations in surface water that have the potential to result in adverse ecological effects and warrant additional evaluation in the BERA.

Inorganic COPECs

Refined surface water ESVs for metal COPECs will be based on USEPA NRWQC or MDEQ chronic surface water quality for the protection of aquatic life, where applicable. Refined surface water ESVs for metal COPECs will be applied to the sample result fraction (total versus dissolved) that corresponds to the aqueous toxicity endpoint (total versus dissolved) used as the basis for chronic aquatic life surface water criteria.

For USEPA NRWQC, chronic surface water quality criteria for many metals are based on exposure to the dissolved fraction (**Table 3**). Refined ESVs for these metals will be compared to metals concentrations in surface water samples filtered through a 0.45-µm pore size filter, which operationally defines the dissolved COPEC fraction. USEPA NRWQC for cadmium, lead, nickel, and zinc are adjusted for total hardness (as $CaCO_3$) using the equations provided in **Table 3**. USEPA NRWQC for copper and aluminum are based on models developed to characterize the bioavailable forms of these metals in surface water based on water quality parameters. The NRWQC for copper is based on the Biotic Ligand Model (BLM), which accounts for organic compounds and inorganic ligands in surface water that are known to complex with copper and affect bioavailability and toxicity (USEPA, 2007b). For aluminum, the refined ESV will be based on draft USEPA aquatic life ambient water quality criteria developed using multiple linear regression models to characterize aluminum bioavailability based on pH, hardness, and dissolved organic carbon (DOC; USEPA, 2017).

MDEQ Aquatic Life Standards (DEQ-7) for metals are based on the total (unfiltered) fraction, except for aluminum. MDEQ criteria for cadmium, copper, lead, nickel, and zinc will be adjusted for total hardness (as $CaCO_3$) using the equations provided in **Table 3**.

Refined ESVs for metals will be based on NRWQC or MDEQ criteria applicable to the sample result fraction (total versus dissolved). If the maximum EPC exceeds the applicable criterion for the corresponding fraction, the metal COPEC will be further evaluated in the BERA.

For metals that lack USEPA NRWQC or MDEQ surface water quality criteria (beryllium and manganese), refined ESVs will be based on lowest chronic values reported for all organisms (fish, daphnids, non-daphnid invertebrates, and aquatic plants) in Suter and Tsao (1996). A revised surface water ESV was not identified for barium; therefore, the minimum ESV used in the SLERA will be used as the basis for further evaluation in the BERA.

ESVs for cyanide and fluoride will be based on minimum ESVs used in the SLERA. The NRWQC criterion for cyanide is based on free cyanide analysis, which represents the concentration of the cyanide ion (CN^-) and hydrogen cyanide (HCN). The MDEQ surface water quality criterion for cyanide is based on total cyanide analysis. If the maximum EPC for free cyanide or total cyanide analyses exceed the applicable criterion, cyanide exposure in surface water will be further evaluated in the BERA.

Inorganic COPECs in surface water will also be evaluated relative to site-specific background data collected as part of the Phase II Site Characterization to further refine surface water COPECs in the BERA.

Organic COPECs

Select PAH compounds were identified as surface water COPECs based on the screening of Phase I Site Characterization and additional COPECs identified in the BERA WP based on detected constituents lacking ESVs. As indicated in **Table 3**, revised ESVs for select PAH compounds will be based on lowest chronic values reported for all organisms (fish, daphnids, non-daphnid invertebrates, and aquatic plants) in Suter and Tsao (1996). If individual PAH compounds exceed revised ESVs, further evaluation of the potential toxicity of PAH mixtures to aquatic organisms will be further evaluated in the BERA.

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Table 1
Summary of Refined Ecological Screening Values (ESVs) for Soil
Draft Technical Memorandum: Proposed Refined Ecological Screening Values
Columbia Falls Aluminum Company
Columbia Fall, Montana

Analyte	CAS Number	Minimum CFAC SLERA ESV	Refined CFAC BERA ESV	Montana State Background Investigation Mean Concentration	Plants					Soil Invertebrates					Mammals					Birds			
					USEPA Eco-SSLs	LANL EcoRisk*	ORNL	USEPA Region 5 ESLs	Refined CFAC Plant ESV	USEPA Eco-SSLs	LANL EcoRisk*	ORNL	USEPA Region 5 ESLs	Refined CFAC Invertebrate ESV	USEPA Eco-SSLs	LANL EcoRisk*	ORNL	USEPA Region 5 ESLs	Refined CFAC Mammalian ESV	USEPA Eco-SSLs	LANL EcoRisk*	ORNL	Refined CFAC Bird ESV
Metals (mg/kg)																							
Aluminum	7429905	50	See Narrative	15500	See Narrative	---	50	---	See Narrative	See Narrative	---	---	---	See Narrative	See Narrative	---	---	---	See Narrative	See Narrative	---	---	See Narrative
Antimony	7440360	0.142	0.27	0.2	---	11	5	---	11	78	78	---	---	78	0.27	2.3	0.248	0.142	0.27	---	--	---	---
Arsenic	7440382	0.25	6.8	11.4	18	18	10	---	18	---	6.8	60	---	6.8	46	19	0.25	5.7	19	43	15	2	15
Barium	7440393	1.04	110	195	---	110	500	---	110	330	330	---	---	330	2000	1800	20	1.04	1800	---	720	17.2	720
Beryllium	7440417	1.06	2.5	0.7	---	2.5	10	---	2.5	40	40	---	---	40	21	35	2.42	1.06	21	---	--	---	---
Cadmium	7440439	0.00222	0.27	0.3	32	32	4	---	32	140	140	20	---	140	0.36	0.27	3.533	0.00222	0.27	0.77	0.29	1.2	0.29
Chromium (trivalent)	7440473	0.35	23	19.6	---	---	---	---	---	---	---	---	---	---	34	63	10026	---	34	26	23	0.83	23
Chromium (hexavalent)	7440473	NE	0.34	---	---	0.35	1	---	0.35	---	0.34	0.4	0.4	0.34	130	510	112.01	---	130	---	140	---	140
Cobalt	7440484	0.14	13	7.3	13	13	20	---	13	---	---	---	---	---	230	240	---	0.14	230	120	76	---	76
Copper	7440508	5.4	14	17.6	70	70	100	---	70	80	80	50	---	80	49	42	55.7	5.4	42	28	14	38.9	14
Iron	7439896	No ESV	See Narrative	18200	See Narrative	---	---	---	See Narrative	See Narrative	---	---	---	See Narrative	See Narrative	---	---	---	See Narrative	See Narrative	---	---	See Narrative
Lead	7439921	0.0537	11	15.3	120	120	50	---	120	1700	1700	500	---	1700	56	93	29.3	0.0537	56	11	11	0.94	11
Manganese	7439965	220	220	508	220	220	500	---	220	450	450	---	---	450	4000	1400	322	---	1400	4300	1300	825	1300
Mercury	7439976	0.005	0.013	0.05	---	34	0.3	---	34	---	0.05	0.1	0.1	0.05	---	1.7	4.76		1.7	---	0.013	0.37	0.013
Nickel	7440020	9.7	10	16.6	38	38	30	---	38	280	280	200	---	280	130	10	146.52	13.6	10	210	20	64.08	20
Selenium	7782492	0.0276	0.52	0.4	0.52	0.52	1	---	0.52	4.1	4.1	70	---	4.1	0.63	0.7	0.733	0.0276	0.63	1.2	0.71	0.331	0.71
Thallium	7440280	0.027	0.05	0.25	---	0.05	1	---	0.05	---	---	---	---	---	---	0.42	0.027	0.0569	0.42	---	4.5	---	4.5
Vanadium	7440622	0.714	4.7	30.9	---	60	2	---	60	---	---	---	---	---	280	290	0.714	1.59	280	7.8	4.7	9.439	4.7
Zinc	7440666	6.62	46	60.5	160	160	50	---	160	120	120	200	6.62	120	79	99	586.1		79	46	47	12	46
Essential Nutrients (mg/kg)																							
Calcium	7440702	No ESV	Background	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Magnesium	7439954	No ESV	Background	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Potassium	7440097	No ESV	Background	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Sodium	7440235	No ESV	Background	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Other Inorganic Parameters (mg/kg)																							
Cyanide, Total	57125	0.1	0.098	---	---	---	---	---	---	---	---	---	---	---	---	330	---	1.33	330	---	0.098	---	0.098
Fluoride	16984488	6.5	120	---	---	---	---	---	---	---	---	---	---	---	---	1100	149.4	---	1100	---	120	6.5	120
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)																							
Total LMW PAHs	NA	29	29	---	---	---	---	---	---	29	---	---	---	29	100	---	---	---	100	---	---	---	---
Total HMW PAHs	NA	1.1	1.1	---	---	---	---	---	---	18	---	---	---	18	1.1	---	---	---	1.1	---	---	---	---
Semi-Volatile Organic Compounds (SVOCs) - Non PAH (mg/kg)																							
1,2,4,5-Tetrachlorobenzene	95943	2.02	2.02	---	---	---	---	---	---	---	---	---	---	---	---	--	---	2.02	2.02	---	---	---	---
1.4-Dioxane	123911	1.83	1.83	---	---	---	---	---	---	---	---	---	---	---	---	--	1.83	2.05	1.83	---	---	---	---
2,4,5-Trichlorophenol	95954	4	4	---	---	---	4	---	4	---	---	9	---	9	---	--	---	14.1	14.1	---	---	---	---
2,4-Dimethylphenol	105679	0.01	0.01	---	---	---	---	0.01	0.01	---	---	---	---	---	---	--	---		---	---	---	---	---
2,4-Dinitrophenol	51285	0.0609	0.0609	---	---	---	20	---	20	---	---	---	---	---	---	--	---	0.0609	0.0609	---	---	---	---
2,4-Dinitrotoluene	121142	1.28	6	---	---	6	---	---	6	---	18	---	---	18	---	14	---	1.28	14	---	---	---	---
2,6-Dinitrotoluene	606202	0.0328	4	---	---	---	---	---	---	---	30	---	---	30	---	4	---	0.0328	4	---	52	---	52
2-Chloronaphthalene	91587	0.0122	0.0122	---	---	---	---	---	---	---	---	---	---	---	---	--	---	0.0122	0.0122	---	---	---	---
2-Chlorophenol	95578	0.243	0.39	---	---	---	---	---	---	---	---	---	---	---	---	0.54	---	0.243	0.54	---	0.39	---	0.39
2-Methylphenol	95487	0.67	0.67	---	---	0.67	---	---	0.67	---	---	---	---	---	---	580	---	---	580	---	---	---	---
2-Nitrophenol	88755	1.6	1.6	---	---	---	---	---	---	---	---	---	---	---	---	--	---	1.6	1.6	---	---	---	---
3,3'-Dicholorobenzidine	91941	0.646	0.646	---	---	---	---	---	---	---	---	---	---	---	---	--	---	0.646	0.646	---	---	---	---
4,6-Dinitro-2-methylphenol	534521	0.144	0.144	---	---	---	---	---	---	---	---	---	---	---	---	--	---	0.144	0.144	---	---	---	---
4-Chloroaniline	106478	1	1	---	---	1	---	---	1	---	1.8	---	---	1.8	---	--	---	---	---	---	---	---	---
4-Nitrophenol	100027	No ESV	7	---	---	---	---	---	---	---	---	7	---	7	---	--	---	---	---	---	---	---	---
Bis(2-chloroethoxy) methane	111911	0.302	0.302	---	---	---	---	---	---	---	---	---	---	---	---	--	---	0.302	0.302	---	---	---	---
Bis(2-ethylhexyl) phthalate	117817	0.02	0.02	---	---	---	---	---	---	---	---	---	---	---	---	0.6	36	0.925	0.6	---	0.02	0.91	0.02
Butylbenzylphthalate	85687	0.239	0.239	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Caprolactam	105602	No ESV	No ESV	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Dibenzofuran	132649	6.1	6.1	---	---	6.1	---	---	6.1	---	---	---	---	---	---	--	---	---	---	---	---	---	---
Di-n-butylphthalate	84742	0.011	0.011	---	---	160	200	---	160	---	---	---	---	---	---	180	1090	---	180	---	0.011	0.09	0.011
Di-n-octylphthalate	117840	0.91	0.91	---	---	---	---	---	---	---	---	---	---	---	---	0.91	---	---	0.91	---	---	---	---
Hexachlorobenzene	118741	0.079	0.079	---	---	10	---	---	10	---	10	---	---	10	---	0.2	---	0.199	0.2	---	0.079	---	0.079
Hexachlorobutadiene	87683	0.0398	0.0398	---	---	---	---	---	---	---	---	---	---	---	---	--	---	0.0398	0.0398	---	---	---	---

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Analyte	CAS Number	Minimum CFAC SLERA ESV	Refined CFAC BERA ESV	Montana State Background Investigation Mean Concentration	Plants					Soil Invertebrates					Mammals					Birds			
					USEPA Eco-SSLs	LANL EcoRisk*	ORNL	USEPA Region 5 ESLs	Refined CFAC Plant ESV	USEPA Eco-SSLs	LANL EcoRisk*	ORNL	USEPA Region 5 ESLs	Refined CFAC Invertebrate ESV	USEPA Eco-SSLs	LANL EcoRisk*	ORNL	USEPA Region 5 ESLs	Refined CFAC Mammalian ESV	USEPA Eco-SSLs	LANL EcoRisk*	ORNL	Refined CFAC Bird ESV
Hexachlorocyclopentadiene	77474	0.755	0.755	---	---	---	10	---	10	---	---	---	---	---	---	--	---	0.755	0.755	---	---	---	---
Hexachloroethane	67721	0.596	0.596	---	---	---	---	---	---	---	---	---	---	---	---	--	---	0.596	0.596	---	---	---	---
Nitrobenzene	98953	1.31	2.2	---	---	---	---	---	---	---	2.2	40	---	2.2	---	4.8	---	1.31	4.8	---	---	---	---
N-Nitrosodi-n-propylamine	621647	0.544	0.544	---	---	---	---	---	---	---	---	---	---	---	---	--	---	0.544	0.544	---	---	---	---
N-Nitrosodiphenylamine	86306	0.545	0.545	---	---	---	---	---	---	---	---	20	---	20	---	--	---	0.545	0.545	---	---	---	---
Pentachlorophenol	87865	0.119	0.36	---	5	5	3	---	5	31	31	6	---	31	2.8	0.81	0.879	0.119	0.81	2.1	0.36	---	0.36
Phenol	108952	0.79	0.79	---	---	0.79	70	---	0.79	---	1.8	30	---	1.8	---	37	---	120	37	---	---	---	---
Volatile Organic Compounds (VOCs) (mg/kg)																							
Bromomethane	74839	0.235	0.235	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.235	---	---	---	---	---
Cyclohexane	110827	No ESV	No ESV	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Isopropylbenzene	98828	No ESV	No ESV	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl acetate	79209	No ESV	No ESV	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methylcyclohexane	108872	No ESV	No ESV	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
M,P-Xylene	179601231	No ESV	No ESV	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
O-Xylene	95476	No ESV	No ESV	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Total Xylenes	1330207	No ESV	1.4	---	---	100	---	10	100	---	---	---	---	---	---	1.4	4.162	---	1.4	---	41	---	41
Dioxin and Dioxin-Like Compounds (mg/kg)																							
Mammalian $TEC_{2,3,7,8\text{-TCDD}}$	NA	NE	0.00000029	---	---	---	---	---	---	---	5	---	---	5	---	0.00000029	3.15E-07	---	0.00000029	---	---	---	---
Avian $TEC_{2,3,7,8\text{-TCDD}}$	NA	NE	0.00000158	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.00000158	0.00000158
Polychlorinated Biphenyls (mg/kg)																							
Aroclor-1016	12674-11-2	1.1	1.1	---	---	---	---	---	---	---	---	---	---	---	---	1.1	6.52	---	1.1	---	---	---	---
Aroclor-1221	11104-28-2	No ESV	No ESV	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Aroclor-1232	11141-16-5	No ESV	No ESV	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Aroclor-1242	53469-21-9	0.041	0.041	---	---	---	---	---	---	---	---	---	---	---	---	0.39	0.329	---	0.39	---	0.041	0.339	0.041
Aroclor-1248	12672-29-6	0.0073	0.0073	---	---	---	---	---	---	---	---	---	---	---	---	0.0073	0.071	---	0.0073	---	0.041	---	0.041
Aroclor-1254	11097-69-1	0.041	0.041	---	---	160	---	---	160	---	---	---	---	---	---	0.45	0.111	---	0.45	---	0.041	0.149	0.041
Aroclor-1260	11096-82-5	0.88	0.88	---	---	---	---	---	---	---	---	---	---	---	---	10	---	---	10	---	0.88	---	0.88
Aroclor-1262	37324-23-5	No ESV	No ESV	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Aroclor-1268	11100-14-4	No ESV	No ESV	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Total PCB Aroclors	1336-36-3	0.000332	0.000332	---	---	---	40	---	40	---	---	---	---	---	---	---	---	0.000332	0.000332	---	---	---	---

Notes:

No ESV, An ecological screening value was not identified from the listed sources. BERA, Baseline Ecological Risk Assessment

CFAC, Columbia Falls Aluminum Company

Eco-SSL, Ecological Soil Screening Level

ESL, Ecological Screening Level

ESV, Ecological Screening Value

HMW, High Molecular Weight

LANL, Los Alamos National Laboratory

LMW, Low Molecular Weight

NA, Not applicable.

NE, Not evaluated.

ORNL, Oak Ridge National Laboratory Benchmarks

PAH, Polycyclic Aromatic Hydrocarbons

SLERA, Screening-Level Ecological Risk Assessment

$TEC_{2,3,7,8\text{-TCDD}}$, Toxicity equivalency concentration - 2,3,7,8-TCDD

USEPA, United States Environmental Protection Agency

*, An asterisk (*) indicates that the values identified in LANL are geometric mean no-effect benchmarks for particular receptor groups.

Table 2
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Columbia Falls Aluminum Company
Columbia Fall, Montana

Analyte	CAS Number	log K_{ow}	Minimum CFAC SLERA ESV	Refined CFAC BERA ESV	Threshold Effects Ecological Screening Values					
					Consensus-based Threshold Effect Concentration (TEC) (MacDonald et al., 2000)	USEPA Region 5 RCRA Ecological Screening Levels	USEPA Region 3 BTAG Freshwater Sediment Screening Benchmarks	TEL-HA28 (USEPA, 1996; Ingersoll et al., 1996)	USEPA ESBs PAHs (USEPA, 2003d) Coc, PAHi,FCVi (mg/kg @ 1% TOC)	USEPA ESBs Nonpolar Organics (USEPA, 2008c) (mg/kg @ 1% TOC)
Metals (mg/kg)										
Aluminum	7429905	NA	26000	26000	--	--	--	26000	--	--
Antimony	7440360	NA	2	2	--	--	2	--	--	--
Arsenic	7440382	NA	9.79	9.79	9.79	9.79	9.8	10.787	--	--
Barium	7440393	NA	No ESV	No ESV	--	--	--	--	--	--
Beryllium	7440417	NA	No ESV	No ESV	--	--	--	--	--	--
Cadmium	7440439	NA	0.583	0.99	0.99	0.99	0.99	0.583	--	--
Chromium	7440473	NA	36.2	43.4	43.4	43.4	43.4	36.2	--	--
Cobalt	7440484	NA	50	50	--	50	50	--	--	--
Copper	7440508	NA	28	31.6	31.6	31.6	31.6	28	--	--
Iron	7439896	NA	20000	20000	--	--	20000	188400	--	--
Lead	7439921	NA	35.8	35.8	35.8	35.8	35.8	37.2	--	--
Manganese	7439965	NA	460	460	--	--	460	631	--	--
Mercury	7439976	NA	0.174	0.18	0.18	0.174	0.18	--	--	--
Nickel	7440020	NA	19.5	22.7	22.7	22.7	22.7	19.5	--	--
Selenium	7782492	NA	2	2	--	--	2	--	--	--
Silver	7440224	NA	0.5	1	--	0.5	1	--	--	--
Thallium	7440280	NA	No ESV	No ESV	--	--	--	--	--	--
Vanadium	7440622	NA	No ESV	No ESV	--	--	--	--	--	--
Zinc	7440666	NA	98	121	121	121	121	98	--	--
Essential Nutrients (mg/kg)										
Calcium	7440702	NA	No ESV	Background	--	--	--	--	--	--
Magnesium	7439954	NA	No ESV	Background	--	--	--	--	--	--
Potassium	7440097	NA	No ESV	Background	--	--	--	--	--	--
Sodium	7440235	NA	No ESV	Background	--	--	--	--	--	--
Other Inorganic Parameters (mg/kg)										
Cyanide, Total	57125	NA	0.0001	0.1	--	0.0001	0.1	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)										
2-Methylnaphthalene	91576	3.72	0.0202	Equilibrium Partitioning Sediment Benchmark ($\sum ESBTU_{FCV,Total}$) approach based on sample-specific organic carbon content (USEPA, 2003d; see text)	--	0.0202	0.0202	--	4.47	--
Acenaphthene	83329	4.01	0.00671		--	0.00671	0.00671	--	4.91	--
Acenaphthylene	208968	3.22	0.00587		--	0.00587	0.0059	--	4.52	--
Anthracene	120127	4.53	0.01		0.0572	0.0572	0.0572	0.01	5.94	--
Fluorene	86737	4.21	0.01		0.0774	0.0774	0.0774	0.01	5.38	--
Naphthalene	91203	3.36	0.015		0.176	0.176	0.176	0.015	3.85	--
Phenanthrene	85018	4.57	0.019		0.204	0.204	0.204	0.019	5.96	--
Total LMW PAHs	NA	NA	0.076		--	--	0.076	0.076	--	--
Benzo(a) pyrene	50328	6.11	0.032		0.15	0.15	0.15	0.032	9.65	--

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					Consensus-based Threshold Effect Concentration (TEC) (MacDonald et al., 2000)	USEPA Region 5 RCRA Ecological Screening Levels	USEPA Region 3 BTAG Freshwater Sediment Screening Benchmarks	TEL-HA28 (USEPA, 1996; Ingersoll et al., 1996)	USEPA ESBs PAHs (USEPA, 2003d) Coc, PAHi,FCVi (mg/kg @ 1% TOC)	USEPA ESBs Nonpolar Organics (USEPA, 2008c) (mg/kg @ 1% TOC)
Benzo(a)anthracene	56553	6.71	0.016	Equilibrium Partitioning Sediment Benchmark ($\sum ESBTU_{FCV,Total}$) approach based on sample-specific organic carbon content (USEPA, 2003d; see text)	0.108	0.108	0.108	0.016	8.41	--
Benzo(b) fluoranthene	205992	6.27	10.4		--	10.4	--	--	9.79	--
Benzo(g,h,i) perylene	191242	6.51	0.016		--	0.17	0.17	0.016	10.95	--
Benzo(k) fluoranthene	207089	6.29	0.24		--	0.24	0.24	--	9.81	--
Chrysene	218019	5.71	0.027		0.166	0.166	0.166	0.027	8.44	--
Dibenzo(a,h) anthracene	53703	6.71	0.01		0.033	0.033	0.033	0.01	11.23	--
Indeno(1,2,3,-cd) pyrene	193395	6.72	0.017		--	0.2	0.017	0.017	11.15	--
Fluoranthene	206440	5.08	0.031		0.423	0.423	0.423	0.031	7.07	--
Pyrene	129000	4.92	0.044		0.195	0.195	0.195	0.044	6.97	--
Total HMW PAHs	NA	NA	0.19		--	--	0.19	0.19	--	--
Total PAHs	NA	NA	0.26		1.61	--	1.61	0.26	--	--
Semi-Volatile Organic Compounds (SVOCs) - Non PAH (mg/kg)										
Acetophenone	98862	1.67	No ESV	No ESV	--	--	--	--	--	--
Benzaldehyde	100527	1.71	No ESV	No ESV	--	--	--	--	--	--
Bis(2-chloroethyl) ether	111444	1.56	No ESV	No ESV	--	--	--	--	--	--
Carbazole	86748	3.29	No ESV	No ESV	--	--	--	--	--	--
Dibenzofuran	132649	3.71	0.300736	17 @ 1 % OC	--	0.449	0.415	--	--	17
Methylphenol, 3 & 4	106445	2.06	No ESV	0.67	--	0.0202	0.67	--	--	--

Notes:

No ESV, An ecological screening value was not identified from the listed sources.
$\sum ESBTU_{FCV,Total}$, Equilibrium-Partitioning Sediment Benchmark Toxic Units based on final chronic values (FCVs)
BERA, Baseline Ecological Risk Assessment
BTAG, Biological Technical Assistance Group
CFAC, Columbia Falls Aluminum Company
ESB, Equilibrium Partitioning Sediment Benchmark
ESV, Ecological Screening Value
HMW, High Molecular Weight
LMW, Low Molecular Weight
NA, Not applicable.
NE, Not evaluated.
OC, Organic carbon
PAH, Polycyclic Aromatic Hydrocarbons
RCRA, Resource Conservation and Recovery Act
SLERA, Screening-Level Ecological Risk Assessment
TEC, Threshold Effect Concentration
TEL-HA28, Threshold effect level - *Hyalella azteca* 28-day test
TOC, Total organic carbon

Table 3
Summary of Refined Ecological Screening Values (ESVs) for Surface Water
Draft Technical Memorandum: Proposed Refined Ecological Screening Values
Columbia Falls Aluminum Company
Columbia Fall, Montana

Analyte	CAS Number	Fraction	Minimum CFAC SLERA ESV	Refined CFAC BERA ESV	Refined ESV Basis	DEQ-7 Aquatic Life Standard	USEPA National Recommended Water Quality Criteria	USEPA Region 3 Freshwater Screening Benchmark	Toxicological Benchmarks for Screening		Canadian Water Quality Guidelines (CCME)
									Lowest Chronic Value - All Organisms	Tier II Secondary Chronic Values	
Metals (µg/L)											
Aluminum	7429905	D	87	87 (pH 6.5-9)	DEQ-7	87 (pH 6.5-9)	--	87	460	--	--
		T	87	2017 Draft Freshwater Chronic Criteria	USEPA (2017)	--	87 (pH 6.5-9)	--	--	--	--
Barium	7440393	D	4	4	Suter and Tsao (1996)	--	--	4	--	4	--
		T	4	--	--	--	--	--	--	--	--
Beryllium	7440417	D	0.66	5.3	Suter and Tsao (1996)	--	--	0.66	5.3	0.66	--
		T	0.66	--	--	--	--	--	--	--	--
Cadmium	7440439	D	0.09	0.09 (h)	NRWQC	--	0.25 (h)	0.09 (h)	0.15	--	0.09
		T	0.09	0.25 (h)	DEQ-7	0.25 (h)	--	--	--	--	--
Copper	7440508	D	0.23	USEPA Biotic Ligand Model (BLM)	USEPA (2007)	--	Biotic Ligand Model (BLM)	2.74 (h)	0.23	--	--
		T	0.23	2.85 (h)	DEQ-7	2.85 (h)	--	--	--	--	--
Iron	7439896	D	158	--	--	--	--	300	158	--	300
		T	158	1000	NRWQC/DEQ-7	1000	1000	--	--	--	--
Lead	7439921	D	0.54	0.54 (h)	NRWQC	--	0.54 (h)	0.54 (h)	12.26	--	--
		T	0.545	0.545 (h)	DEQ-7	0.545 (h)	--	--	--	--	--
Manganese	7439965	D	120	1100	Suter and Tsao (1996)	--	--	120	1100	120	--
		T	120	--	--	--	--	--	--	--	--
Nickel	7440020	D	5	16.1 (h)	NRWQC	--	16.1 (h)	16.1 (h)	5	--	--
		T	5	16.1 (h)	DEQ-7	16.1 (h)	--	--	--	--	--
Zinc	7440666	D	30	36.5 (h)	NRWQC	--	36.5 (h)	36.5 (h)	30	--	30
		T	30	37 (h)	DEQ-7	37 (h)	--	--	--	--	--
Other Inorganic Parameters (µg/L)											
Cyanide, Total	57125	T	5.2	5.2	DEQ-7	5.2	--	--	7.8	--	5
Cyanide, Free	STL02227	T	5.2	5.2	NRWQC	--	5.2	5		--	--
Fluoride	16984488	T	120	120	CCME	--	--	602.7 (h)	--	--	120

Table 3
Summary of Refined Ecological Screening Values (ESVs) for Surface Water
Draft Technical Memorandum: Proposed Refined Ecological Screening Values
Columbia Falls Aluminum Company
Columbia Fall, Montana

Analyte	CAS Number	Fraction	Minimum CFAC SLERA ESV	Refined CFAC BERA ESV	Refined ESV Basis	DEQ-7 Aquatic Life Standard	USEPA National Recommended Water Quality Criteria	USEPA Region 3 Freshwater Screening Benchmark	Toxicological Benchmarks for Screening		Canadian Water Quality Guidelines (CCME)
									Lowest Chronic Value - All Organisms	Tier II Secondary Chronic Values	
Polycyclic Aromatic Hydrocarbons (PAHs) (µg/L)											
Benzo(a) pyrene	50328	T	0.014	0.3	Suter and Tsao (1996)	--	--	0.015	0.3	0.014	0.015
Benzo(a)anthracene	56553	T	0.018	0.65	Suter and Tsao (1996)	--	--	0.018	0.65	0.027	0.018
Benzo(b) fluoranthene	205992	T	No ESV	No ESV	--	--	--	--	--	--	--
Benzo(g,h,i) perylene	191242	T	No ESV	No ESV	--	--	--	--	--	--	--
Chrysene	218019	T	No ESV	No ESV	--	--	--	--	--	--	--
Fluoranthene	206440	T	0.04	15	Suter and Tsao (1996)	--	--	0.04	15	--	0.04
Indeno(1,2,3,-cd) pyrene	193395	T	No ESV	No ESV	--	--	--	--	--	--	--
Phenanthrene	85018	T	0.4	200	Suter and Tsao (1996)	--	--	0.4	200	--	0.4
Pyrene	129000	T	0.025	0.025	--	--	--	0.025	--	--	0.025

Notes:

No ESV, An ecological screening value was not identified from the listed sources.

D, Dissolved (filtered) fraction

T, Total (unfiltered) fraction

--, No value available.

(d), Criterion based on dissolved fraction.

(h), Hardness-dependent criterion estimated at a total hardness values of 25 mg/L as $CaCO_3$ based on the following equations:

Metal	MDEQ exp.{mc[ln(hardness)]+bc}		NRWQC exp{mC [ln(hardness)]+ bC} (CF)			EPA R3 exp{mC [ln(hardness)]+ bC} (CF)		
	mc	bc	mc	bc	CF	mc	bc	CF
Cadmium	0.7977	-3.909	0.7977	-3.909	1.101672-[(lnhardness)(0.041838)]	0.7977	-3.909	1.101672-[(lnhardness)(0.041838)]
Copper	0.8545	-1.702	Biotic Ligand Model					
Fluoride						0.907	7.3940	0.02
Lead	1.273	-4.705	1.273	-4.705	1.46203-[(lnhardness)(0.145712)]	1.273	-4.705	1.46203-[(lnhardness)(0.145712)]
Nickel	0.846	0.0584	0.846	0.0584	0.997	0.846	0.0584	0.997
Zinc	0.8473	0.884	0.8473	0.884	0.986	0.8473	0.884	0.986

BERA, Baseline Ecological Risk Assessment
BLM, Biotic ligand model.
CCME, Canadian Council of Ministers of the Environment
CFAC, Columbia Falls Aluminum Company
DEQ-7, Montana Department of Environmental Quality Circular DEQ-7 Montana Numeric Water Quality Standards
ESV, Ecological Screening Value
NRWQC, National Recommended Water Quality Criteria
SLERA, Screening-Level Ecological Risk Assessment
USEPA, United States Environmental Protection Agency

Appendix A2 Technical Memorandum: Proposed Wildlife Exposure Modeling Approach to Support the Baseline Ecological Risk at the Columbia Falls Superfund Site

MEMORANDUM

Date: February 21, 2019

To: Mike Cirian, USEPA

From: Laura Jensen, Roux

CC: John Stroiazzo, Glencore
Steve Wright, CFAC
Dick Sloan, MDEQ
Andrew Baris, Roux
Michael Ritorto, Roux
Gary Long, EHS Support, LLC

Subject: **Technical Memorandum: Proposed Wildlife Exposure Modeling Approach to Support the Baseline Ecological Risk Assessment at the Columbia Falls Superfund Site**
Former Columbia Falls Aluminum Company Aluminum Reduction Facility
Columbia Falls, Montana

On behalf of Columbia Falls Aluminum Company, LLC (CFAC), Roux Environmental Engineering and Geology, D.P.C. (Roux) and EHS Support, LLC prepared the attached Technical Memorandum for Proposed Wildlife Exposure Modeling Approach to Support the Baseline Ecological Risk Assessment (BERA) for the CFAC Superfund Site in Columbia Falls, Montana. This memorandum has been prepared as part of the ongoing Remedial Investigation/Feasibility Study (RI/FS) being conducted pursuant to the Administrative Settlement Agreement and Order on Consent (AOC) dated November 30, 2015 between CFAC and the United States Environmental Protection Agency (USEPA) (CERCLA Docket No. 08-2016-0002).

Should there be any questions or comments on this submission, please do not hesitate to contact me at (631) 230-2300.

Sincerely,

Laura Jensen

Laura Jensen, P.G. (NY)
Senior Hydrogeologist

MEMO

To: Andrew Baris, Roux

From: Gary Long

CC: Michael Ritorto, Roux
Laura Jensen, Roux
Tom Biksey, EHS Support

Date: February 21, 2019

Re: *Technical Memorandum: Proposed Wildlife Exposure Modeling Approach to Support the Baseline Ecological Risk Assessment at the Columbia Falls Superfund Site*
Former Columbia Falls Aluminum Company Aluminum Reduction Facility
Columbia Falls, Montana

Introduction

This technical memorandum describes the approach for estimating dietary exposure to terrestrial and semi-aquatic wildlife in the Baseline Ecological Risk Assessment (BERA) for the Columbia Falls Aluminum Company (CFAC) Superfund Site in Columbia Falls, Montana. The technical memorandum was prepared as an interim deliverable to supplement the general risk assessment framework provided in the *Baseline Ecological Risk Assessment Work Plan* (BERA WP) submitted to the United States Environmental Protection Agency (USEPA) and Montana Department of Environmental Quality (MDEQ) in November 2017 and revised in May 2018 (EHS Support, 2018).

The technical memorandum presents the modeling approach, preliminary exposure parameters, bioaccumulation relationships, and toxicity reference values (TRVs) that are proposed to evaluate dietary pathways to terrestrial and semi-aquatic wildlife receptors that may be exposed to bioaccumulative constituents of potential ecological concern (COPECs) at the Site. Bioaccumulation relationships and TRVs are proposed for potentially bioaccumulative COPECs identified in the *Screening Level Ecological Risk Assessment* (SLERA) conducted based on Phase I Site Characterization data (Roux Associates, 2017). Further identification of potentially bioaccumulative COPECs will be conducted based on a re-screening of the Phase I Site Characterization data with additional data being collected in accordance with the Phase II Site Characterization Sampling and Analysis Plan (Roux Associates, 2018). In addition, further evaluation of the appropriateness of exposure assumptions and model parameters presented in this technical memorandum may be warranted in the BERA to reduce uncertainty in dietary exposure estimates used to characterize risk to wildlife through dietary pathways. The BERA Report will include an appendix that provides documentation and justification for the exposure parameters and model assumptions used in dietary exposure models for the Site.

The following sections describe the identification of preliminary bioaccumulative COPECs to evaluate via dietary exposure pathways, the dietary exposure modeling approach and parameters, and the preliminary selection of wildlife TRVs.

Identification of Bioaccumulative COPECs

COPECs identified in the SLERA and BERA WP based on the preliminary analysis of Phase I Site Characterization data (Roux Associates, 2017) were evaluated to identify potentially bioaccumulative constituents for dietary exposure modeling in the BERA. COPECs were conservatively identified in the SLERA based on comparisons of maximum concentrations in the Phase I Site Characterization datasets to minimum ecological screening values (ESVs). In addition, the BERA WP identified additional COPECs based on detected constituents lacking ESVs. COPECs with the potential to bioaccumulate were identified for dietary exposure modeling in the BERA based on satisfaction of one or more of the following criteria:

1. Constituents identified as Persistent, Bioaccumulative, and Toxic Constituents as part of the USEPA Toxics Release Inventory (TRI) Program
2. Constituents identified as important bioaccumulative constituents in USEPA (2000)
3. Organic constituents with a log octanol-water partitioning coefficient (log K_{ow}) greater than 3.5 based on USEPA (2000)
4. Constituents with USEPA Ecological Soil Screening Levels (Eco-SSLs) derived for birds or mammals (USEPA, 2005a).

Table 1 presents a preliminary list of COPECs that will be included in dietary exposure modeling in the BERA based on the above criteria. The preliminary list of bioaccumulative COPECs presented in Table 1 will be re-evaluated based on the combined results of the Phase I and Phase II Site Characterization sampling. As indicated in the BERA WP, relevant exposure data from the Phase I and Phase II Site Characterization datasets will be re-screened to identify COPECs based on conservative comparisons of maximum concentrations to minimum ESVs. COPECs identified in the re-screening of the combined Phase I and Phase II datasets that have the potential to bioaccumulate based on one or more of the above criteria will be included in the dietary dose modeling presented in the BERA. Dietary exposure to these potentially bioaccumulative COPECs will be evaluated in a manner consistent with the approach described in this technical memorandum.

Dietary Exposure Modeling

The evaluation of potential exposure via direct and incidental ingestion pathways will be conducted based on a tiered approach in accordance with the USEPA guidance for conducting probabilistic ecological risk assessment (USEPA, 2001). The tiered approach will include the following ingestion models to quantitatively assess potential risks to representative wildlife receptors:

- Deterministic exposure modeling: Based on conventional single point estimates of exposure point concentrations (EPCs) and typical exposure parameters. Deterministic exposure models will be developed based using a tiered approach that incorporates preliminary and refined exposure estimates:
    - Preliminary exposure estimates: Screening-level exposure assumptions based on maximum EPCs and conservative exposure assumptions.

    - Refined exposure estimates: Refined exposure estimates using EPCs based on conservative estimates of the mean concentrations at the site, assuming random foraging throughout each exposure area and more realistic exposure assumptions.

  Further discussion of the assumptions supporting the preliminary and refined exposure estimates are provided in relevant sections within this technical memorandum.
- Probabilistic exposure modeling: If estimated doses based on refined deterministic modeling exceed doses associated with lowest-observed-adverse-effect levels (LOAELs), probabilistic models may be developed to estimate exposure based on the distributions of EPCs and exposure parameters to account for variability and/or uncertainty in model parameters.

The following sections describe the basic model structure, receptor-specific exposure factors, exposure variables, bioaccumulation relationships, and area use factors that will be used for dietary exposure modeling in the BERA.

Model Structure

The underlying algorithm of the dietary exposure model is the same for deterministic and probabilistic approaches. However, deterministic estimates use single, discrete values for model parameters (i.e., representative of a typical or a worst case), whereas probabilistic estimates use a distribution of values for model parameters to account for the inherent variability and/or uncertainty in the estimation of those parameters. Procedures for calculating probabilistic exposure estimates are consistent with USEPA (2001) guidance on probabilistic ecological risk assessments and USEPA (1997) guidance on Monte Carlo analyses. The following sections describe the model structure and the general procedures for deterministic and probabilistic modeling.

Deterministic Modeling Procedures

Deterministic exposure estimates will be based on comparisons of receptor-specific estimated daily doses (EDDs) calculated from simple dose rate models to TRVs. Dietary exposure estimates consider receptor-specific exposure factors, including typical dietary composition, and exposure variables that represent site-specific measurements of COPEC concentrations in exposure media. The general form of the dose rate model used to calculate EDDs is:

$$EDD = \frac{1}{BW}\sum_{i=1}^{N}\left(FIR_{dw} \times \sum_{j=1}^{M}\left(f_j \times C_j\right) + SIR_{dw} \times C_{sub} + WIR \times C_{sw}\right)_i \times AUF_i \qquad (1)$$

where:

N = Number of exposure areas within the typical receptor home range
M = Receptor-specific dietary items
BW = Receptor-specific body weight (kg)
FIR_{dw} = Receptor-specific daily food ingestion rate (kg/day, dry weight)
f_j = Proportion of dietary item *j* to total dietary composition
C_j = COPEC concentration in dietary item *j* (mg/kg tissue dry weight)
SIR_{dw} = Receptor-specific incidental substrate ingestion rate (kg/day, dry weight)
C_{sub} = COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
WIR = Receptor-specific daily drinking-water ingestion rate (Liters (L)/day)
C_{sw} = COPEC concentration in unfiltered surface water (mg COPEC/L)

AUF_i = Area use factor for a given exposure area and receptor

For receptors with foraging ranges that are smaller than a given exposure area, the EDD will be calculated based on EPCs derived from data collected within that exposure area. If the foraging range of a receptor is greater than an exposure area, the EDD will be calculated as the sum of area use factor (AUF)-weighted doses obtained from the exposure areas within the typical home range of the receptor. Further explanation regarding the calculation of AUFs is presented in the *Area Use Factors* section of this technical memorandum.

As stated in the BERA WP, dietary exposure to small home range receptors will also be evaluated based on point-by-point comparisons of measured COPEC concentrations in biologically relevant sampling intervals to estimated soil or sediment benchmark concentrations that are back-calculated from TRVs. Consistent with the approach used to calculate USEPA Eco-SSL values (USEPA, 2005a), the general exposure model presented in Equation 1 will be used to back-calculate soil or sediment benchmarks for each representative small home range receptor by setting the EDD equivalent to the TRV and solving for the C_{sub} value.

A modified version of the dietary exposure model presented in Equation 1 will be used to evaluate the potential additive exposure to dioxin/furan compounds in surface soil sampled within the Main Plant Area and adjacent areas. Additive exposure to dioxin/furan compounds will be evaluated using the toxicity equivalence methodology consistent with USEPA (2008a). The modified dietary exposure model will calculate an EDD for the 17 individual dioxin/furan compounds in each sample based on the general model presented above. The EDD for each compound will be multiplied by the compound-specific toxicity equivalence factor (TEF) for birds or mammals relative to the toxicity of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) to estimate the toxicity equivalence concentration (TEC) for each compound (Van den Berg et al., 2006; Van den Berg et al., 1998; USEPA, 2008a). TECs of the 17 dioxin/furan compounds will be summed to calculate an overall TEC:

$$TEC = \sum_{n=1}^{k} EDD_n \times TEF_n \qquad (2)$$

where:
TEC = Toxicity equivalence concentration
EDD_n = Estimated daily dose calculated for dioxin-like chemical n
TEF_n = Toxicity equivalence factor for dioxin-like chemical n
k = Number of toxic dioxin-like chemicals in the mixture

The TEC will be evaluated relative to dietary TRVs for 2,3,7,8-TCDD derived for birds and mammals.

Probabilistic Modeling Procedures

Procedures for calculating probabilistic exposure estimates will be consistent with USEPA (2001) guidance on probabilistic ecological risk assessments and USEPA (1997) guidance on Monte Carlo analyses. As warranted based on the outcome of deterministic exposure estimates, Monte Carlo simulations may be conducted using the statistical computing and graphics language R (R Core Team, 2013) to estimate the EDD and the average estimated daily dose (AEDD) distributions for each receptor based on the following procedures.

To estimate the EDD distribution for a receptor:

1. R will be used to randomly select a body weight (BW) from its literature-derived distribution and to calculate the corresponding food ingestion rate (dry weight) (FIR_{dw}), incidental substrate ingestion rate (dry weight) (SIR_{dw}), and drinking water ingestion rate (WIR).
2. f_i will be selected based on dietary composition.
3. C_i and C_{sub} will be randomly selected from their corresponding distributions from site-specific concentrations measured during the Phase I and Phase II Site Characterization sampling.
4. EDD will be calculated using Equation (1) above.
5. Steps #1 to #4 will be repeated a pre-set number of times to estimate the EDD distribution; the number of iterations will be pre-set at 10,000 based on convergence criteria provide in Sample et al. (1996a).

To estimate the average estimated daily dose (AEDD) distribution for a receptor:

1. The Bootstrapping Method will be used to randomly select N number of EDD from the EDD distribution above, where N = Number of days/year the receptor is exposed within site exposure areas.
2. AEDD, defined as the arithmetic mean of the selected EDDs, will be calculated.
3. Steps #1 and #2 will be repeated a pre-set number of times to estimate the AEDD distribution; the number of iterations will be pre-set at 10,000 based on convergence criteria provide in Sample et al. (1996a).

The following section presents the basis for selecting receptors of concern and model parameters used in deterministic and probabilistic dietary exposure modeling.

Receptors of Concern

Ecological exposure areas identified in the BERA WP may support multiple terrestrial and semi-aquatic wildlife receptors of concern (EHS Support, 2018). As indicated in the BERA WP, exposure to avian and mammalian wildlife receptors will be evaluated based on dietary exposure pathways using the approach presented in this technical memorandum. Exposure to other ecological receptors of concern, including fish, reptiles, and amphibians, will be evaluated based on direct contact exposure pathways in the BERA (EHS Support, 2018).

Several surrogate species were identified in the BERA WP as representative species to evaluate exposure to mammalian and avian receptors based on feeding guild using dietary exposure models. Representative terrestrial species for each receptor group based on feeding guild include:

Receptor Group	Scientific Name	Common Name
Mammalian Fauna		
Herbivorous mammal	*Microtus pennsylvanicus*	Meadow Vole
Insectivorous mammal	*Blarina brevicauda*	Northern Short-tailed Shrew
Carnivorous mammal	*Mustela frenata*	Long-tailed Weasel
Avian Fauna		
Herbivorous bird	*Zenaida macroura*	Mourning Dove
Invertivorous bird	*Scolopax minor*	Woodcock
Carnivorous bird	*Buteo jamaicensis*	Red-tailed Hawk

Representative semi-aquatic species for each receptor group based on feeding guild include:

Receptor Group	Scientific Name	Common Name
Mammalian Fauna		
Piscivorous mammal	*Mustela vison*	Mink
Avian Fauna		
Invertivorous bird	*Cinclus mexicanus*	American Dipper
Piscivorous bird	*Megaceryle alcyon*	Belted Kingfisher

In addition to the mammalian and avian receptors representing feeding guilds expected to be present at the site, potential dietary exposure to four federally threatened (or proposed threatened) species identified by the United States Fish and Wildlife Service Information for Planning and Consultation[1] (USFWS IPaC) will also be evaluated (EHS Support, 2018):

Scientific Name	Common Name	Status	Potential Exposure Area – General Habitat
Mammals			
Lynx canadensis	Canada Lynx	Threatened	Terrestrial – Boreal spruce-fir forest habitat
Ursus arctos horribilis	Grizzly Bear	Threatened	Terrestrial – Relatively undisturbed mountainous habitat
Gulo gulo luscus	North American Wolverine	Proposed Threatened	Terrestrial – High elevation habitat near the tree-line
Birds			
Coccyzus americanus	Yellow-billed Cuckoo	Threatened	Terrestrial – Dense, cottonwood-dominated forests canopies

[1] Accessed at: https://ecos.fws.gov/ipac

The following sections present receptor-specific exposure factors selected to estimate dietary doses to wildlife receptors of concern.

Receptor-Specific Exposure Factors

Receptor-specific exposure factors were identified to estimate exposure and area use for identified wildlife receptors of concern evaluated in dietary exposure models. Receptor-specific exposure factors used in the dietary exposure models include:

- BW
- FIR_{dw}
- SIR_{dw}
- WIR
- Dietary composition, proportion of dietary item *j* to total diet (f_j)
- AUF

Receptor-specific exposure parameters will be derived from general literature sources and compilations of exposure factors developed to support dietary exposure modeling (e.g., USEPA, 1993; USEPA, 2007a; USCHPPM, 2004; Sample and Suter, 1994).

Deterministic exposure modeling uses exposure factors that are representative of typical or average (e.g., mean parameter) exposure conditions. Probabilistic exposure modeling evaluates a range of potential exposure factors to capture the individual- and population-level variation in exposure factors that are likely to occur within exposure areas. A summary of exposure factors that will be used in the deterministic exposure model is presented in **Table 2**. The approach for selecting exposure factors for dietary exposure models is summarized below.

Body Weight

In deterministic exposure models, representative body weights will be estimated as arithmetic mean values of adult body weights reported in the literature or midpoints of the range of body weights when arithmetic mean values are not available (**Table 2**). When body weights are available for both sexes, the more conservative (lower) estimate of the average body weight will be selected. Minimum body weights were identified from the available literature as conservative body weight estimates for special status species, including Canada lynx, grizzly bear, and North American wolverine (**Table 2**).

For probabilistic exposure estimates, distributions of potential body weights of adult receptors will be estimated using R based on available arithmetic mean (μ) and standard deviation (σ) of body weights reported in the literature for the selected receptors (**Table 2**). Normal distributions of potential body weights will be assumed for each receptor. Estimated distributions of potential body weights will be truncated to the range of body weights reported in the literature to avoid unrealistic estimates of receptor body weight (i.e., the distribution of potential body weights will not include values that are greater than or less than the range of body weights reported in the literature).

Food Ingestion Rate

Food ingestion rates FIR_{dw} will be estimated based on receptor-specific BW values using appropriate empirical allometric (scaling) relationships developed by Nagy (2001). Nagy (2001) derived allometric relationships for various avian and mammalian feeding groups based on taxon, habitat, and diet. For each wildlife receptor, the most appropriate allometric equation from Nagy (2001) will be used to estimate dry weight food ingestion FIR_{dw} as a function of BW (**Table 2**):

$$FIR_{dw} = a \times BW^{b} \quad (3)$$

where:

FIR_{dw} = Dry weight food ingestion rate (kg dry weight/day)
BW = Receptor-specific body weight (kg)
a and b = Parameters whose values are specific to an allometric equation (see **Table 2**)

In deterministic exposure models, the receptor-specific FIR_{dw} estimated from the appropriate allometric relationship will be used based on average body weight in the point estimate calculation of the EDD. For probabilistic exposure models, distributions of FIR_{dw} will be developed based on allometric relationships using randomly selected body weights from the body weight distribution described in the preceding section. The randomly selected body weights will be used to estimate corresponding FIR_{dw} values using the appropriate form of Equation 3 for the receptor of concern. The resulting distribution of FIR_{dw} will be representative of the range of feeding rates that may be observed within a given receptor population as a function of the potential range of body weights of individuals within the population.

Potential distributions of FIR_{dw} values will not be developed directly from literature-reported values for the following reasons:

- Literature-derived FIRs (primarily mean values) are insufficient to generate robust distributions.
- It is inappropriate to evaluate FIR_{dw} independent of BW; if BW and FIR_{dw} are independent in a probabilistic simulation, a receptor at the lower end of the BW distribution may be unrealistically paired with a FIR_{dw} value at the higher end of the FIR_{dw} distribution.

Incidental Substrate Ingestion Rate

Exposure models account for the dietary intake of soil or sediment (substrate) that may be ingested incidentally because of the feeding behavior of select receptors or indirectly through the ingestion of prey. Incidental substrate ingestion rates (SIR_{dw}) will be estimated based on the average incidental substrate ingestion as a percentage of dry food intake based on FIR_{dw} values derived by Nagy (2001) using the approach described in the preceding section. SIR_{dw} will be expressed as a proportion of the dry food ingestion rate, as follows:

$$SIR = FIR_{dw} \times \left(\frac{Ps}{100}\right) \quad (4)$$

where:

SIR_{dw} = Substrate ingestion rate (kg dry weight/day)
FIR_{dw} = Dry weight food ingestion rate (kg dry weight/day)
P_s = Percentage of dry food intake ingested as substrate

As summarized in **Table 2**, average substrate ingestion, as a percentage of dry food intake, was identified for each receptor of concern based on literature sources. For receptors included in the derivation of Eco-SSLs, the average percentage of dry food intake was obtained from USEPA (2007a). For primarily piscivorous wildlife (mink and belted kingfisher), incidental substrate ingestion was assumed to be negligible, consistent with Sample and Suter (1994). For carnivorous mammals, including Canada lynx, grizzly bear, and North American wolverine, incidental substrate ingestion was assumed to not exceed the average incidental ingestion rate for the red fox reported in Beyer et al. (1994). No incidental substrate ingestion data were identified for the American dipper; therefore, a nominal incidental substrate ingestion rate of 1 percent of dry intake was assumed for American dipper (**Table 2**). However, based on the habitat preference of American dipper for fast-moving, clear streams with sand, pebble, or rocky stream bottoms, the assumption of 1 percent incidental substrate ingestion is likely conservative. Further evaluation of this assumption may be warranted in the BERA pending the potential influence of incidental sediment exposure in the risk characterization for American dipper.

For the deterministic exposure model, the receptor-specific SIR_{dw} will be estimated as a single point estimate based on the dry weight FIR_{dw} calculated using average BW and the average percentage of dry food intake as incidental substrate ingestion (**Table 2**).

For probabilistic exposure models, a distribution of potential SIRs will be developed for each receptor based on the distribution of FIR_{dw} described in the previous section. The distribution of SIRs will be developed based on randomly selected BW values used to develop the distribution of FIR_{dw}. For each randomly selected body weight, a corresponding SIR_{dw} will be calculated using the dry weight FIR_{dw} and the average percentage of dry food intake as incidental substrate ingestion. The receptor-specific distribution of SIRs is representative of the range of rates that may be observed within a given receptor population as a function of the potential range of body weights and corresponding food ingestion rates of individuals within that population.

Drinking Water Ingestion Rate

Drinking-water ingestion rates (WIRs) will also be derived based on an allometric relationships to body weight. For birds, Calder and Braun (1983) developed an equation for drinking-water ingestion based on a dataset representing 21 bird species with a body weights ranging from 0.011 to 3.15 kg, which encompasses the range of average avian body weights included in the exposure modeling for the Site (**Table 2**). WIRs for avian receptors will be estimated based on body weight as follows:

$$WIR_{avian} = 0.059 \times BW^{0.67} \quad (5)$$

where:
WIR_{avian} = Avian drinking water ingestion rate (L/day)
BW = Receptor body weight (kg)

Drinking-water ingestion rates for mammalian receptors ($WIR_{mammalian}$) will be estimated based on an allometric relationship to body weight using an analogous equation from Calder and Braun (1983):

$$WIR_{mammalian} = 0.099 \times BW^{0.90} \quad (6)$$

where:
$WIR_{mammalian}$ = Mammalian drinking-water ingestion rate (L/day)

BW = Receptor body weight (kg)

Like other ingestion rates based on allometric relationships (e.g., FIR_{dw} and SIR_{dw}), estimates of WIR in deterministic exposure models will be based on arithmetic mean values of adult body weights reported in the literature or minimum body weights when arithmetic mean values are not available (**Table 2**). For probabilistic exposure models, WIRs will be calculated from randomly selected body weights used to develop the receptor-specific distributions of body weight, FIR_{dw}, and SIR_{dw}. Estimated WIRs calculated for each randomly selected body weight form a receptor-specific distribution that is representative of the range of drinking water rates that may be observed within a given receptor population, as a function of the potential range of body weights of individuals within that population.

Dietary Preference

Dietary models are developed to evaluate exposure to various trophic categories of wildlife based on typical feeding behaviors. Receptors select dietary items based on species-specific foraging strategies and behaviors, which are also influenced by the availability and abundance of dietary items within an exposure area. The relative compositions of prey items in the diets of wildlife receptors of concern will be estimated based on dietary studies obtained from the literature and summarized in compilations of exposure factors developed to support dietary exposure modeling (USEPA, 1993; USEPA, 2007a; USCHPPM, 2004; Sample and Suter, 1994).

Estimates of dietary composition in deterministic exposure models will be simplified initially to represent the predominant dietary items and/or more conservative exposure scenarios based on literature. A summary of the preliminary dietary compositions for the various receptors that will be evaluated in deterministic exposure models is presented in **Table 2**.

Probabilistic exposure estimates may consider the probability of a receptor selecting and ingesting a certain dietary item during foraging. USEPA (2003a) developed an algorithm to construct a unique and randomly selected diet for receptors based on a dietary matrix. A similar approach may be used to account for potential variability in dietary composition if probabilistic dietary exposure modeling is conducted in the BERA. If this approach is warranted, further documentation will be presented in the appendix describing the wildlife modeling procedures in the BERA Report.

Exposure Point Concentrations

Exposure variables refer to site-specific measurements, namely COPEC concentrations estimated in exposure media. The following sections describe the approach for defining EPCs for deterministic and probabilistic exposure modeling.

Deterministic Exposure Point Concentrations

EPCs to evaluate wildlife exposure in deterministic models in the BERA will be estimated for each exposure area using data collected as part of the Phase I and Phase II Site Characterization. EPCs will be calculated to represent a range of exposure scenarios:

- Maximum EPC: Represents a maximum exposure scenario based on the maximum measured concentration in each exposure area.

- Refined EPC: Represents the likely exposure to a conservative estimate of the mean concentrations at the site, assuming random foraging throughout each exposure area.

Refined EPCs for evaluating wildlife ingestion pathways will be calculated based on upper confidence limit of the mean (UCL_{mean}) COPEC concentrations. UCL_{mean} values represent a conservative estimate of average exposure conditions for a receptor foraging randomly over an exposure area. UCL_{mean} concentrations will be calculated using USEPA ProUCL software (version 5.1 or later) and the statistical approach will be consistent with USEPA ProUCL Version 5.1 Technical Guidance (USEPA, 2015). The UCL_{mean} calculation recommended in ProUCL will typically be used as the refined EPC in the risk estimate. However, ProUCL occasionally recommends the 97.5 or 99% UCL on the arithmetic mean estimated by the Chebyshev method when other methods (e.g., Hall's or bootstrap-t UCL with outliers) result in a 95% UCL that exceeds the maximum value. In these cases, the data will be reviewed, and the 95% UCL estimated by the Chebyshev method may be selected as the EPC in those situations to be consistent with the intent of the reasonable maximum exposure paradigm as defined by EPA (1989; 2002). This approach is also consistent with ProUCL technical guidance (EPA, 2015). EPCs for large-range receptors that include multiple exposure areas (up to and including all exposure areas within the Site), will be calculated using a sum of spatially-weighted estimated daily doses (EDDs) from each of the exposure areas where the receptor may forage. For example, if the size of the Main Plant Area is 70% of the receptor home range, and other sampled areas outside the Main Plant Area (but within the home range of the species) includes an additional 20% (with off-site areas comprising the remaining 10% of the home range), then the total EDD will be equal to (0.7 x Main Plant Area EDD) + (0.2 x non-Main Plant Area EDD) for each chemical.

In addition to UCL_{mean} EPCs, exposure will also be evaluated on a point-by-point basis for wildlife receptors with small home ranges (e.g., meadow vole, short-tailed shrew). Point-by-point comparisons will be conducted for COPECs with maximum EPCs resulting in EDDs that exceed TRV_{Low} doses. The evaluation of potential exposure on a point-by-point basis will support a spatial evaluation of areas where small home range receptors may be exposed to concentrations in soil that may result in adverse effects.

EPCs for small home-range receptors will also be determined for incremental soil methodology (ISM) samples collected in the 43 decision units (DU) within the Operational Soil Area (Roux Associates, 2015). The DUs are approximately 1 acre in size. As indicated in the Phase II Site Characterization Sampling and Analysis Plan (Roux Associates, 2018), replicate ISM samples (r=3) will be collected from four DUs within the Operational Soil Area (approximately ten percent of the total number of DUs in the Operational Soil Area). UCL_{mean} concentrations to estimate EPCs for the DUs with replicate ISM samples will be calculated using the Chebyshev UCL or Student's t UCL methods using the 95% UCL Calculator developed by the ITRC (ITRC, 2012). Given that DUs in the Operational Soil Area have a similar conceptual site model, including similar soil type, site use/history, and expected contaminant types, ISM replicates from the four DUs will be used to provide an estimate of ISM sample variability within a DU. Estimates of ISM sample variability will be extrapolated to similar DUs without replicate ISM samples (similar to how laboratories use batch replicates for determining lab analysis precision). The extrapolation of estimated variability measured in DUs with ISM replication will be conducted in accordance with the guidance

provided in ITRC (2012) based on an evaluation of ISM mean and variance estimates, including relative standard deviation (RSD)[2] and standard deviation, from the DUs with ISM replication.

The Operational Soil Area where the ISM sample grids are located represents a sub-area that overlaps previously established ecological exposure areas, specifically the Central Landfill Area and the Main Plant Area. Soil grab samples were also collected within the ISM sampling grids during Phase I and Phase II. Due to different underlying statistical properties, it is not appropriate to combine data derived from ISM and grab samples to calculate statistical parameters (e.g., UCL_{mean} EPCs for large-range receptors). The collection of grab samples was performed across the entire Site (including the Operational Soil Area) to fully characterize potential risk to ecological receptors. The ISM samples were only collected in a sub-area of the facility where contamination was suspected, but the locations of specific source areas and exposure pathways were not known. Therefore, data from grab samples that are nested within the ISM grids will be included in the Site-wide database that will be used to calculate EPCs for large ranging receptors that may forage in multiple exposure areas. The ISM soil data collected within the Operational Area will not be evaluated for large-range receptors and will only be evaluated in the BERA as focused areas of exposure for small ranging and sessile ecological receptors. ISM results (i.e., the concentrations resulting from the single replicate, or from the UCL_{mean} calculation performed on the DUs with triplicate samples) will be evaluated for each grid based on point-by-point comparisons with ecological benchmarks to evaluate soil exposure to plants, soil invertebrates, and wildlife receptors with foraging ranges less than the size (approximately one acre) of the ISM DUs. Results from grab samples that are appropriate for use in the BERA and that overlap the Operational Area ISM sample grid will also be included (along with all other grab samples within the ecologically relevant soil depth interval across the Site) in the point-by-point evaluation for small range and sessile ecological receptors.

The following sections discuss media-specific approaches for data compilation and pre-processing to support the estimation of EPCs.

Soil

For receptors that receive a majority of their soil exposure at the surface, only data from the surficial soil sampling interval (0 to 0.5 feet below ground surface [ft bgs]. For receptors whose life history patterns indicate the potential for regular exposure to deeper soil (e.g., the sort-tailed shrew, meadow vole, long-tailed weasel, and North American wolverine), dietary ingestion pathways associated with soils will be based on depth-weighted average concentrations of sampling intervals collected from 0-0.5 feet below ground surface (ft bgs) and 0.5-2.0 ft bgs to provide a representative EPC for each soil boring station. Depth-weighted average concentrations for the combined 0-2 ft bgs exposure interval will be calculated as follows:

$$C_{soil,0-2ft} = C_{soil,0-0.5ft} \times \frac{0.5ft}{2ft} + C_{soil,0.5-2ft} \times \frac{1.5ft}{2ft} \quad (7)$$

where:

$C_{soil,0\text{-}2\,ft}$ = Concentration in combined exposure interval starting from 0 to 2 ft bgs
$C_{soil,0\text{-}0.5\,ft}$ = Concentration in sampling interval starting from 0 to 0.5 ft bgs

[2] Relative standard deviation (RSD) is calculated as the standard deviation divided by the arithmetic mean. RSD is also referred to as the coefficient of variation (CV).

$C_{soil,0.5\text{-}2\ ft}$ = Concentration in sampling interval starting from 0.5 to 2 ft bgs

As indicated in the BERA WP, sediment data from the 0 to 0.5 ft bgs sampling interval will be included in soil EPC calculations for transitional exposure areas that may be seasonally dry and provide habitat for terrestrial receptors. As described in the BERA WP, transitional exposure areas include (EHS Support, 2018):

- North Percolation Pond Area
- South Percolation Pond Area
- Cedar Creek Reservoir Overflow Ditch
- Northern Surface Water Feature

Sediment

EPCs for sediment in aquatic exposure areas will be calculated based on surficial samples collected from the 0 to 0.5 ft bgs (nominal) sampling interval. Preliminary EPCs will be based on the maximum measured concentration within an exposure area to represent the most conservative exposure scenario. Refined EPCs will include a conservative estimate of the central tendency of exposure (e.g., UCL_{mean} concentration) to reflect the average dose that a receptor may experience while foraging randomly within an exposure area.

As indicated in the BERA WP, surficial soil data from the 0 to 0.5 ft bgs sampling interval will be included in sediment EPC calculations for transitional exposure areas that may be seasonally inundated and provide temporary aquatic habitat, in addition to terrestrial habitat. As described in the BERA WP, transitional exposure areas include (EHS Support, 2018):

- North Percolation Pond Area
- South Percolation Pond Area
- Cedar Creek Reservoir Overflow Ditch
- Northern Surface Water Feature

Surface Water

Relevant surface water sources that will be used as drinking water sources in the dietary exposure models for small-ranging (S) and long-ranging (L) terrestrial wildlife receptors are summarized below by terrestrial exposure area:

Exposure Area	Surface Water Source					
	Cedar Creek	Cedar Creek Resv. Overflow	North Percolation Ponds	South Percolation Ponds	Flathead River	Northern Surface Water Feature
Eastern Undeveloped Area	L	S,L	L	L	L	L
North-Central Undeveloped Area	L	S,L	S,L	L	L	S,L
Western Undeveloped Area	S,L	L	L	L	L	L
Central Landfill Area	L	S,L	S,L	L	L	L
Industrial Landfill Area	L	S,L	L	L	L	S,L
Main Plant Area	L	L	S,L	L	L	L
Flathead River Riparian Area	L	L	L	S,L	S,L	L
Flathead River Riparian Area	L	L	L	S,L	S,L	L

Notes:
S, Small-ranging receptors
L, Long-ranging receptors

For long-ranging receptors, potential drinking water sources will include an estimate of average exposure point concentrations (e.g., UCL_{mean}) from multiple surface water features that may be encountered while foraging. For receptors with small home ranges, surface water features within or adjacent to terrestrial exposure areas will be considered the primary drinking water source. It will be assumed that semi-aquatic wildlife receptors obtain drinking water from the aquatic or transitional exposure areas from which dietary and incidental ingestion exposure pathways are evaluated. Surface water EPCs will be estimated based on COPEC concentrations measured in unfiltered surface water samples. Consistent with other exposure media, preliminary surface water EPCs will be estimated based on maximum COPEC concentrations and refined EPCs will be estimated on a conservative estimate of the central tendency of exposure (e.g., UCL_{mean} EPC concentration).

Probabilistic Exposure Point Concentrations

For probabilistic estimates, wildlife exposures will be evaluated based on the distribution of possible exposure concentrations, in contrast to the point estimate EPCs described above for deterministic models. Distributions of potential exposure concentrations will be developed in the statistical computing and graphics language R (R Core Team, 2013) based on the soil, sediment, and surface water datasets collected during Phase I and Phase II Site Characterization sampling, as described above for the estimation of deterministic EPCs. EPC distributions will represent the range of potential exposure concentrations that may be experienced by a given receptor foraging within exposure areas at the site. The simulated exposure distributions may be truncated at 0, if necessary, to prevent the simulation from selecting negative exposure concentrations. Extreme concentrations at the upper tail of the simulated distribution will be retained in the primary exposure calculations. However, if extreme concentrations are observed at the upper tail of the simulated distribution, the upper tail of the simulated exposure

distribution may be truncated based on the upper tolerance limit of the site-specific dataset and evaluated as a separate scenario in the uncertainty section of the BERA.

Terrestrial Bioaccumulation Relationships

Bioaccumulation of COPECs from soil into terrestrial dietary items, including vegetation, soil invertebrate tissue, and small mammal tissue will be estimated using soil EPCs described in the preceding section and terrestrial bioaccumulation factors (BAFs). BAFs are regression models or constant uptake factors that reflect the relationship between COPEC concentrations in dietary items and concentrations in soil. Differences in concentration are due to COPEC-specific properties that affect its tendency to bioaccumulate in tissue, balanced by the innate ability of the species to regulate body burden levels of the chemical via metabolic and excretory processes. Environmental conditions such as soil moisture, soil pH, and cation exchange capacities significantly influence whether soil COPECs remain bound in the soil matrix or can be mobilized (in a bioavailable form) and released for uptake.

The selection of appropriate BAFs is a critical component to dietary exposure modeling. General approaches for BAF selection have been discussed in Sample and Suter (1994) and USEPA (2007a). An approach that is consistent with these sources was followed in the selection of BAFs for the CFAC Site. The general hierarchy for selection of BAFs based on types of sources is as follows:

1. Use of regression equations derived from paired field- or laboratory-based measurements of COPEC concentrations in dietary items and soil
2. Ratio-derived BAFs developed based on paired data where the BAF is equal to the dietary tissue concentration divided by the soil concentration
3. Modeled equilibrium partitioning-derived BAFs based on physical or chemical characteristics
4. Assumptions based on values common to chemical class

The use of empirically derived BAF ratios is generally preferred over equilibrium partitioning-based BAFs, which are typically calculated based on factors such as log K_{ow} values, fraction of organic carbon in soil, and/or percent of lipids in invertebrates. Also, in selecting ratio-based BAFs, median values are generally preferred for use over maximum or other high-end BAFs (USEPA, 2007a).

Regression equations used to calculate COPEC concentrations in dietary items based on soil concentrations typically take the following form:

$$\ln C_j = B1 \times \ln C_{sub} + B0 \quad (8)$$

where:
$\ln C_j$ = Natural log of the COPEC concentration in dietary item *j*
$\ln C_{sub}$ = Natural log COPEC concentration in substrate (e.g., soil)
B1 = Slope of the food/prey-soil regression
B0 = Intercept of the food/prey-soil regression

Ratio-derived BAFs can be generally presented as follows:

$$C_j = BAF \times C_{sub} \quad (9)$$

where:
C_j = COPEC concentration in dietary item *j* (mg COPEC/kg tissue, dry weight)
C_{sub} = COPEC concentration in soil or sediment (mg COPEC/kg sediment or soil, dry weight)
BAF= Bioaccumulation factor developed based on paired empirical data where the BAF is equal to the dietary tissue concentration divided by the soil concentration (kg substrate/kg tissue, dry weight)

BAFs calculated based on equilibrium partitioning for non-ionic organic compounds are based on the log K_{ow} of the constituent:

$$\log BAF = B1 \times \log K_{ow} + B0 \qquad (10)$$

where:
BAF = Bioaccumulation factor
K_{ow} = Octanol-water partitioning coefficient
B1 = Slope of the BAF-log K_{ow} regression
B0 = Intercept of the BAF-log K_{ow} regression

BAFs calculated based on equilibrium partitioning are applied as ratio-based BAFs to estimate a dietary tissue concentration value. K_{ow} values to estimate BAFs based on equilibrium partitioning were obtained from USEPA Estimation Program Interface Suite K_{ow}Win v. 1.68 software program.

Finally, where ratio-based BAFs are not available and where no equilibrium partitioning method has been developed for calculating BAFs, other methods, such as using BAFs for chemicals within the same class and with similar structural properties, may be adopted as surrogate BAFs.

Terrestrial BAFs will be derived to estimate dry weight concentrations of dietary items, consistent with the reporting of soil COPEC concentrations in dry weight and the calculation of dry weight food ingestion rates FIR_{dw} (see Equation 1). **Table 3** presents a summary of the terrestrial BAFs that will be used to estimate COPEC uptake from soil into terrestrial dietary items, including plants, soil invertebrates, and small mammals. Estimated concentrations in terrestrial items are also presented based on example EPCs. The following sections discuss the basis for selecting terrestrial BAFs to represent uptake into each terrestrial dietary item.

Terrestrial Plants

The following sections provide the basis for estimating COPEC bioaccumulation from soil into terrestrial vegetation for major constituent groups. **Table 3** presents a summary of terrestrial plant BAFs and associated references.

Metals

Soil-to-plant bioaccumulation relationships for metals were primarily selected from literature sources adopted by USEPA in the derivation of Eco-SSLs (**Table 3**). Bioaccumulation relationships derived in Bechtel-Jacobs (1998a) were the primary soil-to-plant uptake relationships adopted in the Eco-SSL development (USEPA, 2007a). Regression equations were used to estimate plant tissue concentrations

for six metals based on relationships derived in Bechtel-Jacobs (1998a) and two metals based on relationships derived in USEPA (2007a). Slope and intercept values used in soil-to-plant regressions are provided in **Table 3**. Bioaccumulation factors were selected for other metals based on median BAFs derived in Bechtel-Jacobs (1998a) or soil-to-plant BAFs derived in Baes et al. (1984).

Other Inorganics

Soil-to-plant bioaccumulation data were limited for fluoride and cyanide (**Table 3**). A ratio-derived soil-to-plant BAF was identified for fluoride based on Baes et al. (1984). Based on Lanno and Menzie (2005), cyanide bioaccumulation into plant tissues was assumed to be negligible for soil uptake pathways. Bioaccumulation and trophic transfer via the food web is not considered to be a significant pathway for inorganic cyanide compounds (Lanno and Menzie, 2005).

Semi-Volatile Organic Compounds – Polycyclic Aromatic Hydrocarbons

Soil-to-plant bioaccumulation relationships for polycyclic aromatic hydrocarbons (PAHs) were selected based on relationships derived for low molecular weight (LMW) and high molecular weight (HMW) PAHs by USEPA in the derivation of Eco-SSLs (USEPA, 2007a). LMW PAHs typically have three or less condensed aromatic rings, while HMW PAHs have four or more aromatic rings. Acceptable compound-specific regression relationships were derived for LMW PAHs, except fluoranthene and naphthalene, and HMW PAHs, except benzo(b)fluoranthene, benzo(e)pyrene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and pyrene (**Table 3**). Slope and intercept values used in soil-to-plant regressions are provided in **Table 3**. For LMW and HMW PAHs without acceptable regression relationships, median ratio-derived BAFs were used to estimate soil-to-plant uptake (**Table 3**; USEPA, 2007a).

Volatile and Non-PAH Semi-Volatile Organic Compounds

Compound-specific soil-to-plant BAFs were not identified for methylcyclohexane, a volatile organic compound (VOC), or non-PAH semi-volatile organic compounds (SVOCs) identified as soil COPECs, except for pentachlorophenol (PCP). USEPA (2007a) recommends a median BAF from bioaccumulation data for PCP in plants of 5.93. For all other non-ionic compounds in this chemical class, the significant regression equation derived for rinsed plant foliage in USEPA (2007a) will be used to estimate the soil-to-plant BAF as a function of log K_{ow} based on the following relationship:

$$\log BAF = -0.4057 \times \log K_{ow} + 1.781 \qquad (11)$$

where:

BAF = Soil-plant BAF for non-ionic organic constituents
K_{ow} = Octanol-water partitioning coefficient

Compound-specific soil-to-plant BAF values derived from this relationship will be multiplied by the soil EPC to estimate the concentration of non-PAH SVOCs in terrestrial plant tissue (**Table 3**).

Dioxins/Furans

Chemical-specific soil to plant BAFs were not identified for dioxins/furans. Therefore, the regression equation for the uptake of non-ionic organic constituents from soil to rinsed foliage derived in USEPA

(2007a) will be used to estimate uptake from soil to plant tissue for the dioxin/furan congeners identified as COPECs at the site (see Equation 11 above). The application of this regression relationship to estimate soil-to-plant BAFs for dioxin/furans is consistent with the approach used in the Los Alamos National Laboratory (LANL) EcoRisk Database, Release 4.1 (LANL, 2017).

Soil Invertebrates

The following sections provide the basis for estimating COPEC bioaccumulation from soil into soil invertebrate tissue for major constituent groups. **Table 3** presents a summary of soil invertebrate BAFs and associated references.

Metals

Soil-to-soil invertebrate bioaccumulation relationships for metals were primarily selected from literature sources adopted by USEPA in the derivation of Eco-SSLs (**Table 3**). Bioaccumulation relationships derived in Sample et al. (1998a) and Sample et al. (1999) were the primary soil-to-soil invertebrate uptake relationships adopted in the Eco-SSL development (USEPA, 2007a). Regression equations were used to estimate soil invertebrate tissue concentrations for six metals based on relationships derived in Sample et al. (1998a) and Sample et al. (1999). Slope and intercept values used in soil-to-soil invertebrate regressions are provided in **Table 3**. Ratio-derived bioaccumulation factors were selected for other metals based on median BAFs derived in Sample et al. (1998a). The median soil-to-insect BAF reported in USACHPPM (2004) was selected as the BAF for thallium (**Table 3**). Soil-to-soil invertebrate bioaccumulation data were not identified for antimony; therefore, a conservative default BAF of 1 was applied, consistent with USEPA (2007a).

Other Inorganics

Soil-to-soil invertebrate bioaccumulation data were limited for fluoride and cyanide (**Table 3**). A ratio-derived soil-to-plant BAF was identified for fluoride based on the median soil-to-insect BAF reported in USACHPPM (2004). Cyanide bioaccumulation into soil invertebrates was assumed to be negligible for soil uptake pathways, consistent with Lanno and Menzie (2005).

Semi-Volatile Organic Compounds – Polycyclic Aromatic Hydrocarbons

Soil-to-soil invertebrate BAFs for LMW and HMW PAHs were selected from BAFs derived using the partitioning model presented in USEPA (2007a). The model estimates the biota-to-soil water partitioning coefficient (K_{ww}) and divides it by the soil-to-water partitioning coefficient (K_d) to calculate the soil-to-earthworm BAF. USEPA (2007a) used soil organic carbon-to-water partitioning coefficient (K_{oc}) to calculate K_d using the class-specific models presented in Gerstl (1990). Further detail regarding the calculation of soil-to-earthworm BAFs for LMW and HMW PAHs is provided in Section 3.2.2 and Table 5 in USEPA (2007a). Ratio-based soil-to-earthworm BAF values derived in USEPA (2007a) using this modeling approach will be multiplied by soil EPCs to estimate the concentrations of LMW and HMW PAHs in soil invertebrate tissues (**Table 3**).

Volatile and Non-PAH Semi-Volatile Organic Compounds

Compound-specific soil-to-soil invertebrate BAFs were not identified for methylcyclohexane or non-PAH SVOCs identified as soil COPECs, except for PCP. USEPA (2007a) developed a significant regression model to estimate PCP uptake into earthworms; however, the Eco-SSL calculated using this significant regression equation resulted in a soil concentration that was lower than the range of data used to derive the bioaccumulation regression relationship. Therefore, USEPA (2007a) applied a ratio-derived soil-to-earthworm BAF of 14.63 based on the median BAF from empirical studies to estimate soil-to-soil earthworm uptake of PCP. Consistent with USEPA (2007a), the median ratio-derived BAF will be used to estimate PCP concentrations in soil invertebrate tissue in the BERA (**Table 3**).

For other non-ionic compounds in this chemical class, the partitioning model approach applied by USEPA (2007) to estimate soil-to-soil invertebrate BAFs will be used to estimate soil-to-soil invertebrate BAFs in the BERA. Further detail regarding the approach for calculating soil-to-earthworm BAFs for non-ionic organic constituents is provided in Section 3.2.2 in USEPA (2007a). **Table 4** presents the calculations of soil-to-soil invertebrate BAFs for non-PAH SVOC COPECs in soil using the partitioning modeling approach.

Dioxins/Furans

Bioaccumulation of dioxin/furans from soil to earthworm tissues was estimated based on the relationship derived by Sample et al. (1998a):

$$\ln C_{invert} = 3.533 \times \ln C_{soil} + 1.182 \qquad (12)$$

where:

C_{invert} = Concentration in soil invertebrate (mg COPEC/kg tissue, dry weight)
C_{soil} = COPEC concentration in soil (mg COPEC/kg soil, dry weight)

Small Mammals

The following sections provide the basis for estimating COPEC bioaccumulation from soil into mammal tissue for major constituent groups. **Table 3** presents a summary of small mammal BAFs and associated references.

Metals

Soil-to-small mammal bioaccumulation relationships for metals were primarily selected from literature sources adopted by USEPA in the derivation of Eco-SSLs (**Table 3**). Bioaccumulation relationships derived in Sample et al. (1998b) and Baes et al. (1984) were the primary soil-to-small mammal uptake relationships adopted in the Eco-SSL development (USEPA, 2007a). As indicated in **Table 3**, significant regression equations were used to estimate soil invertebrate tissue concentrations for nine metals based on regressions derived in Sample et al. (1998b). Slope and intercept values used in soil-to-small mammal regressions are provided in **Table 3**. A median ratio-derived soil-to-small mammal BAF was selected for mercury, consistent with LANL (2017).

Ratio-derived bioaccumulation factors were selected for antimony, barium, beryllium, and thallium based on diet-to-beef transfer factors reported in Baes et al. (1984). Consistent with USEPA (2007a), in the absence of alternative bioaccumulation relationships for metals, soil-to-beef transfer factors reported for metals in Baes et al. (1984) were used to estimate soil-to-small mammal BAFs based on the following:

$$BAF_{soil-mammal} = BAF_{soil-diet} \times 50 \times Tf_{diet-mammal} \quad (13)$$

where:

$BAF_{soil-mammal}$ = Soil-to-small mammal BAF (kg soil/kg mammal tissue, dry weight)
$BAF_{soil-diet}$ = Soil-to-diet BAF; conservatively assumed to be a soil invertebrate diet (kg soil/kg tissue, dry weight)
$Tf_{diet-mammal}$ = Transfer factor from diet-to-mammal tissue (day/kg mammal tissue)
50 = Cattle food intake rate of 50 kg/day assumed by Baes et al. (1984)

Diet-to-beef transfer factors from Baes et al. (1984) for antimony, barium, beryllium, and thallium are provided in **Table 3**. Soil-to-small mammal BAF values derived using this approach will be multiplied by the soil EPC to estimate the concentration of these select metals in small mammal tissue (**Table 3**).

Other Inorganics

Soil-to-small mammal bioaccumulation data were limited for fluoride and cyanide (**Table 3**). Ratio-derived soil-to-small mammal BAFs were derived by LANL (2015) for fluoride; the LANL-derived soil-to-small mammal BAF values will be multiplied by soil EPCs to estimate the concentrations of fluoride in small mammal tissue (**Table 3**). Cyanide bioaccumulation into small mammals was assumed to be negligible for soil uptake pathways, consistent with Lanno and Menzie (2005).

Semi-Volatile Organic Compounds – Polycyclic Aromatic Hydrocarbons

Small mammal bioaccumulation data for LMW and HMW PAHs are limited. However, USEPA (2007a) assumes that PAH bioaccumulation is minimal due to the rapid metabolism of these compounds following ingestion by birds and mammals. Consistent with USEPA (2007a), the bioaccumulation of LMW and HMW PAHs in small mammal tissue is assumed to be negligible (**Table 3**).

Volatile and Non-PAH Semi-Volatile Organic Compounds

Compound-specific soil-to-small mammal bioaccumulation data were limited in general literature sources for methylcyclohexane and most non-PAH SVOC soil COPECs. USEPA (2007a) developed a general regression equation for the accumulation of PCP from the diet to chicken tissue; this relationship was assumed to be representative of potential accumulation from the diet to small mammal tissues (USEPA, 2007a). LANL (2015) calculated soil-to-small mammal BAFs for phthalates and hexachlorobenzene. These soil-to-small mammal tissue BAFs were also selected to represent potential bioaccumulation into small mammals at the Site (**Table 3**).

For methylcyclohexane and other non-PAH SVOCs, data for uptake from soil into small mammal tissue are lacking. For these constituents, the model used in the LANL (2017) EcoRisk food chain model to estimate the transfer factor for the flesh of prey items (TF_flesh_dw) will be used to estimate the BAF_{soil-}

$_{mammal}$ value in the BERA. The LANL (2017) model multiplies the uptake factor for beef/cattle, derived using the method recommended in EPA (2005j), by maximum ingestion rates and dietary BAFs of prey items consisting of other modeled receptors with lower trophic orders. To retain consistency with the LANL EcoRisk model, the same receptor species that were assumed in that model to be prey items for higher trophic order receptors were used to develop the CFAC BAFs (i.e., American robin, deer mouse, desert cottontail, and short-tailed shrew). The model equation is as follows:

$$BAF_{soil-mammal} = BAF_{beef} \times \left[\frac{\left(FIR_{MAX} \times BAF_{MAX\ Plant/Invert} + SIR_{MAX}\right)}{(1-MC)}\right] \quad (14)$$

where:

$BAF_{soil-mammal}$ = Soil-to-small mammal BAF (kg soil/kg flesh, dry weight)
BAF_{beef} = Diet-beef biotransfer factor (day/kg beef, wet weight)
FIR_{max} = Maximum ingestion rate for prey species (kg food/day, dry weight)
$BAF_{MAX\ Plant/Invert}$ = Maximum BAF for plant or invertebrate dietary items of the prey species (kg soil, dry weight/kg tissue, wet weight)
$IR_{soilMAX}$ = Maximum ingestion rate of soil for prey species (kg soil/day, dry weight)
MC = Moisture content of flesh (assumed 68 percent)

The biotransfer to beef factor is estimated using the following model described in Research Triangle Institute (RTI) (2005) and recommended by EPA (2005j):

$$\log BAF_{beef} = Fat_{beef} \times (-0.099 \times \log {K_{ow}}^2 + 1.07 \times \log K_{ow} - 3.56) \quad (15)$$

where:

BAF_{beef} = Diet-beef biotransfer factor (day/kg beef, wet weight)
Fat_{beef} = Fat content of beef; assumed to be 19 percent or 0.19 based on LANL (2017)
Kow = Octanol-water partition coefficient

Table 5 presents calculated soil-to-small mammal BAFs estimated for methylcyclohexane and non-PAH SVOCs lacking soil-to-mammal BAFs from other literature sources.

Dioxins/Furans

Sample et al. (1998b) developed bioaccumulation relationships for estimating uptake of TCDD and tetrachlorinated dibenzofuran (TCDF) into small mammal tissue based on empirical data for multiple organism groups. A simple regression equation was recommended to estimate TCDD concentrations in small mammal tissue based on soil concentrations. A median ratio-derived soil-to-small mammal BAF was recommended to estimate TCDF concentrations in small mammal tissue. Consistent with the recommendations in Sample et al. (1998b), the simple regression equation will be used to estimate concentrations of TCDD and other dioxin congeners in small mammals; the median soil-to-small mammal BAF for TCDF will be used to estimate concentrations of TCDF and other furan congeners (**Table 3**).

Aquatic Bioaccumulation Relationships

The development of bioaccumulation relationships in aquatic environments will use similar approaches to those described in the preceding section for terrestrial environments. Bioaccumulation of COPECs

from sediment or surface water into aquatic dietary items of semi-aquatic wildlife receptors, including benthic invertebrates and fish, will be estimated using the sediment EPCs and biota-sediment accumulation factors (BSAFs) or surface water EPCs and bioconcentration factors (BCFs). BSAFs or BCFs will be developed based on regression models or constant uptake factors that reflect the relationship between COPEC concentrations in dietary items and concentrations in sediment or surface water. Like BAFs for soil, the uptake of COPECs into biota within the aquatic environment is influenced by COPEC-specific properties, sediment characteristics (e.g., organic carbon content), receptor physiology, and the characteristics of dietary items (e.g., lipid content).

Table 5 presents a summary of the aquatic BSAFs or BCFs that will be used to estimate COPEC bioaccumulation from sediment or surface water into benthic invertebrates and fish. Estimated COPEC concentrations in aquatic biota are expressed on a dry weight basis based on BSAFs or BCFs derived on a dry weight basis. The following sections discuss the basis for selecting aquatic BSAFs or BCFs to represent uptake into each potential dietary item of semi-aquatic wildlife receptors of concern.

Benthic Invertebrates

Literature-based BSAFs or BCFs will be used to estimate the bioaccumulation of COPECs into benthic invertebrates as a function of sediment or surface water concentrations, respectively (**Table 5**). The following sections provide the basis for estimating COPEC bioaccumulation into benthic invertebrates for major constituent groups.

Metals

Metal concentrations in benthic invertebrates were estimated based on BSAFs presented in literature compilations (e.g., Sample et al., 1998b) and individual studies (**Table 5**). Median BSAF values provided in Sample et al. (1998b) were preferentially used to estimate benthic invertebrate concentrations for metals included in the compilation. For metals not included in Sample et al. (1998b), BSAF values were estimated from individual literature studies. The BSAF for aluminum was estimated as the ratio of mean oligochaete (*Lumbriculus variegatus*) tissue concentrations (dry weight) to mean whole sediment aluminum concentrations (dry weight) reported by Stanley et al. (2010). The median BSAF calculated from the ratios of mean benthic invertebrate tissue and mean whole sediment concentrations reported by Dovick et al. (2015) was used to estimate antimony bioaccumulation into benthic macroinvertebrates. Median BSAFs calculated from paired benthic invertebrate and sediment data reported by Hamilton et al. (2002) were used to estimate concentrations of barium, beryllium, selenium, and vanadium (**Table 5**). Sediment bioaccumulation data for thallium were limited; however, biomonitoring data from Turner et al. (2013) were used to estimate a BSAF for deposit-feeding invertebrates. In the absence of other data, a BSAF calculated as the mean concentration in deposit-feeding invertebrates and mean sediment concentration reported for the Plym estuary by Turner et al. (2013) was used as a BSAF for thallium (**Table 5**).

Other Inorganics

Bioaccumulation information for cyanide and fluoride was evaluated from literature reviews and primary literature. Based on Lanno and Menzie (2005), cyanide bioaccumulation into benthic invertebrates was assumed to be negligible for sediment and surface water uptake pathways.

Bioaccumulation and trophic transfer via the food web is not considered to be a significant pathway for inorganic cyanide compounds (Lanno and Menzie, 2005).

Aqueous exposure to the fluoride ion (F^-) is the predominant bioaccumulation pathway for aquatic organisms. Given that aqueous exposure is the predominant bioaccumulation pathway, data reported by Aguirre-Sierra et al. (2013) were used to relate aqueous F^- concentrations to F^- concentrations in muscle tissue and exoskeleton of the freshwater white-clawed crayfish (*Austropotamobius pallipes*). As illustrated in Figure 1a, fluoride bioaccumulation in crayfish exoskeleton and muscle tissue increased exponentially from the control treatment (0.18 ± 0.07 mg/L) to the highest test treatment (84.8 ± 12.4 mg/L). Greater fluoride bioaccumulation was observed in the crayfish exoskeleton relative to muscle tissue, consistent with other studies that indicate greater accumulation in invertebrate exoskeletons (Sands et al. 1998; Camargo, 2003).

Based on the water-to-invertebrate relationships derived from Aguirre-Sierra et al. (2013), F^- concentrations in benthic invertebrate tissues will be estimated in the BERA as a function of F^- concentrations in unfiltered surface water using the relationship for crayfish muscle tissue (Figure 1a; **Table 5**):

$$C_{invertebrates} = 24.253 \times e^{(0.0773 \times C_{water})} \qquad (16)$$

where:

$C_{invertebrates}$ = Concentration in invertebrate tissue (mg F^-/kg dry weight)
C_{water} = Concentration in unfiltered surface water (mg F^-/L)

The crayfish muscle bioaccumulation relationship derived from data reported by Aguirre-Sierra et al. (2013) was selected to represent the more edible and digestible portions of crayfish tissue that may be consumed by wildlife. Further evaluation of this assumption may be warranted in the BERA pending an analysis of the potential influence of this uncertainty on the risk characterization of F- exposure to semi-aquatic wildlife.

Semi-Volatile Organic Compounds – Polycyclic Aromatic Hydrocarbons

PAH concentrations in benthic invertebrates were estimated based on the biota-sediment accumulation relationship described by DiToro and McGrath (2000) in the development of the target lipid model. BSAFs for PAH compounds were estimated on an organic carbon and lipid-normalized basis as a function of K_{ow}:

$$BSAF_{OC} = \frac{C_{lipid}}{C_{oc}} = K_{ow}{}^{-0.038} \qquad (17)$$

where:

$BSAF_{oc}$ = BSAF normalized by organism lipid content and sediment organic carbon content (kg organic carbon/kg lipid)
C_{lipid} = Tissue lipid concentration (mg PAH/kg lipid)
C_{oc} = Sediment organic carbon concentration (mg PAH/kg organic carbon)
K_{ow} = Octanol-water partitioning coefficient

Organic carbon and lipid-normalized BSAFs were estimated on a dry weight basis using assumed lipid and organic carbon content in sediments as follows:

$$BSAF_{dw} = BSAF_{oc} \times f_{lipid} \times \frac{1}{f_{oc}} \qquad (18)$$

where:

$BSAF_{dw}$ = BSAF specific to prey type and COPEC (kg sediment/kg tissue, dry weight)
$BSAF_{oc}$ = Organic carbon and lipid-normalized BSAF specific to prey type and COPEC (kg organic carbon/kg lipid)
f_{lipid} = Fraction of lipid in dietary items (0.065 assumed in **Table 5** for benthic invertebrates)
f_{oc} = Fraction of organic carbon in sediment (0.01 assumed in **Table 5**)

PAH-specific $BASF_{dw}$ values will be multiplied by the COPEC concentration in sediment (mg/kg dry weight) to estimate the COPEC concentration in the dietary item (mg/kg dry weight).

Semi-Volatile Organic Compounds – Non-Polycyclic Aromatic Hydrocarbon

Bioaccumulation of other non-ionic organic compounds was assumed to be similar to PAH bioaccumulation. Therefore, BSAFs for non-PAH SVOCs were estimated as a function of K_{ow} using the identical procedures described in the preceding section for PAHs (**Table 5**).

Fish

Literature-based BASFs or BCFs will be used to estimate the bioaccumulation of COPECs into fish tissue as a function of sediment or surface water concentrations, respectively (**Table 5**). The following sections provide the basis for estimating COPEC bioaccumulation into fish for major constituent groups.

Metals

Metal bioaccumulation into fish tissue was estimated based on the bioconcentration of metals from surface water into tissue. Sample et al. (1996b) was selected as a preferential source of BCFs based on a compilation of metal BCF values identified in the literature (**Table 5**). BCF values were not available in Sample et al. (1996b) for barium, silver, and vanadium; therefore, literature studies were reviewed to identify potential bioaccumulation relationships between surface water and fish tissue concentrations. A BCF of 74.4 for barium bioaccumulation into male fish carcass reported by Nakamoto and Hassler (1992) will be used to estimate barium concentrations in fish tissue. A BCF of 106 reported in study of silver bioaccumulation into Common Carp (*Cyprinus carpo*) will be used to estimate silver bioaccumulation into fish tissue (Laplace et al, 1992). CECBP (2008) compiled a range of BCF values from 365-630 for vanadium uptake into fish. Due to the paucity of data to support the calculation of a BCF for vanadium, the most conservative BCF value of 630 will be used to estimate fish tissue concentrations.

BCFs reported by Sample et al. (1996b) are based on wet weight fish tissue concentrations; therefore, BCF values were divided by 0.25 based on assumed percent solids of 25 percent to estimate fish tissue concentrations on a dry weight basis (**Table 5**). The BCF values for barium, silver, and vanadium were also divided by 0.25, based on BCFs being reported on a wet weight tissue basis.

Other Inorganics

Cyanide and fluoride bioaccumulation into fish tissue were evaluated based on literature reviews and primary literature studies. Consistent with Lanno and Menzie (2005), cyanide bioaccumulation into fish tissue was assumed to be negligible for sediment and surface water uptake pathways.

As previously stated for benthic invertebrates, aqueous exposure is the predominant F^- bioaccumulation pathway for aquatic organisms. Like invertebrates, F^- bioaccumulation in fish tends to be greatest in skeletal tissues, including bones, cartilage, and gills. Shi et al. (2009) evaluated the bioaccumulation of F^- from aqueous exposure into multiple tissue compartments in Siberian sturgeon (*Acipenser baerii*). As illustrated in Figure 1b, F^- concentrations increased in skeletal tissues (bone, cartilage, and gills) with increasing water concentrations ranging from the control treatment (0.26 ± 0.07 mg/L) to the highest test treatment (51.8 ± 3.5 mg/L). However, F^- concentrations in soft tissues, including skin, muscle, and viscera, generally remained unchanged with increasing aqueous exposure.

Based on the assumption that F^- concentrations in soft fish tissue, the more edible and digestible portions of fish for potential piscivorous consumers, will not exceed the concentrations in gill tissue, the bioaccumulation relationship derived using data from Shi et al. (2009) for gill tissue will be used as a conservative estimate of F^- concentrations in soft tissue compartments of fish (Figure 1b). F^- concentrations in fish tissue will be estimated in the BERA as a function of F^- concentrations in unfiltered surface water using the relationship derived for bioaccumulation into fish gills (**Table 5**):

$$C_{fish} = 42.377 \times \ln C_{water} + 214.34 \qquad (19)$$

where:

C_{fish} = Concentration in fish tissue (mg F^-/kg dry weight)
C_{water} = Concentration in unfiltered surface water (mg F^-/L)

The use of the fish gill bioaccumulation relationship derived from data presented in Shi et al. (2009) conservatively estimates F- concentrations in soft tissues that may be preferentially consumed by piscivorous wildlife receptors (e.g., mink) that typically forage on soft tissue (e.g., skin, muscle, and viscera) and forgo fish carcasses that contain mostly skeletal tissue. The use of this relationship also assumes that whole-body fish tissue concentrations will not exceed concentrations observed in fish gill tissue for those piscivorous wildlife that may consume the entire fish. Further evaluation of these assumptions may be warranted in the BERA pending the potential influence of this uncertainty on the risk characterization of F- exposure to semi-aquatic wildlife.

Semi-Volatile Organic Compounds – Polycyclic Aromatic Hydrocarbons

PAH concentrations in fish tissue were estimated based on the K_{ow}-based biota-sediment accumulation relationship used to estimate PAH concentrations in benthic invertebrates (DiToro and McGrath, 2000). Estimated concentrations were based on the equations presented in the preceding section for benthic invertebrates and an assumed dry weight lipid fraction in fish of 0.085 (**Table 5**). The application of the BSAF relationship from DiToro, and McGrath (2000) conservatively assumes that exposure and uptake to fish within the water column does not exceed exposure and uptake in sediment and pore water within the benthic environment.

Semi-Volatile Organic Compounds – Non-Polycyclic Aromatic Hydrocarbons

Fish tissue concentrations of non-PAH SVOCs were estimated using the K_{ow}-based biota-sediment accumulation relationship used to estimate PAH concentrations in fish tissue, as described in the preceding section (DiToro and McGrath, 2000). Consistent with the approach for benthic invertebrates, this approach assumes that the bioaccumulation of other non-ionic organic compounds is a function of compound-specific K_{ow}, similar to PAHs.

Area Use Factors

In dietary exposure models, the AUF reflects the proportion of the dose that a receptor may obtain while foraging within the a given exposure area. The AUF is primarily estimated based on the ratio of the size of the exposure area to the area of the receptor foraging range. Species with very relatively small home ranges (e.g., meadow vole or short-tailed shrew) may forage entirely within the study area. However, for species with larger home ranges (e.g., large birds and mammals), most of the receptor diet may come from outside of an exposure area or the Site. If the foraging range of a receptor is greater than an exposure area, the EDD will be calculated as the sum of AUF-weighted doses obtained from the exposure areas within the typical home range of the receptor.

Available literature sources use various metrics to represent the size of the area used by a receptor: feeding or foraging radius, feeding or foraging distance, and home range or territory size, etc. In most cases, the size of the area used by a receptor for foraging and feeding is reported in acres and is referred to as the home range or territory. For initial exposure modeling, AUFs will be assigned a value of 1 (i.e., 100 percent foraging within the exposure area) and adjusted subsequently in the refined evaluation based on the corresponding sizes of the receptor-specific home range and the exposure area. Refined AUFs may also account for developed or unvegetated areas of the Site that do not provide habitat or forage base for wildlife receptors; these areas may be excluded from refined dietary exposure estimates due to the absence of forage base.

Seasonal use may also be considered in the calculation of the AUF to estimate the exposure duration for receptors that may only be present seasonally at the Site. Seasonal use will initially be assumed to be 100 percent; however, estimates of seasonal use may be incorporated into the AUF for the refined exposure evaluation in the BERA to address the potential uncertainty associated with the duration of exposure for seasonal receptors at the Site.

Toxicity Reference Values

TRVs will be derived to evaluate the potential for adverse ecological effects associated with the dietary doses estimated using the approaches described in the preceding sections. Two tiers of chronic TRVs representing no-observed-adverse-effect levels (NOAELs) and LOAELs for growth and reproduction endpoints will be identified to evaluate the potential for adverse effects via wildlife ingestion pathways:

- Low TRV (TRV_{Low}): Represents the geometric mean NOAEL TRV identified in literature studies.
- High TRV (TRV_{High}): Represents a TRV-based on chronic exposure, that estimates a representative LOAEL in literature studies.

The two tiers of TRVs will be used to evaluate potential wildlife exposure based on EDDs calculated using preliminary and refined exposure assumptions and EPCs. For receptors with special regulatory status (i.e., threatened or endangered species), the TRV_{Low} will be used to estimate the potential for adverse effects to potential individual receptors within the population.

Preliminary TRVs for bioaccumulative COPECs were identified from primarily peer-reviewed compilations of toxicity data for ecological risk assessment including:

- USEPA Eco-SSLs (USEPA, 2005a)
- LANL EcoRisk (LANL, 2017)
- ORNL *Toxicological Benchmarks for Wildlife: 1996 Revision* (Sample et al., 1996b)

At the request of USEPA, LOAELs provided in TechLaw (2008) and the approach used to derive TRVs in TechLaw (2008) were also considered in the selection of TRVs. TRVs presented in *Development of Toxicity Reference Values for Conducting Ecological Risk Assessment at Naval Facilities in California, Interim Final* (Engineering Field Activity West, 1998) were also considered as a source for toxicity reference values. For constituents lacking toxicity data from these compilations, literature sources were reviewed to identify appropriate TRVs. The following sections summarize the basis for selecting preliminary TRVs from literature/database sources for the BERA; a summary of the TRVs and associated sources is provided in **Table 7**. The BERA Report will also include an appendix that documents the basis for deriving final TRVs used in dietary exposure modeling.

Metals

Avian and mammalian TRVs for metals were selected primarily from TRVs used by the USEPA to develop Eco-SSLs or derived from studies accepted by the USEPA for Eco-SSL derivation (USEPA, 2005). The Eco-SSL approach generally adopted TRVs based on the geometric mean of NOAEL doses for growth and reproduction endpoints from accepted studies. However, in cases where the geometric mean of growth and reproduction NOAELs exceeded the lowest bounded LOAEL, the Eco-SSL conservatively selected the highest bounded NOAEL below the lowest bounded LOAEL for growth, reproduction, or survival as the preferred TRV. Other endpoints were considered for metals lacking data on growth, reproduction, or survival data.

Avian TRVs were identified for metal COPECs identified in the SLERA, except antimony and beryllium (**Table 7**). Most avian NOAEL TRVs for metals were obtained from the TRVs used by the USEPA to develop Eco-SSLs (**Table 7**); however, avian Eco-SSL TRVs were not available for mercury and thallium. Avian TRVs identified for mercury by Sample et al. (1996b) will be used as representative NOAEL and LOAEL TRVs in the BERA (**Table 7**). For thallium, avian NOAEL and LOAEL endpoints selected in the LANL EcoRisk database for the derivation of ecological screening levels (ESLs) were identified as preliminary TRVs for the BERA. Avian TRVs were not identified in the literature for antimony or beryllium; therefore, potential avian effects related to the estimated dietary exposure of these metals will be addressed as an uncertainty in the BERA.

Mammalian TRVs were selected primarily from TRVs used by the USEPA to develop Eco-SSLs or derived from studies accepted by the USEPA for Eco-SSL derivation (**Table 6**). NOAEL TRVs were selected based on TRVs used in the Eco-SSL derivation for metals, except for aluminum, mercury, and thallium. Consistent with USEPA (2003b), mammalian exposure to aluminum will be evaluated based on soil

conditions, particularly pH, that control the mobility and bioavailability in soils (EHS Support, 2018). The NOAEL TRVs identified for mercury by Sample et al. (1996b) will be used as the representative NOAEL; however, a corresponding mammalian LOAEL was not identified for mercury (**Table 6**). For thallium, NOAEL and LOAEL endpoints were selected from the mammalian study selected in the LANL EcoRisk database (Formigli et al., 1986) for the derivation of ESLs.

Other Inorganics

Avian and mammalian TRVs for cyanide and fluoride were identified based on studies selected for use in calculating ESLs in the LANL EcoRisk Database (LANL, 2017; **Table 6**). For cyanide, an oral dosing study evaluating American kestrel (*Falco sparverius*) survival conducted by Wiemeyer et al. (1986) will be used as the basis for avian TRVs (**Table 6**). A chronic critical life stage study evaluating reproductive effects in rats conducted by Tewe and Maner (1981) will be used as the basis for mammalian TRVs for cyanide. For fluoride, a dietary study of reproductive effects of chronic-critical life stage exposure of Eastern screech owl (*Megascops asio*) conducted by Pattee et al. (1988) will be used as the basis of the avian NOAEL and LOAEL (**Table 6**). A chronic study evaluating potential reproductive effects of dietary fluorine in mink conducted by Aulerich et al. (1997) will be used the basis for the mammalian NOAEL and LOAEL (**Table 6**).

Semi-Volatile Organic Compounds – Polycyclic Aromatic Hydrocarbons

Consistent with USEPA (2007f), dietary exposure to LMW and HMW PAHs will be evaluated as an aggregate dose of each molecular weight group due to the common toxicological properties of PAH compounds within each group.

Avian toxicological studies for LMW and HMW are limited. USEPA (2007f) did not identify a sufficient number of acceptable studies to derive avian Eco-SSLs for either class of PAHs. Of the avian studies accepted by USEPA (2007f), the minimum NOAEL and LOAEL endpoints for growth reported by Trust et al. (1994) were selected as HMW PAH avian TRVs for the BERA (**Table 6**). For avian exposure to LMW PAHs, physiological endpoints from a chronic dietary exposure (7 months) to mallard duck reported by Patton and Dieter (1980) were selected as LMW PAH avian TRVs for the BERA (**Table 6**).

Mammalian NOAELs for LMW and HMW PAHs were selected based on TRVs used by USEPA in the derivation of Eco-SSLs (USEPA, 2007f). The mammalian NOAEL TRV for LMW PAHs was selected as the geometric mean of NOAELs for growth and reproduction endpoints (**Table 6**). The geometric mean of HMW PAH mammalian endpoints for growth and reproduction evaluated in Eco-SSL studies was 18 mg/kg-bw/day; however, the mammalian Eco-SSL for HMW PAH was conservatively derived based on the highest bounded NOAEL below the lowest bounded LOAEL for growth, reproduction, or survival (0.615 mg/kg-bw/day). The TRV of 0.615 mg/kg-bw/day used in the derivation of the mammalian Eco-SSL for HMW PAHs was conservatively selected as the HMW mammalian NOAEL for the BERA. However, given that this NOAEL TRV is two orders of magnitude below the geometric mean of mammalian growth and reproduction NOAELs for HMW PAHs in Eco-SSL studies, further evaluation of mammalian exposure to HMW PAHs in the BERA will include consideration of the range of NOAEL endpoints for growth and survival. Mammalian LOAEL TRVs for LMW and HMW PAHs selected for the BERA are consistent with TechLaw (2008) based on the geometric mean of LOAEL endpoints for growth and reproduction (**Table 6**).

Semi-Volatile Organic Compounds – Non-Polycyclic Aromatic Hydrocarbons

Limited toxicological data are available for the development of TRVs for non-PAH SVOCs. Avian TRVs were identified in the LANL EcoRisk database (LANL, 2017), Sample et al. (1996b), and USEPA (2007g) for 4 of the 12 non-PAH SVOC COPECs, including two of the phthalate ester compounds, bis(2-ethylhexyl) phthalate and di-n-butyl phthalate (**Table 6**). Avian TRVs for di-n-butyl phthalate were selected as surrogate values that will be used to evaluate butyl benzylphthalate and di-n-octyl phthalate (**Table 6**). The avian NOAEL TRV for pentachlorophenol was selected consistent with USEPA (2007g); the LOAEL TRV for pentachlorophenol was estimated as the geometric mean of LOAEL endpoints for growth and reproduction, consistent with TechLaw (2008). No avian TRVs were identified for the remaining non-PAH SVOC COPECs (**Table 6**). Potential avian effects related to the estimated dietary exposure of these non-PAH SVOCs will be addressed as an uncertainty in the BERA.

Literature-based TRVs for mammalian receptors were identified for 7 of the 12 non-PAH SVOCs (**Table 6**). The selection of mammalian TRVs for non-PAH SVOCs was consistent with the value selected by LANL EcoRisk for bis(2-ethylhexyl) phthalate, butyl benzylphthalate, di-n-octyl phthalate, and hexachlorobenzene (**Table 6**). The mammalian NOAEL for pentachlorophenol was selected consistent with USEPA (2007g); the pentachlorophenol LOAEL was estimated as the geometric mean of LOAEL endpoints for growth and reproduction, consistent with TechLaw (2008). NOAEL and LOAEL endpoints reported by Kociba et al. (1977) in a chronic dietary study of Sprague-Dawley rats were selected as NOAEL and LOAEL TRVs for hexachlorobutadiene (**Table 6**). Sufficient information was not identified to develop TRVs for the remaining five SVOCs; mammalian dietary exposure to these non-PAH SVOCs will be addressed as an uncertainty in the BERA.

Dioxin/Furans

Dietary exposure to dioxin/furan compounds will be evaluated based on the potential additive toxicity of dioxin/furan compounds based on the toxicity equivalence methodology (USEPA, 2008a). A dietary dose will be calculated for the 17-individual dioxin/furan compounds in each sample. The EDD for each compound will be multiplied by the compound-specific TEF for birds or mammals to express the dose toxicity equivalence concentration (TEC) to the toxicity of TCDD. TECs of the 17 dioxin/furan compounds will be summed to calculate an overall TEC for comparison with dietary TRVs for 2,3,7,8-TCDD derived for birds and mammals.

Avian and mammalian TRVs for 2,3,7,8-TCDD were selected consistent with Sample et al. (1996b) and the LANL EcoRisk database (LANL, 2017), respectively (**Table 6**). Sample et al. (1996b) identified reproductive NOAEL and LOAEL endpoints (egg production and hatchability) for ring-necked pheasant in a study reported by Nosek et al. (1992). Farmahin (2012, 2013) noted that bird species fall into one of three sensitivity categories (high, medium, and low) for dioxins, with pheasants falling into the middle category. At the request of EPA, a downward adjustment of a factor of 8 (reflecting the difference in sensitivity between bird species in the moderate and highly sensitive categories) was applied to the avian TRV for 2,3,7,8-TCDD. However, as stated in Farmahin (2012), using toxicity data associated with the most sensitive bird species to evaluate dioxins would likely overestimate potential risk of adverse effects, and could lead to inappropriate decisions about remedial options at contaminated sites. The LANL EcoRisk database selected mammalian NOAEL and LOAEL values based on chronic reproductive endpoints from a multi-generational study of Sprague-Dawley rats reported by Murray et al. (1979).

NOAEL and LOAEL TRVs from these sources were selected to evaluate dietary TECs for avian and mammalian receptors of concern in the BERA (**Table 6**).

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Table 1
Summary of Bioaccumulative COPECs for Evaluation in Wildlife Exposure Modeling
Draft Technical Memorandum: Proposed Wildlife Exposure Modeling Approach
Columbia Falls Aluminum Company
Columbia Falls, Montana

COPECs	log K_{ow} USEPA EPISUITE	COPECs by Matrix			Bioaccumulative COPEC Lists				Wildlife Ingestion COPEC
		Soil	Sediment	Surface Water	log K_{ow} > 3.5?	USEPA 2017 PBT Constituents	USEPA 2000 Important Bioaccumulative Constituents	USEPA Eco-SSL Wildlife Value	
Metals									
Aluminum	NA	●	●	●	NA			Narrative Statement	Yes
Antimony	NA	●	●		NA			Yes	Yes
Arsenic	NA	●	●		NA		Yes	Yes	Yes
Barium	NA	●	○	●	NA			Yes	Yes
Beryllium	NA	●	○		NA			Yes	Yes
Cadmium	NA	●	●	●	NA		Yes	Yes	Yes
Chromium	NA	●	●		NA		Yes	Yes	Yes
Cobalt	NA	●			NA			Yes	Yes
Copper	NA	●	●	●	NA		Yes	Yes	Yes
Lead	NA	●	●	●	NA	Yes	Yes	Yes	Yes
Manganese	NA	●		●	NA			Yes	Yes
Mercury	NA	●		●	NA	Yes	Yes	Yes	Yes
Nickel	NA	●	●	●	NA		Yes	Yes	Yes
Selenium	NA	●	●		NA		Yes	Yes	Yes
Silver	NA		●		NA		Yes	Yes	Yes
Thallium	NA	●			NA				Yes
Vanadium	NA	●	○		NA			Yes	Yes
Zinc	NA	●	●		NA		Yes	Yes	Yes
Other Inorganics									
Cyanide	NA	●	●	●	NA				Yes
Fluoride	NA	●		●	NA				Yes
Other Inorganics - Essential Nutrients									
Calcium	NA	●	○		NA				
Magnesium	NA	●			NA				
Potassium	NA	●			NA				
Sodium	NA	●			NA				
Polycyclic Aromatic Hydrocarbons (PAHs)									
Total HMW- PAHs	NA	●	●	●	NA	Yes	Yes	Yes	Yes
Total LMW- PAHs	NA	●	●	●	NA	Yes	Yes	Yes	Yes
Dioxin and Dioxin-Like Compounds									
Dioxin and Dioxin-Like Compounds	NA	●			NA	Yes	Yes		Yes
Non-PAH Semi-Volatile Organic Compounds (SVOCs)									
1,2,4,5-Tetrachlorobenzene	4.571	●			Yes		Yes		Yes
1,4-Dioxane	-0.320	●			No				
2,3,4,6-Tetrachlorophenol	4.090		●		Yes				Yes
2,4,5-Trichlorophenol	3.446	●	●		No				
2,4-Dimethylphenol	2.607	●	●		No				
2,4-Dinitrophenol	1.726	●	●		No				
2,4-Dinitrotoluene	2.176	●	●		No				
2,6-Dinitrotoluene	2.176	●	●		No				
2-Chloronaphthalene	3.814	●			Yes				Yes
2-Chlorophenol	2.157	●	●		No				
2-Methylphenol	2.060	●	●		No				
2-Nitrophenol	1.908	●			No				
3- and 4-methylphenol	2.060	○	○		No				
3,3'-Dichlorobenzidine	3.212	●	●		No				
4,6-Dinitro-2-methylphenol	2.273	●			No				
4-Chloroaniline	1.721	●			No				
4-Nitrophenol	1.908	●	●		No				
Acetophenone	1.670		○		No				
Benzaldehyde	1.710	○	○		No				
Bis(2-chloroethoxy)methane	1.295	●			No				
Bis(2-chloroethyl)ether	1.560		○		No				
Bis(2-ethylhexyl)phthalate	8.392	●	●		Yes				Yes
Butylbenzylphthalate	4.845	●			Yes				Yes
Caprolactam	0.660	○			No				
Carbazole	3.230		○		No				
Dibenzofuran	3.715	●	●		Yes				Yes
Di-n-butyl phthalate	4.610	●			Yes				Yes
Di-n-octyl phthalate	8.540	●			Yes				Yes
Hexachlorobenzene	5.860	●	●		Yes	Yes	Yes		Yes
Hexachlorobutadiene	4.717	●	●		Yes		Yes		Yes
Hexachlorocyclopentadiene	4.625	●			Yes		Yes		Yes
Hexachloroethane	4.035	●			Yes		Yes		Yes
Nitrobenzene	1.811	●	●		No				
N-Nitrosodi-n-propylamine	1.326	●			No				
N-Nitrosodiphenylamine	3.161	●			No				
Pentachlorophenol	4.735	●	●		Yes		Yes	Yes	Yes
Phenol	1.513	●	●		No				
Volatile Organic Compounds (VOCs)									
Bromomethane	1.180	○			No				
Cyclohexane	3.180	○			No				

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		Soil	Sediment	Surface Water	log K_{ow} > 3.5?	USEPA 2017 PBT Constituents	USEPA 2000 Important Bioaccumulative Constituents	USEPA Eco-SSL Wildlife Value	
Isopropylbenzene	3.450	●			No				
Methylacetate	0.370	●			No				
Methylcyclohexane	3.590	●			Yes				Yes
m,p-Xylene	3.090	●			No				
o-Xylene	3.090	●			No				

Notes:
COPEC, constituent of potential ecological concern
●, COPEC identified in the SLERA
●, COPEC identified in the BERA Work Plan as having a detection in at least one sample and had no associated ecological screening value.
USEPA, United States Environmental Protection Agency
PBT, persistent bioaccumulative toxic
Eco-SSL, ecological soil screening level
NA, not applicable
PAH, polycyclic aromatic hydrocarbons
SVOC, semi-volatile organic compounds
HMW, high molecular weight
LMW, low molecular weight

Table 2
Summary of Exposure Parameters for Wildlife Receptors of Concern
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Columbia Falls Aluminum Company
Columbia Falls, Montana

								Dietary Composition					Ingestion Rates							
					Body Weight (kg wet weight)								Dietary		Drinking Water		Incidental Substrate			
Common Name	Scientific Name	Food-web classification	Foraging Range [a]	Foraging Range Reference	Mean	±SD	Body Weight Reference	Plant Material	Invertebrates	Fish	Small Mammals	Dietary Composition Reference	kg dry weight/day	Reference	L/day	Reference	Average % of Dry Intake	± SD % of Dry Intake	kg dry weight/day	Reference
Avian Receptors																				
American dipper	*Cinclus mexicanus*	semi-aquatic passerine invertivore	0.32 km	Bakus (1959)	0.0546	0.0048	Dunning (2008)		100%			Ealey (1977)	0.0091	Nagy (2001)[b]	0.0084	Calder and Braun (1983)	2%	---	0.0002	Assumption[l]
American woodcock	*Scolopax minor*	small soil probing invertivore	11.1 ac	Gregg (1984); USACHPPM (2004)	0.176	---	Dunning (2008)	10%	90%			Sample and Suter (1994)	0.021	Nagy (2001)[b]	0.018	Calder and Braun (1983)	7.5%	6.9%	0.0016	USEPA (2007a)
Belted kingfisher	*Ceryle alcyon*	small aquatic piscivore	1.03 km	USACHPPM (2004)	0.148	0.0208	Dunning (2008)		10%	90%		Sample and Suter (1994)	0.023	Nagy (2001)[d]	0.016	Calder and Braun (1983)	0%	---	0	Sample and Suter (1994)[h]
Mourning dove	*Zenaida macroura*	small herbivore	1.6 km	Tomlinson et al. (1960)	0.115	0.0018	Dunning (2008)	100%				USEPA (2005a)	0.013	Nagy (2001)[c]	0.014	Calder and Braun (1983)	6.8%	5.3%	0.00089	USEPA (2007a)
Red-tailed hawk	*Buteo jamaicensis*	large carnivore	551 ac	Sample and Suter (1994)	1.028	---	Dunning (2008)				100%	Sample and Suter (1994)	0.084	Nagy (2001)[d]	0.060	Calder and Braun (1983)	2.6%	2.3%	0.0022	USEPA (2007a)
Yellow-billed Cuckoo	*Coccyzus americanus*	terrestrial insectivore (Special Status)	42 ac	USFWS (2017a)	0.064	0.0091	Dunning (2008)		100%			USEPA (1993)	0.010	Nagy (2001)[b]	0.0094	Calder and Braun (1983)	0%	---	0	Assumption[n]
Mammalian Receptors																				
Canada lynx	*Lynx canadensis*	medium carnivore (Special Status)	10,625 ac	USFWS (2017b)	6.0	---	USFWS (2017b)				100%	USFWS (2017b)	0.187	Nagy (2001)[e]	0.497	Calder and Braun (1983)	2.8%	0.08%	0.005	Beyer et al. (1994)[m]
Grizzly bear	*Ursus arctos horribilis*	large carnivore (Special Status)	32,000 ac	USFWS (2007)	90.7	---	USFWS (2007)	65%	15%	10%	10%	USFWS (2007), NPS (2018)	1.959	Nagy (2001)[e]	5.721	Calder and Braun (1983)	2.8%	0.08%	0.055	Beyer et al. (1994)[m]
Long-tailed weasel	*Mustela frenata*	small carnivore	12 ac	USACHPPM (2004)	0.153	0.003	Brown and Lasiewski (1972), as cited in USACHPPM (2004)				100%	USACHPPM (2004)	0.0079	Nagy (2001)[e]	0.018	Calder and Braun (1983)	1.6%	2.1%	0.0001	USEPA (2007a)
Meadow vole	*Microtus pennsylvanicus*	small terrestrial herbivore	0.13 ac	McCann (1976)[k]	0.033	0.0082	Brochu et al. (1988), as cited in USEPA (1993)	100%				USACHPPM (2004)	0.0050	Nagy (2001)[f]	0.005	Calder and Braun (1983)	1.3%	1.4%	0.00007	USEPA (2007a)
Mink	*Mustela vison*	medium semi-aquatic piscivore	1.85 km	Sample and Suter (1994)	0.550	---	Mitchell (1961), as cited in USEPA (1993)			100%		USEPA (1993); Sample and Suter (1994)	0.0238	Nagy (2001)[e]	0.058	Calder and Braun (1983)	0%	---	0	Sample and Suter (1994)
North American Wolverine	*Gulo gulo luscus*	medium carnivore (Special Status)	26000 ac	Montana Field Guide (2018)	8.0	---	USFWS (2018)				100%	Lofroth et al. (2007)	0.240	Nagy (2001)[e]	0.643	Calder and Braun (1983)	2.8%	0.08%	0.007	Beyer et al. (1994)[m]
Short-tailed shrew	*Blarina brevicauda*	small terrestrial invertivore	1 ac	Sample and Suter (1994)	0.015	0.00078	Schlessinger and Potter (1974), as cited in Sample and Suter (1994)		100%			Sample and Suter (1994)	0.002	Nagy (2001)[g]	0.002	Calder and Braun (1983)	1.1%	1.5%	0.00002	USEPA (2007a)

Notes:

a, ac, acres; km, kilometers

b, Estimated food ingestion rate (kg/day dry weight) for insectivorous birds = $(0.54[\text{Body Weight in grams}]^{0.705})/1000$ (Nagy 2001);

c, Estimated food ingestion rate (kg/day dry weight) for omnivorous birds = $(0.670[\text{Body Weight in grams}]^{0.627})/1000$ (Nagy 2001);

d, Estimated food ingestion rate (kg/day dry weight) for carnivorous birds = $(0.849[\text{Body Weight in grams}]^{0.663})/1000$ (Nagy 2001);

e, Estimated food ingestion rate (kg/day dry weight) for Carnivora = $(0.102[\text{Body Weight in grams}]^{0.864})/1000$ (Nagy 2001);

f, Estimated food ingestion rate (kg/day dry weight) for Rodentia = $(0.332[\text{Body Weight in grams}]^{0.774})/1000$ (Nagy 2001);

g, Estimated food ingestion rate (kg/day dry weight) for insectivorous mammals = $(0.373[\text{Body Weight in grams}]^{0.622})/1000$ (Nagy 2001);

h, Based on assumption from Sample and Suter 1994 that substrate ingestion is neglible for piscivores;

i, Estimated drinking water ingestion rate for birds = $(0.059\times[\text{body weight in kg}]BW^{0.67}$ (Caulder and Braun, 1983)

j, Estimated drinking water ingestion rate for mammals = $(0.099\times[\text{body weight in kg}]BW^{0.90}$ (Caulder and Braun, 1983)

k, As cited in the Montana Field Guide, accessed at http://fieldguide.mt.gov/default.aspx

l, Literature-based incidental substrate ingestion rate was not identified; assumed limited incidental ingestion based on habitat preference for fast-moving streams with sandy/rocky bottoms.

m, Based on red fox soil ingestion rate assuming the soil ingestion rate of top predators does not exceed the soil ingestion rate of red fox.

SD, standard deviation

Table 3
Estimated Concentrations in Dietary Items of Terrestrial Receptors
Draft Technical Memorandum: Proposed Wildlife Exposure Modeling Approach
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Soil Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	10.0	8.00E-04	8.0E-03	Baes et al. (1984)	5.3E-02	5.3E-01	Sample et al. (1998a)	6.0E-06	6.0E-05	Baes et al. (1984)[e]
Antimony	NA	10.0	Regression[a]	3.42E-01	USEPA (2007a)	1.0E+00	1.0E+01	Assumption[c]	5.0E-02	5.00E-01	Baes et al. (1984)[e]
Arsenic	NA	10.0	3.75E-02	3.8E-01	Bechtel-Jacobs (1998a)[f]	Regression[d]	1.23E+00	Sample et al. (1999)	Regression[g]	5.17E-02	Sample et al. (1998b)
Barium	NA	10.0	1.56E-01	1.6E+00	Bechtel-Jacobs (1998a)[f]	9.100E-02	9.1E-01	Sample et al. (1998a)	6.8E-04	6.83E-03	Baes et al. (1984)[e]
Beryllium	NA	10.0	Regression[a]	3.17E+00	USEPA (2007a)	4.5E-02	4.5E-01	Sample et al. (1998a)	2.3E-03	2.25E-02	Baes et al. (1984)[e]
Cadmium	NA	10.0	Regression[a]	2.19E+00	Bechtel-Jacobs (1998a)	Regression[d]	5.17E+01	Sample et al. (1999)	Regression[g]	8.44E-01	Sample et al. (1998b)
Chromium	NA	10.0	4.10E-02	4.1E-01	Bechtel-Jacobs (1998a)[f]	3.1E-01	3.1E+00	Sample et al. (1998a)	Regression[g]	1.26E+00	Sample et al. (1998b)
Cobalt	NA	10.0	7.50E-03	7.5E-02	Bechtel-Jacobs (1998a)[f]	1.2E-01	1.2E+00	Sample et al. (1998a)	Regression[g]	2.33E-01	Sample et al. (1998b)
Copper	NA	10.0	Regression[a]	1.27E+00	Bechtel-Jacobs (1998a)	5.2E-01	5.2E+00	Sample et al. (1998a)	Regression[g]	1.07E+01	Sample et al. (1998b)
Lead	NA	10.0	Regression[a]	9.64E-01	Bechtel-Jacobs (1998a)	Regression[d]	5.16E+00	Sample et al. (1999)	Regression[g]	2.99E+00	Sample et al. (1998b)
Manganese	NA	10.0	7.90E-02	7.9E-01	Bechtel-Jacobs (1998a)[f]	Regression[d]	2.14E+00	Sample et al. (1999)	2.1E-02	2.1E-01	Sample et al. (1998b)[k]
Mercury	NA	10.0	Regression[a]	1.74E-01	Bechtel-Jacobs (1998a)	3.9E+00	3.9E+01	Sample et al. (1998a)	3.8E-01	3.8E+00	LANL (2015)
Nickel	NA	10.0	Regression[a]	6.06E-01	Bechtel-Jacobs (1998a)	7.8E-01	7.8E+00	Sample et al. (1998a)	Regression[g]	2.28E+00	Sample et al. (1998b)
Selenium	NA	10.0	Regression[a]	6.46E+00	Bechtel-Jacobs (1998a)	Regression[d]	5.02E+00	Sample et al. (1998a)	Regression[g]	1.57E+00	Sample et al. (1998b)
Thallium	NA	10.0	4.00E-03	4.0E-02	Baes et al. (1984)	5.4E-02	5.4E-01	USCHPPM (2004)	1.1E-01	1.08E+00	Baes et al. (1984)[e]
Vanadium	NA	10.0	4.85E-03	4.9E-02	Bechtel-Jacobs (1998a)[f]	4.2E-02	4.2E-01	Sample et al. (1998a)	1.2E-02	1.2E-01	Sample et al. (1998b)[k]
Zinc	NA	10.0	Regression[a]	1.73E+01	Bechtel-Jacobs (1998a)	Regression[d]	1.82E+02	Sample et al. (1998a)	Regression[g]	9.24E+01	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	10.0	0.00E+00	0.0E+00	Lanno and Menzie (2005)	0.00E+00	0.0E+00	Lanno and Menzie (2005)	0.0E+00	0.0E+00	Lanno and Menzie (2005)
Fluoride	NA	10.0	6.00E-02	6.0E-01	Baes et al. (1984)	1.2E-01	1.2E+00	USCHPPM (2004)	1.6E-02	1.6E-01	LANL (2015)
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	10.0	Regression[a]	5.4E-04	USEPA (2007a)	1.47E+00	1.47E+01	USEPA (2007a)	0.0E+00	0.0E+00	USEPA (2007a)[l]
Acenaphthylene	4.07	10.0	Regression[a]	2.0E+00	USEPA (2007a)	2.29E+01	2.29E+02	USEPA (2007a)	0.0E+00	0.0E+00	USEPA (2007a)[l]
Anthracene	4.55	10.0	Regression[a]	2.2E+00	USEPA (2007a)	2.42E+00	2.42E+01	USEPA (2007a)	0.0E+00	0.0E+00	USEPA (2007a)[l]
Fluorene	4.18	10.0	Regression[a]	5.4E-04	USEPA (2007a)	9.57E+00	9.57E+01	USEPA (2007a)	0.0E+00	0.0E+00	USEPA (2007a)[l]
Naphthalene	3.36	10.0	1.22E+01	1.2E+02	USEPA (2007a)	4.40E+00	4.40E+01	USEPA (2007a)	0.0E+00	0.0E+00	USEPA (2007a)[l]
Phenanthrene	4.55	10.0	Regression[a]	3.5E+00	USEPA (2007a)	1.72E+00	1.72E+01	USEPA (2007a)	0.0E+00	0.0E+00	USEPA (2007a)[l]
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	10.0	Regression[a]	2.6E-01	USEPA (2007a)	1.59E+00	1.59E+01	USEPA (2007a)	0.0E+00	0.0E+00	USEPA (2007a)[l]
Benzo[A]Pyrene	6.11	10.0	Regression[a]	1.2E+00	USEPA (2007a)	1.33E+00	1.33E+01	USEPA (2007a)	0.0E+00	0.0E+00	USEPA (2007a)[l]
Benzo(b)fluoranthene	6.2	10.0	3.10E-01	3.1E+00	USEPA (2007a)	2.60E+00	2.60E+01	USEPA (2007a)	0.0E+00	0.0E+00	USEPA (2007a)[l]
Benzo(g,h,i)perylene	6.7	10.0	Regression[a]	6.0E+00	USEPA (2007a)	2.94E+00	2.94E+01	USEPA (2007a)	0.0E+00	0.0E+00	USEPA (2007a)[l]
Benzo(k)fluoranthene	6.2	10.0	Regression[a]	8.4E-01	USEPA (2007a)	2.60E+00	2.60E+01	USEPA (2007a)	0.0E+00	0.0E+00	USEPA (2007a)[l]
Chrysene	5.7	10.0	Regression[a]	2.6E-01	USEPA (2007a)	2.29E+00	2.29E+01	USEPA (2007a)	0.0E+00	0.0E+00	USEPA (2007a)[l]
Dibenz(a,h)anthracene	6.69	10.0	1.30E-01	1.3E+00	USEPA (2007a)	2.31E+00	2.31E+01	USEPA (2007a)	0.0E+00	0.0E+00	USEPA (2007a)[l]
Fluoranthene	4.95	10.0	5.00E-01	5.0E+00	USEPA (2007a)	3.04E+00	3.04E+01	USEPA (2007a)	0.0E+00	0.0E+00	USEPA (2007a)[l]
Indeno (1,2,3-CD) Pyrene	6.58	10.0	1.10E-01	1.1E+00	USEPA (2007a)	2.86E+00	2.86E+01	USEPA (2007a)	0.0E+00	0.0E+00	USEPA (2007a)[l]
Pyrene	4.88	10.0	7.20E-01	7.2E+00	USEPA (2007a)	1.75E+00	1.75E+01	USEPA (2007a)	0.0E+00	0.0E+00	USEPA (2007a)[l]

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			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
Bis(2-ethylhexyl)phthalate	8.39	10.0	2.38E-02	2.4E-01	USEPA (2007a)	5.4E+01	5.4E+02	USEPA (2007a)	7.8E-01	7.8E+00	LANL (2015)
Butylbenzylphthalate	4.84	10.0	6.54E-01	6.5E+00	USEPA (2007a)	1.1E+01	1.1E+02	USEPA (2007a)	1.2E-01	1.2E+00	LANL (2015)
Dibenzofuran	3.71	10.0	1.88E+00	1.9E+01	USEPA (2007a)	7.0E+00	7.0E+01	USEPA (2007a)	5.60E-02	5.6E-01	Calculated[k]
Di-n-butyl phthalate	4.61	10.0	8.14E-01	8.1E+00	USEPA (2007a)	1.0E+01	1.0E+02	USEPA (2007a)	4.5E-01	4.5E+00	LANL (2015)
Hexachlorobenzene	5.86	10.0	2.53E-01	2.5E+00	USEPA (2007a)	1.8E+01	1.8E+02	USEPA (2007a)	2.7E+00	2.7E+01	LANL (2015)
Pentachlorophenol	4.74	10.0	5.93E+00	5.9E+01	USEPA (2007a)	1.5E+01	1.5E+02	USEPA (2007a)	Regression[h]	8.6E-01	USEPA (2007a)
1,2,4,5-Tetrachlorobenzene	4.57	10.0	8.44E-01	8.4E+00	USEPA (2007a)	1.0E+01	1.0E+02	USEPA (2007a)	1.3E-01	1.3E+00	Calculated[k]
2-Chloronaphthalene	3.81	10.0	1.71E+00	1.7E+01	USEPA (2007a)	7.3E+00	7.3E+01	USEPA (2007a)	6.3E-02	6.3E-01	Calculated[k]
Di-n-octyl phthalate	8.54	10.0	2.07E-02	2.1E-01	USEPA (2007a)	5.8E+01	5.8E+02	USEPA (2007a)	1.0E+00	1.0E+01	LANL (2015)
Hexachlorobutadiene	4.72	10.0	7.37E-01	7.4E+00	USEPA (2007a)	1.1E+01	1.1E+02	USEPA (2007a)	1.5E-01	1.5E+00	Calculated[k]
Hexachlorocyclopentadiene	4.63	10.0	8.03E-01	8.0E+00	USEPA (2007a)	1.0E+01	1.0E+02	USEPA (2007a)	1.4E-01	1.4E+00	Calculated[k]
Hexachloroethane	4.03	10.0	1.39E+00	1.4E+01	USEPA (2007a)	8.0E+00	8.0E+01	USEPA (2007a)	8.1E-02	8.1E-01	Calculated[k]
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	10.0	2.11E+00	2.1E+01	USEPA (2007a)	6.6E+00	6.6E+01	USEPA (2007a)	7.8E-01	7.8E+00	LANL (2015)
Dioxin/Furans											
2,3,7,8-TCDD	6.92	0.000001	9.41E-02	9.4E-08	USEPA (2007a)[b]	Regression[d]	2.8E-06	Sample et al. (1998a)	Regression[g]	5.7E-07	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.000001	5.17E-02	5.2E-08	USEPA (2007a)[b]	Regression[d]	2.8E-06	Sample et al. (1998a)	Regression[g]	5.7E-07	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.000001	2.82E-02	2.8E-08	USEPA (2007a)[b]	Regression[d]	2.8E-06	Sample et al. (1998a)	Regression[g]	5.7E-07	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.000001	2.82E-02	2.8E-08	USEPA (2007a)[b]	Regression[d]	2.8E-06	Sample et al. (1998a)	Regression[g]	5.7E-07	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.000001	2.82E-02	2.8E-08	USEPA (2007a)[b]	Regression[d]	2.8E-06	Sample et al. (1998a)	Regression[g]	5.7E-07	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.000001	1.55E-02	1.6E-08	USEPA (2007a)[b]	Regression[d]	2.8E-06	Sample et al. (1998a)	Regression[g]	5.7E-07	Sample et al. (1998b)
OCDD	9.50	0.000001	8.45E-03	8.4E-09	USEPA (2007a)[b]	Regression[d]	2.8E-06	Sample et al. (1998a)	Regression[g]	5.7E-07	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.000001	1.69E-01	1.7E-07	USEPA (2007a)[b]	Regression[d]	2.8E-06	Sample et al. (1998a)	1.3E-01	1.3E-07	Sample et al. (1998b)[j]
1,2,3,7,8-PeCDF	6.94	0.000001	9.24E-02	9.2E-08	USEPA (2007a)[b]	Regression[d]	2.8E-06	Sample et al. (1998a)	1.3E-01	1.3E-07	Sample et al. (1998b)[j]
2,3,4,7,8-PeCDF	6.94	0.000001	9.24E-02	9.2E-08	USEPA (2007a)[b]	Regression[d]	2.8E-06	Sample et al. (1998a)	1.3E-01	1.3E-07	Sample et al. (1998b)[j]
1,2,3,4,7,8-HxCDF	7.92	0.000001	3.70E-02	3.7E-08	USEPA (2007a)[b]	Regression[d]	2.8E-06	Sample et al. (1998a)	1.3E-01	1.3E-07	Sample et al. (1998b)[j]
1,2,3,6,7,8-HxCDF	7.92	0.000001	3.70E-02	3.7E-08	USEPA (2007a)[b]	Regression[d]	2.8E-06	Sample et al. (1998a)	1.3E-01	1.3E-07	Sample et al. (1998b)[j]
2,3,4,6,7,8-HxCDF	7.92	0.000001	3.70E-02	3.7E-08	USEPA (2007a)[b]	Regression[d]	2.8E-06	Sample et al. (1998a)	1.3E-01	1.3E-07	Sample et al. (1998b)[j]
1,2,3,7,8,9-HxCDF	7.58	0.000001	5.08E-02	5.1E-08	USEPA (2007a)[b]	Regression[d]	2.8E-06	Sample et al. (1998a)	1.3E-01	1.3E-07	Sample et al. (1998b)[j]
1,2,3,4,6,7,8-HpCDF	8.23	0.000001	2.77E-02	2.8E-08	USEPA (2007a)[b]	Regression[d]	2.8E-06	Sample et al. (1998a)	1.3E-01	1.3E-07	Sample et al. (1998b)[j]
1,2,3,4,7,8,9-HpCDF	8.23	0.000001	2.77E-02	2.8E-08	USEPA (2007a)[b]	Regression[d]	2.8E-06	Sample et al. (1998a)	1.3E-01	1.3E-07	Sample et al. (1998b)[j]
OCDF	8.87	0.000001	1.52E-02	1.5E-08	USEPA (2007a)[b]	Regression[d]	2.8E-06	Sample et al. (1998a)	1.3E-01	1.3E-07	Sample et al. (1998b)[j]

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Notes:

Maximum soil exposure point concentrations are example values to illustrate the calculation of COPEC concentrations in tissue; these values are not representative of exposure concentrations at the Site.

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assummed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

g, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.144	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

h, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

i, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

j, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

k, No value was identified in the literature; soil-to-small mammal BAF estimated based on the approach presented in Table 5, consistent with LANL (2017)

Table 4
Estimated Soil to Earthworm Bioaccumulation Factors (BAF) for Non-Ionic Organic Compounds
Draft Technical Memorandum: Proposed Wildlife Exposure Modeling Approach
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	K_{ow}: Octanol to water partitioning coefficient	K_{ww} : worm to soil water partitioning coefficient			K_{oc}: water to soil organic carbon partioning coefficient [c]				K_d: soil to water partitioning coefficient [d]	Soil to Earthworm BAF [e]
	log K_{ow} [f]	log K_{ww} [a]	K_{ww} wet (L/kg worm ww)	K_{ww} dry (L/kg worm dw) [b]	slope	intercept	log K_{oc}	K_{oc}	K_d (L/kg soil dw)	
Bis(2-ethylhexyl)phthalate	8.39	5.30	2.00E+05	1.25E+06	6.79E-01	6.63E-01	6.36E+00	2.30E+06	2.30E+04	**5.44E+01**
Butylbenzylphthalate	4.84	2.21	1.64E+02	1.02E+03	6.79E-01	6.63E-01	3.95E+00	8.96E+03	8.96E+01	**1.14E+01**
Dibenzofuran	3.71	1.23	1.71E+01	1.07E+02	6.79E-01	6.63E-01	3.19E+00	1.53E+03	1.53E+01	**6.96E+00**
Di-n-butyl phthalate	4.61	2.01	1.02E+02	6.41E+02	6.79E-01	6.63E-01	3.79E+00	6.21E+03	6.21E+01	**1.03E+01**
Hexachlorobenzene	5.86	3.10	1.25E+03	7.84E+03	6.79E-01	6.63E-01	4.64E+00	4.38E+04	4.38E+02	**1.79E+01**
Pentachlorophenol	4.74	2.12	1.32E+02	8.23E+02	6.79E-01	6.63E-01	3.88E+00	7.56E+03	7.56E+01	**1.09E+01**
1,2,4,5-Tetrachlorobenzene	4.57	1.98	9.48E+01	5.92E+02	6.79E-01	6.63E-01	3.77E+00	5.84E+03	5.84E+01	**1.01E+01**
2-Chloronaphthalene	3.81	1.32	2.08E+01	1.30E+02	6.79E-01	6.63E-01	3.25E+00	1.79E+03	1.79E+01	**7.27E+00**
Di-n-octyl phthalate	8.54	5.43	2.69E+05	1.68E+06	6.79E-01	6.63E-01	6.46E+00	2.90E+06	2.90E+04	**5.81E+01**
Hexachlorobutadiene	4.72	2.10	1.27E+02	7.94E+02	6.79E-01	6.63E-01	3.87E+00	7.34E+03	7.34E+01	**1.08E+01**
Hexachlorocyclopentadiene	4.63	2.02	1.06E+02	6.61E+02	6.79E-01	6.63E-01	3.80E+00	6.36E+03	6.36E+01	**1.04E+01**
Hexachloroethane	4.03	1.51	3.24E+01	2.02E+02	6.79E-01	6.63E-01	3.40E+00	2.53E+03	2.53E+01	**8.01E+00**
Methylcyclohexane	3.59	1.12	1.33E+01	8.30E+01	6.79E-01	6.63E-01	3.10E+00	1.26E+03	1.26E+01	**6.59E+00**

Notes:

a, log K_{ww} = 0.87*log K_{ow} - 2 (USEPA, 2007a; Jager, 1998)

b, Converted from wet weight to dry weight assuming 16% solids (USEPA, 2005; Jager, 1998)

c, K_{oc} values modeled based on regression equations from Gerstl (1990), for All Compounds: log K_{oc} = A*log K_{ow} + B, where A = slope and B = intercept.

d, K_d = f_{oc}*K_{oc}, where "foc" is the fraction of organic carbon in soil.

f_{oc} is assumed to be: 0.01

e, BAF = K_{ww} (L/kg worm dw) / K_d (L/kg soil dw)

f, log K_{ow} values obtained from EPI SUITE program, KOWWIN module v 1.69.

BAF, bioaccumulation factor
dw, dry weight
ww, wet weight

Table 5
Estimated Soil to Small Mammal Bioaccumulation Factors (BAF) for Non-Ionic Organic Compounds
Draft Technical Memorandum: Proposed Wildlife Exposure Modeling Approach
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Fat content of beef[c]	$BAF_{beef\ ww}$[b]	$BAF_{plant\ ww}$[d]	$BAF_{invert\ ww}$[e]	$BAF_{MAX\ plant/invert\ ww}$[f]	$BAF_{soil\text{-}mammal\ dw}$[a]
			d/kg $beef_{ww}$	mg/kg $plant_{ww}$ per mg COPEC/kg $soil_{dw}$	mg/kg inv_{ww} per mg COPEC/kg $soil_{dw}$	mg/kg $tissue_{ww}$ per mg COPEC/kg $soil_{dw}$	mg/kg $flesh_{dw}$ per mg COPEC/kg $soil_{dw}$
Dibenzofuran	3.71	19%	2.12E-02	2.82E-01	2.71E+00	2.71E+00	5.60E-02
1,2,4,5-Tetrachlorobenzene	4.57	19%	3.48E-02	1.27E-01	3.95E+00	3.95E+00	1.33E-01
2-Chloronaphthalene	3.81	19%	2.29E-02	2.57E-01	2.83E+00	2.83E+00	6.32E-02
Hexachlorobutadiene	4.72	19%	3.66E-02	1.10E-01	4.22E+00	4.22E+00	1.49E-01
Hexachlorocyclopentadiene	4.63	19%	3.55E-02	1.20E-01	4.05E+00	4.05E+00	1.39E-01
Hexachloroethane	4.03	19%	2.66E-02	2.09E-01	3.12E+00	3.12E+00	8.07E-02
Methylcyclohexane	3.59	19%	1.92E-02	3.17E-01	2.57E+00	2.57E+00	4.82E-02

Notes:

a, $BAF_{soil\text{-}mammal}$ model based on LANL (2015) equation for Transfer Factor from soil to dry weight flesh (TF_flesh_dw):

$$BAF_{soil-mammal} = BAF_{beef} \times [\frac{(FIR_{MAX} \times BAF_{MAX\ plant/invert} + SIR_{MAX})}{(1-MC)}]$$

where:
$BAF_{soil\text{-}mammal\ dw}$ = Soil-to-small mammal BAF (kg soil, dw/kg flesh, $_{dw)}$
$BAF_{beef\ ww}$ = Diet-to-beef transfer factor (d/kg $beef_{ww}$)
$FIR_{MAX\ ww}$ = Maximum food ingestion rate for LANL prey species (0.305 kg $food_{ww}$/d; LANL, 2015)
$BAF_{MAXPlant/Invert}$ = Maximum BAF for plant or invertebrate dietary items of the prey species (kg $soil_{dw}$/kg $tissue_{ww}$)
SIR_{MAX} = Maximum incidental soil ingestion rate for LANL prey species (0.0193 kg $soil_{dw}$/d; LANL, 2015)
MC = Moisture content of flesh (assumed 68 percent per LANL, 2015)

b, Diet-to-beef transfer factor calculated based on RTI (2005), consistent with LANL (2017):

$$LogBAF_{beef\ ww} = Fat_{beef} \times (-0.099 \times \log K_{ow}{}^2 + 1.07 \times logKow - 3.56)$$

where:
$BAF_{beef\ ww}$ = Diet-to-beef transfer factor (d/kg $beef_{ww}$)
$Fat_{beef\ ww}$ = Fat content of beef; assumed to be 19 percent or 0.19 based on LANL (2017)
K_{ow} = Octanol-water partitioning coefficient

c, Assumed fat content of beef of 19 percent consistent with LANL (2017)
d, $BAF_{plant\ ww}$, Soil-to-plant bioaccumulation factor calculated on wet weight basis by multiplying the plant BAF in Table 3 by 1-moisture content of plant leaves (1 - 0.85 = 0.15 per LANL, 2017).
e, $BAF_{invert\ ww}$, Soil-to-invertebrate bioaccumulation factor calculated on wet weight basis by multiplying the plant BAF in Table 3 by 1-moisture content in soil invertebrates (1 - 0.61 = 0.39; LANL, 2017).
f, Maximum soil-to-tissue BAF between higher of the $BAF_{plant\ ww}$ and $BAF_{invert\ ww}$
BAF, bioaccumulation factor
dw, dry weight
ww, wet weight

Table 6
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation
Draft Technical Memorandum: Proposed Wildlife Exposure Modeling Approach
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)							
					Aquatic Life Stage Benthic Invertebrates				Fish			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference	BSAF	BCF	Estimated Concentration	BSAF/BCF Reference
Metals												
Aluminum	NA	0.01	10.0	NA	7.40E-02	---	7.40E-01	Stanley et al. (2010)	---	9.24E+02	9.24E+00	Sample et al. (1996b)
Antimony	NA	0.01	10.0	NA	5.75E-01	---	5.75E+00	Dovick et al. (2015)	---	4.00E+00	4.00E-02	Sample et al. (1996b)
Arsenic	NA	0.01	10.0	NA	3.73E-01	---	3.73E+00	Bechtel-Jacobs (1998b)[c]	---	6.80E+01	6.80E-01	Sample et al. (1996b)
Barium	NA	0.01	10.0	NA	2.82E+00	---	2.82E+01	Hamilton et al. (2002)	---	2.98E+02	2.98E+00	Nakamoto and Hassler (1992)
Beryllium	NA	0.01	10.0	NA	1.67E-01	---	1.67E+00	Hamilton et al. (2002)	---	7.60E+01	7.60E-01	Sample et al. (1996)
Cadmium	NA	0.01	10.0	NA	4.59E-01	---	4.59E+00	Bechtel-Jacobs (1998b)[c]	---	4.96E+04	4.96E+02	Sample et al. (1996b)
Chromium	NA	0.01	10.0	NA	8.30E-02	---	8.30E-01	Bechtel-Jacobs (1998b)[c]	---	1.20E+01	1.20E-01	Sample et al. (1996b)
Copper	NA	0.01	10.0	NA	6.61E-01	---	6.61E+00	Bechtel-Jacobs (1998b)[c]	---	1.16E+03	1.16E+01	Sample et al. (1996b)
Lead	NA	0.01	10.0	NA	8.00E-02	---	8.00E-01	Bechtel-Jacobs (1998b)[c]	---	1.80E+02	1.80E+00	Sample et al. (1996b)
Nickel	NA	0.01	10.0	NA	1.34E-01	---	1.34E+00	Bechtel-Jacobs (1998b)[c]	---	4.2E+02	4.2E+00	Sample et al. (1996b)
Selenium	NA	0.01	10.0	NA	3.75E+00	---	3.75E+01	Hamilton et al. (2002)	---	1.0E+04	1.0E+02	Sample et al. (1996b)
Silver	NA	0.01	10.0	NA	1.80E-01	---	1.80E+00	Hirsch (1998)	---	4.2E+02	4.2E+00	Garnier-Laplace et al. (1992)
Thallium	NA	0.01	10.0	NA	2.00E-02	---	2.00E-01	Turner et al. (2013)	---	1.36E+02	1.36E+00	Sample et al. (1996b)
Vanadium	NA	0.01	10.0	NA	2.50E-01	---	2.50E+00	Hamilton et al. (2002)	---	2.52E+03	2.52E+01	CECBP (2008)
Zinc	NA	0.01	10.0	NA	8.40E-01	---	8.40E+00	Bechtel-Jacobs (1998b)[c]	---	3.9E+03	3.86E+01	Sample et al. (1996b)
Inorganics - Other Inorganics												
Cyanide	NA	0.01	10.0	NA	0.0E+00	0.0E+00	0.0E+00	Lanno and Menzie (2005)	0.0E+00	0.0E+00	0.0E+00	Lanno and Menzie (2005)
Fluoride	NA	0.01	10.0	NA	---	Regression	2.43E+01	Derived based on Aguirre-Sierra et al. (2013)	---	Regression	1.92E+01	Derived based on Shi et al. (2009)
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	4.01	0.001	0.1	0.704	4.58E+00	---	4.58E-01	DiToro and McGrath (2000)	5.63E+00	---	5.63E-01	DiToro and McGrath (2000)
Acenaphthylene	3.22	0.001	0.1	0.754	4.90E+00	---	4.90E-01	DiToro and McGrath (2000)	6.04E+00	---	6.04E-01	DiToro and McGrath (2000)
Anthracene	4.53	0.001	0.1	0.673	4.37E+00	---	4.37E-01	DiToro and McGrath (2000)	5.38E+00	---	5.38E-01	DiToro and McGrath (2000)
Fluorene	4.21	0.001	0.1	0.692	4.50E+00	---	4.50E-01	DiToro and McGrath (2000)	5.53E+00	---	5.53E-01	DiToro and McGrath (2000)
Naphthalene	3.36	0.001	0.1	0.745	4.84E+00	---	4.84E-01	DiToro and McGrath (2000)	5.96E+00	---	5.96E-01	DiToro and McGrath (2000)
Phenanthrene	4.57	0.001	0.1	0.670	4.36E+00	---	4.36E-01	DiToro and McGrath (2000)	5.36E+00	---	5.36E-01	DiToro and McGrath (2000)
Total LMW PAHs							2.76E+00				3.39E+00	
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	6.71	0.001	0.1	0.556	3.61E+00	---	3.61E-01	DiToro and McGrath (2000)	4.45E+00	---	4.45E-01	DiToro and McGrath (2000)
Benzo[A]Pyrene	6.11	0.001	0.1	0.586	3.81E+00	---	3.81E-01	DiToro and McGrath (2000)	4.69E+00	---	4.69E-01	DiToro and McGrath (2000)
Benzo(b)fluoranthene	6.27	0.001	0.1	0.578	3.76E+00	---	3.76E-01	DiToro and McGrath (2000)	4.62E+00	---	4.62E-01	DiToro and McGrath (2000)

Table 6
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation
Draft Technical Memorandum: Proposed Wildlife Exposure Modeling Approach
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)							
					Aquatic Life Stage Benthic Invertebrates				Fish			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference	BSAF	BCF	Estimated Concentration	BSAF/BCF Reference
Benzo(g,h,i)perylene	6.51	0.001	0.1	0.566	3.68E+00	---	3.68E-01	DiToro and McGrath (2000)	4.53E+00	---	4.53E-01	DiToro and McGrath (2000)
Benzo(k)fluoranthene	6.29	0.001	0.1	0.577	3.75E+00	---	3.75E-01	DiToro and McGrath (2000)	4.61E+00	---	4.61E-01	DiToro and McGrath (2000)
Chrysene	5.71	0.001	0.1	0.607	3.94E+00	---	3.94E-01	DiToro and McGrath (2000)	4.85E+00	---	4.85E-01	DiToro and McGrath (2000)
Dibenz(A,H)Anthracene	6.71	0.001	0.1	0.556	3.61E+00	---	3.61E-01	DiToro and McGrath (2000)	4.45E+00	---	4.45E-01	DiToro and McGrath (2000)
Fluoranthene	5.08	0.001	0.1	0.641	4.17E+00	---	4.17E-01	DiToro and McGrath (2000)	5.13E+00	---	5.13E-01	DiToro and McGrath (2000)
Indeno (1,2,3-CD) Pyrene	6.72	0.001	0.1	0.555	3.61E+00	---	3.61E-01	DiToro and McGrath (2000)	4.44E+00	---	4.44E-01	DiToro and McGrath (2000)
Pyrene	4.92	0.001	0.1	0.650	4.23E+00	---	4.23E-01	DiToro and McGrath (2000)	5.20E+00	---	5.20E-01	DiToro and McGrath (2000)
Total HMW PAHs							3.82E+00				4.70E+00	
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
2,3,4,6-Tetrachlorophenol	4.09	0.001	0.1	0.699	4.54E+00	---	4.54E-01	DiToro and McGrath (2000)	5.59E+00	---	5.59E-01	DiToro and McGrath (2000)
2-Chloronaphthalene	3.81	0.001	0.1	0.716	4.66E+00	---	4.66E-01	DiToro and McGrath (2000)	5.73E+00	---	5.73E-01	DiToro and McGrath (2000)
Bis(2-ethylhexyl)phthalate	8.39	0.001	0.1	0.480	3.12E+00	---	3.12E-01	DiToro and McGrath (2000)	3.84E+00	---	3.84E-01	DiToro and McGrath (2000)
Dibenzofuran	3.71	0.001	0.1	0.723	4.70E+00	---	4.70E-01	DiToro and McGrath (2000)	5.78E+00	---	5.78E-01	DiToro and McGrath (2000)
Di-n-octyl phthalate	4.61	0.001	0.1	0.668	4.34E+00	---	4.34E-01	DiToro and McGrath (2000)	5.34E+00	---	5.34E-01	DiToro and McGrath (2000)
Hexachlorobenzene	5.86	0.001	0.1	0.599	3.89E+00	---	3.89E-01	DiToro and McGrath (2000)	4.79E+00	---	4.79E-01	DiToro and McGrath (2000)
Hexachlorobutadiene	4.72	0.001	0.1	0.662	4.30E+00	---	4.30E-01	DiToro and McGrath (2000)	5.29E+00	---	5.29E-01	DiToro and McGrath (2000)
Pentachlorophenol	4.74	0.001	0.1	0.661	4.30E+00	---	4.30E-01	DiToro and McGrath (2000)	5.29E+00	---	5.29E-01	DiToro and McGrath (2000)

Notes:

Maximum exposure point concentrations are example values to illustrate the calculation of COPEC concentrations in tissue; these values are not representative of exposure concentrations at the Site.

NA, Normalized BSAF was not applicable for metals

a, Normalized BSAF (kg OC / kg lipid) calculated based on K_{ow}, where BSAF = $K_{ow}^{-0.038}$ (DiToro and McGrath 2000)

b, For non-ionic organic constituents, dry weight BSAF calculated from sediment organic carbon and lipid normalized BSAF as follows:

$$BSAF_{dry\ weight} = BSAF_{norm} \times f_{lip;id} \times \frac{1}{f_{oc}}$$

where: $BSAF_{norm}$ = Normalized BSAF (kg OC/kg lipid)

f_{lipid} = Fraction of lipids in prey item expressed on a dry weight basis (0.065, invertebrates; 0.08, fish)

f_{oc} = Fraction of sediment organic carbon expressed on a dry weight basis (0.01 or 1.0%)

c, Median BSAF for non-depurated invertebrates determined by Bechtel-Jacobs (1998b)

BCF, bioconcentration factor

BSAF, biota-sediment accumulation factor

kg OC/kg lipid, kilogram organic carbon per kilogram lipid

Table 7
Avian and Mammalian Toxicity Reference Values
Draft Technical Memorandum: Proposed Wildlife Exposure Modeling Approach
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analytes	Avian Receptors				Mammalian Receptors			
	Chronic TRV_{Low}[a] (mg/kg-bw/d)	Chronic TRV_{High}[b] (mg/kg-bw/d)	Test Animal	Source	Chronic TRV_{Low}[a] (mg/kg-bw/d)	Chronic TRV_{High}[b] (mg/kg-bw/d)	Test Animal	Source
Metals								
Aluminum	110	1100	Ringed dove	Carriere et al. (1986); as cited in LANL EcoRisk	Narrative	Narrative	---	USEPA (2003b)
Antimony	NA	NA	--	--	0.059	2.76	geometric mean	USEPA (2005b); TechLaw (2008)
Arsenic	2.24	4.51	geometric mean	USEPA (2005c); TechLaw (2008)	1.04	4.55	geometric mean	USEPA (2005c); TechLaw (2008)
Barium	73.5	131	geometric mean	LANL (2003)	51.8	82.7	geometric mean	USEPA (2005d); TechLaw (2008)
Beryllium	NA	NA	--	--	0.532	0.67	geometric mean	USEPA (2005e); TechLaw (2008)
Cadmium	1.47	6.35	geometric Mean	USEPA (2005f); TechLaw (2008)	0.77	6.87	geometric mean	USEPA (2005f); TechLaw (2008)
Chromium	2.66	15.6	geometric mean	USEPA (2008b); TechLaw (2008)	2.4	58.2	geometric mean	USEPA (2008b); TechLaw (2008)
Cobalt	7.61	20.16	geometric mean	USEPA (2005g); TechLaw (2008)	7.33	18.9	geometric mean	USEPA (2005g); TechLaw (2008)
Copper	4.05	34.8	geometric mean	USEPA (2007b); TechLaw (2008)	5.6	82.7	geometric mean	USEPA (2007b); TechLaw (2008)
Lead	1.63	44.6	geometric mean	USEPA (2005h); TechLaw (2008)	4.7	186.4	geometric mean	USEPA (2005h); TechLaw (2008)
Manganese	179	377	geometric mean	USEPA (2007c); TechLaw (2008)	51.5	146	geometric mean	USEPA (2007c); TechLaw (2008)
Mercury	0.45	0.91	Japanese quail	Hill and Schaffer (1976), as cited in Sample et al. (1996b)	1	NA	mink	Aulerich et al. (1974), as cited in Sample et al. (1996b)
Nickel	6.71	18.6	geometric mean	USEPA (2007d); TechLaw (2008)	1.7	14.8	geometric mean	USEPA (2007d); TechLaw (2008)
Selenium	0.3	0.82	geometric mean	USEPA (2007e); TechLaw (2008)	0.143	0.66	geometric mean	USEPA (2007e); TechLaw (2008)
Silver	2.02	60.5	geometric mean	USEPA (2006); TechLaw (2008)	6.02	119	geometric mean	USEPA (2006); TechLaw (2008)
Thallium	0.35	3.5	starling	Schafer (1972), as cited in LANL EcoRisk	0.48	1.43	rat	Engineering Field Activity West (1998)
Vanadium	0.344	1.7	geometric mean	USEPA (2005i) TechLaw (2008)	4.16	9.44	geometric mean	USEPA (2005i) TechLaw (2008)
Zinc	66.1	171	geometric mean	USEPA (2007e); TechLaw (2008)	75.4	298	geometric mean	USEPA (2007e); TechLaw (2008)
Inorganics - Other Inorganics								
Cyanide	0.04	0.4	American kestrel	Wiemeyer et al. (1986), as cited in LANL EcoRisk	68.7	687	rat	Tewe and Manner (1981), as cited in LANL EcoRisk
Fluoride	12.2	122	Eastern screech owl	Pattee et al. (1988), as cited in LANL EcoRisk	26.6	49	mink	Aulerich et al. (1987), as cited in LANL EcoRisk
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)								
Total LMW PAHs	16.1	161	mallard	Patton and Dieter 1980	65.6	356	geometric mean	USEPA (2007g); TechLaw (2008)
Total HMW PAHs	2	20	European starling	Trust et al. (1994), as cited in USEPA (2007g)	0.615	38.4	geometric mean	USEPA (2007g); TechLaw (2008)
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs								
1,2,4,5-Tetrachlorobenzene	No TRV	No TRV	---	---	No TRV	No TRV	---	---
2,3,4,6-Tetrachlorophenol	No TRV	No TRV	---	---	No TRV	No TRV	---	---
2-Chloronaphthalene	No TRV	No TRV	---	---	No TRV	No TRV	---	---
Bis(2-ethylhexyl)phthalate	1.1	11	Ringed dove	Sample et al. (1996b), as cited in LANL EcoRisk	18.3	183	mouse	Sample et al. (1996b), as cited in LANL EcoRisk
Butylbenzylphthalate	0.11[c]	1.1[c]	Ringed dove	Sample et al. (1996b)	159	1590	rat	NTP (1985), as cited in LANL EcoRisk
Dibenzofuran	No TRV	No TRV	---	---	No TRV	No TRV	---	---
Di-n-butyl phthalate	0.11	1.1	Ringed dove	Sample et al. (1996b)	550	1833	mouse	Sample et al. (1996b)
Di-n-octyl phthalate	0.11[c]	1.1[c]	Ringed dove	Sample et al. (1996b)	65.1	651	mouse	IT Corporation (1997), as cited in LANL (2017)
Hexachlorobenzene	5	50	Japanese quail	Carpenter et al. (1985), as cited in LANL EcoRisk	7.1	71	Deer mouse	Schafer et al. (1985), as cited in LANL EcoRisk
Hexachlorobutadiene	No TRV	No TRV	---	---	200	2000	Rat	Kociba et al. (1977), as cited in USEPA (1999)

Table 7
Avian and Mammalian Toxicity Reference Values
Draft Technical Memorandum: Proposed Wildlife Exposure Modeling Approach
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analytes	Avian Receptors				Mammalian Receptors			
	Chronic TRV_{Low} [a] (mg/kg-bw/d)	Chronic TRV_{High} [b] (mg/kg-bw/d)	Test Animal	Source	Chronic TRV_{Low} [a] (mg/kg-bw/d)	Chronic TRV_{High} [b] (mg/kg-bw/d)	Test Animal	Source
Hexachlorocyclopentadiene	No TRV	No TRV	---	---	No TRV	No TRV	---	---
Hexachloroethane	No TRV	No TRV	---	---	No TRV	No TRV	---	---
Pentachlorophenol	6.73	52	geometric mean	USEPA (2007h); TechLaw (2008)	8.42	22.7	geometric mean	USEPA (2007h); TechLaw (2008)
Volatile Organic Compounds (VOCs)								
Methylcyclohexane	No TRV	No TRV	---	---	No TRV	No TRV	---	---
Dioxin/Furans								
2,3,7,8-TCDD	0.00000175	0.0000175	chicken	Sample et al (1996); Farmahin et al. (2012) [e]	0.000000562	0.00000376	geometric mean	Murray et al. (1979), as cited in LANL EcoRisk

Notes:
a, NOAEL is no observable adverse effects level.
b, LOAEL is low observable adverse effects level.
c, Aroclor 1254 used as a surrogate for Aroclor 1248 for both birds and mammals.
d, Di-n-butyl pthalate used as a surrogate for avian exposure to phthalates.
e, TRV based on the NOAEL for a ring-necked pheasant, divided by 8 based on the higher sensitivity of AHR1-dependent changes in gene expression of chickens and chicken-like birds, per Farmahin et al. (2012).
---, Appropriate data are not available from published literature to derive NOAEL and LOAEL values.
NA, Toxicity Reference Value not available.
bw/d, body weight per day.
TRV, toxicity reference value.

Appendix B Screening-Level COPEC Identification Tables

Table B-1
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	152	152	5540	12606	51200	50	152	1024	Yes	[Maximum] > ESV
Antimony	7440-36-0	152	9	0.31	0.44	0.61	0.142	9	4.3	Yes	[Maximum] > ESV
Arsenic	7440-38-2	152	152	1.60	4.4	8.8	5.7	18	1.5	Yes	[Maximum] > ESV
Barium	7440-39-3	152	152	32.6	106.1	392	1.04	152	376.9	Yes	[Maximum] > ESV
Beryllium	7440-41-7	152	152	0.16	0.46	0.96	1.06	0	<1	No	[Maximum] < ESV
Cadmium	7440-43-9	152	19	0.29	0.56	1.7	0.00222	19	765.8	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	154	154	5.30	11.8	80.8	23	9	3.5	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	154	150	0.14	0.31	2.16	0.34	20	6.4	Yes	[Maximum] > ESV
Chromium, Trivalent	16065-83-1	154	154	5.09	11.53	78.64	23	8	3.4	Yes	[Maximum] > ESV
Cobalt	7440-48-4	152	152	2.80	5.1	9.6	0.14	152	68.6	Yes	[Maximum] > ESV
Copper	7440-50-8	152	152	5.60	14.9	52.6	5.4	152	9.7	Yes	[Maximum] > ESV
Iron	7439-89-6	152	152	6170	13337	21500	NESV	0	---	Yes	No ESV Available
Lead	7439-92-1	152	152	2.90	13.7	57.7	0.0537	152	1074.5	Yes	[Maximum] > ESV
Manganese	7439-96-5	152	152	161	411	1270	220	147	5.8	Yes	[Maximum] > ESV
Mercury	7439-97-6	152	130	0.0094	0.0228	0.27	0.1	1	2.7	Yes	[Maximum] > ESV
Nickel	7440-02-0	152	152	6.30	17.9	140	10	124	14	Yes	[Maximum] > ESV
Selenium	7782-49-2	152	9	0.32	0.47	0.66	0.0276	9	23.9	Yes	[Maximum] > ESV
Silver	7440-22-4	152	2	0.96	0.97	0.99	2	0	<1	No	[Maximum] < ESV
Thallium	7440-28-0	152	1	0.13	0.13	0.13	0.05	1	2.6	Yes	[Maximum] > ESV
Vanadium	7440-62-2	152	152	4.10	11.5	31.8	1.59	152	20	Yes	[Maximum] > ESV
Zinc	7440-66-6	152	152	22.2	50.4	244	6.62	152	36.9	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	152	126	0.017	0.153	2.4	0.098	48	24.5	Yes	[Maximum] > ESV
Fluoride	16984-48-8	152	152	1.55	60.69	571	120	19	4.8	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	152	152	1430	21052	81500	NESV	---	---	Yes	Essential Nutrient
Magnesium	7439-95-4	152	152	4610	9739	27500	NESV	---	---	Yes	Essential Nutrient
Potassium	7440-09-7	152	152	324	802	1580	NESV	---	---	Yes	Essential Nutrient
Sodium	7440-23-5	152	108	26.5	198.3	4750	NESV	---	---	Yes	Essential Nutrient
Dioxins and Furans (mg/kg)											
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	58	41	2.60E-07	9.23E-06	6.97E-05	NESV	---	---	Yes	No ESV Available
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	35822-46-9	58	52	5.80E-07	4.53E-05	6.04E-04	NESV	---	---	Yes	No ESV Available
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	58	10	4.10E-08	1.20E-06	4.13E-06	NESV	---	---	Yes	No ESV Available
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	58	41	4.30E-08	1.20E-06	9.63E-06	NESV	---	---	Yes	No ESV Available
1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	39227-28-6	58	19	3.70E-08	1.14E-06	4.07E-06	NESV	---	---	Yes	No ESV Available
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	58	40	4.40E-08	6.12E-07	4.00E-06	NESV	---	---	Yes	No ESV Available
1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	57653-85-7	58	40	7.50E-08	2.27E-06	1.92E-05	NESV	---	---	Yes	No ESV Available
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	58	2	5.20E-08	6.40E-08	7.70E-08	NESV	---	---	Yes	No ESV Available
1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	19408-74-3	58	45	6.10E-08	1.29E-06	9.54E-06	NESV	---	---	Yes	No ESV Available
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	58	17	1.10E-07	8.60E-07	2.84E-06	NESV	---	---	Yes	No ESV Available
1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	40321-76-4	58	29	2.80E-08	3.18E-07	1.53E-06	NESV	---	---	Yes	No ESV Available
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	58	30	3.10E-08	6.15E-07	4.58E-06	NESV	---	---	Yes	No ESV Available
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	58	33	5.60E-08	5.83E-07	3.65E-06	NESV	---	---	Yes	No ESV Available

Table B-1
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	58	33	4.80E-08	1.22E-06	6.15E-06	NESV	---	---	Yes	No ESV Available
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1746-01-6	58	15	5.10E-08	1.74E-07	5.80E-07	NESV	---	---	Yes	No ESV Available
Octachlorodibenzofuran	39001-02-0	58	44	9.30E-07	2.07E-05	1.90E-04	NESV	---	---	Yes	No ESV Available
Octachlorodibenzo-P-Dioxin	3268-87-9	58	55	3.02E-06	4.44E-04	6.76E-03	NESV	---	---	Yes	No ESV Available
$TEC_{2,3,7,8\text{-TCDD-Bird-1/2MDL}}$	--	58	57	6.55E-08	1.86E-06	1.18E-05	2.08E-07	43	56.7	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Bird-MDL}}$	--	58	57	1.34E-07	2.25E-06	1.23E-05	2.08E-07	52	59.4	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Bird-Zero}}$	--	58	57	4.40E-09	1.73E-06	1.18E-05	2.08E-07	40	56.6	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Mammal-1/2MDL}}$	--	58	57	4.72E-08	1.56E-06	1.55E-05	2.90E-07	39	53.5	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Mammal-MDL}}$	--	58	57	1.02E-07	1.80E-06	1.56E-05	2.90E-07	45	53.8	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Mammal-Zero}}$	--	58	57	4.40E-09	1.46E-06	1.55E-05	2.90E-07	38	53.4	Yes	[Maximum] > ESV
Pesticides (mg/kg)											
Aldrin	309-00-2	18	0	---	---	---	0.00332	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	18	0	---	---	---	0.0994	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	18	0	---	---	---	0.119	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	18	0	---	---	---	0.00398	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	18	0	---	---	---	0.119	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	18	0	---	---	---	0.224	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	18	0	---	---	---	0.005	---	---	No	100% Non-Detect
Dieldrin	60-57-1	18	0	---	---	---	0.00238	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	18	0	---	---	---	0.0358	---	---	No	100% Non-Detect
Endrin	72-20-8	18	0	---	---	---	0.0014	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	18	0	---	---	---	0.0105	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	18	0	---	---	---	NESV	---	---	No	100% Non-Detect
Gamma Bhc (Lindane)	58-89-9	18	0	---	---	---	0.005	---	---	No	100% Non-Detect
Heptachlor	76-44-8	18	0	---	---	---	0.00598	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	18	0	---	---	---	0.152	---	---	No	100% Non-Detect
Methoxychlor	72-43-5	18	0	---	---	---	0.0199	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	18	0	---	---	---	0.0063	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	18	0	---	---	---	0.021	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	18	0	---	---	---	0.0035	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	18	0	---	---	---	0.119	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	18	0	---	---	---	0.224	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	136	0	---	---	---	1.1	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	136	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	136	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	136	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)	12672-29-6	136	0	---	---	---	0.0073	---	---	No	100% Non-Detect
PCB-1254 (Aroclor 1254)	11097-69-1	136	4	0.056	0.073	0.11	0.041	4	2.7	Yes	[Maximum] > ESV
PCB-1260 (Aroclor 1260)	11096-82-5	136	0	---	---	---	0.88	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	136	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	136	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	136	4	0.056	0.073	0.11	0.000332	4	331.3	Yes	[Maximum] > ESV
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											

Table B-1
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
2-Methylnaphthalene	91-57-6	152	66	0.0017	0.1313	1.7	3.24	0	<1	No	[Maximum] < ESV
Acenaphthene	83-32-9	152	112	0.0026	0.4436	15	0.25	26	60	Yes	[Maximum] > ESV
Acenaphthylene	208-96-8	152	18	0.0018	0.018	0.055	120	0	<1	No	[Maximum] < ESV
Anthracene	120-12-7	152	99	0.002	0.983	22	6.8	4	3.2	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	152	145	0.0021	5.807	170	10	19	17	Yes	[Maximum] > ESV
Fluorene	86-73-7	152	106	0.0018	0.3234	10	3.7	1	2.7	Yes	[Maximum] > ESV
Naphthalene	91-20-3	152	84	0.0017	0.2584	4	0.0994	28	40.2	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	152	143	0.0027	3.4346	120	5.5	22	21.8	Yes	[Maximum] > ESV
Total LMW PAHs - 1/2MDL	--	152	145	0.00795	10.67521	341.63	29	12	11.8	Yes	[Maximum] > ESV
Total LMW PAHs - MDL	--	152	145	0.0138	10.6946	341.86	29	12	11.8	Yes	[Maximum] > ESV
Total LMW PAHs - Zero	--	152	145	0.0021	10.6558	341.4	29	12	11.8	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	152	143	0.0015	3.9527	130	1.52	41	85.5	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	152	134	0.0013	3.6711	110	0.73	47	150.7	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	152	145	0.002	5.044	150	18	9	8.3	Yes	[Maximum] > ESV
Benzo(G,H,I)Perylene	191-24-2	152	139	0.0015	3.8796	99	25	4	4	Yes	[Maximum] > ESV
Benzo(K)Fluoranthene	207-08-9	152	130	0.0023	2.2358	68	71	0	<1	No	[Maximum] < ESV
Chrysene	218-01-9	152	145	0.0015	4.35	130	3.1	28	41.9	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	152	112	0.0017	1.1401	28	14	1	2	Yes	[Maximum] > ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	152	137	0.0029	3.7306	100	71	1	1.4	Yes	[Maximum] > ESV
Pyrene	129-00-0	152	144	0.0017	6.4281	220	10	19	22	Yes	[Maximum] > ESV
Total HMW PAHs - 1/2MDL	--	152	145	0.01205	33.20223	1035	1.1	103	940.9	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	--	152	145	0.0146	33.2071	1035	1.1	103	940.9	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	--	152	145	0.0095	33.1973	1035	1.1	103	940.9	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
1,2,4,5-Tetrachlorobenzene	95-94-3	152	0	---	---	---	2.02	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	152	0	---	---	---	2.05	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	152	0	---	---	---	0.199	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	152	0	---	---	---	4	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	152	0	---	---	---	9.94	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	152	0	---	---	---	87.5	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	152	0	---	---	---	0.01	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	152	0	---	---	---	0.0609	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	152	0	---	---	---	1.28	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	152	0	---	---	---	0.0328	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	152	0	---	---	---	0.0122	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	152	0	---	---	---	0.243	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	152	0	---	---	---	0.67	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	152	0	---	---	---	5.3	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	152	0	---	---	---	1.6	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	106445	120	4	0.011	0.023	0.036	NESV	---	---	Yes	No ESV Available
3,3'-Dichlorobenzidine	91-94-1	152	0	---	---	---	0.646	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	152	0	---	---	---	3.16	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	152	0	---	---	---	0.144	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	152	0	---	---	---	NESV	---	---	No	100% Non-Detect

Table B-1
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
4-Chloro-3-Methylphenol	59-50-7	152	0	---	---	---	7.95	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	152	0	---	---	---	1	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	152	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	152	0	---	---	---	21.9	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	152	0	---	---	---	5.12	---	---	No	100% Non-Detect
Acetophenone	98-86-2	152	5	0.0024	0.0152	0.046	300	0	<1	No	[Maximum] < ESV
Atrazine	1912-24-9	152	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	152	6	0.0049	0.0302	0.093	NESV	---	---	Yes	No ESV Available
Benzyl Butyl Phthalate	85-68-7	152	30	0.013	0.516	5.6	0.239	9	23.4	Yes	[Maximum] > ESV
Biphenyl (Diphenyl)	92-52-4	152	10	0.0017	0.0498	0.14	60	0	<1	No	[Maximum] < ESV
Bis(2-Chloroethoxy) Methane	111-91-1	152	0	---	---	---	0.302	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	152	0	---	---	---	23.7	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	152	0	---	---	---	19.9	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	152	47	0.016	0.268	5.8	0.02	44	290	Yes	[Maximum] > ESV
Caprolactam	105-60-2	152	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	152	116	0.0046	0.7384	17	79	0	<1	No	[Maximum] < ESV
Dibenzofuran	132-64-9	152	84	0.0017	0.2202	4.8	6.1	0	<1	No	[Maximum] < ESV
Diethyl Phthalate	84-66-2	152	0	---	---	---	24.8	---	---	No	100% Non-Detect
Dimethyl Phthalate	131-11-3	152	0	---	---	---	10	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	152	21	0.013	0.038	0.19	0.011	21	17.3	Yes	[Maximum] > ESV
Di-N-Octylphthalate	117-84-0	152	0	---	---	---	0.91	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	152	1	0.091	0.091	0.091	0.079	1	1.2	Yes	[Maximum] > ESV
Hexachlorobutadiene	87-68-3	152	0	---	---	---	0.0398	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	152	0	---	---	---	0.755	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	152	0	---	---	---	0.596	---	---	No	100% Non-Detect
Isophorone	78-59-1	152	9	0.0099	0.8181	3.3	139	0	<1	No	[Maximum] < ESV
Nitrobenzene	98-95-3	152	0	---	---	---	1.31	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	152	0	---	---	---	0.544	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	152	0	---	---	---	0.545	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	151	4	0.17	0.32	0.53	0.119	4	4.5	Yes	[Maximum] > ESV
Phenol	108-95-2	152	1	0.021	0.021	0.021	0.79	0	<1	No	[Maximum] < ESV
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)											
1,1,1-Trichloroethane	71-55-6	64	0	---	---	---	29.8	---	---	No	100% Non-Detect
1,1,2,2-Tetrachloroethane	79-34-5	64	0	---	---	---	0.127	---	---	No	100% Non-Detect
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	64	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,1,2-Trichloroethane	79-00-5	64	0	---	---	---	28.6	---	---	No	100% Non-Detect
1,1-Dichloroethane	75-34-3	64	0	---	---	---	20.1	---	---	No	100% Non-Detect
1,1-Dichloroethene	75-35-4	64	0	---	---	---	8.28	---	---	No	100% Non-Detect
1,2,3-Trichlorobenzene	87-61-6	64	0	---	---	---	11.1	---	---	No	100% Non-Detect
1,2,4-Trichlorobenzene	120-82-1	64	0	---	---	---	0.27	---	---	No	100% Non-Detect
1,2-Dibromo-3-Chloropropane	96-12-8	64	0	---	---	---	0.0352	---	---	No	100% Non-Detect
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	64	0	---	---	---	1.23	---	---	No	100% Non-Detect
1,2-Dichlorobenzene	95-50-1	64	0	---	---	---	0.92	---	---	No	100% Non-Detect
1,2-Dichloroethane	107-06-2	64	1	0.00014	0.00014	0.00014	0.85	0	<1	No	[Maximum] < ESV

Table B-1
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
1,2-Dichloropropane	78-87-5	64	0	---	---	---	32.7	---	---	No	100% Non-Detect
1,3-Dichlorobenzene	541-73-1	64	0	---	---	---	0.74	---	---	No	100% Non-Detect
1,4-Dichlorobenzene	106-46-7	64	0	---	---	---	0.546	---	---	No	100% Non-Detect
2-Hexanone	591-78-6	64	1	0.0012	0.0012	0.0012	0.36	0	<1	No	[Maximum] < ESV
Acetone	67-64-1	64	62	0.0055	0.0307	0.11	1.2	0	<1	No	[Maximum] < ESV
Benzene	71-43-2	64	45	0.00019	0.00049	0.0013	0.255	0	<1	No	[Maximum] < ESV
Bromochloromethane	74-97-5	64	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bromodichloromethane	75-27-4	64	0	---	---	---	0.54	---	---	No	100% Non-Detect
Bromoform	75-25-2	64	0	---	---	---	15.9	---	---	No	100% Non-Detect
Bromomethane	74-83-9	64	1	0.0011	0.0011	0.0011	0.235	0	<1	No	[Maximum] < ESV
Carbon Disulfide	75-15-0	64	36	0.00038	0.00113	0.0028	0.0941	0	<1	No	[Maximum] < ESV
Carbon Tetrachloride	56-23-5	64	0	---	---	---	2.98	---	---	No	100% Non-Detect
Chlorobenzene	108-90-7	64	0	---	---	---	2.4	---	---	No	100% Non-Detect
Chloroethane	75-00-3	64	0	---	---	---	NESV	---	---	No	100% Non-Detect
Chloroform	67-66-3	64	0	---	---	---	1.19	---	---	No	100% Non-Detect
Chloromethane	74-87-3	64	0	---	---	---	10.4	---	---	No	100% Non-Detect
Cis-1,2-Dichloroethylene	156-59-2	64	0	---	---	---	24	---	---	No	100% Non-Detect
Cis-1,3-Dichloropropene	10061-01-5	64	0	---	---	---	0.398	---	---	No	100% Non-Detect
Cyclohexane	110-82-7	64	17	0.00039	0.0011	0.0055	NESV	---	---	Yes	No ESV Available
Dibromochloromethane	124-48-1	64	0	---	---	---	2.05	---	---	No	100% Non-Detect
Dichlorodifluoromethane	75-71-8	64	0	---	---	---	39.5	---	---	No	100% Non-Detect
Ethylbenzene	100-41-4	64	17	0.00017	0.00041	0.0011	5.16	0	<1	No	[Maximum] < ESV
Isopropylbenzene (Cumene)	98-82-8	64	1	0.0003	0.0003	0.0003	NESV	---	---	Yes	No ESV Available
Methyl Acetate	79-20-9	64	12	0.0016	0.033	0.32	NESV	---	---	Yes	No ESV Available
Methyl Ethyl Ketone (2-Butanone)	78-93-3	64	25	0.0012	0.0039	0.014	89.6	0	<1	No	[Maximum] < ESV
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	64	1	0.0043	0.0043	0.0043	9.7	0	<1	No	[Maximum] < ESV
Methylcyclohexane	108-87-2	64	29	0.00045	0.00128	0.0076	NESV	---	---	Yes	No ESV Available
Methylene Chloride	75-09-2	64	3	0.00068	0.00183	0.0027	2.6	0	<1	No	[Maximum] < ESV
Styrene	100-42-5	64	1	0.0003	0.0003	0.0003	1.2	0	<1	No	[Maximum] < ESV
Tert-Butyl Methyl Ether	1634-04-4	64	0	---	---	---	NESV	---	---	No	100% Non-Detect
Tetrachloroethylene (PCE)	127-18-4	64	1	0.00033	0.00033	0.00033	0.18	0	<1	No	[Maximum] < ESV
Toluene	108-88-3	64	53	0.00016	0.00107	0.012	5.45	0	<1	No	[Maximum] < ESV
Trans-1,2-Dichloroethene	156-60-5	64	0	---	---	---	0.784	---	---	No	100% Non-Detect
Trans-1,3-Dichloropropene	10061-02-6	64	0	---	---	---	0.398	---	---	No	100% Non-Detect
Trichloroethylene (TCE)	79-01-6	64	0	---	---	---	12.4	---	---	No	100% Non-Detect
Trichlorofluoromethane	75-69-4	64	0	---	---	---	16.4	---	---	No	100% Non-Detect
Vinyl Chloride	75-01-4	64	0	---	---	---	0.12	---	---	No	100% Non-Detect
M,P-Xylene	179601-23-1	64	41	0.000091	0.000652	0.0042	NESV	---	---	Yes	No ESV Available
O-Xylene (1,2-Dimethylbenzene)	95-47-6	64	20	0.00015	0.00058	0.0051	NESV	---	---	Yes	No ESV Available
Total Xylene - 1/2MDL	--	64	41	0.000156	0.000975	0.0093	1.4	0	<1	No	[Maximum] < ESV
Total Xylene - MDL	--	64	41	0.000221	0.001014	0.0093	1.4	0	<1	No	[Maximum] < ESV
Total Xylene - Zero	--	64	41	0.000091	0.000936	0.0093	1.4	0	<1	No	[Maximum] < ESV
Physicochemical Parameters											
pH (s.u.)	---	34	34	6.13	7.34	8.72	NESV	---	---	---	---

Table B-1
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Total Organic Carbon	7440440	44	43	82.3	14895.8	47000	NESV	---	---	---	---

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
TAL: Target Analyte List
TCL: Target Compound List
TEC: Toxic Equivalency Concentration

Table B-2
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum		110	110	4500	13702	36800	50	110	736	Yes	[Maximum] > ESV
Antimony	7440-36-0	110	4	0.37	0.91	1.5	0.142	4	10.6	Yes	[Maximum] > ESV
Arsenic	7440-38-2	110	110	2.8	6.2	17.9	5.7	53	3.1	Yes	[Maximum] > ESV
Barium	7440-39-3	110	110	40.7	133.5	436	1.04	110	419.2	Yes	[Maximum] > ESV
Beryllium	7440-41-7	110	108	0.24	0.6	4.7	1.06	3	4.4	Yes	[Maximum] > ESV
Cadmium	7440-43-9	110	5	0.27	0.77	1.6	0.00222	5	720.7	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	118	117	2.4	11	84.8	23	1	3.7	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	118	110	0.06	0.29	2.27	0.34	18	6.7	Yes	[Maximum] > ESV
Chromium, Trivalent	16065-83-1	118	117	2.34	10.7	82.53	23	1	3.6	Yes	[Maximum] > ESV
Cobalt	7440-48-4	110	110	1.5	5.7	13	0.14	110	92.9	Yes	[Maximum] > ESV
Copper	7440-50-8	110	110	5.9	81	7260	5.4	110	1344.4	Yes	[Maximum] > ESV
Iron	7439-89-6	110	110	2940	14944	37100	NESV	---	---	Yes	No ESV Available
Lead	7439-92-1	110	110	5.9	12.9	63.7	0.0537	110	1186.2	Yes	[Maximum] > ESV
Manganese	7439-96-5	110	110	129	455	1140	220	106	5.2	Yes	[Maximum] > ESV
Mercury	7439-97-6	110	89	0.01	0.02	0.08	0.1	0	<1	No	[Maximum] < ESV
Nickel	7440-02-0	110	110	4.9	23.8	534	10	96	53.4	Yes	[Maximum] > ESV
Selenium	7782-49-2	110	16	0.34	0.83	3	0.0276	16	108.7	Yes	[Maximum] > ESV
Silver	7440-22-4	110	0	---	---	---	2	---	---	No	100% Non-Detect
Thallium	7440-28-0	110	16	0.11	0.25	1.1	0.05	16	22	Yes	[Maximum] > ESV
Vanadium	7440-62-2	110	110	3	14	151	1.59	110	95	Yes	[Maximum] > ESV
Zinc	7440-66-6	110	110	28.7	49.5	114	6.62	110	17.2	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	110	75	0.016	0.576	13	0.098	40	132.7	Yes	[Maximum] > ESV
Fluoride	16984-48-8	110	110	3.24	60.9	796	120	10	6.6	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	110	110	921	29670	313000	NESV	---	---	Yes	Essential Nutrient
Magnesium	7439-95-4	110	110	2890	10283	18800	NESV	---	---	Yes	Essential Nutrient
Potassium	7440-09-7	110	110	332	1095	10900	NESV	---	---	Yes	Essential Nutrient
Sodium	7440-23-5	110	76	33	370	5170	NESV	---	---	Yes	Essential Nutrient
Dioxins and Furans (mg/kg)											
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	4	2	5.13E-06	5.25E-06	5.37E-06	NESV	---	---	Yes	No ESV Available
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	35822-46-9	4	4	1.38E-06	2.84E-05	7.63E-05	NESV	---	---	Yes	No ESV Available
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	4	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	4	2	1.06E-06	1.36E-06	1.67E-06	NESV	---	---	Yes	No ESV Available
1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	39227-28-6	4	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	4	4	1.70E-07	4.40E-07	7.80E-07	NESV	---	---	Yes	No ESV Available
1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	57653-85-7	4	3	3.00E-07	1.50E-06	2.50E-06	NESV	---	---	Yes	No ESV Available
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	4	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	19408-74-3	4	2	7.00E-07	9.00E-07	1.10E-06	NESV	---	---	Yes	No ESV Available
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	4	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	40321-76-4	4	2	7.30E-08	1.96E-07	3.20E-07	NESV	---	---	Yes	No ESV Available
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	4	1	5.70E-07	5.70E-07	5.70E-07	NESV	---	---	Yes	No ESV Available
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	4	3	1.10E-07	4.50E-07	9.50E-07	NESV	---	---	Yes	No ESV Available

Table B-2
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	4	3	4.60E-07	9.80E-07	1.78E-06	NESV	---	---	Yes	No ESV Available
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1746-01-6	4	1	2.70E-07	2.70E-07	2.70E-07	NESV	---	---	Yes	No ESV Available
Octachlorodibenzofuran	39001-02-0	4	2	7.31E-06	1.21E-05	1.68E-05	NESV	---	---	Yes	No ESV Available
Octachlorodibenzo-P-Dioxin	3268-87-9	4	4	8.87E-06	3.04E-04	8.91E-04	NESV	---	---	Yes	No ESV Available
$TEC_{2,3,7,8\text{-TCDD-Bird-1/2MDL}}$	---	4	4	1.61E-07	1.60E-06	3.67E-06	2.08E-07	3	17.6	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Bird-MDL}}$	---	4	4	6.29E-07	2.21E-06	4.39E-06	2.08E-07	4	21.1	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Bird-Zero}}$	---	4	4	2.03E-08	1.51E-06	3.60E-06	2.08E-07	3	17.3	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Mammal-1/2MDL}}$	---	4	4	1.38E-07	1.11E-06	1.90E-06	2.90E-07	3	6.6	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Mammal-MDL}}$	---	4	4	5.77E-07	1.69E-06	2.75E-06	2.90E-07	4	9.5	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Mammal-Zero}}$	---	4	4	3.45E-08	1.03E-06	1.83E-06	2.90E-07	3	6.3	Yes	[Maximum] > ESV
Pesticides (mg/kg)											
Aldrin	309-00-2	10	0	---	---	---	0.00332	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	10	0	---	---	---	0.0994	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	10	0	---	---	---	0.119	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	10	0	---	---	---	0.00398	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	10	0	---	---	---	0.119	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	10	0	---	---	---	0.224	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	10	0	---	---	---	0.005	---	---	No	100% Non-Detect
Dieldrin	60-57-1	9	0	---	---	---	0.00238	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	10	0	---	---	---	0.0358	---	---	No	100% Non-Detect
Endrin	72-20-8	10	0	---	---	---	0.0014	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	10	0	---	---	---	0.0105	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	10	0	---	---	---	NESV	---	---	No	100% Non-Detect
Gamma Bhc (Lindane)	58-89-9	10	0	---	---	---	0.005	---	---	No	100% Non-Detect
Heptachlor	76-44-8	10	0	---	---	---	0.00598	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	10	0	---	---	---	0.152	---	---	No	100% Non-Detect
Methoxychlor	72-43-5	10	0	---	---	---	0.0199	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	10	0	---	---	---	0.0063	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	10	0	---	---	---	0.021	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	10	0	---	---	---	0.0035	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	10	0	---	---	---	0.119	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	10	0	---	---	---	0.224	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	70	0	---	---	---	1.1	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	70	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	70	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	70	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)	12672-29-6	70	0	---	---	---	0.0073	---	---	No	100% Non-Detect
PCB-1254 (Aroclor 1254)	11097-69-1	70	6	0.062	0.472	1.2	0.041	6	29.3	Yes	[Maximum] > ESV
PCB-1260 (Aroclor 1260)	11096-82-5	70	0	---	---	---	0.88	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	70	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	70	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	70	6	0.062	0.472	1.2	0.000332	6	3614.5	Yes	[Maximum] > ESV
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											

Table B-2
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
2-Methylnaphthalene	91-57-6	110	27	0.0016	0.2564	3.9	3.24	1	1.2	Yes	[Maximum] > ESV
Acenaphthene	83-32-9	110	68	0.0022	0.8178	28	0.25	6	112	Yes	[Maximum] > ESV
Acenaphthylene	208-96-8	110	7	0.0015	0.2242	1	120	0	<1	No	[Maximum] < ESV
Anthracene	120-12-7	110	72	0.002	1.471	48	6.8	2	7.1	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	110	108	0.01	5.6	240	10	5	24	Yes	[Maximum] > ESV
Fluorene	86-73-7	110	69	0.0014	0.6958	25	3.7	2	6.8	Yes	[Maximum] > ESV
Naphthalene	91-20-3	110	47	0.0014	0.3476	10	0.0994	5	100.6	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	110	106	0.0052	4.4839	240	5.5	5	43.6	Yes	[Maximum] > ESV
Total LMW PAHs - 1/2MDL	---	110	108	0.02055	12.18888	595.9	29	3	20.5	Yes	[Maximum] > ESV
Total LMW PAHs - MDL	---	110	108	0.0256	12.2059	595.9	29	3	20.5	Yes	[Maximum] > ESV
Total LMW PAHs - Zero	---	110	108	0.0155	12.1719	595.9	29	3	20.5	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	110	105	0.0057	2.4132	100	1.52	9	65.8	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	110	102	0.005	2.571	100	0.73	14	137	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	110	106	0.0093	3.4379	120	18	4	6.7	Yes	[Maximum] > ESV
Benzo(G,H,I)Perylene	191-24-2	110	102	0.0051	1.9895	62	25	2	2.5	Yes	[Maximum] > ESV
Benzo(K)Fluoranthene	207-08-9	110	98	0.0027	1.3951	50	71	0	<1	No	[Maximum] < ESV
Chrysene	218-01-9	110	109	0.007	3.353	110	3.1	7	35.5	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	110	89	0.0016	0.7165	21	14	2	1.5	Yes	[Maximum] > ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	110	101	0.0031	2.1718	76	71	1	1.1	Yes	[Maximum] > ESV
Pyrene	129-00-0	110	105	0.0083	3.718	150	10	5	15	Yes	[Maximum] > ESV
Total HMW PAHs - 1/2MDL	---	110	109	0.0477	20.7267	789	1.1	61	717.3	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	110	109	0.0485	20.7321	789	1.1	62	717.3	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	110	109	0.011	20.721	789	1.1	61	717.3	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
1,2,4,5-Tetrachlorobenzene	95-94-3	110	0	---	---	---	2.02	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	110	0	---	---	---	2.05	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	110	0	---	---	---	0.199	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	110	0	---	---	---	4	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	110	0	---	---	---	9.94	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	110	0	---	---	---	87.5	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	110	0	---	---	---	0.01	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	110	0	---	---	---	0.0609	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	110	0	---	---	---	1.28	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	110	0	---	---	---	0.0328	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	110	0	---	---	---	0.0122	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	110	0	---	---	---	0.243	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	110	0	---	---	---	0.67	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	110	0	---	---	---	5.3	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	110	0	---	---	---	1.6	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	106445	54	4	0.012	0.271	1	NESV	---	---	Yes	No ESV Available
3,3'-Dichlorobenzidine	91-94-1	110	0	---	---	---	0.646	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	110	0	---	---	---	3.16	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	110	0	---	---	---	0.144	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	110	0	---	---	---	NESV	---	---	No	100% Non-Detect

Table B-2
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Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
4-Chloro-3-Methylphenol	59-50-7	110	0	---	---	---	7.95	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	110	0	---	---	---	1	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	110	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	110	0	---	---	---	21.9	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	110	0	---	---	---	5.12	---	---	No	100% Non-Detect
Acetophenone	98-86-2	110	6	0.0022	0.0064	0.019	300	0	<1	No	[Maximum] < ESV
Atrazine	1912-24-9	110	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	110	10	0.0049	0.0171	0.082	NESV	---	---	Yes	No ESV Available
Benzyl Butyl Phthalate	85-68-7	110	7	0.013	0.198	0.98	0.239	1	4.1	Yes	[Maximum] > ESV
Biphenyl (Diphenyl)	92-52-4	110	3	0.0035	0.0147	0.035	60	0	<1	No	[Maximum] < ESV
Bis(2-Chloroethoxy) Methane	111-91-1	110	0	---	---	---	0.302	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	110	0	---	---	---	23.7	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	110	0	---	---	---	19.9	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	110	14	0.025	0.252	2.5	0.02	14	125	Yes	[Maximum] > ESV
Caprolactam	105-60-2	110	2	0.039	0.052	0.066	NESV	---	---	Yes	No ESV Available
Carbazole	86-74-8	110	92	0.0017	0.7162	32	79	0	<1	No	[Maximum] < ESV
Dibenzofuran	132-64-9	110	52	0.0016	0.5221	15	6.1	2	2.5	Yes	[Maximum] > ESV
Diethyl Phthalate	84-66-2	110	0	---	---	---	24.8	---	---	No	100% Non-Detect
Dimethyl Phthalate	131-11-3	110	0	---	---	---	10	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	110	6	0.013	0.033	0.056	0.011	6	5.1	Yes	[Maximum] > ESV
Di-N-Octylphthalate	117-84-0	110	2	0.096	0.353	0.61	0.91	0	<1	No	[Maximum] < ESV
Hexachlorobenzene	118-74-1	110	0	---	---	---	0.079	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	110	0	---	---	---	0.0398	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	110	0	---	---	---	0.755	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	110	0	---	---	---	0.596	---	---	No	100% Non-Detect
Isophorone	78-59-1	110	14	0.011	0.151	1.4	139	0	<1	No	[Maximum] < ESV
Nitrobenzene	98-95-3	110	0	---	---	---	1.31	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	110	0	---	---	---	0.544	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	110	0	---	---	---	0.545	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	110	0	---	---	---	0.119	---	---	No	100% Non-Detect
Phenol	108-95-2	110	4	0.016	0.349	1.2	0.79	1	1.5	Yes	[Maximum] > ESV
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)											
1,1,1-Trichloroethane	71-55-6	27	0	---	---	---	29.8	---	---	No	100% Non-Detect
1,1,2,2-Tetrachloroethane	79-34-5	27	0	---	---	---	0.127	---	---	No	100% Non-Detect
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	27	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,1,2-Trichloroethane	79-00-5	27	0	---	---	---	28.6	---	---	No	100% Non-Detect
1,1-Dichloroethane	75-34-3	27	0	---	---	---	20.1	---	---	No	100% Non-Detect
1,1-Dichloroethene	75-35-4	27	0	---	---	---	8.28	---	---	No	100% Non-Detect
1,2,3-Trichlorobenzene	87-61-6	27	0	---	---	---	11.1	---	---	No	100% Non-Detect
1,2,4-Trichlorobenzene	120-82-1	27	0	---	---	---	0.27	---	---	No	100% Non-Detect
1,2-Dibromo-3-Chloropropane	96-12-8	27	0	---	---	---	0.0352	---	---	No	100% Non-Detect
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	27	0	---	---	---	1.23	---	---	No	100% Non-Detect
1,2-Dichlorobenzene	95-50-1	27	0	---	---	---	0.92	---	---	No	100% Non-Detect

Table B-2
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Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
1,2-Dichloroethane	107-06-2	27	0	---	---	---	0.85	---	---	No	100% Non-Detect
1,2-Dichloropropane	78-87-5	27	0	---	---	---	32.7	---	---	No	100% Non-Detect
1,3-Dichlorobenzene	541-73-1	27	0	---	---	---	0.74	---	---	No	100% Non-Detect
1,4-Dichlorobenzene	106-46-7	27	0	---	---	---	0.546	---	---	No	100% Non-Detect
2-Hexanone	591-78-6	27	0	---	---	---	0.36	---	---	No	100% Non-Detect
Acetone	67-64-1	27	25	0.0079	0.0296	0.13	1.2	0	<1	No	[Maximum] < ESV
Benzene	71-43-2	27	12	0.00017	0.00108	0.0097	0.255	0	<1	No	[Maximum] < ESV
Bromochloromethane	74-97-5	27	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bromodichloromethane	75-27-4	27	0	---	---	---	0.54	---	---	No	100% Non-Detect
Bromoform	75-25-2	27	0	---	---	---	15.9	---	---	No	100% Non-Detect
Bromomethane	74-83-9	27	1	0.00045	0.00045	0.00045	0.235	0	<1	No	[Maximum] < ESV
Carbon Disulfide	75-15-0	27	13	0.00039	0.0016	0.0041	0.0941	0	<1	No	[Maximum] < ESV
Carbon Tetrachloride	56-23-5	27	0	---	---	---	2.98	---	---	No	100% Non-Detect
Chlorobenzene	108-90-7	27	0	---	---	---	2.4	---	---	No	100% Non-Detect
Chloroethane	75-00-3	27	0	---	---	---	NESV	---	---	No	100% Non-Detect
Chloroform	67-66-3	27	0	---	---	---	1.19	---	---	No	100% Non-Detect
Chloromethane	74-87-3	27	0	---	---	---	10.4	---	---	No	100% Non-Detect
Cis-1,2-Dichloroethylene	156-59-2	27	0	---	---	---	24	---	---	No	100% Non-Detect
Cis-1,3-Dichloropropene	10061-01-5	27	0	---	---	---	0.398	---	---	No	100% Non-Detect
Cyclohexane	110-82-7	27	1	0.00052	0.00052	0.00052	NESV	---	---	Yes	No ESV Available
Dibromochloromethane	124-48-1	27	0	---	---	---	2.05	---	---	No	100% Non-Detect
Dichlorodifluoromethane	75-71-8	27	0	---	---	---	39.5	---	---	No	100% Non-Detect
Ethylbenzene	100-41-4	27	1	0.0024	0.0024	0.0024	5.16	0	<1	No	[Maximum] < ESV
Isopropylbenzene (Cumene)	98-82-8	27	1	0.00034	0.00034	0.00034	NESV	---	---	Yes	No ESV Available
Methyl Acetate	79-20-9	27	7	0.0028	0.0088	0.017	NESV	---	---	Yes	No ESV Available
Methyl Ethyl Ketone (2-Butanone)	78-93-3	27	6	0.0009	0.0032	0.012	89.6	0	<1	No	[Maximum] < ESV
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	27	0	---	---	---	9.7	---	---	No	100% Non-Detect
Methylcyclohexane	108-87-2	27	5	0.00042	0.00067	0.001	NESV	---	---	Yes	No ESV Available
Methylene Chloride	75-09-2	27	1	0.00056	0.00056	0.00056	2.6	0	<1	No	[Maximum] < ESV
Styrene	100-42-5	27	0	---	---	---	1.2	---	---	No	100% Non-Detect
Tert-Butyl Methyl Ether	1634-04-4	27	0	---	---	---	NESV	---	---	No	100% Non-Detect
Tetrachloroethylene (PCE)	127-18-4	27	1	0.00034	0.00034	0.00034	0.18	0	<1	No	[Maximum] < ESV
Toluene	108-88-3	27	22	0.00015	0.00091	0.012	5.45	0	<1	No	[Maximum] < ESV
Trans-1,2-Dichloroethene	156-60-5	27	0	---	---	---	0.784	---	---	No	100% Non-Detect
Trans-1,3-Dichloropropene	10061-02-6	27	0	---	---	---	0.398	---	---	No	100% Non-Detect
Trichloroethylene (TCE)	79-01-6	27	0	---	---	---	12.4	---	---	No	100% Non-Detect
Trichlorofluoromethane	75-69-4	27	0	---	---	---	16.4	---	---	No	100% Non-Detect
Vinyl Chloride	75-01-4	27	0	---	---	---	0.12	---	---	No	100% Non-Detect
M,P-Xylene	179601-23-1	27	10	0.00012	0.00063	0.0038	NESV	---	---	Yes	No ESV Available
O-Xylene (1,2-Dimethylbenzene)	95-47-6	27	2	0.00022	0.00091	0.0016	NESV	---	---	Yes	No ESV Available
Total Xylene - 1/2MDL	1330-20-7	27	10	0.000185	0.000874	0.0054	1.4	0	<1	No	[Maximum] < ESV
Total Xylene - MDL	1330-20-7	27	10	0.00025	0.00093	0.0054	1.4	0	<1	No	[Maximum] < ESV
Total Xylene - Zero	1330-20-7	27	10	0.00012	0.00082	0.0054	1.4	0	<1	No	[Maximum] < ESV

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Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Physicochemical Parameters											
Moisture, Percent	---	24	24	3.4	12.2	62.5	NESV	---	---	---	---
pH (s.u.)	---	78	78	4.99	7.01	8.13	NESV	---	---	---	---
Total Organic Carbon	7440440	66	61	2280	20280	137000	NESV	---	---	---	---

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
TAL: Target Analyte List
TCL: Target Compound List
TEC: Toxic Equivalency Concentration

Table B-3
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Industrial Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	12	12	9030	28891	117000	50	12	2340	Yes	[Maximum] > ESV
Antimony	7440-36-0	12	5	0.32	1.4	2.9	0.142	5	20.4	Yes	[Maximum] > ESV
Arsenic	7440-38-2	12	12	4	9	24	5.7	7	4.1	Yes	[Maximum] > ESV
Barium	7440-39-3	12	12	49.7	122.1	234	1.04	12	225	Yes	[Maximum] > ESV
Beryllium	7440-41-7	12	12	0.3	1.8	7.7	1.06	3	7.3	Yes	[Maximum] > ESV
Cadmium	7440-43-9	12	4	0.36	0.88	1.5	0.00222	4	675.7	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	12	12	8.4	14.4	39.2	23	1	1.7	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	12	12	0.25	0.39	1.05	0.34	5	3.1	Yes	[Maximum] > ESV
Chromium, Trivalent	16065-83-1	12	12	8.18	14.03	38.15	23	1	1.7	Yes	[Maximum] > ESV
Cobalt	7440-48-4	12	12	3.4	7.4	16	0.14	12	114.3	Yes	[Maximum] > ESV
Copper	7440-50-8	12	12	11.3	83	776	5.4	12	143.7	Yes	[Maximum] > ESV
Iron	7439-89-6	12	12	6400	15067	20600	NESV	---	---	Yes	No ESV Available
Lead	7439-92-1	12	12	7.6	13.2	19.4	0.0537	12	361.3	Yes	[Maximum] > ESV
Manganese	7439-96-5	12	12	137	379	606	220	11	2.8	Yes	[Maximum] > ESV
Mercury	7439-97-6	12	9	0.012	0.017	0.022	0.1	0	<1	No	[Maximum] < ESV
Nickel	7440-02-0	12	12	11.7	105.4	513	10	12	51.3	Yes	[Maximum] > ESV
Selenium	7782-49-2	12	4	0.37	0.47	0.75	0.0276	4	27.2	Yes	[Maximum] > ESV
Silver	7440-22-4	12	0	---	---	---	2	---	---	No	100% Non-Detect
Thallium	7440-28-0	12	4	0.13	0.16	0.19	0.05	4	3.8	Yes	[Maximum] > ESV
Vanadium	7440-62-2	12	12	7	43	169	1.59	12	106.3	Yes	[Maximum] > ESV
Zinc	7440-66-6	12	12	36.9	51.9	67	6.62	12	10.1	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	12	3	0.14	0.18	0.22	0.098	3	2.2	Yes	[Maximum] > ESV
Fluoride	16984-48-8	12	12	1.37	149.14	810	120	3	6.8	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	12	12	2880	30595	52500	NESV	---	---	Yes	Essential Nutrient
Magnesium	7439-95-4	12	12	4950	10570	14100	NESV	---	---	Yes	Essential Nutrient
Potassium	7440-09-7	12	12	492	1797	6760	NESV	---	---	Yes	Essential Nutrient
Sodium	7440-23-5	12	11	38.3	11037.4	61300	NESV	---	---	Yes	Essential Nutrient
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	12	8	0.0055	0.0972	0.41	3.24	0	<1	No	[Maximum] < ESV
Acenaphthene	83-32-9	12	12	0.0028	0.6883	3.4	0.25	5	13.6	Yes	[Maximum] > ESV
Acenaphthylene	208-96-8	12	0	---	---	---	120	---	---	No	100% Non-Detect
Anthracene	120-12-7	12	12	0.0057	0.9915	6.4	6.8	0	<1	No	[Maximum] < ESV
Fluoranthene	206-44-0	12	12	0.096	11.407	71	10	4	7.1	Yes	[Maximum] > ESV
Fluorene	86-73-7	12	12	0.0018	0.3615	2.7	3.7	0	<1	No	[Maximum] < ESV
Naphthalene	91-20-3	12	9	0.0077	0.2589	1.8	0.0994	3	18.1	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	12	12	0.044	5.409	40	5.5	2	7.3	Yes	[Maximum] > ESV
Total LMW PAHs - 1/2MDL	---	12	12	0.1526	19.1	125.7	29	2	4.3	Yes	[Maximum] > ESV
Total LMW PAHs - MDL	---	12	12	0.1548	19.1	125.8	29	2	4.3	Yes	[Maximum] > ESV
Total LMW PAHs - Zero	---	12	12	0.1503	19.1	125.7	29	2	4.3	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	12	12	0.067	9.452	53	1.52	7	34.9	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	12	12	0.054	7.621	43	0.73	8	58.9	Yes	[Maximum] > ESV

Table B-3
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Industrial Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Benzo(B)Fluoranthene	205-99-2	12	12	0.077	10.525	60	18	2	3.3	Yes	[Maximum] > ESV
Benzo(G,H,I)Perylene	191-24-2	12	12	0.064	8.908	43	25	1	1.7	Yes	[Maximum] > ESV
Benzo(K)Fluoranthene	207-08-9	12	12	0.036	4.645	24	71	0	<1	No	[Maximum] < ESV
Chrysene	218-01-9	12	12	0.067	8.807	51	3.1	5	16.5	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	12	12	0.013	1.997	11	14	0	<1	No	[Maximum] < ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	12	12	0.05	6.91	36	71	0	<1	No	[Maximum] < ESV
Pyrene	129-00-0	12	12	0.1	11.1	67	10	4	6.7	Yes	[Maximum] > ESV
Total HMW PAHs - 1/2MDL	---	12	12	0.528	69.988	388	1.1	11	352.7	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	12	12	0.528	69.988	388	1.1	11	352.7	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	12	12	0.528	69.988	388	1.1	11	352.7	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
1,2,4,5-Tetrachlorobenzene	95-94-3	12	0	---	---	---	2.02	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	12	0	---	---	---	2.05	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	12	0	---	---	---	0.199	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	12	0	---	---	---	4	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	12	0	---	---	---	9.94	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	12	0	---	---	---	87.5	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	12	0	---	---	---	0.01	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	12	0	---	---	---	0.0609	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	12	0	---	---	---	1.28	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	12	0	---	---	---	0.0328	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	12	0	---	---	---	0.0122	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	12	0	---	---	---	0.243	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	12	0	---	---	---	0.67	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	12	0	---	---	---	5.3	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	12	0	---	---	---	1.6	---	---	No	100% Non-Detect
3,3'-Dichlorobenzidine	91-94-1	12	0	---	---	---	0.646	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	12	0	---	---	---	3.16	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	12	0	---	---	---	0.144	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	12	0	---	---	---	7.95	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	12	0	---	---	---	1	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	12	0	---	---	---	21.9	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	12	0	---	---	---	5.12	---	---	No	100% Non-Detect
Acetophenone	98-86-2	12	0	---	---	---	300	---	---	No	100% Non-Detect
Atrazine	1912-24-9	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzyl Butyl Phthalate	85-68-7	12	0	---	---	---	0.239	---	---	No	100% Non-Detect
Biphenyl (Diphenyl)	92-52-4	12	1	0.11	0.11	0.11	60	0	<1	No	[Maximum] < ESV
Bis(2-Chloroethoxy) Methane	111-91-1	12	0	---	---	---	0.302	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	12	0	---	---	---	23.7	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	12	0	---	---	---	19.9	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	12	0	---	---	---	0.02	---	---	No	100% Non-Detect

Table B-3
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Industrial Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Caprolactam	105-60-2	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	12	12	0.0095	0.9967	7.1	79	0	<1	No	[Maximum] < ESV
Dibenzofuran	132-64-9	12	11	0.0019	0.1907	1.3	6.1	0	<1	No	[Maximum] < ESV
Diethyl Phthalate	84-66-2	12	0	---	---	---	24.8	---	---	No	100% Non-Detect
Dimethyl Phthalate	131-11-3	12	0	---	---	---	10	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	12	0	---	---	---	0.011	---	---	No	100% Non-Detect
Di-N-Octylphthalate	117-84-0	12	0	---	---	---	0.91	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	12	0	---	---	---	0.079	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	12	0	---	---	---	0.0398	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	12	0	---	---	---	0.755	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	12	0	---	---	---	0.596	---	---	No	100% Non-Detect
Isophorone	78-59-1	12	0	---	---	---	139	---	---	No	100% Non-Detect
Nitrobenzene	98-95-3	12	0	---	---	---	1.31	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	12	0	---	---	---	0.544	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	12	0	---	---	---	0.545	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	12	0	---	---	---	0.119	---	---	No	100% Non-Detect
Phenol	108-95-2	12	0	---	---	---	0.79	---	---	No	100% Non-Detect
Physicochemical Parameters											
Moisture, Percent	---	12	12	4.9	9	19.6	NESV	---	---	---	---
pH (s.u.)	---	12	12	6.57	7.26	8.04	NESV	---	---	---	---
Total Organic Carbon	7440440	12	12	3070	12870	20700	NESV	---	---	---	---

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
TAL: Target Analyte List
TCL: Target Compound List

Table B-4
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	37	37	5350	16218	30300	50	37	606	Yes	[Maximum] > ESV
Antimony	7440-36-0	37	0	---	---	---	0.142	---	---	No	100% Non-Detect
Arsenic	7440-38-2	37	37	2	5	12	5.7	14	2.2	Yes	[Maximum] > ESV
Barium	7440-39-3	37	37	45.3	371.3	1060	1.04	37	1019.2	Yes	[Maximum] > ESV
Beryllium	7440-41-7	37	37	0.23	0.52	0.87	1.06	0	<1	No	[Maximum] < ESV
Cadmium	7440-43-9	37	6	0.38	0.59	0.7	0.00222	6	315.3	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	37	37	5.6	8.3	15.8	23	0	<1	No	[Maximum] < ESV
Chromium, Hexavalent	18540-29-9	37	37	0.15	0.22	0.42	0.34	1	1.2	Yes	[Maximum] > ESV
Chromium, Trivalent	16065-83-1	37	37	5.4	8	15.4	23	0	<1	No	[Maximum] < ESV
Cobalt	7440-48-4	37	37	3	5	7	0.14	37	52.1	Yes	[Maximum] > ESV
Copper	7440-50-8	37	37	4.7	11.1	25.5	5.4	36	4.7	Yes	[Maximum] > ESV
Iron	7439-89-6	37	37	8490	12383	21800	NESV	---	---	Yes	No ESV Available
Lead	7439-92-1	37	37	4.5	13.4	36.2	0.0537	37	674.1	Yes	[Maximum] > ESV
Manganese	7439-96-5	37	37	169	818	3950	220	35	18	Yes	[Maximum] > ESV
Mercury	7439-97-6	37	34	0.011	0.028	0.12	0.1	1	1.2	Yes	[Maximum] > ESV
Nickel	7440-02-0	37	37	7.4	18.3	68.9	10	28	6.9	Yes	[Maximum] > ESV
Selenium	7782-49-2	37	2	0.52	0.58	0.64	0.0276	2	23.2	Yes	[Maximum] > ESV
Silver	7440-22-4	37	0	---	---	---	2	---	---	No	100% Non-Detect
Thallium	7440-28-0	37	7	0.11	0.13	0.15	0.05	7	3	Yes	[Maximum] > ESV
Vanadium	7440-62-2	37	37	4.9	12.3	25.7	1.59	37	16.2	Yes	[Maximum] > ESV
Zinc	7440-66-6	37	37	25.3	58.9	150	6.62	37	22.7	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	37	21	0.06	0.23	0.64	0.098	17	6.5	Yes	[Maximum] > ESV
Fluoride	16984-48-8	37	37	0.69	16.15	61.4	120	0	<1	No	[Maximum] < ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	37	37	1620	11273	54100	NESV	---	---	Yes	Essential Nutrient
Magnesium	7439-95-4	37	37	2700	7718	15500	NESV	---	---	Yes	Essential Nutrient
Potassium	7440-09-7	37	37	327	1057	2070	NESV	---	---	Yes	Essential Nutrient
Sodium	7440-23-5	37	26	38.2	93.1	189	NESV	---	---	Yes	Essential Nutrient
Pesticides (mg/kg)											
Aldrin	309-00-2	7	0	---	---	---	0.00332	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	7	0	---	---	---	0.0994	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	7	0	---	---	---	0.119	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	7	0	---	---	---	0.00398	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	7	0	---	---	---	0.119	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	7	0	---	---	---	0.224	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	7	0	---	---	---	0.005	---	---	No	100% Non-Detect
Dieldrin	60-57-1	7	0	---	---	---	0.00238	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	7	0	---	---	---	0.0358	---	---	No	100% Non-Detect
Endrin	72-20-8	7	0	---	---	---	0.0014	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	7	0	---	---	---	0.0105	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	7	0	---	---	---	NESV	---	---	No	100% Non-Detect
Gamma Bhc (Lindane)	58-89-9	7	0	---	---	---	0.005	---	---	No	100% Non-Detect

Table B-4
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Heptachlor	76-44-8	7	0	---	---	---	0.00598	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	7	0	---	---	---	0.152	---	---	No	100% Non-Detect
Methoxychlor	72-43-5	7	0	---	---	---	0.0199	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	7	0	---	---	---	0.0063	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	7	0	---	---	---	0.021	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	7	0	---	---	---	0.0035	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	7	0	---	---	---	0.119	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	7	0	---	---	---	0.224	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	7	0	---	---	---	1.1	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	7	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	7	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	7	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)	12672-29-6	7	0	---	---	---	0.0073	---	---	No	100% Non-Detect
PCB-1254 (Aroclor 1254)	11097-69-1	7	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1260 (Aroclor 1260)	11096-82-5	7	0	---	---	---	0.88	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	7	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	7	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	7	0	---	---	---	0.000332	---	---	No	100% Non-Detect
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	37	6	0.0031	0.0085	0.014	3.24	0	<1	No	[Maximum] < ESV
Acenaphthene	83-32-9	37	23	0.0024	0.0175	0.11	0.25	0	<1	No	[Maximum] < ESV
Acenaphthylene	208-96-8	37	3	0.0069	0.0117	0.021	120	0	<1	No	[Maximum] < ESV
Anthracene	120-12-7	37	25	0.0019	0.0376	0.21	6.8	0	<1	No	[Maximum] < ESV
Fluoranthene	206-44-0	37	37	0.0035	0.3528	2.8	10	0	<1	No	[Maximum] < ESV
Fluorene	86-73-7	37	23	0.0018	0.0103	0.038	3.7	0	<1	No	[Maximum] < ESV
Naphthalene	91-20-3	37	16	0.0016	0.006	0.025	0.0994	0	<1	No	[Maximum] < ESV
Phenanthrene	85-01-8	37	36	0.0045	0.1495	1.1	5.5	0	<1	No	[Maximum] < ESV
Total LMW PAHs - 1/2MDL	---	37	37	0.00935	0.56586	4.371	29	0	<1	No	[Maximum] < ESV
Total LMW PAHs - MDL	---	37	37	0.0152	0.5858	4.522	29	0	<1	No	[Maximum] < ESV
Total LMW PAHs - Zero	---	37	37	0.0035	0.5459	4.22	29	0	<1	No	[Maximum] < ESV
Benzo(A)Pyrene	50-32-8	37	37	0.0026	0.2573	1.9	1.52	1	1.3	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	37	35	0.0023	0.1813	1.5	0.73	2	2.1	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	37	37	0.0041	0.6119	4.5	18	0	<1	No	[Maximum] < ESV
Benzo(G,H,I)Perylene	191-24-2	37	37	0.0035	0.3768	3.1	25	0	<1	No	[Maximum] < ESV
Benzo(K)Fluoranthene	207-08-9	37	36	0.0047	0.2022	1.6	71	0	<1	No	[Maximum] < ESV
Chrysene	218-01-9	37	37	0.0028	0.3565	2.8	3.1	0	<1	No	[Maximum] < ESV
Dibenz(A,H)Anthracene	53-70-3	37	28	0.0049	0.0992	0.62	14	0	<1	No	[Maximum] < ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	37	37	0.0026	0.3268	2.5	71	0	<1	No	[Maximum] < ESV
Pyrene	129-00-0	37	37	0.0047	0.3476	2.9	10	0	<1	No	[Maximum] < ESV
Total HMW PAHs - 1/2MDL	---	37	37	0.02445	2.72233	21.42	1.1	17	19.5	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	37	37	0.0263	2.7244	21.42	1.1	17	19.5	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	37	37	0.0226	2.7203	21.42	1.1	17	19.5	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											

Table B-4
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
1,2,4,5-Tetrachlorobenzene	95-94-3	37	0	---	---	---	2.02	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	37	0	---	---	---	2.05	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	37	0	---	---	---	0.199	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	37	0	---	---	---	4	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	37	0	---	---	---	9.94	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	37	0	---	---	---	87.5	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	37	0	---	---	---	0.01	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	37	0	---	---	---	0.0609	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	37	0	---	---	---	1.28	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	37	0	---	---	---	0.0328	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	37	0	---	---	---	0.0122	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	37	0	---	---	---	0.243	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	37	0	---	---	---	0.67	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	37	0	---	---	---	5.3	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	37	0	---	---	---	1.6	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	106445	7	2	0.01	0.04	0.07	NESV	---	---	Yes	No ESV Available
3,3'-Dichlorobenzidine	91-94-1	37	0	---	---	---	0.646	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	37	0	---	---	---	3.16	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	37	0	---	---	---	0.144	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	37	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	37	0	---	---	---	7.95	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	37	0	---	---	---	1	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	37	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	37	0	---	---	---	21.9	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	37	0	---	---	---	5.12	---	---	No	100% Non-Detect
Acetophenone	98-86-2	37	13	0.0022	0.0061	0.024	300	0	<1	No	[Maximum] < ESV
Atrazine	1912-24-9	37	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	37	14	0.0048	0.0129	0.06	NESV	---	---	Yes	No ESV Available
Benzyl Butyl Phthalate	85-68-7	37	0	---	---	---	0.239	---	---	No	100% Non-Detect
Biphenyl (Diphenyl)	92-52-4	37	2	0.0036	0.0038	0.0041	60	0	<1	No	[Maximum] < ESV
Bis(2-Chloroethoxy) Methane	111-91-1	37	0	---	---	---	0.302	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	37	0	---	---	---	23.7	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	37	0	---	---	---	19.9	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	37	8	0.016	0.091	0.15	0.02	7	7.5	Yes	[Maximum] > ESV
Caprolactam	105-60-2	37	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	37	30	0.0027	0.0523	0.37	79	0	<1	No	[Maximum] < ESV
Dibenzofuran	132-64-9	37	21	0.002	0.007	0.028	6.1	0	<1	No	[Maximum] < ESV
Diethyl Phthalate	84-66-2	37	2	0.012	0.028	0.044	24.8	0	<1	No	[Maximum] < ESV
Dimethyl Phthalate	131-11-3	37	0	---	---	---	10	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	37	1	0.22	0.22	0.22	0.011	1	20	Yes	[Maximum] > ESV
Di-N-Octylphthalate	117-84-0	37	1	0.027	0.027	0.027	0.91	0	<1	No	[Maximum] < ESV
Hexachlorobenzene	118-74-1	37	0	---	---	---	0.079	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	37	0	---	---	---	0.0398	---	---	No	100% Non-Detect

Table B-4
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Hexachlorocyclopentadiene	77-47-4	37	0	---	---	---	0.755	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	37	0	---	---	---	0.596	---	---	No	100% Non-Detect
Isophorone	78-59-1	37	0	---	---	---	139	---	---	No	100% Non-Detect
Nitrobenzene	98-95-3	37	0	---	---	---	1.31	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	37	0	---	---	---	0.544	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	37	0	---	---	---	0.545	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	37	0	---	---	---	0.119	---	---	No	100% Non-Detect
Phenol	108-95-2	37	0	---	---	---	0.79	---	---	No	100% Non-Detect
Physicochemical Parameters											
pH (s.u.)	---	30	30	5.74	6.75	8.2	NESV	---	---	---	---
Total Organic Carbon	7440440	30	30	9370	41521	187000	NESV	---	---	---	---

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
TAL: Target Analyte List
TCL: Target Compound List

Table B-5
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	54	54	6230	15154	29400	50	54	588	Yes	[Maximum] > ESV
Antimony	7440-36-0	54	0	---	---	---	0.142	---	---	No	100% Non-Detect
Arsenic	7440-38-2	54	54	2.4	6	15.3	5.7	27	2.7	Yes	[Maximum] > ESV
Barium	7440-39-3	54	54	57.9	208.7	482	1.04	54	463.5	Yes	[Maximum] > ESV
Beryllium	7440-41-7	54	52	0.26	0.55	0.97	1.06	0	<1	No	[Maximum] < ESV
Cadmium	7440-43-9	54	2	0.3	0.3	0.4	0.00222	2	175.7	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	54	54	4.4	9.6	13.5	23	0	<1	No	[Maximum] < ESV
Chromium, Hexavalent	18540-29-9	54	54	0.12	0.26	0.36	0.34	3	1.1	Yes	[Maximum] > ESV
Chromium, Trivalent	16065-83-1	54	54	4.28	9.31	13.14	23	0	<1	No	[Maximum] < ESV
Cobalt	7440-48-4	54	54	2.7	5.5	8.6	0.14	54	61.4	Yes	[Maximum] > ESV
Copper	7440-50-8	54	54	3.5	12.9	26.7	5.4	52	4.9	Yes	[Maximum] > ESV
Iron	7439-89-6	54	54	6880	15309	23400	NESV	---	---	Yes	No ESV Available
Lead	7439-92-1	54	54	7	12	22	0.0537	54	406	Yes	[Maximum] > ESV
Manganese	7439-96-5	54	54	175	586	2620	220	52	11.9	Yes	[Maximum] > ESV
Mercury	7439-97-6	54	43	0.0098	0.0255	0.055	0.1	0	<1	No	[Maximum] < ESV
Nickel	7440-02-0	54	54	5.1	12.3	35.7	10	43	3.6	Yes	[Maximum] > ESV
Selenium	7782-49-2	54	8	0.26	0.38	0.5	0.0276	8	18.1	Yes	[Maximum] > ESV
Silver	7440-22-4	54	0	---	---	---	2	---	---	No	100% Non-Detect
Thallium	7440-28-0	54	3	0.11	0.14	0.19	0.05	3	3.8	Yes	[Maximum] > ESV
Vanadium	7440-62-2	54	54	4.6	11.6	20.4	1.59	54	12.8	Yes	[Maximum] > ESV
Zinc	7440-66-6	54	54	30.5	54.9	116	6.62	54	17.5	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	54	26	0.042	0.153	0.42	0.098	16	4.3	Yes	[Maximum] > ESV
Fluoride	16984-48-8	54	53	1.12	8.37	37.8	120	0	<1	No	[Maximum] < ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	54	54	1120	11984	170000	NESV	---	---	Yes	Essential Nutrient
Magnesium	7439-95-4	54	54	3280	8571	14800	NESV	---	---	Yes	Essential Nutrient
Potassium	7440-09-7	54	54	400	942	1620	NESV	---	---	Yes	Essential Nutrient
Sodium	7440-23-5	54	36	34.3	58.1	168	NESV	---	---	Yes	Essential Nutrient
Pesticides (mg/kg)											
Aldrin	309-00-2	2	0	---	---	---	0.00332	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	2	0	---	---	---	0.0994	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	2	0	---	---	---	0.119	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	2	0	---	---	---	0.00398	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	2	0	---	---	---	0.119	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	2	0	---	---	---	0.224	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	2	0	---	---	---	0.005	---	---	No	100% Non-Detect
Dieldrin	60-57-1	2	0	---	---	---	0.00238	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	2	0	---	---	---	0.0358	---	---	No	100% Non-Detect
Endrin	72-20-8	2	0	---	---	---	0.0014	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	2	0	---	---	---	0.0105	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
Gamma Bhc (Lindane)	58-89-9	2	0	---	---	---	0.005	---	---	No	100% Non-Detect

Table B-5
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Heptachlor	76-44-8	2	0	---	---	---	0.00598	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	2	0	---	---	---	0.152	---	---	No	100% Non-Detect
Methoxychlor	72-43-5	2	0	---	---	---	0.0199	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	2	0	---	---	---	0.0063	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	2	0	---	---	---	0.021	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	2	0	---	---	---	0.0035	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	2	0	---	---	---	0.119	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	2	0	---	---	---	0.224	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	8	0	---	---	---	1.1	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	8	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)	12672-29-6	8	0	---	---	---	0.0073	---	---	No	100% Non-Detect
PCB-1254 (Aroclor 1254)	11097-69-1	8	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1260 (Aroclor 1260)	11096-82-5	8	0	---	---	---	0.88	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	8	0	---	---	---	0.000332	---	---	No	100% Non-Detect
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	54	7	0.0018	0.0043	0.0064	3.24	0	<1	No	[Maximum] < ESV
Acenaphthene	83-32-9	54	21	0.0022	0.0074	0.024	0.25	0	<1	No	[Maximum] < ESV
Acenaphthylene	208-96-8	54	0	---	---	---	120	---	---	No	100% Non-Detect
Anthracene	120-12-7	54	26	0.0021	0.0099	0.046	6.8	0	<1	No	[Maximum] < ESV
Fluoranthene	206-44-0	54	48	0.0021	0.0784	0.55	10	0	<1	No	[Maximum] < ESV
Fluorene	86-73-7	54	23	0.0018	0.0052	0.016	3.7	0	<1	No	[Maximum] < ESV
Naphthalene	91-20-3	54	21	0.0015	0.0077	0.049	0.0994	0	<1	No	[Maximum] < ESV
Phenanthrene	85-01-8	54	46	0.0025	0.04	0.21	5.5	0	<1	No	[Maximum] < ESV
Total LMW PAHs - 1/2MDL	---	54	49	0.0082	0.1377	0.8633	29	0	<1	No	[Maximum] < ESV
Total LMW PAHs - MDL	---	54	49	0.0143	0.1462	0.8687	29	0	<1	No	[Maximum] < ESV
Total LMW PAHs - Zero	---	54	49	0.0021	0.1291	0.858	29	0	<1	No	[Maximum] < ESV
Benzo(A)Pyrene	50-32-8	54	47	0.0021	0.0603	0.47	1.52	0	<1	No	[Maximum] < ESV
Benzo(A)Anthracene	56-55-3	54	45	0.0015	0.0468	0.4	0.73	0	<1	No	[Maximum] < ESV
Benzo(B)Fluoranthene	205-99-2	54	49	0.0018	0.1048	0.9	18	0	<1	No	[Maximum] < ESV
Benzo(G,H,I)Perylene	191-24-2	54	47	0.0023	0.0678	0.53	25	0	<1	No	[Maximum] < ESV
Benzo(K)Fluoranthene	207-08-9	54	41	0.0029	0.0386	0.22	71	0	<1	No	[Maximum] < ESV
Chrysene	218-01-9	54	48	0.0017	0.0764	0.59	3.1	0	<1	No	[Maximum] < ESV
Dibenz(A,H)Anthracene	53-70-3	54	32	0.0028	0.0206	0.12	14	0	<1	No	[Maximum] < ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	54	45	0.0016	0.0563	0.4	71	0	<1	No	[Maximum] < ESV
Pyrene	129-00-0	54	48	0.0017	0.0766	0.51	10	0	<1	No	[Maximum] < ESV
Total HMW PAHs - 1/2MDL	---	54	49	0.01105	0.52283	4.14	1.1	6	3.8	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	54	49	0.0153	0.5277	4.14	1.1	6	3.8	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	54	49	0.0068	0.518	4.14	1.1	6	3.8	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											

Table B-5
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
1,2,4,5-Tetrachlorobenzene	95-94-3	54	0	---	---	---	2.02	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	54	0	---	---	---	2.05	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	54	0	---	---	---	0.199	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	54	0	---	---	---	4	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	54	0	---	---	---	9.94	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	54	0	---	---	---	87.5	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	54	0	---	---	---	0.01	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	54	0	---	---	---	0.0609	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	54	0	---	---	---	1.28	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	54	0	---	---	---	0.0328	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	54	0	---	---	---	0.0122	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	54	0	---	---	---	0.243	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	54	0	---	---	---	0.67	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	54	0	---	---	---	5.3	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	54	0	---	---	---	1.6	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	106445	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
3,3'-Dichlorobenzidine	91-94-1	54	0	---	---	---	0.646	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	54	0	---	---	---	3.16	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	54	0	---	---	---	0.144	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	54	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	54	0	---	---	---	7.95	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	54	0	---	---	---	1	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	54	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	54	0	---	---	---	21.9	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	54	0	---	---	---	5.12	---	---	No	100% Non-Detect
Acetophenone	98-86-2	54	13	0.0019	0.0035	0.0066	300	0	<1	No	[Maximum] < ESV
Atrazine	1912-24-9	54	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	54	15	0.0052	0.0099	0.018	NESV	---	---	Yes	No ESV Available
Benzyl Butyl Phthalate	85-68-7	54	3	0.028	0.04	0.047	0.239	0	<1	No	[Maximum] < ESV
Biphenyl (Diphenyl)	92-52-4	54	5	0.0033	0.004	0.0053	60	0	<1	No	[Maximum] < ESV
Bis(2-Chloroethoxy) Methane	111-91-1	54	0	---	---	---	0.302	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	54	0	---	---	---	23.7	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	54	0	---	---	---	19.9	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	54	21	0.043	0.159	0.66	0.02	21	33	Yes	[Maximum] > ESV
Caprolactam	105-60-2	54	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	54	31	0.0018	0.0113	0.048	79	0	<1	No	[Maximum] < ESV
Dibenzofuran	132-64-9	54	16	0.0016	0.0052	0.013	6.1	0	<1	No	[Maximum] < ESV
Diethyl Phthalate	84-66-2	54	0	---	---	---	24.8	---	---	No	100% Non-Detect
Dimethyl Phthalate	131-11-3	54	0	---	---	---	10	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	54	0	---	---	---	0.011	---	---	No	100% Non-Detect
Di-N-Octylphthalate	117-84-0	54	0	---	---	---	0.91	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	54	0	---	---	---	0.079	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	54	0	---	---	---	0.0398	---	---	No	100% Non-Detect

Table B-5
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Hexachlorocyclopentadiene	77-47-4	54	0	---	---	---	0.755	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	54	0	---	---	---	0.596	---	---	No	100% Non-Detect
Isophorone	78-59-1	54	3	0.002	0.008	0.013	139	0	<1	No	[Maximum] < ESV
Nitrobenzene	98-95-3	54	0	---	---	---	1.31	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	54	0	---	---	---	0.544	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	54	0	---	---	---	0.545	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	54	0	---	---	---	0.119	---	---	No	100% Non-Detect
Phenol	108-95-2	54	0	---	---	---	0.79	---	---	No	100% Non-Detect
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)											
1,1,1-Trichloroethane	71-55-6	4	0	---	---	---	29.8	---	---	No	100% Non-Detect
1,1,2,2-Tetrachloroethane	79-34-5	4	0	---	---	---	0.127	---	---	No	100% Non-Detect
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	4	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,1,2-Trichloroethane	79-00-5	4	0	---	---	---	28.6	---	---	No	100% Non-Detect
1,1-Dichloroethane	75-34-3	4	0	---	---	---	20.1	---	---	No	100% Non-Detect
1,1-Dichloroethene	75-35-4	4	0	---	---	---	8.28	---	---	No	100% Non-Detect
1,2,3-Trichlorobenzene	87-61-6	4	0	---	---	---	11.1	---	---	No	100% Non-Detect
1,2,4-Trichlorobenzene	120-82-1	4	0	---	---	---	0.27	---	---	No	100% Non-Detect
1,2-Dibromo-3-Chloropropane	96-12-8	4	0	---	---	---	0.0352	---	---	No	100% Non-Detect
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	4	0	---	---	---	1.23	---	---	No	100% Non-Detect
1,2-Dichlorobenzene	95-50-1	4	0	---	---	---	0.92	---	---	No	100% Non-Detect
1,2-Dichloroethane	107-06-2	4	0	---	---	---	0.85	---	---	No	100% Non-Detect
1,2-Dichloropropane	78-87-5	4	0	---	---	---	32.7	---	---	No	100% Non-Detect
1,3-Dichlorobenzene	541-73-1	4	0	---	---	---	0.74	---	---	No	100% Non-Detect
1,4-Dichlorobenzene	106-46-7	4	0	---	---	---	0.546	---	---	No	100% Non-Detect
2-Hexanone	591-78-6	4	0	---	---	---	0.36	---	---	No	100% Non-Detect
Acetone	67-64-1	4	4	0.0091	0.04	0.071	1.2	0	<1	No	[Maximum] < ESV
Benzene	71-43-2	4	1	0.00041	0.00041	0.00041	0.255	0	<1	No	[Maximum] < ESV
Bromochloromethane	74-97-5	4	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bromodichloromethane	75-27-4	4	0	---	---	---	0.54	---	---	No	100% Non-Detect
Bromoform	75-25-2	4	0	---	---	---	15.9	---	---	No	100% Non-Detect
Bromomethane	74-83-9	4	0	---	---	---	0.235	---	---	No	100% Non-Detect
Carbon Disulfide	75-15-0	4	1	0.00035	0.00035	0.00035	0.0941	0	<1	No	[Maximum] < ESV
Carbon Tetrachloride	56-23-5	4	0	---	---	---	2.98	---	---	No	100% Non-Detect
Chlorobenzene	108-90-7	4	0	---	---	---	2.4	---	---	No	100% Non-Detect
Chloroethane	75-00-3	4	0	---	---	---	NESV	---	---	No	100% Non-Detect
Chloroform	67-66-3	4	0	---	---	---	1.19	---	---	No	100% Non-Detect
Chloromethane	74-87-3	4	0	---	---	---	10.4	---	---	No	100% Non-Detect
Cis-1,2-Dichloroethylene	156-59-2	4	0	---	---	---	24	---	---	No	100% Non-Detect
Cis-1,3-Dichloropropene	10061-01-5	4	0	---	---	---	0.398	---	---	No	100% Non-Detect
Cyclohexane	110-82-7	4	0	---	---	---	NESV	---	---	No	100% Non-Detect
Dibromochloromethane	124-48-1	4	0	---	---	---	2.05	---	---	No	100% Non-Detect
Dichlorodifluoromethane	75-71-8	4	0	---	---	---	39.5	---	---	No	100% Non-Detect
Ethylbenzene	100-41-4	4	0	---	---	---	5.16	---	---	No	100% Non-Detect

Table B-5
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Isopropylbenzene (Cumene)	98-82-8	4	0	---	---	---	NESV	---	---	No	100% Non-Detect
Methyl Acetate	79-20-9	4	3	0.0019	0.0926	0.27	NESV	---	---	Yes	No ESV Available
Methyl Ethyl Ketone (2-Butanone)	78-93-3	4	2	0.0018	0.0026	0.0034	89.6	0	<1	No	[Maximum] < ESV
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	4	0	---	---	---	9.7	---	---	No	100% Non-Detect
Methylcyclohexane	108-87-2	4	0	---	---	---	NESV	---	---	No	100% Non-Detect
Methylene Chloride	75-09-2	4	0	---	---	---	2.6	---	---	No	100% Non-Detect
Styrene	100-42-5	4	0	---	---	---	1.2	---	---	No	100% Non-Detect
Tert-Butyl Methyl Ether	1634-04-4	4	0	---	---	---	NESV	---	---	No	100% Non-Detect
Tetrachloroethylene (PCE)	127-18-4	4	0	---	---	---	0.18	---	---	No	100% Non-Detect
Toluene	108-88-3	4	1	0.00064	0.00064	0.00064	5.45	0	<1	No	[Maximum] < ESV
Trans-1,2-Dichloroethene	156-60-5	4	0	---	---	---	0.784	---	---	No	100% Non-Detect
Trans-1,3-Dichloropropene	10061-02-6	4	0	---	---	---	0.398	---	---	No	100% Non-Detect
Trichloroethylene (TCE)	79-01-6	4	0	---	---	---	12.4	---	---	No	100% Non-Detect
Trichlorofluoromethane	75-69-4	4	0	---	---	---	16.4	---	---	No	100% Non-Detect
Vinyl Chloride	75-01-4	4	0	---	---	---	0.12	---	---	No	100% Non-Detect
M,P-Xylene	179601-23-1	4	0	---	---	---	NESV	---	---	No	100% Non-Detect
O-Xylene (1,2-Dimethylbenzene)	95-47-6	4	0	---	---	---	NESV	---	---	No	100% Non-Detect
Total Xylene - 1/2MDL	1330-20-7	4	0	---	---	---	1.4	---	---	No	100% Non-Detect
Total Xylene - MDL	1330-20-7	4	0	---	---	---	1.4	---	---	No	100% Non-Detect
Total Xylene - Zero	1330-20-7	4	0	---	---	---	1.4	---	---	No	100% Non-Detect
Physicochemical Parameters											
pH (s.u.)	---	46	46	5.08	6.32	8.13	NESV	---	---	---	---
Total Organic Carbon	7440440	50	50	1240	20796	97700	NESV	---	---	---	---

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
TAL: Target Analyte List
TCL: Target Compound List

Table B-6
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	82	82	5230	17154	30900	50	82	618	Yes	[Maximum] > ESV
Antimony	7440-36-0	82	1	0.36	0.36	0.36	0.142	1	2.5	Yes	[Maximum] > ESV
Arsenic	7440-38-2	82	82	2	5	16	5.7	25	2.8	Yes	[Maximum] > ESV
Barium	7440-39-3	82	82	74.5	248.7	533	1.04	82	512.5	Yes	[Maximum] > ESV
Beryllium	7440-41-7	82	81	0.21	0.65	1.2	1.06	3	1.1	Yes	[Maximum] > ESV
Cadmium	7440-43-9	82	3	0.48	0.64	0.78	0.00222	3	351.4	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	82	82	4	11	21	23	0	<1	No	[Maximum] < ESV
Chromium, Hexavalent	18540-29-9	82	82	0.11	0.29	0.56	0.34	23	1.6	Yes	[Maximum] > ESV
Chromium, Trivalent	16065-83-1	82	82	3.89	10.58	20.34	23	0	<1	No	[Maximum] < ESV
Cobalt	7440-48-4	82	82	2.2	5.5	7.4	0.14	82	52.9	Yes	[Maximum] > ESV
Copper	7440-50-8	82	82	6.6	15.6	33.2	5.4	82	6.1	Yes	[Maximum] > ESV
Iron	7439-89-6	82	82	5720	14693	21100	NESV	---	---	Yes	No ESV Available
Lead	7439-92-1	82	82	4.3	12.4	44.8	0.0537	82	834.3	Yes	[Maximum] > ESV
Manganese	7439-96-5	82	82	36.1	426.8	2210	220	65	10	Yes	[Maximum] > ESV
Mercury	7439-97-6	82	58	0.012	0.025	0.063	0.1	0	<1	No	[Maximum] < ESV
Nickel	7440-02-0	82	82	4.2	11	17.4	10	63	1.7	Yes	[Maximum] > ESV
Selenium	7782-49-2	82	23	0.29	0.62	1.1	0.0276	23	39.9	Yes	[Maximum] > ESV
Silver	7440-22-4	82	0	---	---	---	2	---	---	No	100% Non-Detect
Thallium	7440-28-0	82	3	0.12	0.22	0.41	0.05	3	8.2	Yes	[Maximum] > ESV
Vanadium	7440-62-2	82	82	4	12	21	1.59	82	13.5	Yes	[Maximum] > ESV
Zinc	7440-66-6	82	82	10.1	51.1	238	6.62	82	36	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	82	55	0.022	0.183	2.2	0.098	33	22.4	Yes	[Maximum] > ESV
Fluoride	16984-48-8	82	82	0.31	5.43	19.6	120	0	<1	No	[Maximum] < ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	82	82	988	9876	177000	NESV	---	---	Yes	Essential Nutrient
Magnesium	7439-95-4	82	82	2110	7831	18300	NESV	---	---	Yes	Essential Nutrient
Potassium	7440-09-7	82	82	335	931	1530	NESV	---	---	Yes	Essential Nutrient
Sodium	7440-23-5	82	67	29.8	109.9	555	NESV	---	---	Yes	Essential Nutrient
Dioxins and Furans (mg/kg)											
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	20	4	8.60E-07	1.19E-06	2.03E-06	NESV	---	---	Yes	No ESV Available
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	35822-46-9	20	13	4.50E-07	3.31E-06	6.36E-06	NESV	---	---	Yes	No ESV Available
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	20	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	20	4	7.50E-08	3.06E-07	8.00E-07	NESV	---	---	Yes	No ESV Available
1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	39227-28-6	20	1	1.07E-06	1.07E-06	1.07E-06	NESV	---	---	Yes	No ESV Available
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	20	10	9.70E-08	2.34E-07	7.60E-07	NESV	---	---	Yes	No ESV Available
1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	57653-85-7	20	3	2.90E-07	5.70E-07	1.11E-06	NESV	---	---	Yes	No ESV Available
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	20	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	19408-74-3	20	7	2.60E-07	4.50E-07	1.29E-06	NESV	---	---	Yes	No ESV Available
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	20	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	40321-76-4	20	10	4.50E-08	1.16E-07	3.10E-07	NESV	---	---	Yes	No ESV Available
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	20	3	1.00E-07	4.00E-07	9.00E-07	NESV	---	---	Yes	No ESV Available
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	20	4	6.90E-08	1.33E-07	2.80E-07	NESV	---	---	Yes	No ESV Available

Table B-6
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	20	0	---	---	---	NESV	---	---	No	100% Non-Detect
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1746-01-6	20	4	6.80E-08	6.15E-07	1.84E-06	NESV	---	---	Yes	No ESV Available
Octachlorodibenzofuran	39001-02-0	20	6	1.22E-06	3.07E-06	7.38E-06	NESV	---	---	Yes	No ESV Available
Octachlorodibenzo-P-Dioxin	3268-87-9	20	15	3.74E-06	1.78E-05	3.35E-05	NESV	---	---	Yes	No ESV Available
$TEC_{2,3,7,8\text{-TCDD-Bird-1/2MDL}}$	---	20	17	9.96E-08	3.92E-07	2.03E-06	2.08E-07	8	9.8	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Bird-MDL}}$	---	20	17	5.21E-07	1.10E-06	3.05E-06	2.08E-07	17	14.7	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Bird-Zero}}$	---	20	17	2.73E-09	3.02E-07	1.84E-06	2.08E-07	5	8.8	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Mammal-1/2MDL}}$	---	20	17	7.24E-08	3.79E-07	1.95E-06	2.90E-07	5	6.7	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Mammal-MDL}}$	---	20	17	3.43E-07	7.27E-07	2.18E-06	2.90E-07	17	7.5	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Mammal-Zero}}$	---	20	17	8.62E-09	3.18E-07	1.84E-06	2.90E-07	4	6.3	Yes	[Maximum] > ESV
Pesticides (mg/kg)											
Aldrin	309-00-2	13	0	---	---	---	0.00332	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	13	0	---	---	---	0.0994	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	13	0	---	---	---	0.119	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	13	0	---	---	---	0.00398	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	13	0	---	---	---	0.119	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	13	0	---	---	---	0.224	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	13	0	---	---	---	0.005	---	---	No	100% Non-Detect
Dieldrin	60-57-1	13	0	---	---	---	0.00238	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	13	0	---	---	---	0.0358	---	---	No	100% Non-Detect
Endrin	72-20-8	13	0	---	---	---	0.0014	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	13	0	---	---	---	0.0105	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	13	0	---	---	---	NESV	---	---	No	100% Non-Detect
Gamma Bhc (Lindane)	58-89-9	13	0	---	---	---	0.005	---	---	No	100% Non-Detect
Heptachlor	76-44-8	13	0	---	---	---	0.00598	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	13	0	---	---	---	0.152	---	---	No	100% Non-Detect
Methoxychlor	72-43-5	13	0	---	---	---	0.0199	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	13	0	---	---	---	0.0063	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	13	0	---	---	---	0.021	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	13	0	---	---	---	0.0035	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	13	0	---	---	---	0.119	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	13	0	---	---	---	0.224	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	30	0	---	---	---	1.1	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	30	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	30	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	30	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)	12672-29-6	30	0	---	---	---	0.0073	---	---	No	100% Non-Detect
PCB-1254 (Aroclor 1254)	11097-69-1	30	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1260 (Aroclor 1260)	11096-82-5	30	0	---	---	---	0.88	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	30	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	30	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	30	0	---	---	---	0.000332	---	---	No	100% Non-Detect
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											

Table B-6
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
2-Methylnaphthalene	91-57-6	82	12	0.0019	0.0093	0.023	3.24	0	<1	No	[Maximum] < ESV
Acenaphthene	83-32-9	82	19	0.0024	0.0083	0.018	0.25	0	<1	No	[Maximum] < ESV
Acenaphthylene	208-96-8	82	0	---	---	---	120	---	---	No	100% Non-Detect
Anthracene	120-12-7	82	23	0.0022	0.0095	0.031	6.8	0	<1	No	[Maximum] < ESV
Fluoranthene	206-44-0	82	53	0.0022	0.0669	0.41	10	0	<1	No	[Maximum] < ESV
Fluorene	86-73-7	82	23	0.0015	0.0053	0.014	3.7	0	<1	No	[Maximum] < ESV
Naphthalene	91-20-3	82	19	0.0015	0.0051	0.013	0.0994	0	<1	No	[Maximum] < ESV
Phenanthrene	85-01-8	82	55	0.002	0.034	0.16	5.5	0	<1	No	[Maximum] < ESV
Total LMW PAHs - 1/2MDL	---	82	62	0.008	0.114	0.64	29	0	<1	No	[Maximum] < ESV
Total LMW PAHs - MDL	---	82	62	0.014	0.13	0.643	29	0	<1	No	[Maximum] < ESV
Total LMW PAHs - Zero	---	82	62	0.002	0.099	0.636	29	0	<1	No	[Maximum] < ESV
Benzo(A)Pyrene	50-32-8	82	49	0.002	0.046	0.27	1.52	0	<1	No	[Maximum] < ESV
Benzo(A)Anthracene	56-55-3	82	45	0.0017	0.0395	0.2	0.73	0	<1	No	[Maximum] < ESV
Benzo(B)Fluoranthene	205-99-2	82	53	0.003	0.076	0.52	18	0	<1	No	[Maximum] < ESV
Benzo(G,H,I)Perylene	191-24-2	82	45	0.002	0.054	0.28	25	0	<1	No	[Maximum] < ESV
Benzo(K)Fluoranthene	207-08-9	82	41	0.0022	0.0336	0.19	71	0	<1	No	[Maximum] < ESV
Chrysene	218-01-9	82	54	0.0021	0.0559	0.37	3.1	0	<1	No	[Maximum] < ESV
Dibenz(A,H)Anthracene	53-70-3	82	25	0.0022	0.018	0.059	14	0	<1	No	[Maximum] < ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	82	43	0.0015	0.0487	0.3	71	0	<1	No	[Maximum] < ESV
Pyrene	129-00-0	82	50	0.0024	0.0698	0.38	10	0	<1	No	[Maximum] < ESV
Total HMW PAHs - 1/2MDL	---	82	54	0.0144	0.3992	2.499	1.1	5	2.3	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	82	54	0.0179	0.411	2.499	1.1	5	2.3	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	82	54	0.0109	0.3874	2.499	1.1	5	2.3	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
1,2,4,5-Tetrachlorobenzene	95-94-3	82	0	---	---	---	2.02	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	82	0	---	---	---	2.05	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	82	0	---	---	---	0.199	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	82	0	---	---	---	4	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	82	0	---	---	---	9.94	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	82	0	---	---	---	87.5	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	82	0	---	---	---	0.01	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	82	0	---	---	---	0.0609	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	82	0	---	---	---	1.28	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	82	0	---	---	---	0.0328	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	82	0	---	---	---	0.0122	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	82	0	---	---	---	0.243	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	82	0	---	---	---	0.67	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	82	0	---	---	---	5.3	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	82	0	---	---	---	1.6	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	106445	30	0	---	---	---	NESV	---	---	No	100% Non-Detect
3,3'-Dichlorobenzidine	91-94-1	82	0	---	---	---	0.646	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	82	0	---	---	---	3.16	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	82	0	---	---	---	0.144	---	---	No	100% Non-Detect

Table B-6
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
4-Bromophenyl Phenyl Ether	101-55-3	82	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	82	0	---	---	---	7.95	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	82	0	---	---	---	1	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	82	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	82	1	0.0059	0.0059	0.0059	21.9	0	<1	No	[Maximum] < ESV
4-Nitrophenol	100-02-7	82	0	---	---	---	5.12	---	---	No	100% Non-Detect
Acetophenone	98-86-2	82	8	0.0022	0.0065	0.025	300	0	<1	No	[Maximum] < ESV
Atrazine	1912-24-9	82	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	82	10	0.0052	0.0106	0.044	NESV	---	---	Yes	No ESV Available
Benzyl Butyl Phthalate	85-68-7	82	4	0.034	0.046	0.074	0.239	0	<1	No	[Maximum] < ESV
Biphenyl (Diphenyl)	92-52-4	82	11	0.0023	0.0079	0.046	60	0	<1	No	[Maximum] < ESV
Bis(2-Chloroethoxy) Methane	111-91-1	82	0	---	---	---	0.302	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	82	0	---	---	---	23.7	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	82	0	---	---	---	19.9	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	82	13	0.016	0.132	0.35	0.02	12	17.5	Yes	[Maximum] > ESV
Caprolactam	105-60-2	82	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	82	34	0.0019	0.01	0.037	79	0	<1	No	[Maximum] < ESV
Dibenzofuran	132-64-9	82	16	0.0018	0.0048	0.0087	6.1	0	<1	No	[Maximum] < ESV
Diethyl Phthalate	84-66-2	82	1	0.032	0.032	0.032	24.8	0	<1	No	[Maximum] < ESV
Dimethyl Phthalate	131-11-3	82	0	---	---	---	10	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	82	4	0.011	0.129	0.48	0.011	3	43.6	Yes	[Maximum] > ESV
Di-N-Octylphthalate	117-84-0	82	0	---	---	---	0.91	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	82	0	---	---	---	0.079	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	82	0	---	---	---	0.0398	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	82	0	---	---	---	0.755	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	82	0	---	---	---	0.596	---	---	No	100% Non-Detect
Isophorone	78-59-1	82	0	---	---	---	139	---	---	No	100% Non-Detect
Nitrobenzene	98-95-3	82	0	---	---	---	1.31	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	82	0	---	---	---	0.544	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	82	0	---	---	---	0.545	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	82	0	---	---	---	0.119	---	---	No	100% Non-Detect
Phenol	108-95-2	82	0	---	---	---	0.79	---	---	No	100% Non-Detect
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)											
1,1,1-Trichloroethane	71-55-6	17	0	---	---	---	29.8	---	---	No	100% Non-Detect
1,1,2,2-Tetrachloroethane	79-34-5	17	0	---	---	---	0.127	---	---	No	100% Non-Detect
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	17	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,1,2-Trichloroethane	79-00-5	17	0	---	---	---	28.6	---	---	No	100% Non-Detect
1,1-Dichloroethane	75-34-3	17	0	---	---	---	20.1	---	---	No	100% Non-Detect
1,1-Dichloroethene	75-35-4	17	0	---	---	---	8.28	---	---	No	100% Non-Detect
1,2,3-Trichlorobenzene	87-61-6	17	0	---	---	---	11.1	---	---	No	100% Non-Detect
1,2,4-Trichlorobenzene	120-82-1	17	0	---	---	---	0.27	---	---	No	100% Non-Detect
1,2-Dibromo-3-Chloropropane	96-12-8	17	0	---	---	---	0.0352	---	---	No	100% Non-Detect
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	17	0	---	---	---	1.23	---	---	No	100% Non-Detect

Table B-6
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Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
1,2-Dichlorobenzene	95-50-1	17	0	---	---	---	0.92	---	---	No	100% Non-Detect
1,2-Dichloroethane	107-06-2	17	0	---	---	---	0.85	---	---	No	100% Non-Detect
1,2-Dichloropropane	78-87-5	17	0	---	---	---	32.7	---	---	No	100% Non-Detect
1,3-Dichlorobenzene	541-73-1	17	0	---	---	---	0.74	---	---	No	100% Non-Detect
1,4-Dichlorobenzene	106-46-7	17	0	---	---	---	0.546	---	---	No	100% Non-Detect
2-Hexanone	591-78-6	17	0	---	---	---	0.36	---	---	No	100% Non-Detect
Acetone	67-64-1	17	17	0.0094	0.0557	0.17	1.2	0	<1	No	[Maximum] < ESV
Benzene	71-43-2	17	9	0.00029	0.00075	0.0015	0.255	0	<1	No	[Maximum] < ESV
Bromochloromethane	74-97-5	17	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bromodichloromethane	75-27-4	17	0	---	---	---	0.54	---	---	No	100% Non-Detect
Bromoform	75-25-2	17	0	---	---	---	15.9	---	---	No	100% Non-Detect
Bromomethane	74-83-9	17	0	---	---	---	0.235	---	---	No	100% Non-Detect
Carbon Disulfide	75-15-0	17	0	---	---	---	0.0941	---	---	No	100% Non-Detect
Carbon Tetrachloride	56-23-5	17	0	---	---	---	2.98	---	---	No	100% Non-Detect
Chlorobenzene	108-90-7	17	0	---	---	---	2.4	---	---	No	100% Non-Detect
Chloroethane	75-00-3	17	0	---	---	---	NESV	---	---	No	100% Non-Detect
Chloroform	67-66-3	17	0	---	---	---	1.19	---	---	No	100% Non-Detect
Chloromethane	74-87-3	17	0	---	---	---	10.4	---	---	No	100% Non-Detect
Cis-1,2-Dichloroethylene	156-59-2	17	0	---	---	---	24	---	---	No	100% Non-Detect
Cis-1,3-Dichloropropene	10061-01-5	17	0	---	---	---	0.398	---	---	No	100% Non-Detect
Cyclohexane	110-82-7	17	1	0.001	0.001	0.001	NESV	---	---	Yes	No ESV Available
Dibromochloromethane	124-48-1	17	0	---	---	---	2.05	---	---	No	100% Non-Detect
Dichlorodifluoromethane	75-71-8	17	0	---	---	---	39.5	---	---	No	100% Non-Detect
Ethylbenzene	100-41-4	17	0	---	---	---	5.16	---	---	No	100% Non-Detect
Isopropylbenzene (Cumene)	98-82-8	17	0	---	---	---	NESV	---	---	No	100% Non-Detect
Methyl Acetate	79-20-9	17	10	0.002	0.08	0.4	NESV	---	---	Yes	No ESV Available
Methyl Ethyl Ketone (2-Butanone)	78-93-3	17	5	0.0022	0.0049	0.009	89.6	0	<1	No	[Maximum] < ESV
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	17	0	---	---	---	9.7	---	---	No	100% Non-Detect
Methylcyclohexane	108-87-2	17	1	0.0015	0.0015	0.0015	NESV	---	---	Yes	No ESV Available
Methylene Chloride	75-09-2	17	0	---	---	---	2.6	---	---	No	100% Non-Detect
Styrene	100-42-5	17	0	---	---	---	1.2	---	---	No	100% Non-Detect
Tert-Butyl Methyl Ether	1634-04-4	17	0	---	---	---	NESV	---	---	No	100% Non-Detect
Tetrachloroethylene (PCE)	127-18-4	17	0	---	---	---	0.18	---	---	No	100% Non-Detect
Toluene	108-88-3	17	6	0.00018	0.00125	0.003	5.45	0	<1	No	[Maximum] < ESV
Trans-1,2-Dichloroethene	156-60-5	17	0	---	---	---	0.784	---	---	No	100% Non-Detect
Trans-1,3-Dichloropropene	10061-02-6	17	0	---	---	---	0.398	---	---	No	100% Non-Detect
Trichloroethylene (TCE)	79-01-6	17	0	---	---	---	12.4	---	---	No	100% Non-Detect
Trichlorofluoromethane	75-69-4	17	1	0.00078	0.00078	0.00078	16.4	0	<1	No	[Maximum] < ESV
Vinyl Chloride	75-01-4	17	0	---	---	---	0.12	---	---	No	100% Non-Detect
M,P-Xylene	179601-23-1	17	1	0.00051	0.00051	0.00051	NESV	---	---	Yes	No ESV Available
O-Xylene (1,2-Dimethylbenzene)	95-47-6	17	0	---	---	---	NESV	---	---	No	100% Non-Detect
Total Xylene - 1/2MDL	1330-20-7	17	1	0.00059	0.00059	0.00059	1.4	0	<1	No	[Maximum] < ESV
Total Xylene - MDL	1330-20-7	17	1	0.00067	0.00067	0.00067	1.4	0	<1	No	[Maximum] < ESV

Table B-6
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Total Xylene - Zero	1330-20-7	17	1	0.00051	0.00051	0.00051	1.4	0	<1	No	[Maximum] < ESV
Physicochemical Parameters											
pH (s.u.)	---	50	50	5.29	6.58	7.87	NESV	---	---	---	---
Total Organic Carbon	7440440	58	57	1070	22216	107000	NESV	---	---	---	---

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
TAL: Target Analyte List
TCL: Target Compound List
TEC: Toxic Equivalency Concentration

Table B-7
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	38	38	6070	8796	10800	50	38	216	Yes	[Maximum] > ESV
Antimony	7440-36-0	38	0	---	---	---	0.142	---	---	No	100% Non-Detect
Arsenic	7440-38-2	38	38	1.9	4.5	8.2	5.7	1	1.4	Yes	[Maximum] > ESV
Barium	7440-39-3	38	38	67.6	130.7	236	1.04	38	226.9	Yes	[Maximum] > ESV
Beryllium	7440-41-7	38	38	0.3	0.5	0.6	1.06	0	<1	No	[Maximum] < ESV
Cadmium	7440-43-9	38	0	---	---	---	0.00222	---	---	No	100% Non-Detect
Chromium, Total	7440-47-3	38	38	6.4	9.5	12.4	23	0	<1	No	[Maximum] < ESV
Chromium, Hexavalent	18540-29-9	38	38	0.17	0.26	0.33	0.34	0	<1	No	[Maximum] < ESV
Chromium, Trivalent	16065-83-1	38	38	6.23	9.28	12.07	23	0	<1	No	[Maximum] < ESV
Cobalt	7440-48-4	38	38	4	6	8	0.14	38	54.3	Yes	[Maximum] > ESV
Copper	7440-50-8	38	38	8.9	15.2	22.7	5.4	38	4.2	Yes	[Maximum] > ESV
Iron	7439-89-6	38	38	9160	13882	17600	NESV	---	---	Yes	No ESV Available
Lead	7439-92-1	38	38	6.3	9.1	13.6	0.0537	38	253.3	Yes	[Maximum] > ESV
Manganese	7439-96-5	38	38	76.4	300.8	467	220	32	2.1	Yes	[Maximum] > ESV
Mercury	7439-97-6	38	38	0.011	0.021	0.049	0.1	0	<1	No	[Maximum] < ESV
Nickel	7440-02-0	38	38	9.2	12.6	18.1	10	33	1.8	Yes	[Maximum] > ESV
Selenium	7782-49-2	38	1	0.65	0.65	0.65	0.0276	1	23.6	Yes	[Maximum] > ESV
Silver	7440-22-4	38	0	---	---	---	2	---	---	No	100% Non-Detect
Thallium	7440-28-0	38	0	---	---	---	0.05	---	---	No	100% Non-Detect
Vanadium	7440-62-2	38	38	7.6	13.5	17.3	1.59	38	10.9	Yes	[Maximum] > ESV
Zinc	7440-66-6	38	38	27.7	42.1	56.3	6.62	38	8.5	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	38	25	0.03	0.77	3.7	0.098	19	37.8	Yes	[Maximum] > ESV
Cyanide (Free)	STL00131	5	0	---	---	---	1.33	---	---	No	100% Non-Detect
Fluoride	16984-48-8	38	38	1.58	15.34	32.7	120	0	<1	No	[Maximum] < ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	38	38	7410	18067	35100	NESV	---	---	Yes	Essential Nutrient
Magnesium	7439-95-4	38	38	7060	10582	14800	NESV	---	---	Yes	Essential Nutrient
Potassium	7440-09-7	38	38	436	885	1290	NESV	---	---	Yes	Essential Nutrient
Sodium	7440-23-5	38	22	42.1	108.5	249	NESV	---	---	Yes	Essential Nutrient
Pesticides (mg/kg)											
Aldrin	309-00-2	1	0	---	---	---	0.00332	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	1	0	---	---	---	0.0994	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	1	0	---	---	---	0.119	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	1	0	---	---	---	0.00398	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	1	0	---	---	---	0.119	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	1	0	---	---	---	0.224	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	1	0	---	---	---	0.005	---	---	No	100% Non-Detect
Dieldrin	60-57-1	1	0	---	---	---	0.00238	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	1	0	---	---	---	0.0358	---	---	No	100% Non-Detect
Endrin	72-20-8	1	0	---	---	---	0.0014	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	1	0	---	---	---	0.0105	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	1	0	---	---	---	NESV	---	---	No	100% Non-Detect

Table B-7
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Gamma Bhc (Lindane)	58-89-9	1	0	---	---	---	0.005	---	---	No	100% Non-Detect
Heptachlor	76-44-8	1	0	---	---	---	0.00598	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	1	0	---	---	---	0.152	---	---	No	100% Non-Detect
Methoxychlor	72-43-5	1	0	---	---	---	0.0199	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	1	0	---	---	---	0.0063	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	1	0	---	---	---	0.021	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	1	0	---	---	---	0.0035	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	1	0	---	---	---	0.119	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	1	0	---	---	---	0.224	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	8	0	---	---	---	1.1	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	8	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)	12672-29-6	8	0	---	---	---	0.0073	---	---	No	100% Non-Detect
PCB-1254 (Aroclor 1254)	11097-69-1	8	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1260 (Aroclor 1260)	11096-82-5	8	0	---	---	---	0.88	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	8	0	---	---	---	0.000332	---	---	No	100% Non-Detect
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	38	6	0.024	0.157	0.48	3.24	0	<1	No	[Maximum] < ESV
Acenaphthene	83-32-9	38	3	0.01	0.02	0.02	0.25	0	<1	No	[Maximum] < ESV
Acenaphthylene	208-96-8	38	3	0.024	0.058	0.1	120	0	<1	No	[Maximum] < ESV
Anthracene	120-12-7	38	0	---	---	---	6.8	---	---	No	100% Non-Detect
Fluoranthene	206-44-0	38	28	0.019	0.098	0.42	10	0	<1	No	[Maximum] < ESV
Fluorene	86-73-7	38	2	0.015	0.027	0.04	3.7	0	<1	No	[Maximum] < ESV
Naphthalene	91-20-3	38	6	0.04	0.28	0.81	0.0994	3	8.1	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	38	22	0.019	0.056	0.21	5.5	0	<1	No	[Maximum] < ESV
Total LMW PAHs - 1/2MDL	---	38	30	0.06815	0.27213	1.932	29	0	<1	No	[Maximum] < ESV
Total LMW PAHs - MDL	---	38	30	0.1163	0.3141	1.953	29	0	<1	No	[Maximum] < ESV
Total LMW PAHs - Zero	---	38	30	0.019	0.23	1.911	29	0	<1	No	[Maximum] < ESV
Benzo(A)Pyrene	50-32-8	38	19	0.024	0.092	0.36	1.52	0	<1	No	[Maximum] < ESV
Benzo(A)Anthracene	56-55-3	38	16	0.038	0.08	0.26	0.73	0	<1	No	[Maximum] < ESV
Benzo(B)Fluoranthene	205-99-2	38	25	0.036	0.158	0.62	18	0	<1	No	[Maximum] < ESV
Benzo(G,H,I)Perylene	191-24-2	38	17	0.049	0.123	0.46	25	0	<1	No	[Maximum] < ESV
Benzo(K)Fluoranthene	207-08-9	38	17	0.02	0.06	0.21	71	0	<1	No	[Maximum] < ESV
Chrysene	218-01-9	38	27	0.012	0.106	0.42	3.1	0	<1	No	[Maximum] < ESV
Dibenz(A,H)Anthracene	53-70-3	38	8	0.019	0.051	0.079	14	0	<1	No	[Maximum] < ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	38	21	0.031	0.124	0.43	71	0	<1	No	[Maximum] < ESV
Pyrene	129-00-0	38	24	0.03	0.13	0.56	10	0	<1	No	[Maximum] < ESV
Total HMW PAHs - 1/2MDL	---	38	27	0.1045	0.737	3.399	1.1	5	3.1	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	38	27	0.166	0.766	3.399	1.1	5	3.1	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	38	27	0.027	0.708	3.399	1.1	5	3.1	Yes	[Maximum] > ESV

Table B-7
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Flathead River Riparian Area
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Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
1,2,4,5-Tetrachlorobenzene	95-94-3	38	0	---	---	---	2.02	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	38	0	---	---	---	2.05	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	38	0	---	---	---	0.199	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	38	0	---	---	---	4	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	38	0	---	---	---	9.94	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	38	0	---	---	---	87.5	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	38	0	---	---	---	0.01	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	38	0	---	---	---	0.0609	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	38	0	---	---	---	1.28	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	38	0	---	---	---	0.0328	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	38	0	---	---	---	0.0122	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	38	0	---	---	---	0.243	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	38	0	---	---	---	0.67	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	38	0	---	---	---	5.3	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	38	0	---	---	---	1.6	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	106445	38	0	---	---	---	NESV	---	---	No	100% Non-Detect
3,3'-Dichlorobenzidine	91-94-1	38	0	---	---	---	0.646	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	38	0	---	---	---	3.16	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	38	0	---	---	---	0.144	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	38	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	38	0	---	---	---	7.95	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	38	0	---	---	---	1	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	38	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	38	0	---	---	---	21.9	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	38	0	---	---	---	5.12	---	---	No	100% Non-Detect
Acetophenone	98-86-2	38	1	0.011	0.011	0.011	300	0	<1	No	[Maximum] < ESV
Atrazine	1912-24-9	38	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	38	4	0.031	0.052	0.088	NESV	---	---	Yes	No ESV Available
Benzyl Butyl Phthalate	85-68-7	38	0	---	---	---	0.239	---	---	No	100% Non-Detect
Biphenyl (Diphenyl)	92-52-4	38	1	0.05	0.05	0.05	60	0	<1	No	[Maximum] < ESV
Bis(2-Chloroethoxy) Methane	111-91-1	38	0	---	---	---	0.302	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	38	0	---	---	---	23.7	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	38	0	---	---	---	19.9	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	38	0	---	---	---	0.02	---	---	No	100% Non-Detect
Caprolactam	105-60-2	38	2	0.042	0.044	0.046	NESV	---	---	Yes	No ESV Available
Carbazole	86-74-8	38	9	0.0089	0.0189	0.051	79	0	<1	No	[Maximum] < ESV
Dibenzofuran	132-64-9	38	1	0.02	0.02	0.02	6.1	0	<1	No	[Maximum] < ESV
Diethyl Phthalate	84-66-2	38	0	---	---	---	24.8	---	---	No	100% Non-Detect
Dimethyl Phthalate	131-11-3	38	0	---	---	---	10	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	38	4	0.014	0.022	0.034	0.011	4	3.1	Yes	[Maximum] > ESV
Di-N-Octylphthalate	117-84-0	38	0	---	---	---	0.91	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	38	0	---	---	---	0.079	---	---	No	100% Non-Detect

Table B-7
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
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Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Hexachlorobutadiene	87-68-3	38	0	---	---	---	0.0398	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	38	0	---	---	---	0.755	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	38	0	---	---	---	0.596	---	---	No	100% Non-Detect
Isophorone	78-59-1	38	0	---	---	---	139	---	---	No	100% Non-Detect
Nitrobenzene	98-95-3	38	0	---	---	---	1.31	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	38	0	---	---	---	0.544	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	38	0	---	---	---	0.545	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	38	0	---	---	---	0.119	---	---	No	100% Non-Detect
Phenol	108-95-2	38	0	---	---	---	0.79	---	---	No	100% Non-Detect
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)											
1,1,1-Trichloroethane	71-55-6	19	0	---	---	---	29.8	---	---	No	100% Non-Detect
1,1,2,2-Tetrachloroethane	79-34-5	19	0	---	---	---	0.127	---	---	No	100% Non-Detect
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	19	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,1,2-Trichloroethane	79-00-5	19	0	---	---	---	28.6	---	---	No	100% Non-Detect
1,1-Dichloroethane	75-34-3	19	0	---	---	---	20.1	---	---	No	100% Non-Detect
1,1-Dichloroethene	75-35-4	19	0	---	---	---	8.28	---	---	No	100% Non-Detect
1,2,3-Trichlorobenzene	87-61-6	19	0	---	---	---	11.1	---	---	No	100% Non-Detect
1,2,4-Trichlorobenzene	120-82-1	19	0	---	---	---	0.27	---	---	No	100% Non-Detect
1,2-Dibromo-3-Chloropropane	96-12-8	19	0	---	---	---	0.0352	---	---	No	100% Non-Detect
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	19	0	---	---	---	1.23	---	---	No	100% Non-Detect
1,2-Dichlorobenzene	95-50-1	19	0	---	---	---	0.92	---	---	No	100% Non-Detect
1,2-Dichloroethane	107-06-2	19	0	---	---	---	0.85	---	---	No	100% Non-Detect
1,2-Dichloropropane	78-87-5	19	0	---	---	---	32.7	---	---	No	100% Non-Detect
1,3-Dichlorobenzene	541-73-1	19	0	---	---	---	0.74	---	---	No	100% Non-Detect
1,4-Dichlorobenzene	106-46-7	19	0	---	---	---	0.546	---	---	No	100% Non-Detect
2-Hexanone	591-78-6	19	0	---	---	---	0.36	---	---	No	100% Non-Detect
Acetone	67-64-1	19	19	0.017	0.06	0.18	1.2	0	<1	No	[Maximum] < ESV
Benzene	71-43-2	19	19	0.00031	0.00141	0.0022	0.255	0	<1	No	[Maximum] < ESV
Bromochloromethane	74-97-5	19	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bromodichloromethane	75-27-4	19	0	---	---	---	0.54	---	---	No	100% Non-Detect
Bromoform	75-25-2	19	0	---	---	---	15.9	---	---	No	100% Non-Detect
Bromomethane	74-83-9	19	0	---	---	---	0.235	---	---	No	100% Non-Detect
Carbon Disulfide	75-15-0	19	17	0.00032	0.00137	0.0038	0.0941	0	<1	No	[Maximum] < ESV
Carbon Tetrachloride	56-23-5	19	0	---	---	---	2.98	---	---	No	100% Non-Detect
Chlorobenzene	108-90-7	19	0	---	---	---	2.4	---	---	No	100% Non-Detect
Chloroethane	75-00-3	19	0	---	---	---	NESV	---	---	No	100% Non-Detect
Chloroform	67-66-3	19	0	---	---	---	1.19	---	---	No	100% Non-Detect
Chloromethane	74-87-3	19	0	---	---	---	10.4	---	---	No	100% Non-Detect
Cis-1,2-Dichloroethylene	156-59-2	19	0	---	---	---	24	---	---	No	100% Non-Detect
Cis-1,3-Dichloropropene	10061-01-5	19	0	---	---	---	0.398	---	---	No	100% Non-Detect
Cyclohexane	110-82-7	19	18	0.00047	0.00235	0.005	NESV	---	---	Yes	No ESV Available
Dibromochloromethane	124-48-1	19	0	---	---	---	2.05	---	---	No	100% Non-Detect
Dichlorodifluoromethane	75-71-8	19	0	---	---	---	39.5	---	---	No	100% Non-Detect

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Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Ethylbenzene	100-41-4	19	15	0.00037	0.00063	0.0012	5.16	0	<1	No	[Maximum] < ESV
Isopropylbenzene (Cumene)	98-82-8	19	0	---	---	---	NESV	---	---	No	100% Non-Detect
Methyl Acetate	79-20-9	19	3	0.011	0.324	0.6	NESV	---	---	Yes	No ESV Available
Methyl Ethyl Ketone (2-Butanone)	78-93-3	19	18	0.0037	0.0058	0.013	89.6	0	<1	No	[Maximum] < ESV
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	19	0	---	---	---	9.7	---	---	No	100% Non-Detect
Methylcyclohexane	108-87-2	19	19	0.00058	0.00422	0.011	NESV	---	---	Yes	No ESV Available
Methylene Chloride	75-09-2	19	3	0.00031	0.00115	0.0027	2.6	0	<1	No	[Maximum] < ESV
Styrene	100-42-5	19	0	---	---	---	1.2	---	---	No	100% Non-Detect
Tert-Butyl Methyl Ether	1634-04-4	19	0	---	---	---	NESV	---	---	No	100% Non-Detect
Tetrachloroethylene (PCE)	127-18-4	19	1	0.0004	0.0004	0.0004	0.18	0	<1	No	[Maximum] < ESV
Toluene	108-88-3	19	19	0.0011	0.0031	0.0069	5.45	0	<1	No	[Maximum] < ESV
Trans-1,2-Dichloroethene	156-60-5	19	0	---	---	---	0.784	---	---	No	100% Non-Detect
Trans-1,3-Dichloropropene	10061-02-6	19	0	---	---	---	0.398	---	---	No	100% Non-Detect
Trichloroethylene (TCE)	79-01-6	19	0	---	---	---	12.4	---	---	No	100% Non-Detect
Trichlorofluoromethane	75-69-4	19	0	---	---	---	16.4	---	---	No	100% Non-Detect
Vinyl Chloride	75-01-4	19	0	---	---	---	0.12	---	---	No	100% Non-Detect
M,P-Xylene	179601-23-1	19	19	0.00031	0.00144	0.0033	NESV	---	---	Yes	No ESV Available
O-Xylene (1,2-Dimethylbenzene)	95-47-6	19	18	0.00011	0.00048	0.0011	NESV	---	---	Yes	No ESV Available
Total Xylene - 1/2MDL	1330-20-7	19	19	0.000405	0.001902	0.0044	1.4	0	<1	No	[Maximum] < ESV
Total Xylene - MDL	1330-20-7	19	19	0.00042	0.00191	0.0044	1.4	0	<1	No	[Maximum] < ESV
Total Xylene - Zero	1330-20-7	19	19	0.00034	0.0019	0.0044	1.4	0	<1	No	[Maximum] < ESV
Physicochemical Parameters											
pH (s.u.)	---	30	30	7.4	8.2	9	NESV	---	---	---	---
Total Organic Carbon	7440440	30	30	6040	13820	30800	NESV	---	---	---	---

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
TAL: Target Analyte List
TCL: Target Compound List

Table B-8a
Screening-Level Ecological Exposure Estimate for Bulk Soil Using Upper RSD-Adjusted Results (0-2 feet)
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	86	86	9014	21350	39465	50	86	789.3	Yes	[Maximum] > ESV
Antimony	7440-36-0	86	75	0.141	0.796	11.0	0.142	74	77.6	Yes	[Maximum] > ESV
Arsenic	7440-38-2	86	86	4.41	7.02	35.6	5.7	50	6.3	Yes	[Maximum] > ESV
Barium	7440-39-3	86	86	61.8	159	330	1.04	86	317.2	Yes	[Maximum] > ESV
Beryllium	7440-41-7	86	86	0.420	0.882	3.93	1.06	16	3.7	Yes	[Maximum] > ESV
Cadmium	7440-43-9	86	86	0.057	0.325	1.84	0.00222	86	829	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	86	86	14.3	23.1	58.6	23	25	2.5	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	86	86	0.382	0.619	1.57	0.34	86	4.6	Yes	[Maximum] > ESV
Chromium, Trivalent	16065-83-1	86	86	13.9	22.5	57.0	23	24	2.5	Yes	[Maximum] > ESV
Cobalt	7440-48-4	86	86	5.59	6.64	14.0	0.14	86	99.8	Yes	[Maximum] > ESV
Copper	7440-50-8	86	86	14.8	69.5	996	5.4	86	184.4	Yes	[Maximum] > ESV
Iron	7439-89-6	86	86	14373	19400	68967	NESV	---	---	Yes	No ESV Available
Lead	7439-92-1	86	86	8.89	46.5	603	0.0537	86	11228.5	Yes	[Maximum] > ESV
Manganese	7439-96-5	86	86	360	522	902	220	86	4.1	Yes	[Maximum] > ESV
Mercury	7439-97-6	86	60	0.020	0.037	0.140	0.1	1	1.4	Yes	[Maximum] > ESV
Nickel	7440-02-0	86	86	14.4	33.4	163	10	86	16.3	Yes	[Maximum] > ESV
Selenium	7782-49-2	86	86	0.214	1.74	16.0	0.0276	86	578.1	Yes	[Maximum] > ESV
Silver	7440-22-4	86	86	0.032	0.128	1.42	2	0	<1	No	[Maximum] < ESV
Thallium	7440-28-0	86	86	0.064	0.133	0.457	0.05	86	9.1	Yes	[Maximum] > ESV
Vanadium	7440-62-2	86	86	8.88	20.1	59.5	1.59	86	37.4	Yes	[Maximum] > ESV
Zinc	7440-66-6	86	86	46.8	125	1939	6.62	86	292.8	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	86	84	0.023	1.18	25.5	0.098	78	260.4	Yes	[Maximum] > ESV
Fluoride	16984-48-8	86	86	21.4	333	1218	120	49	10.2	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	86	86	2886	21316	50575	NESV	---	---	Yes	No ESV Available
Magnesium	7439-95-4	86	86	6979	10849	13590	NESV	---	---	Yes	No ESV Available
Potassium	7440-09-7	86	86	771	1549	3272	NESV	---	---	Yes	No ESV Available
Sodium	7440-23-5	86	82	55.8	1332	11767	NESV	---	---	Yes	No ESV Available
Pesticides (mg/kg)											
Aldrin	309-00-2	43	0	---	--	---	0.00332	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	43	0	---	--	---	0.0994	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	43	0	---	--	---	0.119	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	43	0	---	--	---	0.00398	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	43	0	---	--	---	0.119	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	43	0	---	--	---	0.224	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	43	0	---	--	---	0.005	---	---	No	100% Non-Detect
Dieldrin	60-57-1	43	0	---	--	---	0.00238	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	43	0	---	--	---	0.0358	---	---	No	100% Non-Detect
Endrin	72-20-8	43	0	---	--	---	0.0014	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	43	0	---	--	---	0.0105	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	43	0	---	--	---	NESV	---	---	No	100% Non-Detect
Gamma Bhc (Lindane)	58-89-9	43	0	---	--	---	0.005	---	---	No	100% Non-Detect
Heptachlor	76-44-8	43	0	---	--	---	0.00598	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	43	0	---	--	---	0.152	---	---	No	100% Non-Detect
Methoxychlor	72-43-5	43	0	---	--	---	0.0199	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	43	0	---	--	---	0.0063	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	43	0	---	--	---	0.021	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	43	0	---	--	---	0.0035	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	43	0	---	--	---	0.119	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	43	0	---	--	---	0.224	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	86	0	---	--	---	1.1	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	86	0	---	--	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	86	0	---	--	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	86	0	---	--	---	0.041	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)[1]	12672-29-6	86	1	0.200	0.200	0.200	0.0073	1	27.4	Yes	[Maximum] > ESV
PCB-1254 (Aroclor 1254)	11097-69-1	86	14	0.110	0.426	1.73	0.041	14	42.2	Yes	[Maximum] > ESV
PCB-1260 (Aroclor 1260)	11096-82-5	86	0	---	--	---	0.88	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	86	0	---	--	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	86	0	---	--	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	86	15	0.110	0.430	1.73	0.000332	15	5207.2	Yes	[Maximum] > ESV
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	86	72	0.003	1.04	39.9	3.24	4	12.3	Yes	[Maximum] > ESV
Acenaphthene	83-32-9	86	84	0.014	4.66	199	0.25	43	796.1	Yes	[Maximum] > ESV
Acenaphthylene	208-96-8	86	26	0.002	0.427	5.05	120	0	<1	No	[Maximum] < ESV
Anthracene	120-12-7	86	80	0.027	7.98	274	6.8	10	40.2	Yes	[Maximum] > ESV

Table B-8a
Screening-Level Ecological Exposure Estimate for Bulk Soil Using Upper RSD-Adjusted Results (0-2 feet)
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Fluoranthene	206-44-0	86	86	0.036	29.0	754	10	23	75.4	Yes	[Maximum] > ESV
Fluorene	86-73-7	86	83	0.011	3.85	164	3.7	6	44.2	Yes	[Maximum] > ESV
Naphthalene	91-20-3	86	76	0.005	2.05	87.6	0.0994	34	881.5	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	86	86	0.020	25.6	801	5.5	22	145.7	Yes	[Maximum] > ESV
Total LMW PAHs - 1/2MDL	---	86	86	0.118	73.3	2339	29	20	80.6	Yes	[Maximum] > ESV
Total LMW PAHs - MDL	---	86	86	0.181	73.3	2339	29	20	80.6	Yes	[Maximum] > ESV
Total LMW PAHs - Zero	---	86	86	0.056	73.3	2339	29	20	80.6	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	86	85	0.030	16.7	401	1.52	53	264.1	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	86	84	0.139	16.4	405	0.73	61	554.9	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	86	86	0.035	20.0	432	18	16	24	Yes	[Maximum] > ESV
Benzo(G,H,I)Perylene	191-24-2	86	85	0.040	14.2	354	25	9	14.1	Yes	[Maximum] > ESV
Benzo(K)Fluoranthene	207-08-9	86	85	0.025	7.92	214	71	1	3	Yes	[Maximum] > ESV
Chrysene	218-01-9	86	86	0.036	18.6	407	3.1	46	131.4	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	86	82	0.034	3.98	83.6	14	4	6	Yes	[Maximum] > ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	86	84	0.110	12.9	275	71	4	3.9	Yes	[Maximum] > ESV
Pyrene	129-00-0	86	86	0.029	27.9	708	10	21	70.8	Yes	[Maximum] > ESV
Total HMW PAHs - 1/2MDL	---	86	86	0.222	133	3263	1.1	84	2966.4	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	86	86	0.313	133	3263	1.1	84	2966.4	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	86	86	0.130	133	3263	1.1	84	2966.4	Yes	[Maximum] > ESV
Total PAHs - 1/2MDL	---	86	86	0.269	185	5094		86	---	Yes	No ESV Available
Total PAHs - MDL	---	86	86	0.417	185	5094		86	---	Yes	No ESV Available
Total PAHs - Zero	---	86	86	0.121	185	5094		86	---	Yes	No ESV Available
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
1,2,4,5-Tetrachlorobenzene	95-94-3	86	0	---	--	---	2.02	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	86	0	---	--	---	2.05	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	86	0	---	--	---	0.199	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	86	0	---	--	---	4	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	86	0	---	--	---	9.94	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	86	0	---	--	---	87.5	---	---	No	100% Non-Detect
2,4-Dimethylphenol[1]	105-67-9	86	2	0.250	0.480	0.710	0.01	2	71	Yes	[Maximum] > ESV
2,4-Dinitrophenol	51-28-5	86	0	---	--	---	0.0609	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	86	0	---	--	---	1.28	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	86	0	---	--	---	0.0328	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	86	0	---	--	---	0.0122	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	86	0	---	--	---	0.243	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	86	0	---	--	---	0.67	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	86	0	---	--	---	5.3	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	86	0	---	--	---	1.6	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)[1]	106445	62	2	0.011	0.014	0.017	NESV	---	---	Yes	No ESV Available
3,3'-Dichlorobenzidine	91-94-1	86	0	---	--	---	0.646	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	86	0	---	--	---	3.16	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	86	0	---	--	---	0.144	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	86	0	---	--	---	NESV	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	86	0	---	--	---	7.95	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	86	0	---	--	---	1	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	86	0	---	--	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	86	0	---	--	---	21.9	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	86	0	---	--	---	5.12	---	---	No	100% Non-Detect
Acetophenone	98-86-2	86	21	0.003	0.021	0.043	300	0	<1	No	[Maximum] < ESV
Atrazine	1912-24-9	86	0	---	--	---	NESV	---	---	No	100% Non-Detect
Benzaldehyde[1]	100-52-7	86	8	0.007	0.026	0.051	NESV	---	---	Yes	No ESV Available
Benzyl Butyl Phthalate	85-68-7	86	16	0.013	0.233	1.40	0.239	4	5.9	Yes	[Maximum] > ESV

Table B-8a
Screening-Level Ecological Exposure Estimate for Bulk Soil Using Upper RSD-Adjusted Results (0-2 feet)
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Biphenyl (Diphenyl)	92-52-4	86	20	0.003	1.18	14.1	60	0	<1	No	[Maximum] < ESV
Bis(2-Chloroethoxy) Methane	111-91-1	86	0	---	--	---	0.302	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	86	0	---	--	---	23.7	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	86	0	---	--	---	19.9	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate[1]	117-81-7	86	16	0.014	0.115	0.810	0.02	15	40.5	Yes	[Maximum] > ESV
Caprolactam	105-60-2	86	0	---	--	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	86	84	0.021	4.09	137	79	1	1.7	Yes	[Maximum] > ESV
Dibenzofuran	132-64-9	86	78	0.006	2.30	93.5	6.1	4	15.3	Yes	[Maximum] > ESV
Diethyl Phthalate[1]	84-66-2	86	2	0.014	0.015	0.015	24.8	0	<1	No	[Maximum] < ESV
Dimethyl Phthalate	131-11-3	86	0	---	--	---	10	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate[1]	84-74-2	86	22	0.011	0.025	0.067	0.011	20	6.1	Yes	[Maximum] > ESV
Di-N-Octylphthalate	117-84-0	86	0	---	--	---	0.91	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	86	0	---	--	---	0.079	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	86	0	---	--	---	0.0398	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	86	0	---	--	---	0.755	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	86	0	---	--	---	0.596	---	---	No	100% Non-Detect
Isophorone	78-59-1	86	13	0.006	0.055	0.146	139	0	<1	No	[Maximum] < ESV
Nitrobenzene	98-95-3	86	0	---	--	---	1.31	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	86	0	---	--	---	0.544	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	86	0	---	--	---	0.545	---	---	No	100% Non-Detect
Pentachlorophenol[1]	87-86-5	86	1	0.100	0.100	0.100	0.119	0	<1	No	[Maximum] < ESV
Phenol[1]	108-95-2	86	9	0.012	0.018	0.033	0.79	0	<1	No	[Maximum] < ESV
Physicochemical Parameters											
pH	PH	24	24	6.20	7.19	8.36	NESV	---	---	---	---
Total Organic Carbon	7440440	24	23	6282	21089	64145	NESV	---	---	---	---

Notes:
[1], No RSD adjustment or UCL substitution due to no detected results in replicate samples. Measured results used instead
---, Not applicable.
COPEC: Constituent of Potential Ecological Concern
ESV, Ecological Screening Value
HMW, High molecular weight
HQ, Hazard Quotient
HQ_{Max}, Maximum hazard quotient,
LMW, Low molecular weight
[Maximum]: Maximum concentration
mg/kg, milligrams per kilograms
MDL: Method Detection Limit
NESV: No Ecological Screening Value
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
TAL: Target Analyte List
TCL: Target Compound List
TEC: Toxic Equivalency Concentration

Table B-8b
Screening-Level Ecological Exposure Estimate for Bulk Soil Using Measured Results (0-2 feet)
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	86	86	8620	20499	37700	50	86	754	Yes	[Maximum] > ESV
Antimony	7440-36-0	86	75	0.092	0.588	8.60	0.142	61	60.6	Yes	[Maximum] > ESV
Arsenic	7440-38-2	86	86	4.10	6.39	31.3	5.7	36	5.5	Yes	[Maximum] > ESV
Barium	7440-39-3	86	86	59.4	150	302	1.04	86	290.4	Yes	[Maximum] > ESV
Beryllium	7440-41-7	86	86	0.400	0.839	3.70	1.06	14	3.5	Yes	[Maximum] > ESV
Cadmium	7440-43-9	86	86	0.054	0.291	1.60	0.00222	86	720.7	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	86	86	12.9	21.3	54.4	23	21	2.4	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	86	86	0.345	0.571	1.46	0.34	86	4.3	Yes	[Maximum] > ESV
Chromium, Trivalent	16065-83-1	86	86	12.6	20.7	52.9	23	20	2.3	Yes	[Maximum] > ESV
Cobalt	7440-48-4	86	86	5.40	6.48	13.5	0.14	86	96.4	Yes	[Maximum] > ESV
Copper	7440-50-8	86	86	14.1	63.7	887	5.4	86	164.3	Yes	[Maximum] > ESV
Iron	7439-89-6	86	86	13900	18893	66700	NESV	---	---	Yes	No ESV Available
Lead	7439-92-1	86	86	8.60	35.2	406	0.0537	86	7560.5	Yes	[Maximum] > ESV
Manganese	7439-96-5	86	86	341	494	902	220	86	4.1	Yes	[Maximum] > ESV
Mercury	7439-97-6	86	60	0.013	0.028	0.140	0.1	1	1.4	Yes	[Maximum] > ESV
Nickel	7440-02-0	86	86	13.4	30.1	142	10	86	14.2	Yes	[Maximum] > ESV
Selenium	7782-49-2	86	86	0.180	1.48	13.3	0.0276	86	481.9	Yes	[Maximum] > ESV
Silver	7440-22-4	86	86	0.029	0.118	1.30	2	0	<1	No	[Maximum] < ESV
Thallium	7440-28-0	86	86	0.060	0.122	0.400	0.05	86	8	Yes	[Maximum] > ESV
Vanadium	7440-62-2	86	86	8.60	19.0	54.5	1.59	86	34.3	Yes	[Maximum] > ESV
Zinc	7440-66-6	86	86	44.4	114	1720	6.62	86	259.8	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	86	84	0.017	0.928	18.2	0.098	76	185.7	Yes	[Maximum] > ESV
Fluoride	16984-48-8	86	86	16.6	272	976	120	47	8.1	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	86	86	2886	19082	45700	NESV	---	---	Yes	No ESV Available
Magnesium	7439-95-4	86	86	6830	10612	13300	NESV	---	---	Yes	No ESV Available
Potassium	7440-09-7	86	86	721	1464	3080	NESV	---	---	Yes	No ESV Available
Sodium	7440-23-5	86	82	46.1	1084	9000	NESV	---	---	Yes	No ESV Available
Pesticides (mg/kg)											
Aldrin	309-00-2	43	0	---	---	---	0.00332	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	43	0	---	---	---	0.0994	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	43	0	---	---	---	0.119	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	43	0	---	---	---	0.00398	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	43	0	---	---	---	0.119	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	43	0	---	---	---	0.224	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	43	0	---	---	---	0.005	---	---	No	100% Non-Detect
Dieldrin	60-57-1	43	0	---	---	---	0.00238	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	43	0	---	---	---	0.0358	---	---	No	100% Non-Detect
Endrin	72-20-8	43	0	---	---	---	0.0014	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	43	0	---	---	---	0.0105	---	---	No	100% Non-Detect

Table B-8b
Screening-Level Ecological Exposure Estimate for Bulk Soil Using Measured Results (0-2 feet)
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Endrin Ketone	53494-70-5	43	0	---	---	---	NESV	---	---	No	100% Non-Detect
Gamma Bhc (Lindane)	58-89-9	43	0	---	---	---	0.005	---	---	No	100% Non-Detect
Heptachlor	76-44-8	43	0	---	---	---	0.00598	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	43	0	---	---	---	0.152	---	---	No	100% Non-Detect
Methoxychlor	72-43-5	43	0	---	---	---	0.0199	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	43	0	---	---	---	0.0063	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	43	0	---	---	---	0.021	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	43	0	---	---	---	0.0035	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	43	0	---	---	---	0.119	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	43	0	---	---	---	0.224	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	86	0	---	---	---	1.1	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	86	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	86	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	86	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)[1]	12672-29-6	86	1	0.200	0.200	0.200	0.0073	1	27.4	Yes	[Maximum] > ESV
PCB-1254 (Aroclor 1254)	11097-69-1	86	14	0.046	0.310	1.73	0.041	14	42.2	Yes	[Maximum] > ESV
PCB-1260 (Aroclor 1260)	11096-82-5	86	0	---	---	---	0.88	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	86	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	86	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	86	15	0.046	0.303	1.73	0.000332	15	5207.2	Yes	[Maximum] > ESV
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	86	72	0.003	0.706	27.0	3.24	4	8.3	Yes	[Maximum] > ESV
Acenaphthene	83-32-9	86	84	0.008	2.78	110	0.25	38	440	Yes	[Maximum] > ESV
Acenaphthylene	208-96-8	86	26	0.001	0.288	3.10	120	0	<1	No	[Maximum] < ESV
Anthracene	120-12-7	86	80	0.027	4.86	150	6.8	8	22.1	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	86	86	0.021	19.1	440	10	17	44	Yes	[Maximum] > ESV
Fluorene	86-73-7	86	83	0.010	2.37	94.0	3.7	6	25.4	Yes	[Maximum] > ESV
Naphthalene	91-20-3	86	76	0.005	1.55	68.0	0.0994	27	684.1	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	86	86	0.011	16.3	450	5.5	20	81.8	Yes	[Maximum] > ESV
Total LMW PAHs - 1/2MDL	---	86	86	0.068	46.9	1342	29	16	46.3	Yes	[Maximum] > ESV
Total LMW PAHs - MDL	---	86	86	0.104	46.9	1342	29	16	46.3	Yes	[Maximum] > ESV
Total LMW PAHs - Zero	---	86	86	0.032	46.8	1342	29	16	46.3	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	86	85	0.018	11.2	240	1.52	46	157.9	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	86	84	0.084	11.1	240	0.73	56	328.8	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	86	86	0.022	14.2	270	18	13	15	Yes	[Maximum] > ESV
Benzo(G,H,I)Perylene	191-24-2	86	85	0.025	9.94	220	25	6	8.8	Yes	[Maximum] > ESV
Benzo(K)Fluoranthene	207-08-9	86	85	0.015	5.45	130	71	1	1.8	Yes	[Maximum] > ESV
Chrysene	218-01-9	86	86	0.022	12.9	250	3.1	38	80.6	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	86	82	0.021	2.70	51.0	14	4	3.6	Yes	[Maximum] > ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	86	84	0.076	9.07	170	71	3	2.4	Yes	[Maximum] > ESV
Pyrene	129-00-0	86	86	0.017	18.2	410	10	18	41	Yes	[Maximum] > ESV

Table B-8b
Screening-Level Ecological Exposure Estimate for Bulk Soil Using Measured Results (0-2 feet)
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Total HMW PAHs - 1/2MDL	---	86	86	0.135	93.5	1981	1.1	80	1800.9	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	86	86	0.190	93.5	1981	1.1	80	1800.9	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	86	86	0.079	93.5	1981	1.1	80	1800.9	Yes	[Maximum] > ESV
Total PAHs - 1/2MDL	---	86	86	0.160	126	3026		86	---	Yes	No ESV Available
Total PAHs - MDL	---	86	86	0.248	126	3026		86	---	Yes	No ESV Available
Total PAHs - Zero	---	86	86	0.072	126	3026		86	---	Yes	No ESV Available
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
1,2,4,5-Tetrachlorobenzene	95-94-3	86	0	---	---	---	2.02	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	86	0	---	---	---	2.05	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	86	0	---	---	---	0.199	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	86	0	---	---	---	4	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	86	0	---	---	---	9.94	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	86	0	---	---	---	87.5	---	---	No	100% Non-Detect
2,4-Dimethylphenol[1]	105-67-9	86	2	0.250	0.480	0.710	0.01	2	71	Yes	[Maximum] > ESV
2,4-Dinitrophenol	51-28-5	86	0	---	---	---	0.0609	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	86	0	---	---	---	1.28	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	86	0	---	---	---	0.0328	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	86	0	---	---	---	0.0122	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	86	0	---	---	---	0.243	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	86	0	---	---	---	0.67	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	86	0	---	---	---	5.3	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	86	0	---	---	---	1.6	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)[1]	106445	62	2	0.011	0.014	0.017	NESV	---	---	Yes	No ESV Available
3,3'-Dichlorobenzidine	91-94-1	86	0	---	---	---	0.646	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	86	0	---	---	---	3.16	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	86	0	---	---	---	0.144	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	86	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	86	0	---	---	---	7.95	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	86	0	---	---	---	1	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	86	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	86	0	---	---	---	21.9	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	86	0	---	---	---	5.12	---	---	No	100% Non-Detect
Acetophenone	98-86-2	86	21	0.002	0.015	0.030	300	0	<1	No	[Maximum] < ESV
Atrazine	1912-24-9	86	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzaldehyde[1]	100-52-7	86	8	0.007	0.026	0.051	NESV	---	---	Yes	No ESV Available
Benzyl Butyl Phthalate	85-68-7	86	16	0.010	0.230	1.40	0.239	4	5.9	Yes	[Maximum] > ESV
Biphenyl (Diphenyl)	92-52-4	86	20	0.001	0.632	7.10	60	0	<1	No	[Maximum] < ESV
Bis(2-Chloroethoxy) Methane	111-91-1	86	0	---	---	---	0.302	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	86	0	---	---	---	23.7	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	86	0	---	---	---	19.9	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate[1]	117-81-7	86	16	0.014	0.115	0.810	0.02	15	40.5	Yes	[Maximum] > ESV

Table B-8b
Screening-Level Ecological Exposure Estimate for Bulk Soil Using Measured Results (0-2 feet)
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Caprolactam	105-60-2	86	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	86	84	0.012	2.61	78.0	79	0	<1	No	[Maximum] < ESV
Dibenzofuran	132-64-9	86	78	0.006	1.44	55.0	6.1	4	9	Yes	[Maximum] > ESV
Diethyl Phthalate[1]	84-66-2	86	2	0.014	0.015	0.015	24.8	0	<1	No	[Maximum] < ESV
Dimethyl Phthalate	131-11-3	86	0	---	---	---	10	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate[1]	84-74-2	86	22	0.011	0.025	0.067	0.011	20	6.1	Yes	[Maximum] > ESV
Di-N-Octylphthalate	117-84-0	86	0	---	---	---	0.91	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	86	0	---	---	---	0.079	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	86	0	---	---	---	0.0398	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	86	0	---	---	---	0.755	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	86	0	---	---	---	0.596	---	---	No	100% Non-Detect
Isophorone	78-59-1	86	13	0.006	0.048	0.110	139	0	<1	No	[Maximum] < ESV
Nitrobenzene	98-95-3	86	0	---	---	---	1.31	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	86	0	---	---	---	0.544	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	86	0	---	---	---	0.545	---	---	No	100% Non-Detect
Pentachlorophenol[1]	87-86-5	86	1	0.100	0.100	0.100	0.119	0	<1	No	[Maximum] < ESV
Phenol[1]	108-95-2	86	9	0.012	0.018	0.033	0.79	0	<1	No	[Maximum] < ESV
Physicochemical Parameters											
pH	PH	24	24	6.20	7.19	8.36	NESV	---	---	---	---
Total Organic Carbon	7440440	24	23	3800	17340	38800	NESV	---	---	---	---

Notes:

[1,] No UCL substitution due to no detected results in replicate samples. Measured results used instead.
---, Not applicable.
COPEC: Constituent of Potential Ecological Concern
ESV, Ecological Screening Value
HMW, High molecular weight
HQ, Hazard Quotient
HQ_{Max}, Maximum hazard quotient,
LMW, Low molecular weight
[Maximum]: Maximum concentration
mg/kg, milligrams per kilograms
MDL: Method Detection Limit
NESV: No Ecological Screening Value
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
TAL: Target Analyte List
TCL: Target Compound List
TEC: Toxic Equivalency Concentration

Table B-8c
Screening-Level Ecological Exposure Estimate for Bulk Soil Using Lower RSD-Adjusted Results (0-2 feet)
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	86	86	8226	19649	35935	50	86	718.7	Yes	[Maximum] > ESV
Antimony	7440-36-0	86	75	0.027	0.379	6.19	0.142	37	43.6	Yes	[Maximum] > ESV
Arsenic	7440-38-2	86	86	3.62	5.76	27.0	5.7	22	4.7	Yes	[Maximum] > ESV
Barium	7440-39-3	86	86	57.0	141	281	1.04	86	270.4	Yes	[Maximum] > ESV
Beryllium	7440-41-7	86	86	0.380	0.796	3.47	1.06	11	3.3	Yes	[Maximum] > ESV
Cadmium	7440-43-9	86	86	0.051	0.257	1.36	0.00222	86	612.4	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	86	86	11.5	19.5	50.2	23	18	2.2	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	86	86	0.309	0.522	1.34	0.34	84	4	Yes	[Maximum] > ESV
Chromium, Trivalent	16065-83-1	86	86	11.2	19.0	48.8	23	17	2.1	Yes	[Maximum] > ESV
Cobalt	7440-48-4	86	86	5.21	6.31	13.0	0.14	86	93	Yes	[Maximum] > ESV
Copper	7440-50-8	86	86	13.4	57.9	778	5.4	86	144.1	Yes	[Maximum] > ESV
Iron	7439-89-6	86	86	13427	18386	64433	NESV	---	---	Yes	No ESV Available
Lead	7439-92-1	86	86	6.18	24.0	253	0.0537	86	4708.4	Yes	[Maximum] > ESV
Manganese	7439-96-5	86	86	322	465	902	220	86	4.1	Yes	[Maximum] > ESV
Mercury	7439-97-6	86	60	0.006	0.018	0.140	0.1	1	1.4	Yes	[Maximum] > ESV
Nickel	7440-02-0	86	86	11.5	26.9	121	10	86	12.1	Yes	[Maximum] > ESV
Selenium	7782-49-2	86	86	0.146	1.21	10.6	0.0276	86	385.7	Yes	[Maximum] > ESV
Silver	7440-22-4	86	86	0.026	0.107	1.18	2	0	<1	No	[Maximum] < ESV
Thallium	7440-28-0	86	86	0.056	0.110	0.387	0.05	86	7.7	Yes	[Maximum] > ESV
Vanadium	7440-62-2	86	86	8.32	17.8	52.3	1.59	86	32.9	Yes	[Maximum] > ESV
Zinc	7440-66-6	86	86	42.0	103	1501	6.62	86	226.8	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	86	84	0.011	0.671	10.9	0.098	62	111.1	Yes	[Maximum] > ESV
Fluoride	16984-48-8	86	86	11.8	212	781	120	43	6.5	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	86	86	2886	16847	40825	NESV	---	---	Yes	No ESV Available
Magnesium	7439-95-4	86	86	6681	10374	13010	NESV	---	---	Yes	No ESV Available
Potassium	7440-09-7	86	86	671	1379	3069	NESV	---	---	Yes	No ESV Available
Sodium	7440-23-5	86	82	36.4	836	6298	NESV	---	---	Yes	No ESV Available
Pesticides (mg/kg)											
Aldrin	309-00-2	43	0	---	---	---	0.00332	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	43	0	---	---	---	0.0994	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	43	0	---	---	---	0.119	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	43	0	---	---	---	0.00398	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	43	0	---	---	---	0.119	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	43	0	---	---	---	0.224	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	43	0	---	---	---	0.005	---	---	No	100% Non-Detect
Dieldrin	60-57-1	43	0	---	---	---	0.00238	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	43	0	---	---	---	0.0358	---	---	No	100% Non-Detect
Endrin	72-20-8	43	0	---	---	---	0.0014	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	43	0	---	---	---	0.0105	---	---	No	100% Non-Detect

Table B-8c
Screening-Level Ecological Exposure Estimate for Bulk Soil Using Lower RSD-Adjusted Results (0-2 feet)
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Endrin Ketone	53494-70-5	43	0	---	---	---	NESV	---	---	No	100% Non-Detect
Gamma Bhc (Lindane)	58-89-9	43	0	---	---	---	0.005	---	---	No	100% Non-Detect
Heptachlor	76-44-8	43	0	---	---	---	0.00598	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	43	0	---	---	---	0.152	---	---	No	100% Non-Detect
Methoxychlor	72-43-5	43	0	---	---	---	0.0199	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	43	0	---	---	---	0.0063	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	43	0	---	---	---	0.021	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	43	0	---	---	---	0.0035	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	43	0	---	---	---	0.119	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	43	0	---	---	---	0.224	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	86	0	---	---	---	1.1	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	86	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	86	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	86	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)[1]	12672-29-6	86	1	0.200	0.200	0.200	0.0073	1	27.4	Yes	[Maximum] > ESV
PCB-1254 (Aroclor 1254)	11097-69-1	86	14	-0.106856201	0.194	1.73	0.041	7	42.2	Yes	[Maximum] > ESV
PCB-1260 (Aroclor 1260)	11096-82-5	86	0	---	---	---	0.88	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	86	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	86	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	86	15	-0.106856201	0.176	1.73	0.000332	7	5207.2	Yes	[Maximum] > ESV
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	86	72	0.002	0.373	14.1	3.24	2	4.4	Yes	[Maximum] > ESV
Acenaphthene	83-32-9	86	84	0.002	0.897	22.0	0.25	20	88.2	Yes	[Maximum] > ESV
Acenaphthylene	208-96-8	86	26	0.000520709	0.148	1.92	120	0	<1	No	[Maximum] < ESV
Anthracene	120-12-7	86	80	0.005	1.74	44.3	6.8	5	6.5	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	86	86	0.006	9.09	188	10	15	18.8	Yes	[Maximum] > ESV
Fluorene	86-73-7	86	83	0.002	0.897	24.3	3.7	4	6.6	Yes	[Maximum] > ESV
Naphthalene	91-20-3	86	76	0.005	1.05	48.4	0.0994	24	486.7	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	86	86	0.002	6.94	186	5.5	15	33.9	Yes	[Maximum] > ESV
Total LMW PAHs - 1/2MDL	---	86	86	0.017	20.4	474	29	11	16.4	Yes	[Maximum] > ESV
Total LMW PAHs - MDL	---	86	86	0.027	20.4	475	29	11	16.4	Yes	[Maximum] > ESV
Total LMW PAHs - Zero	---	86	86	0.008	20.4	474	29	11	16.3	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	86	85	0.006	5.67	83.0	1.52	33	54.6	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	86	84	0.026	5.79	95.1	0.73	47	130.3	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	86	86	0.009	8.49	108	18	10	6	Yes	[Maximum] > ESV
Benzo(G,H,I)Perylene	191-24-2	86	85	0.010	5.67	86.3	25	4	3.5	Yes	[Maximum] > ESV
Benzo(K)Fluoranthene	207-08-9	86	85	0.005	2.98	46.1	71	0	<1	No	[Maximum] < ESV
Chrysene	218-01-9	86	86	0.008	7.17	103	3.1	28	33.1	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	86	82	0.008	1.41	18.4	14	3	1.3	Yes	[Maximum] > ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	86	84	0.029	5.20	68.9	71	0	<1	No	[Maximum] < ESV
Pyrene	129-00-0	86	86	0.005	8.47	176	10	15	17.6	Yes	[Maximum] > ESV

Table B-8c
Screening-Level Ecological Exposure Estimate for Bulk Soil Using Lower RSD-Adjusted Results (0-2 feet)
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Total HMW PAHs - 1/2MDL	---	86	86	0.047	53.7	828	1.1	72	752.7	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	86	86	0.067	53.7	828	1.1	72	752.7	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	86	86	0.028	53.7	828	1.1	72	752.7	Yes	[Maximum] > ESV
Total PAHs - 1/2MDL	---	86	86	0.051	65.9	1205		86	---	Yes	No ESV Available
Total PAHs - MDL	---	86	86	0.078	65.9	1205		86	---	Yes	No ESV Available
Total PAHs - Zero	---	86	86	0.023	65.8	1205		86	---	Yes	No ESV Available
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
1,2,4,5-Tetrachlorobenzene	95-94-3	86	0	---	---	---	2.02	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	86	0	---	---	---	2.05	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	86	0	---	---	---	0.199	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	86	0	---	---	---	4	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	86	0	---	---	---	9.94	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	86	0	---	---	---	87.5	---	---	No	100% Non-Detect
2,4-Dimethylphenol[1]	105-67-9	86	2	0.250	0.480	0.710	0.01	2	71	Yes	[Maximum] > ESV
2,4-Dinitrophenol	51-28-5	86	0	---	---	---	0.0609	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	86	0	---	---	---	1.28	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	86	0	---	---	---	0.0328	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	86	0	---	---	---	0.0122	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	86	0	---	---	---	0.243	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	86	0	---	---	---	0.67	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	86	0	---	---	---	5.3	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	86	0	---	---	---	1.6	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)[1]	106445	62	2	0.011	0.014	0.017	NESV	---	---	Yes	No ESV Available
3,3'-Dichlorobenzidine	91-94-1	86	0	---	---	---	0.646	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	86	0	---	---	---	3.16	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	86	0	---	---	---	0.144	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	86	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	86	0	---	---	---	7.95	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	86	0	---	---	---	1	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	86	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	86	0	---	---	---	21.9	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	86	0	---	---	---	5.12	---	---	No	100% Non-Detect
Acetophenone	98-86-2	86	21	0.001	0.009	0.017	300	0	<1	No	[Maximum] < ESV
Atrazine	1912-24-9	86	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzaldehyde[1]	100-52-7	86	8	0.007	0.026	0.051	NESV	---	---	Yes	No ESV Available
Benzyl Butyl Phthalate	85-68-7	86	16	0.007	0.227	1.40	0.239	4	5.9	Yes	[Maximum] > ESV
Biphenyl (Diphenyl)	92-52-4	86	20	2.33972E-05	0.089	1.06	60	0	<1	No	[Maximum] < ESV
Bis(2-Chloroethoxy) Methane	111-91-1	86	0	---	---	---	0.302	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	86	0	---	---	---	23.7	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	86	0	---	---	---	19.9	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate[1]	117-81-7	86	16	0.014	0.115	0.810	0.02	15	40.5	Yes	[Maximum] > ESV

Table B-8c
Screening-Level Ecological Exposure Estimate for Bulk Soil Using Lower RSD-Adjusted Results (0-2 feet)
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Caprolactam	105-60-2	86	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	86	84	0.003	1.13	26.4	79	0	<1	No	[Maximum] < ESV
Dibenzofuran	132-64-9	86	78	0.002	0.584	16.5	6.1	2	2.7	Yes	[Maximum] > ESV
Diethyl Phthalate[1]	84-66-2	86	2	0.014	0.015	0.015	24.8	0	<1	No	[Maximum] < ESV
Dimethyl Phthalate	131-11-3	86	0	---	---	---	10	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate[1]	84-74-2	86	22	0.011	0.025	0.067	0.011	20	6.1	Yes	[Maximum] > ESV
Di-N-Octylphthalate	117-84-0	86	0	---	---	---	0.91	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	86	0	---	---	---	0.079	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	86	0	---	---	---	0.0398	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	86	0	---	---	---	0.755	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	86	0	---	---	---	0.596	---	---	No	100% Non-Detect
Isophorone	78-59-1	86	13	0.006	0.041	0.099	139	0	<1	No	[Maximum] < ESV
Nitrobenzene	98-95-3	86	0	---	---	---	1.31	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	86	0	---	---	---	0.544	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	86	0	---	---	---	0.545	---	---	No	100% Non-Detect
Pentachlorophenol[1]	87-86-5	86	1	0.100	0.100	0.100	0.119	0	<1	No	[Maximum] < ESV
Phenol[1]	108-95-2	86	9	0.012	0.018	0.033	0.79	0	<1	No	[Maximum] < ESV
Physicochemical Parameters											
pH	PH	24	24	6.20	7.19	8.36	NESV	---	---	---	---
Total Organic Carbon	7440440	24	23	1318	13592	30142	NESV	---	---	---	---

Notes:
[1,] No RSD adjustment or UCL substitution due to no detected results in replicate samples. Measured results used instead.
---, Not applicable.
COPEC: Constituent of Potential Ecological Concern
ESV, Ecological Screening Value
HMW, High molecular weight
HQ, Hazard Quotient
HQ_{Max}, Maximum hazard quotient,
LMW, Low molecular weight
[Maximum]: Maximum concentration
mg/kg, milligrams per kilograms
MDL: Method Detection Limit
NESV: No Ecological Screening Value
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
TAL: Target Analyte List
TCL: Target Compound List
TEC: Toxic Equivalency Concentration

Table B-9
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	42	42	6290	35213	123000	50	42	2460	Yes	[Maximum] > ESV
Antimony	7440-36-0	42	10	0.43	1.45	2.6	0.142	10	18.3	Yes	[Maximum] > ESV
Arsenic	7440-38-2	42	42	2.4	11	34.1	5.7	32	6	Yes	[Maximum] > ESV
Barium	7440-39-3	42	42	19.6	211.6	1560	1.04	42	1500	Yes	[Maximum] > ESV
Beryllium	7440-41-7	42	42	0.31	2.71	17.2	1.06	25	16.2	Yes	[Maximum] > ESV
Cadmium	7440-43-9	42	36	0.29	2.48	9.6	0.00222	36	4324.3	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	46	46	5.6	21.7	53	23	16	2.3	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	44	39	0.2	0.6	1.4	0.34	29	4.1	Yes	[Maximum] > ESV
Chromium, Trivalent	16065-83-1	44	44	5.52	20.01	50.12	23	14	2.2	Yes	[Maximum] > ESV
Cobalt	7440-48-4	42	42	1.2	6.6	27.4	0.14	42	195.7	Yes	[Maximum] > ESV
Copper	7440-50-8	42	42	6.4	28.3	83.6	5.4	42	15.5	Yes	[Maximum] > ESV
Iron	7439-89-6	42	42	1330	9661	23600	NESV	---	---	Yes	No ESV Available
Lead	7439-92-1	42	42	6.4	48	238	0.0537	42	4432	Yes	[Maximum] > ESV
Manganese	7439-96-5	42	42	12.8	172.2	762	220	12	3.5	Yes	[Maximum] > ESV
Mercury	7439-97-6	42	32	0.012	0.035	0.12	0.1	1	1.2	Yes	[Maximum] > ESV
Nickel	7440-02-0	42	42	10.3	188.2	1250	10	42	125	Yes	[Maximum] > ESV
Selenium	7782-49-2	42	26	0.34	1.19	3.4	0.0276	26	123.2	Yes	[Maximum] > ESV
Silver	7440-22-4	42	3	0.7	0.9	1	2	0	<1	No	[Maximum] < ESV
Thallium	7440-28-0	42	35	0.14	0.95	4.6	0.05	35	92	Yes	[Maximum] > ESV
Vanadium	7440-62-2	42	42	6.1	62.6	348	1.59	42	218.9	Yes	[Maximum] > ESV
Zinc	7440-66-6	42	42	29.2	216.1	871	6.62	42	131.6	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	42	41	0.078	13.598	137	0.098	38	1398	Yes	[Maximum] > ESV
Fluoride	16984-48-8	42	42	2.42	86.44	306	120	12	2.6	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	42	42	427	21195	106000	NESV	---	---	Yes	Essential Nutrient
Magnesium	7439-95-4	42	42	442	6561	21800	NESV	---	---	Yes	Essential Nutrient
Potassium	7440-09-7	42	42	101	868	3200	NESV	---	---	Yes	Essential Nutrient
Sodium	7440-23-5	42	38	28.3	406	2390	NESV	---	---	Yes	Essential Nutrient
Pesticides (mg/kg)											
Aldrin	309-00-2	9	0	---	---	---	0.00332	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	9	0	---	---	---	0.0994	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	9	0	---	---	---	0.119	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	9	0	---	---	---	0.00398	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	9	0	---	---	---	0.119	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	9	0	---	---	---	0.224	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	9	0	---	---	---	0.005	---	---	No	100% Non-Detect
Dieldrin	60-57-1	9	0	---	---	---	0.00238	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	9	0	---	---	---	0.0358	---	---	No	100% Non-Detect
Endrin	72-20-8	9	0	---	---	---	0.0014	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	9	0	---	---	---	0.0105	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Gamma Bhc (Lindane)	58-89-9	9	0	---	---	---	0.005	---	---	No	100% Non-Detect

Table B-9
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Heptachlor	76-44-8	9	0	---	---	---	0.00598	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	9	0	---	---	---	0.152	---	---	No	100% Non-Detect
Methoxychlor	72-43-5	9	0	---	---	---	0.0199	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	9	0	---	---	---	0.0063	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	9	0	---	---	---	0.021	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	9	0	---	---	---	0.0035	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	9	0	---	---	---	0.119	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	9	0	---	---	---	0.224	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	20	0	---	---	---	1.1	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	20	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	20	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	20	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)	12672-29-6	20	0	---	---	---	0.0073	---	---	No	100% Non-Detect
PCB-1254 (Aroclor 1254)	11097-69-1	20	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1260 (Aroclor 1260)	11096-82-5	20	0	---	---	---	0.88	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	20	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	20	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	20	0	---	---	---	0.000332	---	---	No	100% Non-Detect
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	40	30	0.0055	0.963	6.9	3.24	3	2.1	Yes	[Maximum] > ESV
Acenaphthene	83-32-9	41	40	0.016	13.475	190	0.25	28	760	Yes	[Maximum] > ESV
Acenaphthylene	208-96-8	41	7	0.033	0.563	1.2	120	0	<1	No	[Maximum] < ESV
Anthracene	120-12-7	41	40	0.049	25.116	250	6.8	16	36.8	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	41	40	0.029	309.111	3700	10	27	370	Yes	[Maximum] > ESV
Fluorene	86-73-7	41	33	0.012	8.238	82	3.7	11	22.2	Yes	[Maximum] > ESV
Naphthalene	91-20-3	41	28	0.028	1.628	12	0.0994	23	120.7	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	41	40	0.23	101.33	1300	5.5	25	236.4	Yes	[Maximum] > ESV
Total LMW PAHs - 1/2MDL	---	41	40	1.26675	459.17222	5561.4	29	23	191.8	Yes	[Maximum] > ESV
Total LMW PAHs - MDL	---	41	40	1.2855	460.555	5593.9	29	23	192.9	Yes	[Maximum] > ESV
Total LMW PAHs - Zero	---	41	40	1.248	457.789	5528.9	29	23	190.7	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	41	39	0.95	202.76	3100	1.52	37	2039.5	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	41	39	0.66	184.73	2700	0.73	38	3698.6	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	41	39	1.6	238.8	3000	18	25	166.7	Yes	[Maximum] > ESV
Benzo(G,H,I)Perylene	191-24-2	41	39	1.2	152	2200	25	18	88	Yes	[Maximum] > ESV
Benzo(K)Fluoranthene	207-08-9	41	39	1.2	144.9	2400	71	8	33.8	Yes	[Maximum] > ESV
Chrysene	218-01-9	41	40	0.011	208.761	2800	3.1	35	903.2	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	41	39	0.35	50.01	740	14	13	52.9	Yes	[Maximum] > ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	41	39	1.1	141.7	2000	71	9	28.2	Yes	[Maximum] > ESV
Pyrene	129-00-0	41	40	0.058	272.596	3200	10	26	320	Yes	[Maximum] > ESV
Total HMW PAHs - 1/2MDL	---	41	41	0.0865	1530.144	22140	1.1	39	20127.3	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	41	41	0.162	1530.148	22140	1.1	39	20127.3	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	41	41	0.011	1530.14	22140	1.1	39	20127.3	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											

Table B-9
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
1,2,4,5-Tetrachlorobenzene	95-94-3	40	0	---	---	---	2.02	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	40	0	---	---	---	2.05	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	40	0	---	---	---	0.199	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	40	0	---	---	---	4	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	40	0	---	---	---	9.94	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	40	0	---	---	---	87.5	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	40	0	---	---	---	0.01	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	40	0	---	---	---	0.0609	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	40	0	---	---	---	1.28	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	40	0	---	---	---	0.0328	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	40	0	---	---	---	0.0122	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	40	0	---	---	---	0.243	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	40	0	---	---	---	0.67	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	40	0	---	---	---	5.3	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	40	0	---	---	---	1.6	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	106445	20	0	---	---	---	NESV	---	---	No	100% Non-Detect
3,3'-Dichlorobenzidine	91-94-1	40	0	---	---	---	0.646	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	40	0	---	---	---	3.16	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	40	0	---	---	---	0.144	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	40	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	40	0	---	---	---	7.95	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	40	1	0.13	0.13	0.13	1	0	<1	No	[Maximum] < ESV
4-Chlorophenyl Phenyl Ether	7005-72-3	40	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	40	0	---	---	---	21.9	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	40	0	---	---	---	5.12	---	---	No	100% Non-Detect
Acetophenone	98-86-2	40	1	0.011	0.011	0.011	300	0	<1	No	[Maximum] < ESV
Atrazine	1912-24-9	40	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	40	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzyl Butyl Phthalate	85-68-7	40	1	0.55	0.55	0.55	0.239	1	2.3	Yes	[Maximum] > ESV
Biphenyl (Diphenyl)	92-52-4	40	6	0.0021	0.161	0.55	60	0	<1	No	[Maximum] < ESV
Bis(2-Chloroethoxy) Methane	111-91-1	40	0	---	---	---	0.302	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	40	0	---	---	---	23.7	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	40	0	---	---	---	19.9	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	40	4	0.17	1.62	5.9	0.02	4	295	Yes	[Maximum] > ESV
Caprolactam	105-60-2	40	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	40	38	0.0043	12.855	190	79	1	2.4	Yes	[Maximum] > ESV
Dibenzofuran	132-64-9	40	37	0.019	2.566	28	6.1	5	4.6	Yes	[Maximum] > ESV
Diethyl Phthalate	84-66-2	40	2	0.022	1.161	2.3	24.8	0	<1	No	[Maximum] < ESV
Dimethyl Phthalate	131-11-3	40	0	---	---	---	10	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	40	0	---	---	---	0.011	---	---	No	100% Non-Detect
Di-N-Octylphthalate	117-84-0	40	0	---	---	---	0.91	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	40	0	---	---	---	0.079	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	40	0	---	---	---	0.0398	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	40	0	---	---	---	0.755	---	---	No	100% Non-Detect

Table B-9
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Hexachloroethane	67-72-1	40	0	---	---	---	0.596	---	---	No	100% Non-Detect
Isophorone	78-59-1	40	0	---	---	---	139	---	---	No	100% Non-Detect
Nitrobenzene	98-95-3	40	0	---	---	---	1.31	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	40	0	---	---	---	0.544	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	40	0	---	---	---	0.545	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	40	0	---	---	---	0.119	---	---	No	100% Non-Detect
Phenol	108-95-2	40	1	0.26	0.26	0.26	0.79	0	<1	No	[Maximum] < ESV
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)											
1,1,1-Trichloroethane	71-55-6	9	0	---	---	---	29.8	---	---	No	100% Non-Detect
1,1,2,2-Tetrachloroethane	79-34-5	9	0	---	---	---	0.127	---	---	No	100% Non-Detect
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,1,2-Trichloroethane	79-00-5	9	0	---	---	---	28.6	---	---	No	100% Non-Detect
1,1-Dichloroethane	75-34-3	9	0	---	---	---	20.1	---	---	No	100% Non-Detect
1,1-Dichloroethene	75-35-4	9	0	---	---	---	8.28	---	---	No	100% Non-Detect
1,2,3-Trichlorobenzene	87-61-6	9	0	---	---	---	11.1	---	---	No	100% Non-Detect
1,2,4-Trichlorobenzene	120-82-1	9	0	---	---	---	0.27	---	---	No	100% Non-Detect
1,2-Dibromo-3-Chloropropane	96-12-8	9	0	---	---	---	0.0352	---	---	No	100% Non-Detect
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	9	0	---	---	---	1.23	---	---	No	100% Non-Detect
1,2-Dichlorobenzene	95-50-1	9	0	---	---	---	0.92	---	---	No	100% Non-Detect
1,2-Dichloroethane	107-06-2	9	0	---	---	---	0.85	---	---	No	100% Non-Detect
1,2-Dichloropropane	78-87-5	9	0	---	---	---	32.7	---	---	No	100% Non-Detect
1,3-Dichlorobenzene	541-73-1	9	0	---	---	---	0.74	---	---	No	100% Non-Detect
1,4-Dichlorobenzene	106-46-7	9	0	---	---	---	0.546	---	---	No	100% Non-Detect
2-Hexanone	591-78-6	9	2	0.0024	0.003	0.0036	0.36	0	<1	No	[Maximum] < ESV
Acetone	67-64-1	9	9	0.0096	0.1426	0.31	1.2	0	<1	No	[Maximum] < ESV
Benzene	71-43-2	9	4	0.00043	0.00146	0.0031	0.255	0	<1	No	[Maximum] < ESV
Bromochloromethane	74-97-5	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bromodichloromethane	75-27-4	9	0	---	---	---	0.54	---	---	No	100% Non-Detect
Bromoform	75-25-2	9	0	---	---	---	15.9	---	---	No	100% Non-Detect
Bromomethane	74-83-9	9	0	---	---	---	0.235	---	---	No	100% Non-Detect
Carbon Disulfide	75-15-0	9	6	0.00092	0.0039	0.0059	0.0941	0	<1	No	[Maximum] < ESV
Carbon Tetrachloride	56-23-5	9	0	---	---	---	2.98	---	---	No	100% Non-Detect
Chlorobenzene	108-90-7	9	0	---	---	---	2.4	---	---	No	100% Non-Detect
Chloroethane	75-00-3	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Chloroform	67-66-3	9	0	---	---	---	1.19	---	---	No	100% Non-Detect
Chloromethane	74-87-3	9	0	---	---	---	10.4	---	---	No	100% Non-Detect
Cis-1,2-Dichloroethylene	156-59-2	9	0	---	---	---	24	---	---	No	100% Non-Detect
Cis-1,3-Dichloropropene	10061-01-5	9	0	---	---	---	0.398	---	---	No	100% Non-Detect
Cyclohexane	110-82-7	9	3	0.0027	0.0048	0.0086	NESV	---	---	Yes	No ESV Available
Dibromochloromethane	124-48-1	9	0	---	---	---	2.05	---	---	No	100% Non-Detect
Dichlorodifluoromethane	75-71-8	9	0	---	---	---	39.5	---	---	No	100% Non-Detect
Ethylbenzene	100-41-4	9	3	0.0015	0.0023	0.0038	5.16	0	<1	No	[Maximum] < ESV
Isopropylbenzene (Cumene)	98-82-8	9	2	0.0002	0.0004	0.0005	NESV	---	---	Yes	No ESV Available

Table B-9
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Methyl Acetate	79-20-9	9	5	0.0022	0.0044	0.0065	NESV	---	---	Yes	No ESV Available
Methyl Ethyl Ketone (2-Butanone)	78-93-3	9	7	0.002	0.023	0.041	89.6	0	<1	No	[Maximum] < ESV
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	9	0	---	---	---	9.7	---	---	No	100% Non-Detect
Methylcyclohexane	108-87-2	9	3	0.0052	0.0086	0.015	NESV	---	---	Yes	No ESV Available
Methylene Chloride	75-09-2	9	1	0.002	0.002	0.002	2.6	0	<1	No	[Maximum] < ESV
Styrene	100-42-5	9	0	---	---	---	1.2	---	---	No	100% Non-Detect
Tert-Butyl Methyl Ether	1634-04-4	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Tetrachloroethylene (PCE)	127-18-4	9	0	---	---	---	0.18	---	---	No	100% Non-Detect
Toluene	108-88-3	9	8	0.00033	0.00338	0.013	5.45	0	<1	No	[Maximum] < ESV
Trans-1,2-Dichloroethene	156-60-5	9	0	---	---	---	0.784	---	---	No	100% Non-Detect
Trans-1,3-Dichloropropene	10061-02-6	9	0	---	---	---	0.398	---	---	No	100% Non-Detect
Trichloroethylene (TCE)	79-01-6	9	0	---	---	---	12.4	---	---	No	100% Non-Detect
Trichlorofluoromethane	75-69-4	9	0	---	---	---	16.4	---	---	No	100% Non-Detect
Vinyl Chloride	75-01-4	9	0	---	---	---	0.12	---	---	No	100% Non-Detect
M,P-Xylene	179601-23-1	9	5	0.00016	0.00359	0.0091	NESV	---	---	Yes	No ESV Available
O-Xylene (1,2-Dimethylbenzene)	95-47-6	9	3	0.00094	0.00195	0.0032	NESV	---	---	Yes	No ESV Available
Total Xylene - 1/2MDL	1330-20-7	9	5	0.00026	0.00482	0.0123	1.4	0	<1	No	[Maximum] < ESV
Total Xylene - MDL	1330-20-7	9	5	0.00036	0.00489	0.0123	1.4	0	<1	No	[Maximum] < ESV
Total Xylene - Zero	1330-20-7	9	5	0.00016	0.00476	0.0123	1.4	0	<1	No	[Maximum] < ESV
Physicochemical Parameters											
pH (s.u.)	---	22	22	5.57	6.98	7.82	NESV	---	---	---	---
Total Organic Carbon	7440440	24	23	12300	108674	494000	NESV	---	---	---	---

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
TAL: Target Analyte List
TCL: Target Compound List

Table B-10
Screening-Level Ecological Exposure Estimate for Surface Water
North Percolations Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (ug/L)												
Aluminum	7429-90-5	U	2	2	109	4370	8630	87	2	99.2	Yes	[Maximum] > ESV
Aluminum	7429-90-5	F	1	1	4780	4780	4780	87	1	54.9	Yes	[Maximum] > ESV
Antimony	7440-36-0	U	2	1	7.7	7.7	7.7	30	0	<1	No	[Maximum] < ESV
Antimony	7440-36-0	F	1	1	7.2	7.2	7.2	30	0	<1	No	[Maximum] < ESV
Arsenic	7440-38-2	U	2	1	2.4	2.4	2.4	5	0	<1	No	[Maximum] < ESV
Arsenic	7440-38-2	F	1	1	1	1	1	3.1	0	<1	No	[Maximum] < ESV
Barium	7440-39-3	U	2	2	43.4	138.7	234	4	2	58.5	Yes	[Maximum] > ESV
Barium	7440-39-3	F	1	1	26.4	26.4	26.4	4	1	6.6	Yes	[Maximum] > ESV
Beryllium	7440-41-7	U	2	1	0.71	0.71	0.71	0.66	1	1.1	Yes	[Maximum] > ESV
Beryllium	7440-41-7	F	1	1	0.51	0.51	0.51	0.66	0	<1	No	[Maximum] < ESV
Cadmium	7440-43-9	U	2	1	3	3	3	0.089	1	33.6	Yes	[Maximum] > ESV
Cadmium	7440-43-9	F	1	1	2.5	2.5	2.5	0.089	1	28	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	U	2	1	2.7	2.7	2.7	8.9	0	<1	No	[Maximum] < ESV
Chromium, Total	7440-47-3	F	1	0	---	---	---	8.9	---	---	No	100% Non-Detect
Cobalt	7440-48-4	U	2	1	1.6	1.6	1.6	5.1	0	<1	No	[Maximum] < ESV
Cobalt	7440-48-4	F	1	0	---	---	---	5.1	---	---	No	100% Non-Detect
Copper	7440-50-8	U	2	2	3.8	10.2	16.5	0.23	2	71.7	Yes	[Maximum] > ESV
Copper	7440-50-8	F	1	1	2	2	2	0.23	1	8.7	Yes	[Maximum] > ESV
Iron	7439-89-6	U	2	1	817	817	817	300	1	2.7	Yes	[Maximum] > ESV
Iron	7439-89-6	F	1	0	---	---	---	158	---	---	No	100% Non-Detect
Lead	7439-92-1	U	2	1	7.6	7.6	7.6	1.316	1	5.8	Yes	[Maximum] > ESV
Lead	7439-92-1	F	1	0	---	---	---	1.172	---	---	No	100% Non-Detect
Manganese	7439-96-5	U	2	1	37.4	37.4	37.4	120	0	<1	No	[Maximum] < ESV
Manganese	7439-96-5	F	1	1	31.8	31.8	31.8	120	0	<1	No	[Maximum] < ESV
Mercury	7439-97-6	U	2	0	---	---	---	0.026	---	---	No	100% Non-Detect
Mercury	7439-97-6	F	1	0	---	---	---	0.026	---	---	No	100% Non-Detect
Nickel	7440-02-0	U	2	2	1.9	28.9	55.9	29.0196	1	1.9	Yes	[Maximum] > ESV
Nickel	7440-02-0	F	1	1	22.1	22.1	22.1	5	1	4.4	Yes	[Maximum] > ESV
Selenium	7782-49-2	U	2	0	---	---	---	1	---	---	No	100% Non-Detect
Selenium	7782-49-2	F	1	0	---	---	---	3.1	---	---	No	100% Non-Detect
Silver	7440-22-4	U	2	0	---	---	---	0.25	---	---	No	100% Non-Detect
Silver	7440-22-4	F	1	0	---	---	---	0.12	---	---	No	100% Non-Detect
Thallium	7440-28-0	U	2	1	0.27	0.27	0.27	0.8	0	<1	No	[Maximum] < ESV
Thallium	7440-28-0	F	1	0	---	---	---	12	---	---	No	100% Non-Detect
Vanadium	7440-62-2	U	2	2	6.9	12.4	18	NESV	---	---	Yes	No ESV Available
Vanadium	7440-62-2	F	1	1	4.3	4.3	4.3	20	0	<1	No	[Maximum] < ESV
Zinc	7440-66-6	U	2	1	537	537	537	66.597	1	8.1	Yes	[Maximum] > ESV
Zinc	7440-66-6	F	1	1	512	512	512	7	1	73.1	Yes	[Maximum] > ESV
Other Inorganic Parameters (ug/L unless otherwise noted)												
Chloride (As Cl)	16887-00-6	U	2	2	1390	1495	1600	120000	0	<1	No	[Maximum] < ESV
Cyanide	57-12-5	U	2	1	7.6	7.6	7.6	5.2	1	1.5	Yes	[Maximum] > ESV
Cyanide	57-12-5	F	1	0	---	---	---	5.2	---	---	No	100% Non-Detect
Fluoride	16984-48-8	U	2	2	2150	12275	22400	120	2	186.7	Yes	[Maximum] > ESV
Fluoride	16984-48-8	F	1	1	21500	21500	21500	120	1	179.2	Yes	[Maximum] > ESV
Nitrogen, Ammonia (As N)	7664-41-7	U	2	1	1840	1840	1840	3327.436	0	<1	No	[Maximum] < ESV
Essential Nutrients (ug/L)												
Calcium	7440-70-2	U	2	2	7860	35580	63300	116000	0	<1	No	Essential Nutrient
Calcium	7440-70-2	F	1	1	7020	7020	7020	116000	0	<1	No	Essential Nutrient
Magnesium	7439-95-4	U	2	2	804	7352	13900	82000	0	<1	No	Essential Nutrient

Table B-10
Screening-Level Ecological Exposure Estimate for Surface Water
North Percolations Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Magnesium	7439-95-4	F	1	1	384	384	384	82000	0	<1	No	Essential Nutrient
Potassium	7440-09-7	U	2	2	646	730	814	53000	0	<1	No	Essential Nutrient
Potassium	7440-09-7	F	1	1	760	760	760	53000	0	<1	No	Essential Nutrient
Sodium	7440-23-5	U	2	2	5280	6005	6730	680000	0	<1	No	Essential Nutrient
Sodium	7440-23-5	F	1	1	6180	6180	6180	680000	0	<1	No	Essential Nutrient
Pesticides (ug/L)												
Aldrin	309-00-2	U	1	0	---	---	---	0.004	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	U	1	0	---	---	---	2.2	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	U	1	0	---	---	---	0.003	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	U	1	0	---	---	---	2.2	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	U	1	0	---	---	---	0.051	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	U	1	0	---	---	---	0.0043	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	U	1	0	---	---	---	2.2	---	---	No	100% Non-Detect
Dieldrin	60-57-1	U	1	0	---	---	---	0.056	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	U	1	0	---	---	---	0.051	---	---	No	100% Non-Detect
Endrin	72-20-8	U	1	0	---	---	---	0.0023	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	U	1	0	---	---	---	0.036	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	U	1	0	---	---	---	0.036	---	---	No	100% Non-Detect
Gamma Bhc (Lindane)	58-89-9	U	1	0	---	---	---	0.01	---	---	No	100% Non-Detect
Heptachlor	76-44-8	U	1	0	---	---	---	0.0019	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	U	1	0	---	---	---	0.0019	---	---	No	100% Non-Detect
Methoxychlor	72-43-5	U	1	0	---	---	---	0.019	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	U	1	0	---	---	---	0.001	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	U	1	0	---	---	---	0.001	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	U	1	0	---	---	---	0.0005	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	U	1	0	---	---	---	0.0002	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	U	1	0	---	---	---	0.0043	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (ug/L)												
PCB-1016 (Aroclor 1016)	12674-11-2	U	1	0	---	---	---	0.000074	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	U	1	0	---	---	---	0.000074	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	U	1	0	---	---	---	0.000074	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	U	1	0	---	---	---	0.000074	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)	12672-29-6	U	1	0	---	---	---	0.000074	---	---	No	100% Non-Detect
PCB-1254 (Aroclor 1254)	11097-69-1	U	1	0	---	---	---	0.000074	---	---	No	100% Non-Detect
PCB-1260 (Aroclor 1260)	11096-82-5	U	1	0	---	---	---	0.000074	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	U	1	0	---	---	---	0.000074	---	---	No	100% Non-Detect
Polycyclic Aromatic Hydrocarbons (PAHs) (ug/L)												
2-Methylnaphthalene	91-57-6	U	1	0	---	---	---	4.7	---	---	No	100% Non-Detect
Acenaphthene	83-32-9	U	1	0	---	---	---	5.8	---	---	No	100% Non-Detect
Acenaphthylene	208-96-8	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Anthracene	120-12-7	U	1	0	---	---	---	0.012	---	---	No	100% Non-Detect
Benzo(A)Anthracene	56-55-3	U	1	1	3	3	3	0.018	1	166.7	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	U	1	1	3.9	3.9	3.9	0.014	1	278.6	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	U	1	1	10	10	10	NESV	---	---	Yes	No ESV Available
Benzo(G,H,I)Perylene	191-24-2	U	1	1	3.9	3.9	3.9	NESV	---	---	Yes	No ESV Available
Benzo(K)Fluoranthene	207-08-9	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Chrysene	218-01-9	U	1	1	7.6	7.6	7.6	NESV	---	---	Yes	No ESV Available

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Screening-Level Ecological Exposure Estimate for Surface Water
North Percolations Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Dibenz(A,H)Anthracene	53-70-3	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Fluoranthene	206-44-0	U	1	1	9.3	9.3	9.3	0.04	1	232.5	Yes	[Maximum] > ESV
Fluorene	86-73-7	U	1	0	---	---	---	3	---	---	No	100% Non-Detect
Indeno(1,2,3-C,D)Pyrene	193-39-5	U	1	1	3.1	3.1	3.1	NESV	---	---	Yes	No ESV Available
Naphthalene	91-20-3	U	1	0	---	---	---	1.1	---	---	No	100% Non-Detect
Phenanthrene	85-01-8	U	1	1	1.5	1.5	1.5	0.4	1	3.8	Yes	[Maximum] > ESV
Pyrene	129-00-0	U	1	1	7	7	7	0.025	1	280	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (ug/L)												
1,2,4,5-Tetrachlorobenzene	95-94-3	U	1	0	---	---	---	3	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	U	1	0	---	---	---	1	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	U	1	0	---	---	---	4.9	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	U	1	0	---	---	---	11	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	U	1	0	---	---	---	44	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	U	1	0	---	---	---	81	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	U	1	0	---	---	---	24	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	U	1	0	---	---	---	13	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	U	1	0	---	---	---	300	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	MEPH3MEPH4	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
3,3'-Dichlorobenzidine	91-94-1	U	1	0	---	---	---	4.5	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	U	1	0	---	---	---	1.5	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	U	1	0	---	---	---	232	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	U	1	0	---	---	---	60	---	---	No	100% Non-Detect
Acetophenone	98-86-2	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Atrazine	1912-24-9	U	1	0	---	---	---	1.8	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzyl Butyl Phthalate	85-68-7	U	1	0	---	---	---	19	---	---	No	100% Non-Detect
Biphenyl (Diphenyl)	92-52-4	U	1	0	---	---	---	14	---	---	No	100% Non-Detect
Bis(2-Chloroethoxy) Methane	111-91-1	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	U	1	0	---	---	---	3	---	---	No	100% Non-Detect
Caprolactam	105-60-2	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Dibenzofuran	132-64-9	U	1	0	---	---	---	3.7	---	---	No	100% Non-Detect
Diethyl Phthalate	84-66-2	U	1	0	---	---	---	210	---	---	No	100% Non-Detect
Dimethyl Phthalate	131-11-3	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	U	1	0	---	---	---	19	---	---	No	100% Non-Detect

Table B-10
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North Percolations Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Di-N-Octylphthalate	117-84-0	U	1	0	---	---	---	22	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	U	1	0	---	---	---	0.0003	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	U	1	0	---	---	---	1.3	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	U	1	0	---	---	---	12	---	---	No	100% Non-Detect
Isophorone	78-59-1	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Nitrobenzene	98-95-3	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	U	1	0	---	---	---	210	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	U	1	0	---	---	---	0.5	---	---	No	100% Non-Detect
Phenol	108-95-2	U	1	0	---	---	---	4	---	---	No	100% Non-Detect
TCL Volatile Organic Compounds (TCL VOCs) (ug/L)												
1,1,1-Trichloroethane	71-55-6	U	1	0	---	---	---	11	---	---	No	100% Non-Detect
1,1,2,2-Tetrachloroethane	79-34-5	U	1	0	---	---	---	610	---	---	No	100% Non-Detect
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,1,2-Trichloroethane	79-00-5	U	1	0	---	---	---	1200	---	---	No	100% Non-Detect
1,1-Dichloroethane	75-34-3	U	1	0	---	---	---	47	---	---	No	100% Non-Detect
1,1-Dichloroethene	75-35-4	U	1	0	---	---	---	25	---	---	No	100% Non-Detect
1,2,3-Trichlorobenzene	87-61-6	U	1	0	---	---	---	8	---	---	No	100% Non-Detect
1,2,4-Trichlorobenzene	120-82-1	U	1	0	---	---	---	24	---	---	No	100% Non-Detect
1,2-Dibromo-3-Chloropropane	96-12-8	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,2-Dichlorobenzene	95-50-1	U	1	0	---	---	---	0.7	---	---	No	100% Non-Detect
1,2-Dichloroethane	107-06-2	U	1	0	---	---	---	100	---	---	No	100% Non-Detect
1,2-Dichloropropane	78-87-5	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,3-Dichlorobenzene	541-73-1	U	1	0	---	---	---	71	---	---	No	100% Non-Detect
1,4-Dichlorobenzene	106-46-7	U	1	0	---	---	---	15	---	---	No	100% Non-Detect
2-Hexanone	591-78-6	U	1	0	---	---	---	99	---	---	No	100% Non-Detect
Acetone	67-64-1	U	1	1	12	12	12	1500	0	<1	No	[Maximum] < ESV
Benzene	71-43-2	U	1	0	---	---	---	130	---	---	No	100% Non-Detect
Bromochloromethane	74-97-5	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bromodichloromethane	75-27-4	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bromoform	75-25-2	U	1	0	---	---	---	320	---	---	No	100% Non-Detect
Bromomethane	74-83-9	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbon Disulfide	75-15-0	U	1	0	---	---	---	0.92	---	---	No	100% Non-Detect
Carbon Tetrachloride	56-23-5	U	1	0	---	---	---	9.8	---	---	No	100% Non-Detect
Chlorobenzene	108-90-7	U	1	0	---	---	---	1.3	---	---	No	100% Non-Detect
Chloroethane	75-00-3	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Chloroform	67-66-3	U	1	0	---	---	---	1.8	---	---	No	100% Non-Detect
Chloromethane	74-87-3	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Cis-1,2-Dichloroethylene	156-59-2	U	1	0	---	---	---	590	---	---	No	100% Non-Detect
Cis-1,3-Dichloropropene	10061-01-5	U	1	0	---	---	---	0.055	---	---	No	100% Non-Detect
Cyclohexane	110-82-7	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Dibromochloromethane	124-48-1	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Dichlorodifluoromethane	75-71-8	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Ethylbenzene	100-41-4	U	1	0	---	---	---	7.3	---	---	No	100% Non-Detect
Isopropylbenzene (Cumene)	98-82-8	U	1	0	---	---	---	2.6	---	---	No	100% Non-Detect
Methyl Acetate	79-20-9	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect

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Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Methyl Ethyl Ketone (2-Butanone)	78-93-3	U	1	0	---	---	---	14000	---	---	No	100% Non-Detect
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	U	1	0	---	---	---	170	---	---	No	100% Non-Detect
Methylcyclohexane	108-87-2	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Methylene Chloride	75-09-2	U	1	0	---	---	---	98.1	---	---	No	100% Non-Detect
Styrene	100-42-5	U	1	0	---	---	---	72	---	---	No	100% Non-Detect
Tert-Butyl Methyl Ether	1634-04-4	U	1	0	---	---	---	10000	---	---	No	100% Non-Detect
Tetrachloroethylene (PCE)	127-18-4	U	1	0	---	---	---	98	---	---	No	100% Non-Detect
Toluene	108-88-3	U	1	0	---	---	---	2	---	---	No	100% Non-Detect
Trans-1,2-Dichloroethene	156-60-5	U	1	0	---	---	---	590	---	---	No	100% Non-Detect
Trans-1,3-Dichloropropene	10061-02-6	U	1	0	---	---	---	0.055	---	---	No	100% Non-Detect
Trichloroethylene (TCE)	79-01-6	U	1	0	---	---	---	21	---	---	No	100% Non-Detect
Trichlorofluoromethane	75-69-4	U	1	0	---	---	---	NESV	---	---	No	100% Non-Detect
Vinyl Chloride	75-01-4	U	1	0	---	---	---	930	---	---	No	100% Non-Detect
M,P-Xylene	179601-23-1	U	1	0	---	---	---	1.8	---	---	No	100% Non-Detect
O-Xylene (1,2-Dimethylbenzene)	95-47-6	U	1	0	---	---	---	13	---	---	No	100% Non-Detect
Total Xylene - 1/2MDL	1330-20-7	U	1	0	---	---	---	13	---	---	No	100% Non-Detect
Total Xylene - MDL	1330-20-7	U	1	0	---	---	---	13	---	---	No	100% Non-Detect
Total Xylene - Zero	1330-20-7	U	1	0	---	---	---	13	---	---	No	100% Non-Detect
Physicochemical Parameters												
Alkalinity, Total (As CaCO3)	---	U	2	2	13900	115450	217000	NESV	---	---	---	---
Dissolved Oxygen	---	U	2	2	5410	6290	7170	NESV	---	---	---	---
Hardness (As CaCO3)	---	U	2	2	50000	137000	224000	NESV	---	---	---	---
Oxidation-Reduction Potential (mv)	---	U	2	2	177	234	290	NESV	---	---	---	---
pH (s.u.)	---	U	2	2	5.37	6.25	7.14	NESV	---	---	---	---
Specific Conductance (ms/cm)	---	U	2	2	0.119	0.266	0.413	NESV	---	---	---	---
Temperature (°C)	---	U	2	2	5.34	9.64	13.95	NESV	---	---	---	---
Total Dissolved Solids	---	U	2	2	84000	158000	232000	NESV	---	---	---	---
Total Suspended Solids	---	U	2	2	7400	32700	58000	NESV	---	---	---	---
Turbidity (NTU)	---	U	2	2	2.56	10.03	17.5	NESV	---	---	---	---
Other Nutrients (ug/L)												
Nitrogen, Nitrite + Nitrate	NO3NO2N	U	2	2	127	227	327	NESV	---	---	No	Other Nutrient
Phosphorus, Total Orthophosphate (As P)	---	U	2	0	---	---	---	NESV	---	---	No	Other Nutrient
Sulfate (As SO4)	14808-79-8	U	2	2	4390	8795	13200	NESV	---	---	No	Other Nutrient
Sulfide	18496-25-8	U	1	0	---	---	---	NESV	---	---	No	Other Nutrient

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
[Maximum]: Maximum concentration
NESV: No Ecological Screening Value
MDL: Method Detection Limit
SW: Surface Water
TAL: Target Analyte List
TCL: Target Compound List
U: Unfiltered
F: Filtered

Table B-11
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	22	22	7520	37392	112000	26000	11	4.3	Yes	[Maximum] > ESV
Antimony	7440-36-0	22	7	0.43	1.45	2.6	2	2	1.3	Yes	[Maximum] > ESV
Arsenic	7440-38-2	22	22	2.5	10.6	26.4	9.79	9	2.7	Yes	[Maximum] > ESV
Barium	7440-39-3	22	22	19.6	197.4	539	NESV	---	---	Yes	No ESV Available
Beryllium	7440-41-7	22	22	0.34	2.62	17.2	NESV	---	---	Yes	No ESV Available
Cadmium	7440-43-9	22	21	0.29	2.56	8.3	0.583	19	14.2	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	24	24	7.2	24.2	53	36.2	5	1.5	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	22	20	0.21	0.62	1.27	NESV	---	---	Yes	No ESV Available
Chromium, Trivalent	16065-83-1	22	22	6.81	21.51	46.23	NESV	---	---	Yes	No ESV Available
Cobalt	7440-48-4	22	22	1.2	7.2	27.4	50	0	<1	No	[Maximum] < ESV
Copper	7440-50-8	22	22	6.4	36.3	83.6	28	12	3	Yes	[Maximum] > ESV
Iron	7439-89-6	22	22	1330	7930	15400	20000	0	<1	No	[Maximum] < ESV
Lead	7439-92-1	22	22	8.3	52.7	238	35.8	7	6.6	Yes	[Maximum] > ESV
Manganese	7439-96-5	22	22	12.8	139.4	479	460	1	1	Yes	[Maximum] > ESV
Mercury	7439-97-6	22	18	0.014	0.04	0.12	0.174	0	<1	No	[Maximum] < ESV
Nickel	7440-02-0	22	22	17.9	240	1250	19.5	21	64.1	Yes	[Maximum] > ESV
Selenium	7782-49-2	22	16	0.34	1.23	3.4	2	3	1.7	Yes	[Maximum] > ESV
Silver	7440-22-4	22	2	1	1	1	0.5	2	2	Yes	[Maximum] > ESV
Thallium	7440-28-0	22	19	0.14	0.85	4.6	NESV	---	---	Yes	No ESV Available
Vanadium	7440-62-2	22	22	13.3	76.6	348	NESV	---	---	Yes	No ESV Available
Zinc	7440-66-6	22	22	42.2	260.4	871	98	20	8.9	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	22	22	0.096	12.525	137	0.0001	22	1370000	Yes	[Maximum] > ESV
Fluoride	16984-48-8	22	22	2.42	96.08	241	290.2	0	<1	No	[Maximum] < ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	22	22	427	20180	106000	NESV	---	---	Yes	Essential Nutrient
Magnesium	7439-95-4	22	22	442	4847	11800	NESV	---	---	Yes	Essential Nutrient
Potassium	7440-09-7	22	22	101	701	1900	NESV	---	---	Yes	Essential Nutrient
Sodium	7440-23-5	22	21	28.4	385	2140	NESV	---	---	Yes	Essential Nutrient
Pesticides (mg/kg)											
Aldrin	309-00-2	9	0	---	---	---	0.002	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	9	0	---	---	---	0.006	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	9	0	---	---	---	0.00000642	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	9	0	---	---	---	0.005	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	9	0	---	---	---	0.00000642	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	9	0	---	---	---	0.138810616	---	---	No	100% Non-Detect
Dieldrin	60-57-1	9	0	---	---	---	0.0019	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	9	0	---	---	---	0.00000642	---	---	No	100% Non-Detect
Endrin	72-20-8	9	0	---	---	---	0.00222	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	9	0	---	---	---	0.004428	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Gamma Bhc (Lindane)	58-89-9	9	0	---	---	---	0.00237	---	---	No	100% Non-Detect

Table B-11
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Heptachlor	76-44-8	9	0	---	---	---	0.0006	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	9	0	---	---	---	0.00247	---	---	No	100% Non-Detect
Methoxychlor	72-43-5	9	0	---	---	---	0.0136	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	9	0	---	---	---	0.00488	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	9	0	---	---	---	0.00316	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	9	0	---	---	---	0.00416	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	9	0	---	---	---	0.000077	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)	12672-29-6	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1254 (Aroclor 1254)	11097-69-1	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1260 (Aroclor 1260)	11096-82-5	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	11	0	---	---	---	0.032	---	---	No	100% Non-Detect
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	22	18	0.017	1.132	6.9	0.0202	16	341.6	Yes	[Maximum] > ESV
Acenaphthene	83-32-9	22	22	0.031	18.535	190	0.00671	22	28315.9	Yes	[Maximum] > ESV
Acenaphthylene	208-96-8	22	6	0.033	0.548	1.2	0.00587	6	204.4	Yes	[Maximum] > ESV
Anthracene	120-12-7	22	22	0.049	29.153	250	0.01	22	25000	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	22	22	0.029	370.351	3700	0.031	21	119354.8	Yes	[Maximum] > ESV
Fluorene	86-73-7	22	19	0.012	9.478	82	0.01	19	8200	Yes	[Maximum] > ESV
Naphthalene	91-20-3	22	16	0.042	1.863	12	0.015	16	800	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	22	22	0.51	121.99	1300	0.019	22	68421.1	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	22	21	2	285	3100	0.032	21	96875	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	22	21	1.7	258.3	2700	0.016	21	168750	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	22	21	5	324	3000	9.79	16	306.4	Yes	[Maximum] > ESV
Benzo(G,H,I)Perylene	191-24-2	22	21	2.2	211	2200	0.016	21	137500	Yes	[Maximum] > ESV
Benzo(K)Fluoranthene	207-08-9	22	21	2.4	206.2	2400	0.24	21	10000	Yes	[Maximum] > ESV
Chrysene	218-01-9	22	21	2.3	287.4	2800	0.027	21	103703.7	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	22	21	0.61	70.26	740	0.01	21	74000	Yes	[Maximum] > ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	22	21	2.7	197	2000	0.017	21	117647.1	Yes	[Maximum] > ESV
Pyrene	129-00-0	22	22	0.058	331.566	3200	0.044	22	72727.3	Yes	[Maximum] > ESV
Total PAHs - 1/2MDL	---	22	22	1.091	2329.252	24694.5	0.26	22	94978.8	Yes	[Maximum] > ESV
Total PAHs - MDL	---	22	22	1.161	2330.88	24727	0.26	22	95103.8	Yes	[Maximum] > ESV
Total PAHs - Zero	---	22	22	1.021	2327.625	24662	0.26	22	94853.8	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
1,2,4,5-Tetrachlorobenzene	95-94-3	22	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	22	0	---	---	---	NESV	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	22	0	---	---	---	0.129	---	---	No	100% Non-Detect

Table B-11
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
2,4,5-Trichlorophenol	95-95-4	22	0	---	---	---	0.288	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	22	0	---	---	---	0.208	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	22	0	---	---	---	0.0817	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	22	0	---	---	---	0.029	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	22	0	---	---	---	0.00621	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	22	0	---	---	---	0.0144	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	22	0	---	---	---	0.0398	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	22	0	---	---	---	0.417	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	22	0	---	---	---	0.02716	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	22	0	---	---	---	0.011856	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	22	0	---	---	---	NESV	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	22	0	---	---	---	NESV	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	106445	11	0	---	---	---	0.0202	---	---	No	100% Non-Detect
3,3'-Dichlorobenzidine	91-94-1	22	0	---	---	---	0.127	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	22	0	---	---	---	NESV	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	22	0	---	---	---	0.104	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	22	0	---	---	---	0.255	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	22	0	---	---	---	0.388	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	22	1	0.13	0.13	0.13	0.146	0	<1	No	[Maximum] < ESV
4-Chlorophenyl Phenyl Ether	7005-72-3	22	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	22	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	22	0	---	---	---	0.013	---	---	No	100% Non-Detect
Acetophenone	98-86-2	22	1	0.011	0.011	0.011	NESV	---	---	Yes	No ESV Available
Atrazine	1912-24-9	22	0	---	---	---	0.00662	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	22	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzyl Butyl Phthalate	85-68-7	22	1	0.55	0.55	0.55	1.97	0	<1	No	[Maximum] < ESV
Biphenyl (Diphenyl)	92-52-4	22	3	0.0047	0.2089	0.55	1.22	0	<1	No	[Maximum] < ESV
Bis(2-Chloroethoxy) Methane	111-91-1	22	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	22	0	---	---	---	3.52	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	22	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	22	2	0.17	0.18	0.18	0.18	0	1	No	[Maximum] < ESV
Caprolactam	105-60-2	22	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	22	21	0.11	16.24	190	NESV	---	---	Yes	No ESV Available
Dibenzofuran	132-64-9	22	21	0.036	2.659	28	0.300736	12	93.1	Yes	[Maximum] > ESV
Diethyl Phthalate	84-66-2	22	1	0.022	0.022	0.022	0.295	0	<1	No	[Maximum] < ESV
Dimethyl Phthalate	131-11-3	22	0	---	---	---	NESV	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	22	0	---	---	---	1.1989	---	---	No	100% Non-Detect
Di-N-Octylphthalate	117-84-0	22	0	---	---	---	16.8858	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	22	0	---	---	---	0.02	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	22	0	---	---	---	0.0265	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	22	0	---	---	---	0.901	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	22	0	---	---	---	0.2136	---	---	No	100% Non-Detect
Isophorone	78-59-1	22	0	---	---	---	0.432	---	---	No	100% Non-Detect
Nitrobenzene	98-95-3	22	0	---	---	---	0.145	---	---	No	100% Non-Detect

Table B-11
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
N-Nitrosodi-N-Propylamine	621-64-7	22	0	---	---	---	NESV	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	22	0	---	---	---	0.516	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	22	0	---	---	---	0.504	---	---	No	100% Non-Detect
Phenol	108-95-2	22	0	---	---	---	0.001152	---	---	No	100% Non-Detect
Physicochemical Parameters											
pH (s.u.)	---	11	11	5.57	6.83	7.74	NESV	---	---	---	---
Total Organic Carbon	7440440	13	13	23500	147077	494000	NESV	---	---	---	---

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
TAL: Target Analyte List
TCL: Target Compound List

Table B-12
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	38	38	2360	7567	16100	50	38	322	Yes	[Maximum] > ESV
Antimony	7440-36-0	38	1	0.67	0.67	0.67	0.142	1	4.7	Yes	[Maximum] > ESV
Arsenic	7440-38-2	38	35	0.46	1.74	3.7	5.7	0	<1	No	[Maximum] < ESV
Barium	7440-39-3	38	38	43.1	431	972	1.04	38	934.6	Yes	[Maximum] > ESV
Beryllium	7440-41-7	38	29	0.11	0.41	0.79	1.06	0	<1	No	[Maximum] < ESV
Cadmium	7440-43-9	38	4	0.95	1.51	2.5	0.00222	4	1126.1	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	38	38	2.6	9	32.8	23	1	1.4	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	24	24	0.066	0.251	0.878	0.34	3	2.6	Yes	[Maximum] > ESV
Chromium, Trivalent	16065-83-1	24	24	2.53	9.12	31.92	23	1	1.4	Yes	[Maximum] > ESV
Cobalt	7440-48-4	38	36	1.2	3.9	7.2	0.14	36	51.4	Yes	[Maximum] > ESV
Copper	7440-50-8	38	38	3.3	80.8	694	5.4	37	128.5	Yes	[Maximum] > ESV
Iron	7439-89-6	38	38	1490	8008	16300	NESV	---	---	Yes	No ESV Available
Lead	7439-92-1	38	38	2.1	14.9	116	0.0537	38	2160.1	Yes	[Maximum] > ESV
Manganese	7439-96-5	38	38	10.7	86.3	226	220	1	1	Yes	[Maximum] > ESV
Mercury	7439-97-6	38	32	0.015	0.134	1.4	0.1	8	14	Yes	[Maximum] > ESV
Nickel	7440-02-0	38	38	4.3	14.4	53.9	10	29	5.4	Yes	[Maximum] > ESV
Selenium	7782-49-2	38	7	0.4	0.8	1.3	0.0276	7	47.1	Yes	[Maximum] > ESV
Silver	7440-22-4	38	3	1.7	9.8	23.5	2	2	11.8	Yes	[Maximum] > ESV
Thallium	7440-28-0	38	1	0.2	0.2	0.2	0.05	1	4	Yes	[Maximum] > ESV
Vanadium	7440-62-2	38	38	2.3	10.8	55.7	1.59	38	35	Yes	[Maximum] > ESV
Zinc	7440-66-6	38	38	13.1	81.1	351	6.62	38	53	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	38	33	0.038	1.243	16.4	0.098	29	167.3	Yes	[Maximum] > ESV
Cyanide (Free)	STL00131	2	1	0.89	0.89	0.89	1.33	0	<1	No	[Maximum] < ESV
Fluoride	16984-48-8	38	34	1.26	19.27	93.7	120	0	<1	No	[Maximum] < ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	38	38	5140	125544	313000	NESV	---	---	Yes	Essential Nutrient
Magnesium	7439-95-4	38	38	2510	7420	16200	NESV	---	---	Yes	Essential Nutrient
Potassium	7440-09-7	38	38	194	678	1790	NESV	---	---	Yes	Essential Nutrient
Sodium	7440-23-5	38	31	40.3	173.3	434	NESV	---	---	Yes	Essential Nutrient
Pesticides (mg/kg)											
Aldrin	309-00-2	9	0	---	---	---	0.00332	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	9	0	---	---	---	0.0994	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	9	0	---	---	---	0.119	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	9	0	---	---	---	0.00398	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	9	0	---	---	---	0.119	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	9	0	---	---	---	0.224	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	9	0	---	---	---	0.005	---	---	No	100% Non-Detect
Dieldrin	60-57-1	9	0	---	---	---	0.00238	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	9	0	---	---	---	0.0358	---	---	No	100% Non-Detect
Endrin	72-20-8	9	0	---	---	---	0.0014	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	9	0	---	---	---	0.0105	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	9	0	---	---	---	NESV	---	---	No	100% Non-Detect

Table B-12
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Gamma Bhc (Lindane)	58-89-9	9	0	---	---	---	0.005	---	---	No	100% Non-Detect
Heptachlor	76-44-8	9	0	---	---	---	0.00598	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	9	0	---	---	---	0.152	---	---	No	100% Non-Detect
Methoxychlor	72-43-5	9	0	---	---	---	0.0199	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	9	0	---	---	---	0.0063	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	9	0	---	---	---	0.021	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	9	0	---	---	---	0.0035	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	9	0	---	---	---	0.119	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	9	0	---	---	---	0.224	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	21	0	---	---	---	1.1	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	21	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	21	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	21	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)	12672-29-6	21	0	---	---	---	0.0073	---	---	No	100% Non-Detect
PCB-1254 (Aroclor 1254)	11097-69-1	21	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1260 (Aroclor 1260)	11096-82-5	21	0	---	---	---	0.88	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	21	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	21	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	21	0	---	---	---	0.000332	---	---	No	100% Non-Detect
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	38	2	0.01	0.01	0.01	3.24	0	<1	No	[Maximum] < ESV
Acenaphthene	83-32-9	38	4	0.01	0.01	0.02	0.25	0	<1	No	[Maximum] < ESV
Acenaphthylene	208-96-8	38	0	---	---	---	120	---	---	No	100% Non-Detect
Anthracene	120-12-7	38	6	0.021	0.043	0.096	6.8	0	<1	No	[Maximum] < ESV
Fluoranthene	206-44-0	38	35	0.033	0.309	1.3	10	0	<1	No	[Maximum] < ESV
Fluorene	86-73-7	38	2	0.0087	0.0143	0.02	3.7	0	<1	No	[Maximum] < ESV
Naphthalene	91-20-3	38	1	0.015	0.015	0.015	0.0994	0	<1	No	[Maximum] < ESV
Phenanthrene	85-01-8	38	35	0.013	0.133	0.55	5.5	0	<1	No	[Maximum] < ESV
Total LMW PAHs - 1/2MDL	---	38	35	0.0955	0.5412	2.485	29	0	<1	No	[Maximum] < ESV
Total LMW PAHs - MDL	---	38	35	0.132	0.629	3.12	29	0	<1	No	[Maximum] < ESV
Total LMW PAHs - Zero	---	38	35	0.059	0.453	1.85	29	0	<1	No	[Maximum] < ESV
Benzo(A)Pyrene	50-32-8	38	31	0.018	0.446	4	1.52	2	2.6	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	38	30	0.04	0.2	0.75	0.73	1	1	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	38	33	0.029	0.711	6.6	18	0	<1	No	[Maximum] < ESV
Benzo(G,H,I)Perylene	191-24-2	38	32	0.035	0.46	2.7	25	0	<1	No	[Maximum] < ESV
Benzo(K)Fluoranthene	207-08-9	38	32	0.022	0.143	0.64	71	0	<1	No	[Maximum] < ESV
Chrysene	218-01-9	38	35	0.026	0.405	2.6	3.1	0	<1	No	[Maximum] < ESV
Dibenz(A,H)Anthracene	53-70-3	38	19	0.035	0.117	0.44	14	0	<1	No	[Maximum] < ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	38	32	0.044	0.486	3.1	71	0	<1	No	[Maximum] < ESV
Pyrene	129-00-0	38	34	0.032	0.277	1.3	10	0	<1	No	[Maximum] < ESV
Total HMW PAHs - 1/2MDL	---	38	35	0.163	2.997	19.635	1.1	23	17.9	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	38	35	0.221	3.028	20.17	1.1	23	18.3	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	38	35	0.105	2.967	19.1	1.1	23	17.4	Yes	[Maximum] > ESV

Table B-12
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
1,2,4,5-Tetrachlorobenzene	95-94-3	38	0	---	---	---	2.02	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	38	0	---	---	---	2.05	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	38	0	---	---	---	0.199	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	38	0	---	---	---	4	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	38	0	---	---	---	9.94	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	38	0	---	---	---	87.5	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	38	0	---	---	---	0.01	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	38	0	---	---	---	0.0609	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	38	0	---	---	---	1.28	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	38	0	---	---	---	0.0328	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	38	0	---	---	---	0.0122	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	38	0	---	---	---	0.243	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	38	0	---	---	---	0.67	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	38	0	---	---	---	5.3	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	38	0	---	---	---	1.6	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	106445	32	1	0.13	0.13	0.13	NESV	---	---	Yes	No ESV Available
3,3'-Dichlorobenzidine	91-94-1	38	0	---	---	---	0.646	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	38	0	---	---	---	3.16	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	38	0	---	---	---	0.144	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	38	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	38	0	---	---	---	7.95	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	38	4	0.019	0.735	1.9	1	1	1.9	Yes	[Maximum] > ESV
4-Chlorophenyl Phenyl Ether	7005-72-3	38	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	38	0	---	---	---	21.9	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	38	0	---	---	---	5.12	---	---	No	100% Non-Detect
Acetophenone	98-86-2	38	0	---	---	---	300	---	---	No	100% Non-Detect
Atrazine	1912-24-9	38	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	38	1	0.038	0.038	0.038	NESV	---	---	Yes	No ESV Available
Benzyl Butyl Phthalate	85-68-7	38	0	---	---	---	0.239	---	---	No	100% Non-Detect
Biphenyl (Diphenyl)	92-52-4	38	0	---	---	---	60	---	---	No	100% Non-Detect
Bis(2-Chloroethoxy) Methane	111-91-1	38	0	---	---	---	0.302	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	38	1	0.017	0.017	0.017	23.7	0	<1	No	[Maximum] < ESV
Bis(2-Chloroisopropyl) Ether	108-60-1	38	0	---	---	---	19.9	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	38	5	0.074	0.596	2.2	0.02	5	110	Yes	[Maximum] > ESV
Caprolactam	105-60-2	38	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	38	24	0.011	0.107	0.97	79	0	<1	No	[Maximum] < ESV
Dibenzofuran	132-64-9	38	0	---	---	---	6.1	---	---	No	100% Non-Detect
Diethyl Phthalate	84-66-2	38	0	---	---	---	24.8	---	---	No	100% Non-Detect
Dimethyl Phthalate	131-11-3	38	0	---	---	---	10	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	38	6	0.019	0.037	0.058	0.011	6	5.3	Yes	[Maximum] > ESV
Di-N-Octylphthalate	117-84-0	38	0	---	---	---	0.91	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	38	0	---	---	---	0.079	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	38	0	---	---	---	0.0398	---	---	No	100% Non-Detect

Table B-12
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Hexachlorocyclopentadiene	77-47-4	38	0	---	---	---	0.755	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	38	0	---	---	---	0.596	---	---	No	100% Non-Detect
Isophorone	78-59-1	38	3	0.0095	0.0178	0.024	139	0	<1	No	[Maximum] < ESV
Nitrobenzene	98-95-3	38	0	---	---	---	1.31	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	38	0	---	---	---	0.544	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	38	0	---	---	---	0.545	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	38	0	---	---	---	0.119	---	---	No	100% Non-Detect
Phenol	108-95-2	38	0	---	---	---	0.79	---	---	No	100% Non-Detect
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)											
1,1,1-Trichloroethane	71-55-6	17	0	---	---	---	29.8	---	---	No	100% Non-Detect
1,1,2,2-Tetrachloroethane	79-34-5	17	0	---	---	---	0.127	---	---	No	100% Non-Detect
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	17	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,1,2-Trichloroethane	79-00-5	17	0	---	---	---	28.6	---	---	No	100% Non-Detect
1,1-Dichloroethane	75-34-3	17	0	---	---	---	20.1	---	---	No	100% Non-Detect
1,1-Dichloroethene	75-35-4	17	0	---	---	---	8.28	---	---	No	100% Non-Detect
1,2,3-Trichlorobenzene	87-61-6	17	0	---	---	---	11.1	---	---	No	100% Non-Detect
1,2,4-Trichlorobenzene	120-82-1	17	0	---	---	---	0.27	---	---	No	100% Non-Detect
1,2-Dibromo-3-Chloropropane	96-12-8	17	0	---	---	---	0.0352	---	---	No	100% Non-Detect
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	17	0	---	---	---	1.23	---	---	No	100% Non-Detect
1,2-Dichlorobenzene	95-50-1	17	0	---	---	---	0.92	---	---	No	100% Non-Detect
1,2-Dichloroethane	107-06-2	17	0	---	---	---	0.85	---	---	No	100% Non-Detect
1,2-Dichloropropane	78-87-5	17	0	---	---	---	32.7	---	---	No	100% Non-Detect
1,3-Dichlorobenzene	541-73-1	17	0	---	---	---	0.74	---	---	No	100% Non-Detect
1,4-Dichlorobenzene	106-46-7	17	2	0.00021	0.00047	0.00074	0.546	0	<1	No	[Maximum] < ESV
2-Hexanone	591-78-6	17	0	---	---	---	0.36	---	---	No	100% Non-Detect
Acetone	67-64-1	17	17	0.011	0.074	0.29	1.2	0	<1	No	[Maximum] < ESV
Benzene	71-43-2	17	12	0.0002	0.0007	0.0021	0.255	0	<1	No	[Maximum] < ESV
Bromochloromethane	74-97-5	17	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bromodichloromethane	75-27-4	17	0	---	---	---	0.54	---	---	No	100% Non-Detect
Bromoform	75-25-2	17	0	---	---	---	15.9	---	---	No	100% Non-Detect
Bromomethane	74-83-9	17	0	---	---	---	0.235	---	---	No	100% Non-Detect
Carbon Disulfide	75-15-0	17	16	0.00051	0.00426	0.014	0.0941	0	<1	No	[Maximum] < ESV
Carbon Tetrachloride	56-23-5	17	0	---	---	---	2.98	---	---	No	100% Non-Detect
Chlorobenzene	108-90-7	17	0	---	---	---	2.4	---	---	No	100% Non-Detect
Chloroethane	75-00-3	17	0	---	---	---	NESV	---	---	No	100% Non-Detect
Chloroform	67-66-3	17	0	---	---	---	1.19	---	---	No	100% Non-Detect
Chloromethane	74-87-3	17	0	---	---	---	10.4	---	---	No	100% Non-Detect
Cis-1,2-Dichloroethylene	156-59-2	17	0	---	---	---	24	---	---	No	100% Non-Detect
Cis-1,3-Dichloropropene	10061-01-5	17	0	---	---	---	0.398	---	---	No	100% Non-Detect
Cyclohexane	110-82-7	17	7	0.00066	0.00179	0.0046	NESV	---	---	Yes	No ESV Available
Dibromochloromethane	124-48-1	17	0	---	---	---	2.05	---	---	No	100% Non-Detect
Dichlorodifluoromethane	75-71-8	17	0	---	---	---	39.5	---	---	No	100% Non-Detect
Ethylbenzene	100-41-4	17	7	0.00012	0.0005	0.0013	5.16	0	<1	No	[Maximum] < ESV

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Baseline Ecological Risk Assessment
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Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Isopropylbenzene (Cumene)	98-82-8	17	0	---	---	---	NESV	---	---	No	100% Non-Detect
Methyl Acetate	79-20-9	17	3	0.0043	0.0071	0.0089	NESV	---	---	Yes	No ESV Available
Methyl Ethyl Ketone (2-Butanone)	78-93-3	17	15	0.0012	0.0161	0.08	89.6	0	<1	No	[Maximum] < ESV
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	17	0	---	---	---	9.7	---	---	No	100% Non-Detect
Methylcyclohexane	108-87-2	17	9	0.00027	0.00229	0.0081	NESV	---	---	Yes	No ESV Available
Methylene Chloride	75-09-2	17	1	0.001	0.001	0.001	2.6	0	<1	No	[Maximum] < ESV
Styrene	100-42-5	17	0	---	---	---	1.2	---	---	No	100% Non-Detect
Tert-Butyl Methyl Ether	1634-04-4	17	0	---	---	---	NESV	---	---	No	100% Non-Detect
Tetrachloroethylene (PCE)	127-18-4	17	0	---	---	---	0.18	---	---	No	100% Non-Detect
Toluene	108-88-3	17	12	0.00044	0.00186	0.0062	5.45	0	<1	No	[Maximum] < ESV
Trans-1,2-Dichloroethene	156-60-5	17	0	---	---	---	0.784	---	---	No	100% Non-Detect
Trans-1,3-Dichloropropene	10061-02-6	17	0	---	---	---	0.398	---	---	No	100% Non-Detect
Trichloroethylene (TCE)	79-01-6	17	0	---	---	---	12.4	---	---	No	100% Non-Detect
Trichlorofluoromethane	75-69-4	17	0	---	---	---	16.4	---	---	No	100% Non-Detect
Vinyl Chloride	75-01-4	17	0	---	---	---	0.12	---	---	No	100% Non-Detect
M,P-Xylene	179601-23-1	17	11	0.00025	0.00098	0.0033	NESV	---	---	Yes	No ESV Available
O-Xylene (1,2-Dimethylbenzene)	95-47-6	17	7	0.00011	0.00043	0.0011	NESV	---	---	Yes	No ESV Available
Total Xylene - 1/2MDL	1330-20-7	17	11	0.000305	0.001284	0.0044	1.4	0	<1	No	[Maximum] < ESV
Total Xylene - MDL	1330-20-7	17	11	0.00036	0.00132	0.0044	1.4	0	<1	No	[Maximum] < ESV
Total Xylene - Zero	1330-20-7	17	11	0.00025	0.00125	0.0044	1.4	0	<1	No	[Maximum] < ESV
Physicochemical Parameters											
Moisture, Percent	---	9	9	9.6	87.7	234.1	NESV	---	---	---	---
pH (s.u.)	---	11	11	7.1	7.8	8.6	NESV	---	---	---	---
Total Organic Carbon	7440440	20	20	3520	77716	284000	NESV	---	---	---	---

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
TAL: Target Analyte List
TCL: Target Compound List

Table B-13
Screening-Level Ecological Exposure Estimate for Surface Water
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (ug/L)												
Aluminum	7429-90-5	U	26	22	15.3	1760.6	24500	87	13	281.6	Yes	[Maximum] > ESV
Aluminum	7429-90-5	F	17	9	42.6	482.7	2360	87	6	27.1	Yes	[Maximum] > ESV
Antimony	7440-36-0	U	26	3	0.69	0.9	1.1	30	0	<1	No	[Maximum] < ESV
Antimony	7440-36-0	F	17	0	---	---	---	30	---	---	No	100% Non-Detect
Arsenic	7440-38-2	U	26	7	0.71	2.13	4.4	5	0	<1	No	[Maximum] < ESV
Arsenic	7440-38-2	F	17	5	1.1	1.8	2.9	3.1	0	<1	No	[Maximum] < ESV
Barium	7440-39-3	U	26	26	156	371	2710	4	26	677.5	Yes	[Maximum] > ESV
Barium	7440-39-3	F	17	17	119	259	527	4	17	131.8	Yes	[Maximum] > ESV
Beryllium	7440-41-7	U	26	1	1.5	1.5	1.5	0.66	1	2.3	Yes	[Maximum] > ESV
Beryllium	7440-41-7	F	17	0	---	---	---	0.66	---	---	No	100% Non-Detect
Cadmium	7440-43-9	U	26	2	0.66	0.83	1	0.214	1	4.7	Yes	[Maximum] > ESV
Cadmium	7440-43-9	F	17	0	---	---	---	0.214	---	---	No	100% Non-Detect
Chromium, Total	7440-47-3	U	26	9	1.8	5.8	27.2	8.9	1	3.1	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	F	17	1	1.5	1.5	1.5	8.9	0	<1	No	[Maximum] < ESV
Cobalt	7440-48-4	U	26	3	1.5	6.5	15.5	5.1	1	3	Yes	[Maximum] > ESV
Cobalt	7440-48-4	F	17	0	---	---	---	5.1	---	---	No	100% Non-Detect
Copper	7440-50-8	U	26	19	1.6	19.5	183	0.23	19	795.7	Yes	[Maximum] > ESV
Copper	7440-50-8	F	17	7	1.9	8.1	33.4	0.23	7	145.2	Yes	[Maximum] > ESV
Iron	7439-89-6	U	26	23	43.1	1606	22500	300	11	75	Yes	[Maximum] > ESV
Iron	7439-89-6	F	17	10	55.3	354	1430	158	3	9.1	Yes	[Maximum] > ESV
Lead	7439-92-1	U	26	12	0.58	5.05	35.2	5.061	0	7	No	[Maximum] < ESV
Lead	7439-92-1	F	17	6	0.44	1.73	5.2	3.725	0	1.4	No	[Maximum] < ESV
Manganese	7439-96-5	U	26	23	3.2	41.2	337	120	3	2.8	Yes	[Maximum] > ESV
Manganese	7439-96-5	F	17	11	4.5	37.8	243	120	1	2	Yes	[Maximum] > ESV
Mercury	7439-97-6	U	26	1	0.26	0.26	0.26	0.026	1	10	Yes	[Maximum] > ESV
Mercury	7439-97-6	F	17	0	---	---	---	0.026	---	---	No	100% Non-Detect
Nickel	7440-02-0	U	26	8	1.6	10	51.7	71.013	0	<1	No	[Maximum] < ESV
Nickel	7440-02-0	F	17	4	1.3	2.2	4.2	5	0	<1	No	[Maximum] < ESV
Selenium	7782-49-2	U	26	3	1	1	2	1	1	2	Yes	[Maximum] > ESV
Selenium	7782-49-2	F	17	0	---	---	---	3.1	---	---	No	100% Non-Detect
Silver	7440-22-4	U	26	0	---	---	---	0.25	---	---	No	100% Non-Detect
Silver	7440-22-4	F	17	0	---	---	---	0.12	---	---	No	100% Non-Detect
Thallium	7440-28-0	U	26	1	0.33	0.33	0.33	0.8	0	<1	No	[Maximum] < ESV
Thallium	7440-28-0	F	17	0	---	---	---	12	---	---	No	100% Non-Detect
Vanadium	7440-62-2	U	26	8	1.6	5.3	24.8	NESV	---	---	Yes	No ESV Available
Vanadium	7440-62-2	F	17	1	1.3	1.3	1.3	20	0	<1	No	[Maximum] < ESV
Zinc	7440-66-6	U	26	11	7.8	37.3	179	163.191	0	1.1	No	[Maximum] < ESV
Zinc	7440-66-6	F	17	3	7	25	59	7	2	8.4	Yes	[Maximum] > ESV
Other Inorganic Parameters (ug/L unless otherwise noted)												
Chloride (As Cl)	16887-00-6	U	26	26	1160	2963	25900	120000	0	<1	No	[Maximum] < ESV
Cyanide	57-12-5	U	26	15	3	26	139	5.2	11	26.7	Yes	[Maximum] > ESV
Cyanide	57-12-5	F	5	3	5.3	44.1	68.2	5.2	3	13.1	Yes	[Maximum] > ESV
Cyanide (Free)	FREE CN	U	16	13	1.8	4.4	10	5	5	2	Yes	[Maximum] > ESV
Cyanide (Free)	FREE CN	F	3	3	1.7	3	4.9	5	0	<1	No	[Maximum] < ESV
Fluoride	16984-48-8	U	26	26	250	1037	9240	120	26	77	Yes	[Maximum] > ESV
Fluoride	16984-48-8	F	3	3	289	818	1860	120	3	15.5	Yes	[Maximum] > ESV
Nitrogen, Ammonia (As N)	7664-41-7	U	26	17	53	740	8550	634.834	1	13.5	Yes	[Maximum] > ESV
Essential Nutrients (ug/L)												
Calcium	7440-70-2	U	26	26	25200	73042	506000	116000	2	4.4	Yes	Essential Nutrient
Calcium	7440-70-2	F	17	17	18900	49247	147000	116000	1	1.3	Yes	Essential Nutrient
Magnesium	7439-95-4	U	26	26	12600	17100	47800	82000	0	<1	No	Essential Nutrient

Table B-13
Screening-Level Ecological Exposure Estimate for Surface Water
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Magnesium	7439-95-4	F	17	17	12500	15859	21900	82000	0	<1	No	Essential Nutrient
Potassium	7440-09-7	U	26	26	600	1426	9100	53000	0	<1	No	Essential Nutrient
Potassium	7440-09-7	F	17	17	618	1518	9310	53000	0	<1	No	Essential Nutrient
Sodium	7440-23-5	U	26	26	4080	12412	51300	680000	0	<1	No	Essential Nutrient
Sodium	7440-23-5	F	17	17	3670	15825	51200	680000	0	<1	No	Essential Nutrient
Pesticides (ug/L)												
Aldrin	309-00-2	U	3	0	---	---	---	0.004	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	U	3	0	---	---	---	2.2	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	U	3	0	---	---	---	0.003	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	U	3	0	---	---	---	2.2	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	U	3	0	---	---	---	0.051	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	U	3	0	---	---	---	0.0043	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	U	3	0	---	---	---	2.2	---	---	No	100% Non-Detect
Dieldrin	60-57-1	U	3	0	---	---	---	0.056	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	U	3	0	---	---	---	0.051	---	---	No	100% Non-Detect
Endrin	72-20-8	U	3	0	---	---	---	0.0023	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	U	3	0	---	---	---	0.036	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	U	3	0	---	---	---	0.036	---	---	No	100% Non-Detect
Gamma Bhc (Lindane)	58-89-9	U	3	0	---	---	---	0.01	---	---	No	100% Non-Detect
Heptachlor	76-44-8	U	3	0	---	---	---	0.0019	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	U	3	0	---	---	---	0.0019	---	---	No	100% Non-Detect
Methoxychlor	72-43-5	U	3	0	---	---	---	0.019	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	U	3	0	---	---	---	0.001	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	U	3	0	---	---	---	0.001	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	U	3	0	---	---	---	0.0005	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	U	3	0	---	---	---	0.0002	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	U	3	0	---	---	---	0.0043	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (ug/L)												
PCB-1016 (Aroclor 1016)	12674-11-2	U	3	0	---	---	---	0.000074	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	U	3	0	---	---	---	0.000074	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	U	3	0	---	---	---	0.000074	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	U	3	0	---	---	---	0.000074	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)	12672-29-6	U	3	0	---	---	---	0.000074	---	---	No	100% Non-Detect
PCB-1254 (Aroclor 1254)	11097-69-1	U	3	0	---	---	---	0.000074	---	---	No	100% Non-Detect
PCB-1260 (Aroclor 1260)	11096-82-5	U	3	0	---	---	---	0.000074	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	U	3	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	U	3	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	U	3	0	---	---	---	0.000074	---	---	No	100% Non-Detect
Polycyclic Aromatic Hydrocarbons (PAHs) (ug/L)												
2-Methylnaphthalene	91-57-6	U	5	0	---	---	---	4.7	---	---	No	100% Non-Detect
Acenaphthene	83-32-9	U	5	0	---	---	---	5.8	---	---	No	100% Non-Detect
Acenaphthylene	208-96-8	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Anthracene	120-12-7	U	5	0	---	---	---	0.012	---	---	No	100% Non-Detect
Benzo(A)Anthracene	56-55-3	U	5	0	---	---	---	0.018	---	---	No	100% Non-Detect
Benzo(A)Pyrene	50-32-8	U	5	1	0.36	0.36	0.36	0.014	1	25.7	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	U	5	1	0.53	0.53	0.53	NESV	---	---	Yes	No ESV Available
Benzo(G,H,I)Perylene	191-24-2	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzo(K)Fluoranthene	207-08-9	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Chrysene	218-01-9	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Dibenz(A,H)Anthracene	53-70-3	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Fluoranthene	206-44-0	U	5	0	---	---	---	0.04	---	---	No	100% Non-Detect

Table B-13
Screening-Level Ecological Exposure Estimate for Surface Water
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Fluorene	86-73-7	U	5	0	---	---	---	3	---	---	No	100% Non-Detect
Indeno(1,2,3-C,D)Pyrene	193-39-5	U	5	1	0.28	0.28	0.28	NESV	---	---	Yes	No ESV Available
Naphthalene	91-20-3	U	5	0	---	---	---	1.1	---	---	No	100% Non-Detect
Phenanthrene	85-01-8	U	5	0	---	---	---	0.4	---	---	No	100% Non-Detect
Pyrene	129-00-0	U	5	0	---	---	---	0.025	---	---	No	100% Non-Detect
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (ug/L)												
1,2,4,5-Tetrachlorobenzene	95-94-3	U	5	0	---	---	---	3	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	U	5	0	---	---	---	1	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	U	5	0	---	---	---	4.9	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	U	5	0	---	---	---	11	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	U	5	0	---	---	---	44	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	U	5	0	---	---	---	81	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	U	5	0	---	---	---	24	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	U	5	0	---	---	---	13	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	U	5	0	---	---	---	300	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	MEPH3MEPH4	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
3,3'-Dichlorobenzidine	91-94-1	U	5	0	---	---	---	4.5	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	U	5	0	---	---	---	1.5	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	U	5	0	---	---	---	232	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	U	5	0	---	---	---	60	---	---	No	100% Non-Detect
Acetophenone	98-86-2	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Atrazine	1912-24-9	U	5	0	---	---	---	1.8	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzyl Butyl Phthalate	85-68-7	U	5	0	---	---	---	19	---	---	No	100% Non-Detect
Biphenyl (Diphenyl)	92-52-4	U	5	0	---	---	---	14	---	---	No	100% Non-Detect
Bis(2-Chloroethoxy) Methane	111-91-1	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	U	5	0	---	---	---	3	---	---	No	100% Non-Detect
Caprolactam	105-60-2	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Dibenzofuran	132-64-9	U	5	0	---	---	---	3.7	---	---	No	100% Non-Detect
Diethyl Phthalate	84-66-2	U	5	0	---	---	---	210	---	---	No	100% Non-Detect
Dimethyl Phthalate	131-11-3	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	U	5	0	---	---	---	19	---	---	No	100% Non-Detect
Di-N-Octylphthalate	117-84-0	U	5	1	1.4	1.4	1.4	22	0	<1	No	[Maximum] < ESV
Hexachlorobenzene	118-74-1	U	5	0	---	---	---	0.0003	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	U	5	0	---	---	---	1.3	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	U	5	1	0.26	0.26	0.26	12	0	<1	No	[Maximum] < ESV

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Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Isophorone	78-59-1	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Nitrobenzene	98-95-3	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	U	5	0	---	---	---	210	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	U	5	0	---	---	---	0.5	---	---	No	100% Non-Detect
Phenol	108-95-2	U	5	0	---	---	---	4	---	---	No	100% Non-Detect
TCL Volatile Organic Compounds (TCL VOCs) (ug/L)												
1,1,1-Trichloroethane	71-55-6	U	5	0	---	---	---	11	---	---	No	100% Non-Detect
1,1,2,2-Tetrachloroethane	79-34-5	U	5	0	---	---	---	610	---	---	No	100% Non-Detect
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,1,2-Trichloroethane	79-00-5	U	5	0	---	---	---	1200	---	---	No	100% Non-Detect
1,1-Dichloroethane	75-34-3	U	5	0	---	---	---	47	---	---	No	100% Non-Detect
1,1-Dichloroethene	75-35-4	U	5	0	---	---	---	25	---	---	No	100% Non-Detect
1,2,3-Trichlorobenzene	87-61-6	U	5	0	---	---	---	8	---	---	No	100% Non-Detect
1,2,4-Trichlorobenzene	120-82-1	U	5	0	---	---	---	24	---	---	No	100% Non-Detect
1,2-Dibromo-3-Chloropropane	96-12-8	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,2-Dichlorobenzene	95-50-1	U	5	0	---	---	---	0.7	---	---	No	100% Non-Detect
1,2-Dichloroethane	107-06-2	U	5	0	---	---	---	100	---	---	No	100% Non-Detect
1,2-Dichloropropane	78-87-5	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,3-Dichlorobenzene	541-73-1	U	5	0	---	---	---	71	---	---	No	100% Non-Detect
1,4-Dichlorobenzene	106-46-7	U	5	0	---	---	---	15	---	---	No	100% Non-Detect
2-Hexanone	591-78-6	U	5	0	---	---	---	99	---	---	No	100% Non-Detect
Acetone	67-64-1	U	5	0	---	---	---	1500	---	---	No	100% Non-Detect
Benzene	71-43-2	U	5	0	---	---	---	130	---	---	No	100% Non-Detect
Bromochloromethane	74-97-5	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bromodichloromethane	75-27-4	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bromoform	75-25-2	U	5	0	---	---	---	320	---	---	No	100% Non-Detect
Bromomethane	74-83-9	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbon Disulfide	75-15-0	U	5	0	---	---	---	0.92	---	---	No	100% Non-Detect
Carbon Tetrachloride	56-23-5	U	5	0	---	---	---	9.8	---	---	No	100% Non-Detect
Chlorobenzene	108-90-7	U	5	0	---	---	---	1.3	---	---	No	100% Non-Detect
Chloroethane	75-00-3	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Chloroform	67-66-3	U	5	0	---	---	---	1.8	---	---	No	100% Non-Detect
Chloromethane	74-87-3	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Cis-1,2-Dichloroethylene	156-59-2	U	5	0	---	---	---	590	---	---	No	100% Non-Detect
Cis-1,3-Dichloropropene	10061-01-5	U	5	0	---	---	---	0.055	---	---	No	100% Non-Detect
Cyclohexane	110-82-7	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Dibromochloromethane	124-48-1	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Dichlorodifluoromethane	75-71-8	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Ethylbenzene	100-41-4	U	5	0	---	---	---	7.3	---	---	No	100% Non-Detect
Isopropylbenzene (Cumene)	98-82-8	U	5	0	---	---	---	2.6	---	---	No	100% Non-Detect
Methyl Acetate	79-20-9	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Methyl Ethyl Ketone (2-Butanone)	78-93-3	U	5	0	---	---	---	14000	---	---	No	100% Non-Detect
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	U	5	0	---	---	---	170	---	---	No	100% Non-Detect
Methylcyclohexane	108-87-2	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Methylene Chloride	75-09-2	U	5	2	0.47	0.68	0.9	98.1	0	<1	No	[Maximum] < ESV
Styrene	100-42-5	U	5	0	---	---	---	72	---	---	No	100% Non-Detect
Tert-Butyl Methyl Ether	1634-04-4	U	5	0	---	---	---	10000	---	---	No	100% Non-Detect
Tetrachloroethylene (PCE)	127-18-4	U	5	0	---	---	---	98	---	---	No	100% Non-Detect
Toluene	108-88-3	U	5	0	---	---	---	2	---	---	No	100% Non-Detect

Table B-13
Screening-Level Ecological Exposure Estimate for Surface Water
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Trans-1,2-Dichloroethene	156-60-5	U	5	0	---	---	---	590	---	---	No	100% Non-Detect
Trans-1,3-Dichloropropene	10061-02-6	U	5	0	---	---	---	0.055	---	---	No	100% Non-Detect
Trichloroethylene (TCE)	79-01-6	U	5	0	---	---	---	21	---	---	No	100% Non-Detect
Trichlorofluoromethane	75-69-4	U	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Vinyl Chloride	75-01-4	U	5	0	---	---	---	930	---	---	No	100% Non-Detect
M,P-Xylene	179601-23-1	U	5	0	---	---	---	1.8	---	---	No	100% Non-Detect
O-Xylene (1,2-Dimethylbenzene)	95-47-6	U	5	0	---	---	---	13	---	---	No	100% Non-Detect
Total Xylene - 1/2MDL	1330-20-7	U	5	0	---	---	---	13	---	---	No	100% Non-Detect
Total Xylene - MDL	1330-20-7	U	5	0	---	---	---	13	---	---	No	100% Non-Detect
Total Xylene - Zero	1330-20-7	U	5	0	---	---	---	13	---	---	No	100% Non-Detect
Physicochemical Parameters												
Alkalinity, Total (As CaCO3)	---	U	26	26	116000	195346	335000	NESV	---	---	---	---
Dissolved Organic Carbon	---	F	15	15	1030	4106	13300	NESV	---	---	---	---
Dissolved Oxygen	---	U	26	26	770	10674	36890	NESV	---	---	---	---
Hardness (As CaCO3)	---	U	26	26	144000	256769	1740000	NESV	---	---	---	---
Oxidation-Reduction Potential (mv)	---	U	26	26	-31	141	277	NESV	---	---	---	---
pH (s.u.)	---	U	25	25	6.34	7.65	8.64	NESV	---	---	---	---
Specific Conductance (ms/cm)	---	U	26	26	0.138	0.336	0.656	NESV	---	---	---	---
Temperature (°C)	---	U	26	26	0.71	9.5	17.61	NESV	---	---	---	---
Total Organic Carbon	---	U	12	12	830	3825	13600	NESV	---	---	---	---
Total Dissolved Solids	---	U	24	24	134000	207417	350000	NESV	---	---	---	---
Total Suspended Solids	---	U	24	24	1400	66358	399000	NESV	---	---	---	---
Turbidity (NTU)	---	U	25	25	0	88	1000	NESV	---	---	---	---
Other Nutrients (ug/L)												
Nitrogen, Nitrite + Nitrate	NO3NO2N	U	26	14	117	408	2060	NESV	---	---	No	Other Nutrient
Phosphorus, Total Orthophosphate (As P)	---	U	23	0	---	---	---	NESV	---	---	No	Other Nutrient
Sulfate (As SO4)	14808-79-8	U	26	26	3140	6633	20600	NESV	---	---	No	Other Nutrient
Sulfide	18496-25-8	U	15	0	---	---	---	NESV	---	---	No	Other Nutrient

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
[Maximum]: Maximum concentration
NESV: No Ecological Screening Value
MDL: Method Detection Limit
SW: Surface Water
TAL: Target Analyte List
TCL: Target Compound List
U: Unfiltered
F: Filtered

Table B-14
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	26	26	2360	7919	16100	26000	0	<1	No	[Maximum] < ESV
Antimony	7440-36-0	26	1	0.67	0.67	0.67	2	0	<1	No	[Maximum] < ESV
Arsenic	7440-38-2	26	24	0.46	1.72	3.7	9.79	0	<1	No	[Maximum] < ESV
Barium	7440-39-3	26	26	52.3	552.2	972	NESV	---	---	Yes	No ESV Available
Beryllium	7440-41-7	26	17	0.16	0.45	0.79	NESV	---	---	Yes	No ESV Available
Cadmium	7440-43-9	26	3	0.95	1.52	2.5	0.583	3	4.3	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	26	26	2.6	9.5	32.8	36.2	0	<1	No	[Maximum] < ESV
Chromium, Hexavalent	18540-29-9	12	12	0.07	0.29	0.88	NESV	---	---	Yes	No ESV Available
Chromium, Trivalent	16065-83-1	12	12	2.53	10.47	31.92	NESV	---	---	Yes	No ESV Available
Cobalt	7440-48-4	26	24	1.2	3.9	7.2	50	0	<1	No	[Maximum] < ESV
Copper	7440-50-8	26	26	9	87	694	28	19	24.8	Yes	[Maximum] > ESV
Iron	7439-89-6	26	26	1490	7202	15300	20000	0	<1	No	[Maximum] < ESV
Lead	7439-92-1	26	26	3.4	16.1	116	35.8	1	3.2	Yes	[Maximum] > ESV
Manganese	7439-96-5	26	26	14.8	89.9	226	460	0	<1	No	[Maximum] < ESV
Mercury	7439-97-6	26	22	0.016	0.135	1.4	0.174	3	8	Yes	[Maximum] > ESV
Nickel	7440-02-0	26	26	4.4	15.9	53.9	19.5	4	2.8	Yes	[Maximum] > ESV
Selenium	7782-49-2	26	6	0.4	0.8	1.3	2	0	<1	No	[Maximum] < ESV
Silver	7440-22-4	26	2	1.7	12.6	23.5	0.5	2	47	Yes	[Maximum] > ESV
Thallium	7440-28-0	26	1	0.2	0.2	0.2	NESV	---	---	Yes	No ESV Available
Vanadium	7440-62-2	26	26	2.3	9.9	26.2	NESV	---	---	Yes	No ESV Available
Zinc	7440-66-6	26	26	16.3	89.3	351	98	7	3.6	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	26	22	0.12	1.72	16.4	0.0001	22	164000	Yes	[Maximum] > ESV
Cyanide (Free)	STL00131	2	1	0.89	0.89	0.89	NESV	---	---	Yes	No ESV Available
Fluoride	16984-48-8	26	22	1.8	23.7	93.7	290.2	0	<1	No	[Maximum] < ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	26	26	8540	164548	313000	NESV	---	---	Yes	Essential Nutrient
Magnesium	7439-95-4	26	26	2510	7771	16200	NESV	---	---	Yes	Essential Nutrient
Potassium	7440-09-7	26	26	228	740	1790	NESV	---	---	Yes	Essential Nutrient
Sodium	7440-23-5	26	22	54.3	204.7	434	NESV	---	---	Yes	Essential Nutrient
Pesticides (mg/kg)											
Aldrin	309-00-2	9	0	---	---	---	0.002	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	9	0	---	---	---	0.006	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	9	0	---	---	---	0.00000642	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	9	0	---	---	---	0.005	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	9	0	---	---	---	0.00000642	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	9	0	---	---	---	0.138810616	---	---	No	100% Non-Detect
Dieldrin	60-57-1	9	0	---	---	---	0.0019	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	9	0	---	---	---	0.00000642	---	---	No	100% Non-Detect
Endrin	72-20-8	9	0	---	---	---	0.00222	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	9	0	---	---	---	0.004428	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	9	0	---	---	---	NESV	---	---	No	100% Non-Detect

Table B-14
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Gamma Bhc (Lindane)	58-89-9	9	0	---	---	---	0.00237	---	---	No	100% Non-Detect
Heptachlor	76-44-8	9	0	---	---	---	0.0006	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	9	0	---	---	---	0.00247	---	---	No	100% Non-Detect
Methoxychlor	72-43-5	9	0	---	---	---	0.0136	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	9	0	---	---	---	0.00488	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	9	0	---	---	---	0.00316	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	9	0	---	---	---	0.00416	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	9	0	---	---	---	0.000077	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)	12672-29-6	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1254 (Aroclor 1254)	11097-69-1	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1260 (Aroclor 1260)	11096-82-5	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	12	0	---	---	---	0.032	---	---	No	100% Non-Detect
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	26	1	0.01	0.01	0.01	0.0202	0	<1	No	[Maximum] < ESV
Acenaphthene	83-32-9	26	3	0.01	0.01	0.02	0.00671	3	3	Yes	[Maximum] > ESV
Acenaphthylene	208-96-8	26	0	---	---	---	0.00587	---	---	No	100% Non-Detect
Anthracene	120-12-7	26	5	0.021	0.041	0.096	0.01	5	9.6	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	26	25	0.053	0.359	1.3	0.031	25	41.9	Yes	[Maximum] > ESV
Fluorene	86-73-7	26	2	0.0087	0.0143	0.02	0.01	1	2	Yes	[Maximum] > ESV
Naphthalene	91-20-3	26	1	0.015	0.015	0.015	0.015	0	1	No	[Maximum] < ESV
Phenanthrene	85-01-8	26	25	0.037	0.155	0.55	0.019	25	28.9	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	26	23	0.059	0.401	2.8	0.032	23	87.5	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	26	24	0.042	0.196	0.57	0.016	24	35.6	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	26	24	0.084	0.724	6.6	9.79	0	<1	No	[Maximum] < ESV
Benzo(G,H,I)Perylene	191-24-2	26	24	0.045	0.48	2.7	0.016	24	168.8	Yes	[Maximum] > ESV
Benzo(K)Fluoranthene	207-08-9	26	24	0.022	0.171	0.64	0.24	4	2.7	Yes	[Maximum] > ESV
Chrysene	218-01-9	26	25	0.067	0.455	2.6	0.027	25	96.3	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	26	16	0.035	0.097	0.28	0.01	16	28	Yes	[Maximum] > ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	26	24	0.06	0.49	3.1	0.017	24	182.4	Yes	[Maximum] > ESV
Pyrene	129-00-0	26	24	0.058	0.314	1.3	0.044	24	29.5	Yes	[Maximum] > ESV
Total PAHs - 1/2MDL	---	26	25	0.4589	3.1138	15.455	0.26	25	59.4	Yes	[Maximum] > ESV
Total PAHs - MDL	---	26	25	0.5208	3.2308	16.56	0.26	25	63.7	Yes	[Maximum] > ESV
Total PAHs - Zero	---	26	25	0.397	2.997	14.35	0.26	25	55.2	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
1,2,4,5-Tetrachlorobenzene	95-94-3	26	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	26	0	---	---	---	NESV	---	---	No	100% Non-Detect

Table B-14
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
2,3,4,6-Tetrachlorophenol	58-90-2	26	0	---	---	---	0.129	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	26	0	---	---	---	0.288	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	26	0	---	---	---	0.208	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	26	0	---	---	---	0.0817	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	26	0	---	---	---	0.029	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	26	0	---	---	---	0.00621	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	26	0	---	---	---	0.0144	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	26	0	---	---	---	0.0398	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	26	0	---	---	---	0.417	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	26	0	---	---	---	0.02716	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	26	0	---	---	---	0.011856	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	26	0	---	---	---	NESV	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	26	0	---	---	---	NESV	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	106445	20	1	0.13	0.13	0.13	0.0202	1	6.4	Yes	[Maximum] > ESV
3,3'-Dichlorobenzidine	91-94-1	26	0	---	---	---	0.127	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	26	0	---	---	---	NESV	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	26	0	---	---	---	0.104	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	26	0	---	---	---	0.255	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	26	0	---	---	---	0.388	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	26	2	0.13	1.01	1.9	0.146	1	13	Yes	[Maximum] > ESV
4-Chlorophenyl Phenyl Ether	7005-72-3	26	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	26	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	26	0	---	---	---	0.013	---	---	No	100% Non-Detect
Acetophenone	98-86-2	26	0	---	---	---	NESV	---	---	No	100% Non-Detect
Atrazine	1912-24-9	26	0	---	---	---	0.00662	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	26	1	0.038	0.038	0.038	NESV	---	---	Yes	No ESV Available
Benzyl Butyl Phthalate	85-68-7	26	0	---	---	---	1.97	---	---	No	100% Non-Detect
Biphenyl (Diphenyl)	92-52-4	26	0	---	---	---	1.22	---	---	No	100% Non-Detect
Bis(2-Chloroethoxy) Methane	111-91-1	26	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	26	1	0.017	0.017	0.017	3.52	0	<1	No	[Maximum] < ESV
Bis(2-Chloroisopropyl) Ether	108-60-1	26	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	26	2	0.074	0.297	0.52	0.18	1	2.9	Yes	[Maximum] > ESV
Caprolactam	105-60-2	26	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	26	18	0.016	0.113	0.97	NESV	---	---	Yes	No ESV Available
Dibenzofuran	132-64-9	26	0	---	---	---	0.300736	---	---	No	100% Non-Detect
Diethyl Phthalate	84-66-2	26	0	---	---	---	0.295	---	---	No	100% Non-Detect
Dimethyl Phthalate	131-11-3	26	0	---	---	---	NESV	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	26	3	0.019	0.037	0.058	1.1989	0	<1	No	[Maximum] < ESV
Di-N-Octylphthalate	117-84-0	26	0	---	---	---	16.8858	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	26	0	---	---	---	0.02	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	26	0	---	---	---	0.0265	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	26	0	---	---	---	0.901	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	26	0	---	---	---	0.2136	---	---	No	100% Non-Detect
Isophorone	78-59-1	26	2	0.02	0.02	0.02	0.432	0	<1	No	[Maximum] < ESV

Table B-14
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Nitrobenzene	98-95-3	26	0	---	---	---	0.145	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	26	0	---	---	---	NESV	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	26	0	---	---	---	0.516	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	26	0	---	---	---	0.504	---	---	No	100% Non-Detect
Phenol	108-95-2	26	0	---	---	---	0.001152	---	---	No	100% Non-Detect
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)											
1,1,1-Trichloroethane	71-55-6	5	0	---	---	---	0.0302	---	---	No	100% Non-Detect
1,1,2,2-Tetrachloroethane	79-34-5	5	0	---	---	---	0.85	---	---	No	100% Non-Detect
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,1,2-Trichloroethane	79-00-5	5	0	---	---	---	0.518	---	---	No	100% Non-Detect
1,1-Dichloroethane	75-34-3	5	0	---	---	---	0.000575	---	---	No	100% Non-Detect
1,1-Dichloroethene	75-35-4	5	0	---	---	---	0.0194	---	---	No	100% Non-Detect
1,2,3-Trichlorobenzene	87-61-6	5	0	---	---	---	0.858	---	---	No	100% Non-Detect
1,2,4-Trichlorobenzene	120-82-1	5	0	---	---	---	2.1	---	---	No	100% Non-Detect
1,2-Dibromo-3-Chloropropane	96-12-8	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,2-Dichlorobenzene	95-50-1	5	0	---	---	---	0.0165	---	---	No	100% Non-Detect
1,2-Dichloroethane	107-06-2	5	0	---	---	---	0.26	---	---	No	100% Non-Detect
1,2-Dichloropropane	78-87-5	5	0	---	---	---	0.333	---	---	No	100% Non-Detect
1,3-Dichlorobenzene	541-73-1	5	0	---	---	---	1.315	---	---	No	100% Non-Detect
1,4-Dichlorobenzene	106-46-7	5	0	---	---	---	0.318	---	---	No	100% Non-Detect
2-Hexanone	591-78-6	5	0	---	---	---	0.0582	---	---	No	100% Non-Detect
Acetone	67-64-1	5	5	0.075	0.167	0.29	0.0099	5	29.3	Yes	[Maximum] > ESV
Benzene	71-43-2	5	1	0.0021	0.0021	0.0021	0.14157	0	<1	No	[Maximum] < ESV
Bromochloromethane	74-97-5	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bromodichloromethane	75-27-4	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bromoform	75-25-2	5	0	---	---	---	0.492	---	---	No	100% Non-Detect
Bromomethane	74-83-9	5	0	---	---	---	0.00137	---	---	No	100% Non-Detect
Carbon Disulfide	75-15-0	5	5	0.0013	0.0051	0.011	0.000851	5	12.9	Yes	[Maximum] > ESV
Carbon Tetrachloride	56-23-5	5	0	---	---	---	0.0642	---	---	No	100% Non-Detect
Chlorobenzene	108-90-7	5	0	---	---	---	0.00842	---	---	No	100% Non-Detect
Chloroethane	75-00-3	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Chloroform	67-66-3	5	0	---	---	---	0.121	---	---	No	100% Non-Detect
Chloromethane	74-87-3	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Cis-1,2-Dichloroethylene	156-59-2	5	0	---	---	---	0.26	---	---	No	100% Non-Detect
Cis-1,3-Dichloropropene	10061-01-5	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Cyclohexane	110-82-7	5	2	0.00093	0.00276	0.0046	NESV	---	---	Yes	No ESV Available
Dibromochloromethane	124-48-1	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Dichlorodifluoromethane	75-71-8	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Ethylbenzene	100-41-4	5	1	0.0013	0.0013	0.0013	0.175	0	<1	No	[Maximum] < ESV
Isopropylbenzene (Cumene)	98-82-8	5	0	---	---	---	0.086	---	---	No	100% Non-Detect
Methyl Acetate	79-20-9	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Methyl Ethyl Ketone (2-Butanone)	78-93-3	5	5	0.013	0.038	0.08	0.0424	2	1.9	Yes	[Maximum] > ESV

Table B-14
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	5	0	---	---	---	0.0251	---	---	No	100% Non-Detect
Methylcyclohexane	108-87-2	5	2	0.0014	0.0047	0.0081	NESV	---	---	Yes	No ESV Available
Methylene Chloride	75-09-2	5	1	0.001	0.001	0.001	0.159	0	<1	No	[Maximum] < ESV
Styrene	100-42-5	5	0	---	---	---	0.254	---	---	No	100% Non-Detect
Tert-Butyl Methyl Ether	1634-04-4	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Tetrachloroethylene (PCE)	127-18-4	5	0	---	---	---	0.468	---	---	No	100% Non-Detect
Toluene	108-88-3	5	2	0.0027	0.0044	0.0062	1.22	0	<1	No	[Maximum] < ESV
Trans-1,2-Dichloroethene	156-60-5	5	0	---	---	---	0.654	---	---	No	100% Non-Detect
Trans-1,3-Dichloropropene	10061-02-6	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Trichloroethylene (TCE)	79-01-6	5	0	---	---	---	0.0969	---	---	No	100% Non-Detect
Trichlorofluoromethane	75-69-4	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Vinyl Chloride	75-01-4	5	0	---	---	---	0.202	---	---	No	100% Non-Detect
M,P-Xylene	179601-23-1	5	2	0.00077	0.00203	0.0033	0.0252	0	<1	No	[Maximum] < ESV
O-Xylene (1,2-Dimethylbenzene)	95-47-6	5	1	0.0011	0.0011	0.0011	0.433	0	<1	No	[Maximum] < ESV
Total Xylene - 1/2MDL	1330-20-7	5	2	0.000945	0.002672	0.0044	0.433	0	<1	No	[Maximum] < ESV
Total Xylene - MDL	1330-20-7	5	2	0.00112	0.00276	0.0044	0.433	0	<1	No	[Maximum] < ESV
Total Xylene - Zero	1330-20-7	5	2	0.00077	0.00258	0.0044	0.433	0	<1	No	[Maximum] < ESV
Physicochemical Parameters											
Moisture, Percent	---	6	6	9.6	120.4	234.1	NESV	---	---	---	---
pH (s.u.)	---	8	8	7.1	7.6	8.4	NESV	---	---	---	---
Total Organic Carbon	7440440	17	17	15100	78453	284000	NESV	---	---	---	---

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
TAL: Target Analyte List
TCL: Target Compound List

Table B-15
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Cedar Creek Reservoir Overflow Ditch Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	8	8	14700	17950	22700	50	8	454	Yes	[Maximum] > ESV
Antimony	7440-36-0	8	0	---	---	---	0.142	---	---	No	100% Non-Detect
Arsenic	7440-38-2	8	8	4.1	5.9	7.8	5.7	4	1.4	Yes	[Maximum] > ESV
Barium	7440-39-3	8	8	148	240	295	1.04	8	283.7	Yes	[Maximum] > ESV
Beryllium	7440-41-7	8	8	0.46	0.75	1	1.06	0	<1	No	[Maximum] < ESV
Cadmium	7440-43-9	8	0	---	---	---	0.00222	---	---	No	100% Non-Detect
Chromium, Total	7440-47-3	8	8	11.1	13	15	23	0	<1	No	[Maximum] < ESV
Chromium, Hexavalent	18540-29-9	3	3	0.30	0.3	0.4	0.34	1	1.1	Yes	[Maximum] > ESV
Chromium, Trivalent	16065-83-1	3	3	10.80	11.9	13.7	23	0	<1	No	[Maximum] < ESV
Cobalt	7440-48-4	8	8	5.8	7.6	9	0.14	8	64.3	Yes	[Maximum] > ESV
Copper	7440-50-8	8	8	18.6	22	27.8	5.4	8	5.1	Yes	[Maximum] > ESV
Iron	7439-89-6	8	8	14100	17313	20000	NESV	---	---	Yes	No ESV Available
Lead	7439-92-1	8	8	13	15	19	0.0537	8	344.5	Yes	[Maximum] > ESV
Manganese	7439-96-5	8	8	517	1070	1640	220	8	7.5	Yes	[Maximum] > ESV
Mercury	7439-97-6	8	8	0.028	0.036	0.045	0.1	0	<1	No	[Maximum] < ESV
Nickel	7440-02-0	8	8	16	26	44	10	8	4.4	Yes	[Maximum] > ESV
Selenium	7782-49-2	8	6	0.34	0.64	1.4	0.0276	6	50.7	Yes	[Maximum] > ESV
Silver	7440-22-4	8	0	---	---	---	2	---	---	No	100% Non-Detect
Thallium	7440-28-0	8	0	---	---	---	0.05	---	---	No	100% Non-Detect
Vanadium	7440-62-2	8	8	11.1	13.2	18	1.59	8	11.3	Yes	[Maximum] > ESV
Zinc	7440-66-6	8	8	59	92	129	6.62	8	19.5	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	8	8	0.12	0.53	1.5	0.098	8	15.3	Yes	[Maximum] > ESV
Fluoride	16984-48-8	8	8	1.3	2	4.3	120	0	<1	No	[Maximum] < ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	8	8	8370	19034	30100	NESV	---	---	Yes	Essential Nutrient
Magnesium	7439-95-4	8	8	8110	10608	12200	NESV	---	---	Yes	Essential Nutrient
Potassium	7440-09-7	8	8	872	1215	1700	NESV	---	---	Yes	Essential Nutrient
Sodium	7440-23-5	8	5	60	105	171	NESV	---	---	Yes	Essential Nutrient
Pesticides (mg/kg)											
Aldrin	309-00-2	5	0	---	---	---	0.00332	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	5	0	---	---	---	0.0994	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	5	0	---	---	---	0.119	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	5	0	---	---	---	0.00398	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	5	0	---	---	---	0.119	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	5	0	---	---	---	0.224	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	5	0	---	---	---	0.005	---	---	No	100% Non-Detect
Dieldrin	60-57-1	5	0	---	---	---	0.00238	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	5	0	---	---	---	0.0358	---	---	No	100% Non-Detect
Endrin	72-20-8	5	0	---	---	---	0.0014	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	5	0	---	---	---	0.0105	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Gamma Bhc (Lindane)	58-89-9	5	0	---	---	---	0.005	---	---	No	100% Non-Detect

Table B-15
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Cedar Creek Reservoir Overflow Ditch Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Heptachlor	76-44-8	5	0	---	---	---	0.00598	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	5	0	---	---	---	0.152	---	---	No	100% Non-Detect
Methoxychlor	72-43-5	5	0	---	---	---	0.0199	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	5	0	---	---	---	0.0063	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	5	0	---	---	---	0.021	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	5	0	---	---	---	0.0035	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	5	0	---	---	---	0.119	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	5	0	---	---	---	0.224	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	5	0	---	---	---	1.1	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	5	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)	12672-29-6	5	0	---	---	---	0.0073	---	---	No	100% Non-Detect
PCB-1254 (Aroclor 1254)	11097-69-1	5	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1260 (Aroclor 1260)	11096-82-5	5	0	---	---	---	0.88	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	5	0	---	---	---	0.000332	---	---	No	100% Non-Detect
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	8	3	0.0088	0.0119	0.015	3.24	0	<1	No	[Maximum] < ESV
Acenaphthene	83-32-9	8	6	0.034	0.055	0.075	0.25	0	<1	No	[Maximum] < ESV
Acenaphthylene	208-96-8	8	0	---	---	---	120	---	---	No	100% Non-Detect
Anthracene	120-12-7	8	6	0.066	0.107	0.14	6.8	0	<1	No	[Maximum] < ESV
Fluoranthene	206-44-0	8	8	0.13	0.93	1.8	10	0	<1	No	[Maximum] < ESV
Fluorene	86-73-7	8	6	0.022	0.035	0.053	3.7	0	<1	No	[Maximum] < ESV
Naphthalene	91-20-3	8	6	0.013	0.023	0.045	0.0994	0	<1	No	[Maximum] < ESV
Phenanthrene	85-01-8	8	8	0.065	0.475	0.81	5.5	0	<1	No	[Maximum] < ESV
Total LMW PAHs - 1/2MDL	---	8	8	0.23745	1.59287	2.89995	29	0	<1	No	[Maximum] < ESV
Total LMW PAHs - MDL	---	8	8	0.2799	1.6119	2.9031	29	0	<1	No	[Maximum] < ESV
Total LMW PAHs - Zero	---	8	8	0.195	1.574	2.897	29	0	<1	No	[Maximum] < ESV
Benzo(A)Pyrene	50-32-8	8	8	0.11	0.75	1.4	1.52	0	<1	No	[Maximum] < ESV
Benzo(A)Anthracene	56-55-3	8	8	0.093	0.564	1	0.73	3	1.4	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	8	8	0.19	1.08	1.8	18	0	<1	No	[Maximum] < ESV
Benzo(G,H,I)Perylene	191-24-2	8	8	0.11	0.74	1.3	25	0	<1	No	[Maximum] < ESV
Benzo(K)Fluoranthene	207-08-9	8	8	0.051	0.384	0.75	71	0	<1	No	[Maximum] < ESV
Chrysene	218-01-9	8	8	0.13	0.81	1.4	3.1	0	<1	No	[Maximum] < ESV
Dibenz(A,H)Anthracene	53-70-3	8	6	0.14	0.21	0.28	14	0	<1	No	[Maximum] < ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	8	8	0.11	0.69	1.3	71	0	<1	No	[Maximum] < ESV
Pyrene	129-00-0	8	8	0.13	0.97	1.5	10	0	<1	No	[Maximum] < ESV
Total HMW PAHs - 1/2MDL	---	8	8	0.9595	6.1449	10.28	1.1	6	9.3	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	8	8	0.975	6.148	10.28	1.1	6	9.3	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	8	8	0.944	6.142	10.28	1.1	6	9.3	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											

Table B-15
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Cedar Creek Reservoir Overflow Ditch Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
1,2,4,5-Tetrachlorobenzene	95-94-3	8	0	---	---	---	2.02	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	8	0	---	---	---	2.05	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	8	0	---	---	---	0.199	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	8	0	---	---	---	4	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	8	0	---	---	---	9.94	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	8	0	---	---	---	87.5	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	8	0	---	---	---	0.01	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	8	0	---	---	---	0.0609	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	8	0	---	---	---	1.28	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	8	0	---	---	---	0.0328	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	8	0	---	---	---	0.0122	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	8	0	---	---	---	0.243	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	8	0	---	---	---	0.67	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	8	0	---	---	---	5.3	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	8	0	---	---	---	1.6	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	106445	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
3,3'-Dichlorobenzidine	91-94-1	8	0	---	---	---	0.646	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	8	0	---	---	---	3.16	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	8	0	---	---	---	0.144	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	8	0	---	---	---	7.95	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	8	0	---	---	---	1	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	8	0	---	---	---	21.9	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	8	0	---	---	---	5.12	---	---	No	100% Non-Detect
Acetophenone	98-86-2	8	1	0.011	0.011	0.011	300	0	<1	No	[Maximum] < ESV
Atrazine	1912-24-9	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	8	2	0.056	0.062	0.069	NESV	---	---	Yes	No ESV Available
Benzyl Butyl Phthalate	85-68-7	8	1	0.031	0.031	0.031	0.239	0	<1	No	[Maximum] < ESV
Biphenyl (Diphenyl)	92-52-4	8	0	---	---	---	60	---	---	No	100% Non-Detect
Bis(2-Chloroethoxy) Methane	111-91-1	8	0	---	---	---	0.302	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	8	0	---	---	---	23.7	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	8	0	---	---	---	19.9	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	8	1	0.045	0.045	0.045	0.02	1	2.3	Yes	[Maximum] > ESV
Caprolactam	105-60-2	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	8	8	0.011	0.095	0.18	79	0	<1	No	[Maximum] < ESV
Dibenzofuran	132-64-9	8	5	0.014	0.021	0.029	6.1	0	<1	No	[Maximum] < ESV
Diethyl Phthalate	84-66-2	8	0	---	---	---	24.8	---	---	No	100% Non-Detect
Dimethyl Phthalate	131-11-3	8	0	---	---	---	10	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	8	1	0.039	0.039	0.039	0.011	1	3.5	Yes	[Maximum] > ESV
Di-N-Octylphthalate	117-84-0	8	0	---	---	---	0.91	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	8	0	---	---	---	0.079	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	8	0	---	---	---	0.0398	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	8	0	---	---	---	0.755	---	---	No	100% Non-Detect

Table B-15
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-2 feet)
Cedar Creek Reservoir Overflow Ditch Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Hexachloroethane	67-72-1	8	0	---	---	---	0.596	---	---	No	100% Non-Detect
Isophorone	78-59-1	8	4	0.012	0.014	0.016	139	0	<1	No	[Maximum] < ESV
Nitrobenzene	98-95-3	8	0	---	---	---	1.31	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	8	0	---	---	---	0.544	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	8	0	---	---	---	0.545	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	8	0	---	---	---	0.119	---	---	No	100% Non-Detect
Phenol	108-95-2	8	0	---	---	---	0.79	---	---	No	100% Non-Detect
Physicochemical Parameters											
pH (s.u.)	---	3	3	6.9	7.4	7.7	NESV	---	---	---	---
Total Organic Carbon	7440440	8	7	28600	73157	183000	NESV	---	---	---	---

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
TAL: Target Analyte List
TCL: Target Compound List

Table B-16
Screening-Level Ecological Exposure Estimate for Surface Water
Cedar Creek Overflow Ditch Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (ug/L)												
Aluminum	7429-90-5	U	27	20	16.7	133.6	1610	87	2	18.5	Yes	[Maximum] > ESV
Aluminum	7429-90-5	F	16	1	36.1	36.1	36.1	87	0	<1	No	[Maximum] < ESV
Antimony	7440-36-0	U	27	2	2	2	2	30	0	<1	No	[Maximum] < ESV
Antimony	7440-36-0	F	16	0	---	---	---	30	---	---	No	100% Non-Detect
Arsenic	7440-38-2	U	27	5	0.79	1.31	2.2	5	0	<1	No	[Maximum] < ESV
Arsenic	7440-38-2	F	16	1	0.69	0.69	0.69	3.1	0	<1	No	[Maximum] < ESV
Barium	7440-39-3	U	27	27	63.4	90.8	209	4	27	52.3	Yes	[Maximum] > ESV
Barium	7440-39-3	F	16	16	69.9	91	218	4	16	54.5	Yes	[Maximum] > ESV
Beryllium	7440-41-7	U	27	0	---	---	---	0.66	---	---	No	100% Non-Detect
Beryllium	7440-41-7	F	16	0	---	---	---	0.66	---	---	No	100% Non-Detect
Cadmium	7440-43-9	U	27	0	---	---	---	0.207	---	---	No	100% Non-Detect
Cadmium	7440-43-9	F	16	0	---	---	---	0.228	---	---	No	100% Non-Detect
Chromium, Total	7440-47-3	U	27	1	1.4	1.4	1.4	8.9	0	<1	No	[Maximum] < ESV
Chromium, Total	7440-47-3	F	16	0	---	---	---	8.9	---	---	No	100% Non-Detect
Cobalt	7440-48-4	U	27	1	2.4	2.4	2.4	5.1	0	<1	No	[Maximum] < ESV
Cobalt	7440-48-4	F	16	0	---	---	---	5.1	---	---	No	100% Non-Detect
Copper	7440-50-8	U	27	9	1.5	3.7	7.2	0.23	9	31.3	Yes	[Maximum] > ESV
Copper	7440-50-8	F	16	0	---	---	---	0.23	---	---	No	100% Non-Detect
Iron	7439-89-6	U	27	5	49.3	696.3	2910	300	2	9.7	Yes	[Maximum] > ESV
Iron	7439-89-6	F	16	0	---	---	---	158	---	---	No	100% Non-Detect
Lead	7439-92-1	U	27	2	0.54	1.32	2.1	4.794	0	<1	No	[Maximum] < ESV
Lead	7439-92-1	F	16	0	---	---	---	4.032	---	---	No	100% Non-Detect
Manganese	7439-96-5	U	27	26	3	150	3750	120	1	31.3	Yes	[Maximum] > ESV
Manganese	7439-96-5	F	16	3	3.2	6.9	14	120	0	<1	No	[Maximum] < ESV
Mercury	7439-97-6	U	27	0	---	---	---	0.026	---	---	No	100% Non-Detect
Mercury	7439-97-6	F	16	0	---	---	---	0.026	---	---	No	100% Non-Detect
Nickel	7440-02-0	U	27	1	2.3	2.3	2.3	68.502	0	<1	No	[Maximum] < ESV
Nickel	7440-02-0	F	16	0	---	---	---	5	---	---	No	100% Non-Detect
Selenium	7782-49-2	U	27	0	---	---	---	1	---	---	No	100% Non-Detect
Selenium	7782-49-2	F	16	0	---	---	---	3.1	---	---	No	100% Non-Detect
Silver	7440-22-4	U	27	0	---	---	---	0.25	---	---	No	100% Non-Detect
Silver	7440-22-4	F	16	0	---	---	---	0.12	---	---	No	100% Non-Detect
Thallium	7440-28-0	U	27	0	---	---	---	0.8	---	---	No	100% Non-Detect
Thallium	7440-28-0	F	16	0	---	---	---	12	---	---	No	100% Non-Detect
Vanadium	7440-62-2	U	27	6	1.9	2.1	2.2	NESV	---	---	Yes	No ESV Available
Vanadium	7440-62-2	F	16	0	---	---	---	20	---	---	No	100% Non-Detect
Zinc	7440-66-6	U	27	3	7.1	13.4	18.9	157.411	0	<1	No	[Maximum] < ESV
Zinc	7440-66-6	F	16	0	---	---	---	7	---	---	No	100% Non-Detect
Other Inorganic Parameters (ug/L unless otherwise noted)												
Chloride (As Cl)	16887-00-6	U	27	27	320	1598	2640	120000	0	<1	No	[Maximum] < ESV
Cyanide	57-12-5	U	26	0	---	---	---	5.2	---	---	No	100% Non-Detect
Cyanide	57-12-5	F	5	0	---	---	---	5.2	---	---	No	100% Non-Detect
Cyanide (Free)	FREE CN	U	11	3	1.6	3.3	5.8	5	1	1.2	Yes	[Maximum] > ESV
Fluoride	16984-48-8	U	27	27	38.7	220.2	2600	120	9	21.7	Yes	[Maximum] > ESV
Fluoride	16984-48-8	F	5	5	126	149	185	120	5	1.5	Yes	[Maximum] > ESV
Nitrogen, Ammonia (As N)	7664-41-7	U	27	3	48.9	73	97.3	514.428	0	<1	No	[Maximum] < ESV
Essential Nutrients (ug/L)												
Calcium	7440-70-2	U	27	27	38300	46952	59000	116000	0	<1	No	Essential Nutrient

Table B-16
Screening-Level Ecological Exposure Estimate for Surface Water
Cedar Creek Overflow Ditch Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Calcium	7440-70-2	F	16	16	44200	48138	57500	116000	0	<1	No	Essential Nutrient
Magnesium	7439-95-4	U	27	27	6510	11341	18500	82000	0	<1	No	Essential Nutrient
Magnesium	7439-95-4	F	16	16	9720	11144	19200	82000	0	<1	No	Essential Nutrient
Potassium	7440-09-7	U	27	27	368	501	1100	53000	0	<1	No	Essential Nutrient
Potassium	7440-09-7	F	16	16	410	463	844	53000	0	<1	No	Essential Nutrient
Sodium	7440-23-5	U	27	27	1410	2351	4830	680000	0	<1	No	Essential Nutrient
Sodium	7440-23-5	F	16	16	1730	1991	3100	680000	0	<1	No	Essential Nutrient
Physicochemical Parameters (ug/L unless otherwise noted)												
Alkalinity, Total (As CaCO3)	---	U	27	27	133000	167815	236000	NESV	---	---	---	---
Dissolved Organic Carbon	---	F	16	16	1200	1377	2330	NESV	---	---	---	---
Dissolved Oxygen	---	U	27	27	7640	10664	16060	NESV	---	---	---	---
Hardness (As CaCO3)	---	U	27	27	138000	164815	204000	NESV	---	---	---	---
Oxidation-Reduction Potential (mv)	---	U	27	27	63	172	234	NESV	---	---	---	---
pH (s.u.)	---	U	25	25	6.29	7.65	8.39	NESV	---	---	---	---
Specific Conductance (ms/cm)	---	U	27	27	0.171	0.307	0.494	NESV	---	---	---	---
Temperature (°C)	---	U	27	27	1.86	10.42	17.37	NESV	---	---	---	---
Total Organic Carbon	---	U	11	11	1200	1236	1300	NESV	---	---	---	---
Total Dissolved Solids	---	U	27	27	139000	178519	243000	NESV	---	---	---	---
Total Suspended Solids	---	U	27	12	1000	15708	153000	NESV	---	---	---	---
Turbidity (NTU)	---	U	25	25	0	7	84	NESV	---	---	---	---
Other Nutrients (ug/L)												
Nitrogen, Nitrite + Nitrate	NO3NO2N	U	27	3	113	149	216	NESV	---	---	No	Other Nutrient
Phosphorus, Total Orthophosphate (As P)	---	U	20	7	137	144	158	NESV	---	---	No	Other Nutrient
Sulfate (As SO4)	14808-79-8	U	27	27	1540	2378	8230	NESV	---	---	No	Other Nutrient
Sulfide	18496-25-8	U	16	0	---	---	---	NESV	---	---	No	Other Nutrient

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
[Maximum]: Maximum concentration
NESV: No Ecological Screening Value
MDL: Method Detection Limit
SW: Surface Water
TAL: Target Analyte List
U: Unfiltered
F: Filtered

Table B-17
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
Cedar Creek Reservoir Overflow Ditch Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	8	8	14700	17950	22700	26000	0	<1	No	[Maximum] < ESV
Antimony	7440-36-0	8	0	---	---	---	2	---	---	No	100% Non-Detect
Arsenic	7440-38-2	8	8	4.1	5.9	7.8	9.79	0	<1	No	[Maximum] < ESV
Barium	7440-39-3	8	8	148	240	295	NESV	---	---	Yes	No ESV Available
Beryllium	7440-41-7	8	8	0.46	0.75	1	NESV	---	---	Yes	No ESV Available
Cadmium	7440-43-9	8	0	---	---	---	0.583	---	---	No	100% Non-Detect
Chromium, Total	7440-47-3	8	8	11.1	13	15	36.2	0	<1	No	[Maximum] < ESV
Chromium, Hexavalent	18540-29-9	3	3	0.3	0.3	0.4	NESV	---	---	Yes	No ESV Available
Chromium, Trivalent	16065-83-1	3	3	10.8	11.9	13.7	NESV	---	---	Yes	No ESV Available
Cobalt	7440-48-4	8	8	5.8	7.6	9	50	0	<1	No	[Maximum] < ESV
Copper	7440-50-8	8	8	18.6	22	27.8	28	0	<1	No	[Maximum] < ESV
Iron	7439-89-6	8	8	14100	17313	20000	20000	0	1	No	[Maximum] < ESV
Lead	7439-92-1	8	8	13	15	19	35.8	0	<1	No	[Maximum] < ESV
Manganese	7439-96-5	8	8	517	1070	1640	460	8	3.6	Yes	[Maximum] > ESV
Mercury	7439-97-6	8	8	0.028	0.036	0.045	0.174	0	<1	No	[Maximum] < ESV
Nickel	7440-02-0	8	8	16	26	44	19.5	5	2.2	Yes	[Maximum] > ESV
Selenium	7782-49-2	8	6	0.34	0.64	1.4	2	0	<1	No	[Maximum] < ESV
Silver	7440-22-4	8	0	---	---	---	0.5	---	---	No	100% Non-Detect
Thallium	7440-28-0	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
Vanadium	7440-62-2	8	8	11.1	13.2	18	NESV	---	---	Yes	No ESV Available
Zinc	7440-66-6	8	8	59	92	129	98	3	1.3	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	8	8	0.12	0.53	1.5	0.0001	8	15000	Yes	[Maximum] > ESV
Fluoride	16984-48-8	8	8	1.3	2	4.3	290.2	0	<1	No	[Maximum] < ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	8	8	8370	19034	30100	NESV	---	---	Yes	Essential Nutrient
Magnesium	7439-95-4	8	8	8110	10608	12200	NESV	---	---	Yes	Essential Nutrient
Potassium	7440-09-7	8	8	872	1215	1700	NESV	---	---	Yes	Essential Nutrient
Sodium	7440-23-5	8	5	60	105	171	NESV	---	---	Yes	Essential Nutrient
Pesticides (mg/kg)											
Aldrin	309-00-2	5	0	---	---	---	0.002	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	5	0	---	---	---	0.006	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	5	0	---	---	---	0.00000642	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	5	0	---	---	---	0.005	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	5	0	---	---	---	0.00000642	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	5	0	---	---	---	0.138810616	---	---	No	100% Non-Detect
Dieldrin	60-57-1	5	0	---	---	---	0.0019	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	5	0	---	---	---	0.00000642	---	---	No	100% Non-Detect
Endrin	72-20-8	5	0	---	---	---	0.00222	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	5	0	---	---	---	0.004428	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Gamma Bhc (Lindane)	58-89-9	5	0	---	---	---	0.00237	---	---	No	100% Non-Detect

Table B-17
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
Cedar Creek Reservoir Overflow Ditch Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Heptachlor	76-44-8	5	0	---	---	---	0.0006	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	5	0	---	---	---	0.00247	---	---	No	100% Non-Detect
Methoxychlor	72-43-5	5	0	---	---	---	0.0136	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	5	0	---	---	---	0.00488	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	5	0	---	---	---	0.00316	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	5	0	---	---	---	0.00416	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	5	0	---	---	---	0.000077	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)	12672-29-6	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1254 (Aroclor 1254)	11097-69-1	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1260 (Aroclor 1260)	11096-82-5	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	5	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	5	0	---	---	---	0.032	---	---	No	100% Non-Detect
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	8	3	0.0088	0.0119	0.015	0.0202	0	<1	No	[Maximum] < ESV
Acenaphthene	83-32-9	8	6	0.034	0.055	0.075	0.00671	6	11.2	Yes	[Maximum] > ESV
Acenaphthylene	208-96-8	8	0	---	---	---	0.00587	---	---	No	100% Non-Detect
Anthracene	120-12-7	8	6	0.066	0.107	0.14	0.01	6	14	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	8	8	0.13	0.93	1.8	0.031	8	58.1	Yes	[Maximum] > ESV
Fluorene	86-73-7	8	6	0.022	0.035	0.053	0.01	6	5.3	Yes	[Maximum] > ESV
Naphthalene	91-20-3	8	6	0.013	0.023	0.045	0.015	4	3	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	8	8	0.065	0.475	0.81	0.019	8	42.6	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	8	8	0.11	0.75	1.4	0.032	8	43.8	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	8	8	0.093	0.564	1	0.016	8	62.5	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	8	8	0.19	1.08	1.8	9.79	0	<1	No	[Maximum] < ESV
Benzo(G,H,I)Perylene	191-24-2	8	8	0.11	0.74	1.3	0.016	8	81.3	Yes	[Maximum] > ESV
Benzo(K)Fluoranthene	207-08-9	8	8	0.051	0.384	0.75	0.24	6	3.1	Yes	[Maximum] > ESV
Chrysene	218-01-9	8	8	0.13	0.81	1.4	0.027	8	51.9	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	8	6	0.14	0.21	0.28	0.01	6	28	Yes	[Maximum] > ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	8	8	0.11	0.69	1.3	0.017	8	76.5	Yes	[Maximum] > ESV
Pyrene	129-00-0	8	8	0.13	0.97	1.5	0.044	8	34.1	Yes	[Maximum] > ESV
Total PAHs - 1/2MDL	---	8	8	1.0335	6.6549	11.4711	0.26	8	44.1	Yes	[Maximum] > ESV
Total PAHs - MDL	---	8	8	1.106	6.674	11.474	0.26	8	44.1	Yes	[Maximum] > ESV
Total PAHs - Zero	---	8	8	0.961	6.636	11.468	0.26	8	44.1	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
1,2,4,5-Tetrachlorobenzene	95-94-3	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	8	0	---	---	---	0.129	---	---	No	100% Non-Detect

Table B-17
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
Cedar Creek Reservoir Overflow Ditch Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
2,4,5-Trichlorophenol	95-95-4	8	0	---	---	---	0.288	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	8	0	---	---	---	0.208	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	8	0	---	---	---	0.0817	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	8	0	---	---	---	0.029	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	8	0	---	---	---	0.00621	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	8	0	---	---	---	0.0144	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	8	0	---	---	---	0.0398	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	8	0	---	---	---	0.417	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	8	0	---	---	---	0.02716	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	8	0	---	---	---	0.011856	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	106445	5	0	---	---	---	0.0202	---	---	No	100% Non-Detect
3,3'-Dichlorobenzidine	91-94-1	8	0	---	---	---	0.127	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	8	0	---	---	---	0.104	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	8	0	---	---	---	0.255	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	8	0	---	---	---	0.388	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	8	0	---	---	---	0.146	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	8	0	---	---	---	0.013	---	---	No	100% Non-Detect
Acetophenone	98-86-2	8	1	0.011	0.011	0.011	NESV	---	---	Yes	No ESV Available
Atrazine	1912-24-9	8	0	---	---	---	0.00662	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	8	2	0.056	0.062	0.069	NESV	---	---	Yes	No ESV Available
Benzyl Butyl Phthalate	85-68-7	8	1	0.031	0.031	0.031	1.97	0	<1	No	[Maximum] < ESV
Biphenyl (Diphenyl)	92-52-4	8	0	---	---	---	1.22	---	---	No	100% Non-Detect
Bis(2-Chloroethoxy) Methane	111-91-1	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	8	0	---	---	---	3.52	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	8	1	0.045	0.045	0.045	0.18	0	<1	No	[Maximum] < ESV
Caprolactam	105-60-2	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	8	8	0.011	0.095	0.18	NESV	---	---	Yes	No ESV Available
Dibenzofuran	132-64-9	8	5	0.014	0.021	0.029	0.300736	0	<1	No	[Maximum] < ESV
Diethyl Phthalate	84-66-2	8	0	---	---	---	0.295	---	---	No	100% Non-Detect
Dimethyl Phthalate	131-11-3	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	8	1	0.039	0.039	0.039	1.1989	0	<1	No	[Maximum] < ESV
Di-N-Octylphthalate	117-84-0	8	0	---	---	---	16.8858	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	8	0	---	---	---	0.02	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	8	0	---	---	---	0.0265	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	8	0	---	---	---	0.901	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	8	0	---	---	---	0.2136	---	---	No	100% Non-Detect
Isophorone	78-59-1	8	4	0.012	0.014	0.016	0.432	0	<1	No	[Maximum] < ESV
Nitrobenzene	98-95-3	8	0	---	---	---	0.145	---	---	No	100% Non-Detect

Table B-17
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
Cedar Creek Reservoir Overflow Ditch Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
N-Nitrosodi-N-Propylamine	621-64-7	8	0	---	---	---	NESV	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	8	0	---	---	---	0.516	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	8	0	---	---	---	0.504	---	---	No	100% Non-Detect
Phenol	108-95-2	8	0	---	---	---	0.001152	---	---	No	100% Non-Detect
Physicochemical Parameters											
pH (s.u.)	---	3	3	6.9	7.4	7.7	NESV	---	---	---	---
Total Organic Carbon	7440440	8	7	28600	73157	183000	NESV	---	---	---	---

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
TAL: Target Analyte List
TCL: Target Compound List

Table B-18
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-0.5 feet)
Northern Surface Water Feature Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	12	12	12100	20617	35400	50	12	708	Yes	[Maximum] > ESV
Antimony	7440-36-0	12	0	---	---	---	0.142	---	---	No	100% Non-Detect
Arsenic	7440-38-2	12	12	3.2	7.4	14.5	5.7	7	2.5	Yes	[Maximum] > ESV
Barium	7440-39-3	12	12	136	448	905	1.04	12	870.2	Yes	[Maximum] > ESV
Beryllium	7440-41-7	12	10	0.32	0.67	1.1	1.06	2	1	Yes	[Maximum] > ESV
Cadmium	7440-43-9	12	0	---	---	---	0.00222	---	---	No	100% Non-Detect
Chromium, Total	7440-47-3	12	12	5	10	20	23	0	<1	No	[Maximum] < ESV
Cobalt	7440-48-4	12	12	1.9	4.8	6.6	0.14	12	47.1	Yes	[Maximum] > ESV
Copper	7440-50-8	12	12	10.1	20.4	42.5	5.4	12	7.9	Yes	[Maximum] > ESV
Iron	7439-89-6	12	12	7770	14242	25200	NESV	---	---	Yes	No ESV Available
Lead	7439-92-1	12	12	6.1	11.6	17.6	0.0537	12	327.7	Yes	[Maximum] > ESV
Manganese	7439-96-5	12	12	34.1	317.6	988	220	6	4.5	Yes	[Maximum] > ESV
Mercury	7439-97-6	12	6	0.012	0.03	0.062	0.1	0	<1	No	[Maximum] < ESV
Nickel	7440-02-0	12	12	6	11	15	10	6	1.5	Yes	[Maximum] > ESV
Selenium	7782-49-2	12	4	0.57	2.07	4.4	0.0276	4	159.4	Yes	[Maximum] > ESV
Silver	7440-22-4	12	0	---	---	---	2	---	---	No	100% Non-Detect
Thallium	7440-28-0	12	0	---	---	---	0.05	---	---	No	100% Non-Detect
Vanadium	7440-62-2	12	12	7.9	11.6	17.2	1.59	12	10.8	Yes	[Maximum] > ESV
Zinc	7440-66-6	12	12	16	36	65	6.62	12	9.9	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	12	7	0.11	0.41	0.84	0.098	7	8.6	Yes	[Maximum] > ESV
Fluoride	16984-48-8	12	12	1.14	3.68	9.59	120	0	<1	No	[Maximum] < ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	12	12	2500	8153	17800	NESV	---	---	Yes	Essential Nutrient
Magnesium	7439-95-4	12	12	2570	6329	13800	NESV	---	---	Yes	Essential Nutrient
Potassium	7440-09-7	12	12	452	908	1200	NESV	---	---	Yes	Essential Nutrient
Sodium	7440-23-5	12	11	51	368	844	NESV	---	---	Yes	Essential Nutrient
Pesticides (mg/kg)											
Aldrin	309-00-2	2	0	---	---	---	0.00332	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	2	0	---	---	---	0.0994	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	2	0	---	---	---	0.119	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	2	0	---	---	---	0.00398	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	2	0	---	---	---	0.119	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	2	0	---	---	---	0.224	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	2	0	---	---	---	0.005	---	---	No	100% Non-Detect
Dieldrin	60-57-1	2	0	---	---	---	0.00238	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	2	0	---	---	---	0.0358	---	---	No	100% Non-Detect
Endrin	72-20-8	2	0	---	---	---	0.0014	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	2	0	---	---	---	0.0105	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
Gamma Bhc (Lindane)	58-89-9	2	0	---	---	---	0.005	---	---	No	100% Non-Detect
Heptachlor	76-44-8	2	0	---	---	---	0.00598	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	2	0	---	---	---	0.152	---	---	No	100% Non-Detect

Table B-18
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-0.5 feet)
Northern Surface Water Feature Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Methoxychlor	72-43-5	2	0	---	---	---	0.0199	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	2	0	---	---	---	0.0063	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	2	0	---	---	---	0.021	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	2	0	---	---	---	0.0035	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	2	0	---	---	---	0.119	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	2	0	---	---	---	0.224	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	2	0	---	---	---	1.1	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	2	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)	12672-29-6	2	0	---	---	---	0.0073	---	---	No	100% Non-Detect
PCB-1254 (Aroclor 1254)	11097-69-1	2	0	---	---	---	0.041	---	---	No	100% Non-Detect
PCB-1260 (Aroclor 1260)	11096-82-5	2	0	---	---	---	0.88	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	2	0	---	---	---	0.000332	---	---	No	100% Non-Detect
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	12	0	---	---	---	3.24	---	---	No	100% Non-Detect
Acenaphthene	83-32-9	12	0	---	---	---	0.25	---	---	No	100% Non-Detect
Acenaphthylene	208-96-8	12	0	---	---	---	120	---	---	No	100% Non-Detect
Anthracene	120-12-7	12	3	0.0098	0.0116	0.013	6.8	0	<1	No	[Maximum] < ESV
Fluoranthene	206-44-0	12	11	0.013	0.074	0.15	10	0	<1	No	[Maximum] < ESV
Fluorene	86-73-7	12	1	0.0062	0.0062	0.0062	3.7	0	<1	No	[Maximum] < ESV
Naphthalene	91-20-3	12	0	---	---	---	0.0994	---	---	No	100% Non-Detect
Phenanthrene	85-01-8	12	11	0.0058	0.0412	0.085	5.5	0	<1	No	[Maximum] < ESV
Total LMW PAHs - 1/2MDL	---	12	11	0.02475	0.14272	0.241	29	0	<1	No	[Maximum] < ESV
Total LMW PAHs - MDL	---	12	11	0.0307	0.1666	0.29	29	0	<1	No	[Maximum] < ESV
Total LMW PAHs - Zero	---	12	11	0.0188	0.1188	0.2068	29	0	<1	No	[Maximum] < ESV
Benzo(A)Pyrene	50-32-8	12	11	0.007	0.05	0.091	1.52	0	<1	No	[Maximum] < ESV
Benzo(A)Anthracene	56-55-3	12	10	0.0061	0.0413	0.074	0.73	0	<1	No	[Maximum] < ESV
Benzo(B)Fluoranthene	205-99-2	12	11	0.015	0.079	0.16	18	0	<1	No	[Maximum] < ESV
Benzo(G,H,I)Perylene	191-24-2	12	11	0.0076	0.0518	0.1	25	0	<1	No	[Maximum] < ESV
Benzo(K)Fluoranthene	207-08-9	12	10	0.0039	0.0337	0.057	71	0	<1	No	[Maximum] < ESV
Chrysene	218-01-9	12	11	0.016	0.074	0.2	3.1	0	<1	No	[Maximum] < ESV
Dibenz(A,H)Anthracene	53-70-3	12	7	0.0066	0.0126	0.021	14	0	<1	No	[Maximum] < ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	12	11	0.0061	0.0413	0.093	71	0	<1	No	[Maximum] < ESV
Pyrene	129-00-0	12	11	0.011	0.065	0.12	10	0	<1	No	[Maximum] < ESV
Total HMW PAHs - 1/2MDL	---	12	11	0.07365	0.4428	0.8145	1.1	0	<1	No	[Maximum] < ESV
Total HMW PAHs - MDL	---	12	11	0.0746	0.4475	0.828	1.1	0	<1	No	[Maximum] < ESV
Total HMW PAHs - Zero	---	12	11	0.0727	0.4381	0.812	1.1	0	<1	No	[Maximum] < ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
1,2,4,5-Tetrachlorobenzene	95-94-3	12	0	---	---	---	2.02	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	12	0	---	---	---	2.05	---	---	No	100% Non-Detect

Table B-18
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-0.5 feet)
Northern Surface Water Feature Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
2,3,4,6-Tetrachlorophenol	58-90-2	12	0	---	---	---	0.199	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	12	0	---	---	---	4	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	12	0	---	---	---	9.94	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	12	0	---	---	---	87.5	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	12	0	---	---	---	0.01	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	12	0	---	---	---	0.0609	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	12	0	---	---	---	1.28	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	12	0	---	---	---	0.0328	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	12	0	---	---	---	0.0122	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	12	0	---	---	---	0.243	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	12	0	---	---	---	0.67	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	12	0	---	---	---	5.3	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	12	0	---	---	---	1.6	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	106445	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
3,3'-Dichlorobenzidine	91-94-1	12	0	---	---	---	0.646	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	12	0	---	---	---	3.16	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	12	0	---	---	---	0.144	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	12	0	---	---	---	7.95	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	12	0	---	---	---	1	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	12	0	---	---	---	21.9	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	12	0	---	---	---	5.12	---	---	No	100% Non-Detect
Acetophenone	98-86-2	12	1	0.0093	0.0093	0.0093	300	0	<1	No	[Maximum] < ESV
Atrazine	1912-24-9	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	12	2	0.039	0.069	0.1	NESV	---	---	Yes	No ESV Available
Benzyl Butyl Phthalate	85-68-7	12	0	---	---	---	0.239	---	---	No	100% Non-Detect
Biphenyl (Diphenyl)	92-52-4	12	0	---	---	---	60	---	---	No	100% Non-Detect
Bis(2-Chloroethoxy) Methane	111-91-1	12	0	---	---	---	0.302	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	12	0	---	---	---	23.7	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	12	0	---	---	---	19.9	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	12	0	---	---	---	0.02	---	---	No	100% Non-Detect
Caprolactam	105-60-2	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	12	9	0.0023	0.0127	0.023	79	0	<1	No	[Maximum] < ESV
Dibenzofuran	132-64-9	12	0	---	---	---	6.1	---	---	No	100% Non-Detect
Diethyl Phthalate	84-66-2	12	0	---	---	---	24.8	---	---	No	100% Non-Detect
Dimethyl Phthalate	131-11-3	12	0	---	---	---	10	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	12	0	---	---	---	0.011	---	---	No	100% Non-Detect
Di-N-Octylphthalate	117-84-0	12	0	---	---	---	0.91	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	12	0	---	---	---	0.079	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	12	0	---	---	---	0.0398	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	12	0	---	---	---	0.755	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	12	0	---	---	---	0.596	---	---	No	100% Non-Detect

Table B-18
Screening-Level Ecological Exposure Estimate for Bulk Soil (0-0.5 feet)
Northern Surface Water Feature Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Isophorone	78-59-1	12	1	0.015	0.015	0.015	139	0	<1	No	[Maximum] < ESV
Nitrobenzene	98-95-3	12	0	---	---	---	1.31	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	12	0	---	---	---	0.544	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	12	0	---	---	---	0.545	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	12	0	---	---	---	0.119	---	---	No	100% Non-Detect
Phenol	108-95-2	12	1	0.13	0.13	0.13	0.79	0	<1	No	[Maximum] < ESV
Physicochemical Parameters											
Moisture, Percent	---	6	6	31	92	170	NESV	---	---	---	---
Total Organic Carbon	7440440	12	12	5810	57795	162000	NESV	---	---	---	---

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
TAL: Target Analyte List
TCL: Target Compound List

Table B-19
Screening-Level Ecological Exposure Estimate for Surface Water
Northern Surface Water Feature Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (ug/L)												
Aluminum	7429-90-5	U	16	15	16.1	517.8	5750	87	6	66.1	Yes	[Maximum] > ESV
Aluminum	7429-90-5	F	11	0	---	---	---	87	---	---	No	100% Non-Detect
Antimony	7440-36-0	U	16	3	2.4	2.7	2.9	30	0	<1	No	[Maximum] < ESV
Antimony	7440-36-0	F	11	0	---	---	---	30	---	---	No	100% Non-Detect
Arsenic	7440-38-2	U	16	10	0.78	1.25	3.7	5	0	<1	No	[Maximum] < ESV
Arsenic	7440-38-2	F	11	4	0.79	1.02	1.5	3.1	0	<1	No	[Maximum] < ESV
Barium	7440-39-3	U	16	16	77.9	124.9	245	4	16	61.3	Yes	[Maximum] > ESV
Barium	7440-39-3	F	11	11	83.5	121.3	229	4	11	57.3	Yes	[Maximum] > ESV
Beryllium	7440-41-7	U	16	0	---	---	---	0.66	---	---	No	100% Non-Detect
Beryllium	7440-41-7	F	11	0	---	---	---	0.66	---	---	No	100% Non-Detect
Cadmium	7440-43-9	U	16	0	---	---	---	0.241	---	---	No	100% Non-Detect
Cadmium	7440-43-9	F	11	0	---	---	---	0.243	---	---	No	100% Non-Detect
Chromium, Total	7440-47-3	U	16	1	3.4	3.4	3.4	8.9	0	<1	No	[Maximum] < ESV
Chromium, Total	7440-47-3	F	11	0	---	---	---	8.9	---	---	No	100% Non-Detect
Cobalt	7440-48-4	U	16	1	2	2	2	5.1	0	<1	No	[Maximum] < ESV
Cobalt	7440-48-4	F	11	0	---	---	---	5.1	---	---	No	100% Non-Detect
Copper	7440-50-8	U	16	2	2.6	4.2	5.7	0.23	2	24.8	Yes	[Maximum] > ESV
Copper	7440-50-8	F	11	0	---	---	---	0.23	---	---	No	100% Non-Detect
Iron	7439-89-6	U	16	8	50.2	703.9	4760	300	2	15.9	Yes	[Maximum] > ESV
Iron	7439-89-6	F	11	0	---	---	---	158	---	---	No	100% Non-Detect
Lead	7439-92-1	U	16	2	0.66	2.58	4.5	6.065	0	<1	No	[Maximum] < ESV
Lead	7439-92-1	F	11	0	---	---	---	4.366	---	---	No	100% Non-Detect
Manganese	7439-96-5	U	16	13	3	26	127	120	1	1.1	Yes	[Maximum] > ESV
Manganese	7439-96-5	F	11	8	3.4	19.1	80.5	120	0	<1	No	[Maximum] < ESV
Mercury	7439-97-6	U	16	0	---	---	---	0.026	---	---	No	100% Non-Detect
Mercury	7439-97-6	F	11	0	---	---	---	0.026	---	---	No	100% Non-Detect
Nickel	7440-02-0	U	16	2	2.1	3	3.9	80.089	0	<1	No	[Maximum] < ESV
Nickel	7440-02-0	F	11	0	---	---	---	5	---	---	No	100% Non-Detect
Selenium	7782-49-2	U	16	1	1.5	1.5	1.5	1	1	1.5	Yes	[Maximum] > ESV
Selenium	7782-49-2	F	11	1	1.4	1.4	1.4	3.1	0	<1	No	[Maximum] < ESV
Silver	7440-22-4	U	16	0	---	---	---	0.25	---	---	No	100% Non-Detect
Silver	7440-22-4	F	11	0	---	---	---	0.12	---	---	No	100% Non-Detect
Thallium	7440-28-0	U	16	0	---	---	---	0.8	---	---	No	100% Non-Detect
Thallium	7440-28-0	F	11	0	---	---	---	12	---	---	No	100% Non-Detect
Vanadium	7440-62-2	U	16	3	2.1	2.7	3.9	NESV	---	---	Yes	No ESV Available
Vanadium	7440-62-2	F	11	0	---	---	---	20	---	---	No	100% Non-Detect
Zinc	7440-66-6	U	16	2	9.1	14.1	19.2	184.083	0	<1	No	[Maximum] < ESV
Zinc	7440-66-6	F	11	0	---	---	---	7	---	---	No	100% Non-Detect
Other Inorganic Parameters (ug/L unless otherwise noted)												
Chloride (As Cl)	16887-00-6	U	16	16	1200	1796	3970	120000	0	<1	No	[Maximum] < ESV
Cyanide	57-12-5	U	16	1	4.4	4.4	4.4	5.2	0	<1	No	[Maximum] < ESV
Cyanide	57-12-5	F	1	0	---	---	---	5.2	---	---	No	100% Non-Detect
Cyanide (Free)	FREE CN	U	10	6	1.8	2.8	4.1	5	0	<1	No	[Maximum] < ESV
Fluoride	16984-48-8	U	16	16	166	215	301	120	16	2.5	Yes	[Maximum] > ESV
Fluoride	16984-48-8	F	1	1	188	188	188	120	1	1.6	Yes	[Maximum] > ESV
Nitrogen, Ammonia (As N)	7664-41-7	U	16	7	28.4	89.8	167	1001.333	0	<1	No	[Maximum] < ESV
Essential Nutrients (ug/L)												
Calcium	7440-70-2	U	16	16	42600	55506	82100	116000	0	<1	No	Essential Nutrient

Table B-19
Screening-Level Ecological Exposure Estimate for Surface Water
Northern Surface Water Feature Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Calcium	7440-70-2	F	11	11	46700	55073	75400	116000	0	<1	No	Essential Nutrient
Magnesium	7439-95-4	U	16	16	10300	13288	19500	82000	0	<1	No	Essential Nutrient
Magnesium	7439-95-4	F	11	11	10500	12509	16500	82000	0	<1	No	Essential Nutrient
Potassium	7440-09-7	U	16	16	432	615	1250	53000	0	<1	No	Essential Nutrient
Potassium	7440-09-7	F	11	11	397	532	969	53000	0	<1	No	Essential Nutrient
Sodium	7440-23-5	U	16	16	4490	19279	108000	680000	0	<1	No	Essential Nutrient
Sodium	7440-23-5	F	11	11	6400	18653	89200	680000	0	<1	No	Essential Nutrient
Physicochemical Parameters												
Alkalinity, Total (As CaCO3)	---	U	16	16	144000	196063	286000	NESV	---	---	---	---
Dissolved Organic Carbon	---	F	11	11	1460	2296	5260	NESV	---	---	---	---
Dissolved Oxygen	---	U	16	16	1940	8711	13080	NESV	---	---	---	---
Hardness (As CaCO3)	---	U	16	16	166000	199313	304000	NESV	---	---	---	---
Oxidation-Reduction Potential (mv)	---	U	16	16	45	149	292	NESV	---	---	---	---
pH (s.u.)	---	U	15	15	5.93	7.1	8.37	NESV	---	---	---	---
Specific Conductance (ms/cm)	---	U	16	16	0.323	0.412	0.756	NESV	---	---	---	---
Temperature (°C)	---	U	16	16	3.19	10.91	16.65	NESV	---	---	---	---
Total Organic Carbon	---	U	10	10	1300	2080	3900	NESV	---	---	---	---
Total Dissolved Solids	---	U	16	16	168000	256125	560000	NESV	---	---	---	---
Total Suspended Solids	---	U	16	10	1600	39450	262000	NESV	---	---	---	---
Turbidity (NTU)	---	U	15	15	0	4	28	NESV	---	---	---	---
Other Nutrients (ug/L)												
Nitrogen, Nitrite + Nitrate	NO3NO2N	U	16	3	137	349	526	NESV	---	---	No	Other Nutrient
Phosphorus, Total Orthophosphate (As P)	---	U	13	2	138	139	140	NESV	---	---	No	Other Nutrient
Sulfate (As SO4)	14808-79-8	U	16	16	5660	31882	172000	NESV	---	---	No	Other Nutrient
Sulfide	18496-25-8	U	11	0	---	---	---	NESV	---	---	No	Other Nutrient

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
[Maximum]: Maximum concentration
NESV: No Ecological Screening Value
MDL: Method Detection Limit
SW: Surface Water
TAL: Target Analyte List
U: Unfiltered
F: Filtered

Table B-20
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
Northern Surface Water Feature Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	12	12	12100	20617	35400	26000	3	1.4	Yes	[Maximum] > ESV
Antimony	7440-36-0	12	0	---	---	---	2	---	---	No	100% Non-Detect
Arsenic	7440-38-2	12	12	3.2	7.4	14.5	9.79	3	1.5	Yes	[Maximum] > ESV
Barium	7440-39-3	12	12	136	448	905	NESV	---	---	Yes	No ESV Available
Beryllium	7440-41-7	12	10	0.32	0.67	1.1	NESV	---	---	Yes	No ESV Available
Cadmium	7440-43-9	12	0	---	---	---	0.583	---	---	No	100% Non-Detect
Chromium, Total	7440-47-3	12	12	5	10	20	36.2	0	<1	No	[Maximum] < ESV
Cobalt	7440-48-4	12	12	1.9	4.8	6.6	50	0	<1	No	[Maximum] < ESV
Copper	7440-50-8	12	12	10.1	20.4	42.5	28	3	1.5	Yes	[Maximum] > ESV
Iron	7439-89-6	12	12	7770	14242	25200	20000	2	1.3	Yes	[Maximum] > ESV
Lead	7439-92-1	12	12	6.1	11.6	17.6	35.8	0	<1	No	[Maximum] < ESV
Manganese	7439-96-5	12	12	34.1	317.6	988	460	3	2.1	Yes	[Maximum] > ESV
Mercury	7439-97-6	12	6	0.012	0.03	0.062	0.174	0	<1	No	[Maximum] < ESV
Nickel	7440-02-0	12	12	6	11	15	19.5	0	<1	No	[Maximum] < ESV
Selenium	7782-49-2	12	4	0.57	2.07	4.4	2	2	2.2	Yes	[Maximum] > ESV
Silver	7440-22-4	12	0	---	---	---	0.5	---	---	No	100% Non-Detect
Thallium	7440-28-0	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
Vanadium	7440-62-2	12	12	7.9	11.6	17.2	NESV	---	---	Yes	No ESV Available
Zinc	7440-66-6	12	12	16	36	65	98	0	<1	No	[Maximum] < ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	12	7	0.11	0.41	0.84	0.0001	7	8400	Yes	[Maximum] > ESV
Fluoride	16984-48-8	12	12	1.14	3.68	9.59	290.2	0	<1	No	[Maximum] < ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	12	12	2500	8153	17800	NESV	---	---	Yes	Essential Nutrient
Magnesium	7439-95-4	12	12	2570	6329	13800	NESV	---	---	Yes	Essential Nutrient
Potassium	7440-09-7	12	12	452	908	1200	NESV	---	---	Yes	Essential Nutrient
Sodium	7440-23-5	12	11	51	368	844	NESV	---	---	Yes	Essential Nutrient
Pesticides (mg/kg)											
Aldrin	309-00-2	2	0	---	---	---	0.002	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	2	0	---	---	---	0.006	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	2	0	---	---	---	0.000006	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	2	0	---	---	---	0.005	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	2	0	---	---	---	0.000006	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	2	0	---	---	---	0.1388	---	---	No	100% Non-Detect
Dieldrin	60-57-1	2	0	---	---	---	0.0019	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	2	0	---	---	---	0.000006	---	---	No	100% Non-Detect
Endrin	72-20-8	2	0	---	---	---	0.00222	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	2	0	---	---	---	0.004428	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
Gamma Bhc (Lindane)	58-89-9	2	0	---	---	---	0.00237	---	---	No	100% Non-Detect
Heptachlor	76-44-8	2	0	---	---	---	0.0006	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	2	0	---	---	---	0.00247	---	---	No	100% Non-Detect

Table B-20
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
Northern Surface Water Feature Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Methoxychlor	72-43-5	2	0	---	---	---	0.0136	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	2	0	---	---	---	0.00488	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	2	0	---	---	---	0.00316	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	2	0	---	---	---	0.00416	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	2	0	---	---	---	0.000077	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)	12672-29-6	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1254 (Aroclor 1254)	11097-69-1	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1260 (Aroclor 1260)	11096-82-5	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	2	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	2	0	---	---	---	0.032	---	---	No	100% Non-Detect
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	12	0	---	---	---	0.0202	---	---	No	100% Non-Detect
Acenaphthene	83-32-9	12	0	---	---	---	0.0067	---	---	No	100% Non-Detect
Acenaphthylene	208-96-8	12	0	---	---	---	0.0059	---	---	No	100% Non-Detect
Anthracene	120-12-7	12	3	0.0098	0.0116	0.013	0.01	2	1.3	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	12	11	0.013	0.074	0.15	0.031	9	4.8	Yes	[Maximum] > ESV
Fluorene	86-73-7	12	1	0.0062	0.0062	0.0062	0.01	0	<1	No	[Maximum] < ESV
Naphthalene	91-20-3	12	0	---	---	---	0.015	---	---	No	100% Non-Detect
Phenanthrene	85-01-8	12	11	0.0058	0.0412	0.085	0.019	8	4.5	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	12	11	0.007	0.05	0.091	0.032	7	2.8	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	12	10	0.0061	0.0413	0.074	0.016	9	4.6	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	12	11	0.015	0.079	0.16	9.79	0	<1	No	[Maximum] < ESV
Benzo(G,H,I)Perylene	191-24-2	12	11	0.0076	0.0518	0.1	0.016	10	6.3	Yes	[Maximum] > ESV
Benzo(K)Fluoranthene	207-08-9	12	10	0.0039	0.0337	0.057	0.24	0	<1	No	[Maximum] < ESV
Chrysene	218-01-9	12	11	0.016	0.074	0.2	0.027	9	7.4	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	12	7	0.0066	0.0126	0.021	0.01	4	2.1	Yes	[Maximum] > ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	12	11	0.0061	0.0413	0.093	0.017	10	5.5	Yes	[Maximum] > ESV
Pyrene	129-00-0	12	11	0.011	0.065	0.12	0.044	7	2.7	Yes	[Maximum] > ESV
Total PAHs - 1/2MDL	---	12	11	0.0824	0.5024	0.8925	0.26	8	3.4	Yes	[Maximum] > ESV
Total PAHs - MDL	---	12	11	0.0883	0.5273	0.956	0.26	9	3.7	Yes	[Maximum] > ESV
Total PAHs - Zero	---	12	11	0.0765	0.4775	0.8588	0.26	8	3.3	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
1,2,4,5-Tetrachlorobenzene	95-94-3	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	12	0	---	---	---	0.129	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	12	0	---	---	---	0.288	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	12	0	---	---	---	0.208	---	---	No	100% Non-Detect

Table B-20
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
Northern Surface Water Feature Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
2,4-Dichlorophenol	120-83-2	12	0	---	---	---	0.0817	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	12	0	---	---	---	0.029	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	12	0	---	---	---	0.00621	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	12	0	---	---	---	0.0144	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	12	0	---	---	---	0.0398	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	12	0	---	---	---	0.417	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	12	0	---	---	---	0.02716	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	12	0	---	---	---	0.011856	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	106445	2	0	---	---	---	0.0202	---	---	No	100% Non-Detect
3,3'-Dichlorobenzidine	91-94-1	12	0	---	---	---	0.127	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	12	0	---	---	---	0.104	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	12	0	---	---	---	0.255	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	12	0	---	---	---	0.388	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	12	0	---	---	---	0.146	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	12	0	---	---	---	0.013	---	---	No	100% Non-Detect
Acetophenone	98-86-2	12	1	0.0093	0.0093	0.0093	NESV	---	---	Yes	No ESV Available
Atrazine	1912-24-9	12	0	---	---	---	0.00662	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	12	2	0.039	0.069	0.1	NESV	---	---	Yes	No ESV Available
Benzyl Butyl Phthalate	85-68-7	12	0	---	---	---	1.97	---	---	No	100% Non-Detect
Biphenyl (Diphenyl)	92-52-4	12	0	---	---	---	1.22	---	---	No	100% Non-Detect
Bis(2-Chloroethoxy) Methane	111-91-1	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	12	0	---	---	---	3.52	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	12	0	---	---	---	0.18	---	---	No	100% Non-Detect
Caprolactam	105-60-2	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	12	9	0.0023	0.0127	0.023	NESV	---	---	Yes	No ESV Available
Dibenzofuran	132-64-9	12	0	---	---	---	0.300736	---	---	No	100% Non-Detect
Diethyl Phthalate	84-66-2	12	0	---	---	---	0.295	---	---	No	100% Non-Detect
Dimethyl Phthalate	131-11-3	12	0	---	---	---	NESV	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	12	0	---	---	---	1.1989	---	---	No	100% Non-Detect
Di-N-Octylphthalate	117-84-0	12	0	---	---	---	16.8858	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	12	0	---	---	---	0.02	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	12	0	---	---	---	0.0265	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	12	0	---	---	---	0.901	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	12	0	---	---	---	0.2136	---	---	No	100% Non-Detect
Isophorone	78-59-1	12	1	0.015	0.015	0.015	0.432	0	<1	No	[Maximum] < ESV
Nitrobenzene	98-95-3	12	0	---	---	---	0.145	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	12	0	---	---	---	NESV	---	---	No	100% Non-Detect

Table B-20
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
Northern Surface Water Feature Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
N-Nitrosodiphenylamine	86-30-6	12	0	---	---	---	0.516	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	12	0	---	---	---	0.504	---	---	No	100% Non-Detect
Phenol	108-95-2	12	1	0.13	0.13	0.13	0.001152	1	112.8	Yes	[Maximum] > ESV
Physicochemical Parameters											
Moisture, Percent	---	6	6	31	92	170	NESV	---	---	---	---
Total Organic Carbon	7440440	12	12	5810	57795	162000	NESV	---	---	---	---

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
TAL: Target Analyte List
TCL: Target Compound List

Table B-21
Screening-Level Ecological Exposure Estimate for Surface Water
Flathead River Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (ug/L)												
Aluminum	7429-90-5	U	76	70	17.5	333.4	1540	87	44	17.7	Yes	[Maximum] > ESV
Aluminum	7429-90-5	F	49	12	17.1	33.4	75.3	87	0	<1	No	[Maximum] < ESV
Antimony	7440-36-0	U	76	4	0.64	0.64	0.66	30	0	<1	No	[Maximum] < ESV
Antimony	7440-36-0	F	49	0	---	---	---	30	---	---	No	100% Non-Detect
Arsenic	7440-38-2	U	76	5	0.66	0.82	0.95	5	0	<1	No	[Maximum] < ESV
Arsenic	7440-38-2	F	49	0	---	---	---	3.1	---	---	No	100% Non-Detect
Barium	7440-39-3	U	76	76	62.8	110.1	216	4	76	54	Yes	[Maximum] > ESV
Barium	7440-39-3	F	49	49	62.5	95.3	191	4	49	47.8	Yes	[Maximum] > ESV
Beryllium	7440-41-7	U	76	0	---	---	---	0.66	---	---	No	100% Non-Detect
Beryllium	7440-41-7	F	49	0	---	---	---	0.66	---	---	No	100% Non-Detect
Cadmium	7440-43-9	U	76	0	---	---	---	0.1	---	---	No	100% Non-Detect
Cadmium	7440-43-9	F	49	0	---	---	---	0.1	---	---	No	100% Non-Detect
Chromium, Total	7440-47-3	U	76	6	1.3	1.6	2	8.9	0	<1	No	[Maximum] < ESV
Chromium, Total	7440-47-3	F	49	0	---	---	---	8.9	---	---	No	100% Non-Detect
Cobalt	7440-48-4	U	76	4	1.3	1.4	1.7	5.1	0	<1	No	[Maximum] < ESV
Cobalt	7440-48-4	F	49	0	---	---	---	5.1	---	---	No	100% Non-Detect
Copper	7440-50-8	U	76	21	1.4	4.2	12.3	0.23	21	53.5	Yes	[Maximum] > ESV
Copper	7440-50-8	F	49	2	3	15	26	0.23	2	114.8	Yes	[Maximum] > ESV
Iron	7439-89-6	U	76	51	62.4	551.7	1640	300	34	5.5	Yes	[Maximum] > ESV
Iron	7439-89-6	F	49	11	45.8	98.6	164	158	1	1	Yes	[Maximum] > ESV
Lead	7439-92-1	U	76	22	0.38	0.81	2.9	1.576	0	1.8	No	[Maximum] < ESV
Lead	7439-92-1	F	49	0	---	---	---	1.371	---	---	No	100% Non-Detect
Manganese	7439-96-5	U	76	54	2.6	29.3	212	120	1	1.8	Yes	[Maximum] > ESV
Manganese	7439-96-5	F	49	29	2.5	16.4	63.7	120	0	<1	No	[Maximum] < ESV
Mercury	7439-97-6	U	76	0	---	---	---	0.026	---	---	No	100% Non-Detect
Mercury	7439-97-6	F	49	0	---	---	---	0.026	---	---	No	100% Non-Detect
Nickel	7440-02-0	U	76	4	1.4	1.7	2.2	32.71	0	<1	No	[Maximum] < ESV
Nickel	7440-02-0	F	49	2	1.3	16.8	32.2	5	1	6.4	Yes	[Maximum] > ESV
Selenium	7782-49-2	U	76	0	---	---	---	1	---	---	No	100% Non-Detect
Selenium	7782-49-2	F	49	0	---	---	---	3.1	---	---	No	100% Non-Detect
Silver	7440-22-4	U	76	0	---	---	---	0.25	---	---	No	100% Non-Detect
Silver	7440-22-4	F	49	0	---	---	---	0.12	---	---	No	100% Non-Detect
Thallium	7440-28-0	U	76	0	---	---	---	0.8	---	---	No	100% Non-Detect
Thallium	7440-28-0	F	49	0	---	---	---	12	---	---	No	100% Non-Detect
Vanadium	7440-62-2	U	76	4	1.2	1.4	1.9	NESV	---	---	Yes	No ESV Available
Vanadium	7440-62-2	F	49	0	---	---	---	20	---	---	No	100% Non-Detect
Zinc	7440-66-6	U	76	8	6.1	11.6	19.9	75.08	0	<1	No	[Maximum] < ESV
Zinc	7440-66-6	F	49	3	5.8	6.2	6.8	7	0	<1	No	[Maximum] < ESV
Other Inorganic Parameters (ug/L unless otherwise noted)												
Chloride (As Cl)	16887-00-6	U	76	76	227	781	3750	120000	0	<1	No	[Maximum] < ESV
Cyanide	57-12-5	U	76	28	3.2	107.8	378	5.2	27	72.7	Yes	[Maximum] > ESV
Cyanide	57-12-5	F	15	9	11.7	108.7	328	5.2	9	63.1	Yes	[Maximum] > ESV
Cyanide (Free)	FREE CN	U	48	26	1.5	19.3	139	5	14	27.8	Yes	[Maximum] > ESV
Cyanide (Free)	FREE CN	F	10	10	1.6	10.3	42.2	5	7	8.4	Yes	[Maximum] > ESV
Fluoride	16984-48-8	U	76	65	28.6	450.8	2570	120	35	21.4	Yes	[Maximum] > ESV
Fluoride	16984-48-8	F	9	9	109	179	558	120	3	4.7	Yes	[Maximum] > ESV
Nitrogen, Ammonia (As N)	7664-41-7	U	76	18	48	83	143	1241.155	0	<1	No	[Maximum] < ESV
Essential Nutrients (ug/L)												

Table B-21
Screening-Level Ecological Exposure Estimate for Surface Water
Flathead River Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Calcium	7440-70-2	U	76	76	17600	28266	62600	116000	0	<1	No	Essential Nutrient
Calcium	7440-70-2	F	49	49	17300	26282	61900	116000	0	<1	No	Essential Nutrient
Magnesium	7439-95-4	U	76	76	4670	7876	18200	82000	0	<1	No	Essential Nutrient
Magnesium	7439-95-4	F	49	49	4170	6737	17300	82000	0	<1	No	Essential Nutrient
Potassium	7440-09-7	U	76	76	242	495	1200	53000	0	<1	No	Essential Nutrient
Potassium	7440-09-7	F	49	49	237	392	1040	53000	0	<1	No	Essential Nutrient
Sodium	7440-23-5	U	76	76	666	5966	40700	680000	0	<1	No	Essential Nutrient
Sodium	7440-23-5	F	49	49	554	9132	169000	680000	0	<1	No	Essential Nutrient
Polycyclic Aromatic Hydrocarbons (PAHs) (ug/L)												
2-Methylnaphthalene	91-57-6	U	11	0	---	---	---	4.7	---	---	No	100% Non-Detect
Acenaphthene	83-32-9	U	11	0	---	---	---	5.8	---	---	No	100% Non-Detect
Acenaphthylene	208-96-8	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
Anthracene	120-12-7	U	11	1	0.0074	0.0074	0.0074	0.012	0	<1	No	[Maximum] < ESV
Benzo(A)Anthracene	56-55-3	U	11	3	0.0048	0.2353	0.63	0.018	2	35	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	U	11	2	0.041	0.145	0.25	0.014	2	17.9	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	U	11	3	0.0056	0.2685	0.7	NESV	---	---	Yes	No ESV Available
Benzo(G,H,I)Perylene	191-24-2	U	11	1	0.044	0.044	0.044	NESV	---	---	Yes	No ESV Available
Benzo(K)Fluoranthene	207-08-9	U	11	2	0.095	0.277	0.46	NESV	---	---	Yes	No ESV Available
Chrysene	218-01-9	U	11	4	0.011	0.351	1.2	NESV	---	---	Yes	No ESV Available
Dibenz(A,H)Anthracene	53-70-3	U	11	1	0.015	0.015	0.015	NESV	---	---	Yes	No ESV Available
Fluoranthene	206-44-0	U	11	4	0.0077	0.5872	2.1	0.04	3	52.5	Yes	[Maximum] > ESV
Fluorene	86-73-7	U	11	0	---	---	---	3	---	---	No	100% Non-Detect
Indeno(1,2,3-C,D)Pyrene	193-39-5	U	11	1	0.04	0.04	0.04	NESV	---	---	Yes	No ESV Available
Naphthalene	91-20-3	U	11	1	0.004	0.004	0.004	1.1	0	<1	No	[Maximum] < ESV
Phenanthrene	85-01-8	U	11	2	0.024	0.612	1.2	0.4	1	3	Yes	[Maximum] > ESV
Pyrene	129-00-0	U	11	4	0.0069	0.453	1.6	0.025	2	64	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (ug/L)												
1,2,4,5-Tetrachlorobenzene	95-94-3	U	11	0	---	---	---	3	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	U	11	0	---	---	---	1	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	U	11	0	---	---	---	4.9	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	U	11	0	---	---	---	11	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	U	11	0	---	---	---	44	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	U	11	0	---	---	---	81	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	U	11	0	---	---	---	24	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	U	11	0	---	---	---	13	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	U	11	0	---	---	---	300	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	MEPH3MEPH4	U	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
3,3'-Dichlorobenzidine	91-94-1	U	11	0	---	---	---	4.5	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	U	11	0	---	---	---	1.5	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect

Table B-21
Screening-Level Ecological Exposure Estimate for Surface Water
Flathead River Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
4-Chloroaniline	106-47-8	U	11	0	---	---	---	232	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	U	11	0	---	---	---	60	---	---	No	100% Non-Detect
Acetophenone	98-86-2	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
Atrazine	1912-24-9	U	11	0	---	---	---	1.8	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
Benzyl Butyl Phthalate	85-68-7	U	11	3	0.56	0.72	0.86	19	0	<1	No	[Maximum] < ESV
Biphenyl (Diphenyl)	92-52-4	U	11	0	---	---	---	14	---	---	No	100% Non-Detect
Bis(2-Chloroethoxy) Methane	111-91-1	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	U	11	4	1.2	9.1	22	3	3	7.3	Yes	[Maximum] > ESV
Caprolactam	105-60-2	U	11	4	0.6	0.9	1.1	NESV	---	---	Yes	No ESV Available
Carbazole	86-74-8	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
Dibenzofuran	132-64-9	U	11	0	---	---	---	3.7	---	---	No	100% Non-Detect
Diethyl Phthalate	84-66-2	U	11	0	---	---	---	210	---	---	No	100% Non-Detect
Dimethyl Phthalate	131-11-3	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	U	11	0	---	---	---	19	---	---	No	100% Non-Detect
Di-N-Octylphthalate	117-84-0	U	11	0	---	---	---	22	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	U	11	0	---	---	---	0.0003	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	U	11	0	---	---	---	1.3	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	U	11	0	---	---	---	12	---	---	No	100% Non-Detect
Isophorone	78-59-1	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
Nitrobenzene	98-95-3	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	U	11	0	---	---	---	NESV	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	U	11	0	---	---	---	210	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	U	11	0	---	---	---	0.5	---	---	No	100% Non-Detect
Phenol	108-95-2	U	11	0	---	---	---	4	---	---	No	100% Non-Detect
TCL Volatile Organic Compounds (TCL VOCs) (ug/L)												
1,1,1-Trichloroethane	71-55-6	U	6	0	---	---	---	11	---	---	No	100% Non-Detect
1,1,2,2-Tetrachloroethane	79-34-5	U	6	0	---	---	---	610	---	---	No	100% Non-Detect
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	U	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,1,2-Trichloroethane	79-00-5	U	6	0	---	---	---	1200	---	---	No	100% Non-Detect
1,1-Dichloroethane	75-34-3	U	6	0	---	---	---	47	---	---	No	100% Non-Detect
1,1-Dichloroethene	75-35-4	U	6	0	---	---	---	25	---	---	No	100% Non-Detect
1,2,3-Trichlorobenzene	87-61-6	U	6	0	---	---	---	8	---	---	No	100% Non-Detect
1,2,4-Trichlorobenzene	120-82-1	U	6	0	---	---	---	24	---	---	No	100% Non-Detect
1,2-Dibromo-3-Chloropropane	96-12-8	U	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	U	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,2-Dichlorobenzene	95-50-1	U	6	0	---	---	---	0.7	---	---	No	100% Non-Detect
1,2-Dichloroethane	107-06-2	U	6	0	---	---	---	100	---	---	No	100% Non-Detect
1,2-Dichloropropane	78-87-5	U	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,3-Dichlorobenzene	541-73-1	U	6	0	---	---	---	71	---	---	No	100% Non-Detect
1,4-Dichlorobenzene	106-46-7	U	6	0	---	---	---	15	---	---	No	100% Non-Detect
2-Hexanone	591-78-6	U	6	0	---	---	---	99	---	---	No	100% Non-Detect

Table B-21
Screening-Level Ecological Exposure Estimate for Surface Water
Flathead River Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Acetone	67-64-1	U	6	0	---	---	---	1500	---	---	No	100% Non-Detect
Benzene	71-43-2	U	6	0	---	---	---	130	---	---	No	100% Non-Detect
Bromochloromethane	74-97-5	U	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bromodichloromethane	75-27-4	U	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bromoform	75-25-2	U	6	0	---	---	---	320	---	---	No	100% Non-Detect
Bromomethane	74-83-9	U	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbon Disulfide	75-15-0	U	6	0	---	---	---	0.92	---	---	No	100% Non-Detect
Carbon Tetrachloride	56-23-5	U	6	0	---	---	---	9.8	---	---	No	100% Non-Detect
Chlorobenzene	108-90-7	U	6	0	---	---	---	1.3	---	---	No	100% Non-Detect
Chloroethane	75-00-3	U	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Chloroform	67-66-3	U	6	0	---	---	---	1.8	---	---	No	100% Non-Detect
Chloromethane	74-87-3	U	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Cis-1,2-Dichloroethylene	156-59-2	U	6	0	---	---	---	590	---	---	No	100% Non-Detect
Cis-1,3-Dichloropropene	10061-01-5	U	6	0	---	---	---	0.055	---	---	No	100% Non-Detect
Cyclohexane	110-82-7	U	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Dibromochloromethane	124-48-1	U	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Dichlorodifluoromethane	75-71-8	U	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Ethylbenzene	100-41-4	U	6	0	---	---	---	7.3	---	---	No	100% Non-Detect
Isopropylbenzene (Cumene)	98-82-8	U	6	0	---	---	---	2.6	---	---	No	100% Non-Detect
Methyl Acetate	79-20-9	U	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Methyl Ethyl Ketone (2-Butanone)	78-93-3	U	6	0	---	---	---	14000	---	---	No	100% Non-Detect
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	U	6	0	---	---	---	170	---	---	No	100% Non-Detect
Methylcyclohexane	108-87-2	U	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Methylene Chloride	75-09-2	U	6	0	---	---	---	98.1	---	---	No	100% Non-Detect
Styrene	100-42-5	U	6	0	---	---	---	72	---	---	No	100% Non-Detect
Tert-Butyl Methyl Ether	1634-04-4	U	6	0	---	---	---	10000	---	---	No	100% Non-Detect
Tetrachloroethylene (PCE)	127-18-4	U	6	0	---	---	---	98	---	---	No	100% Non-Detect
Toluene	108-88-3	U	6	0	---	---	---	2	---	---	No	100% Non-Detect
Trans-1,2-Dichloroethene	156-60-5	U	6	0	---	---	---	590	---	---	No	100% Non-Detect
Trans-1,3-Dichloropropene	10061-02-6	U	6	0	---	---	---	0.055	---	---	No	100% Non-Detect
Trichloroethylene (TCE)	79-01-6	U	6	0	---	---	---	21	---	---	No	100% Non-Detect
Trichlorofluoromethane	75-69-4	U	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Vinyl Chloride	75-01-4	U	6	0	---	---	---	930	---	---	No	100% Non-Detect
M,P-Xylene	179601-23-1	U	6	0	---	---	---	1.8	---	---	No	100% Non-Detect
O-Xylene (1,2-Dimethylbenzene)	95-47-6	U	6	0	---	---	---	13	---	---	No	100% Non-Detect
Total Xylene - 1/2MDL	1330-20-7	U	6	0	---	---	---	13	---	---	No	100% Non-Detect
Total Xylene - MDL	1330-20-7	U	6	0	---	---	---	13	---	---	No	100% Non-Detect
Total Xylene - Zero	1330-20-7	U	6	0	---	---	---	13	---	---	No	100% Non-Detect
Physicochemical Parameters												
Alkalinity, Total (As CaCO3)	---	U	76	76	69000	106209	278000	NESV	---	---	---	---
Dissolved Organic Carbon	---	F	43	43	956	1322	2450	NESV	---	---	---	---
Dissolved Oxygen	---	U	76	76	1780	11667	24720	NESV	---	---	---	---
Hardness (As CaCO3)	---	U	76	76	57600	104068	252000	NESV	---	---	---	---
Oxidation-Reduction Potential (mv)	---	U	76	76	-25	182	320	NESV	---	---	---	---
pH (s.u.)	---	U	70	70	5.48	7.26	8.24	NESV	---	---	---	---
Specific Conductance (ms/cm)	---	U	76	76	0.127	0.289	5.85	NESV	---	---	---	---
Temperature (°C)	---	U	76	76	2.22	7.83	12.86	NESV	---	---	---	---

Table B-21
Screening-Level Ecological Exposure Estimate for Surface Water
Flathead River Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Total Organic Carbon	---	U	34	34	960	1214	1500	NESV	---	---	---	---
Total Dissolved Solids	---	U	70	70	33000	112986	343000	NESV	---	---	---	---
Total Suspended Solids	---	U	70	61	1500	26921	413000	NESV	---	---	---	---
Turbidity (NTU)	---	U	73	73	0	21	281	NESV	---	---	---	---
Other Nutrients (ug/L)												
Nitrogen, Nitrite + Nitrate	NO3NO2N	U	76	56	100	503	2860	NESV	---	---	No	Other Nutrient
Phosphorus, Total Orthophosphate (As P)	---	U	76	2	144	153	162	NESV	---	---	No	Other Nutrient
Sulfate (As SO4)	14808-79-8	U	76	76	2430	5893	23800	NESV	---	---	No	Other Nutrient
Sulfide	18496-25-8	U	43	0	---	---	---	NESV	---	---	No	Other Nutrient

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
[Maximum]: Maximum concentration
NESV: No Ecological Screening Value
MDL: Method Detection Limit
SW: Surface Water
TAL: Target Analyte List
TCL: Target Compound List
U: Unfiltered
F: Filtered

Table B-22
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
Flathead River Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	32	32	5750	7803	12000	26000	0	<1	No	[Maximum] < ESV
Antimony	7440-36-0	32	0	---	---	---	2	---	---	No	100% Non-Detect
Arsenic	7440-38-2	32	32	2.7	3.8	6.2	9.79	0	<1	No	[Maximum] < ESV
Barium	7440-39-3	32	32	38	89	151	NESV	---	---	Yes	No ESV Available
Beryllium	7440-41-7	32	31	0.22	0.39	0.57	NESV	---	---	Yes	No ESV Available
Cadmium	7440-43-9	32	0	---	---	---	0.583	---	---	No	100% Non-Detect
Chromium, Total	7440-47-3	32	32	6.5	8.8	10.5	36.2	0	<1	No	[Maximum] < ESV
Cobalt	7440-48-4	32	32	4.1	5.2	6.4	50	0	<1	No	[Maximum] < ESV
Copper	7440-50-8	32	32	6.9	11.1	17.1	28	0	<1	No	[Maximum] < ESV
Iron	7439-89-6	32	32	10000	13056	15600	20000	0	<1	No	[Maximum] < ESV
Lead	7439-92-1	32	32	4.3	6.8	11.7	35.8	0	<1	No	[Maximum] < ESV
Manganese	7439-96-5	32	32	129	201	297	460	0	<1	No	[Maximum] < ESV
Mercury	7439-97-6	32	11	0.013	0.024	0.042	0.174	0	<1	No	[Maximum] < ESV
Nickel	7440-02-0	32	32	8.4	11	18.5	19.5	0	<1	No	[Maximum] < ESV
Selenium	7782-49-2	32	0	---	---	---	2	---	---	No	100% Non-Detect
Silver	7440-22-4	32	0	---	---	---	0.5	---	---	No	100% Non-Detect
Thallium	7440-28-0	32	0	---	---	---	NESV	---	---	No	100% Non-Detect
Vanadium	7440-62-2	32	32	7.5	14.3	25.5	NESV	---	---	Yes	No ESV Available
Zinc	7440-66-6	32	32	28.7	38.3	58.4	98	0	<1	No	[Maximum] < ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	32	17	0.067	1.601	8.3	0.0001	17	83000	Yes	[Maximum] > ESV
Cyanide (Free)	STL00131	4	0	---	---	---	NESV	---	---	No	100% Non-Detect
Fluoride	16984-48-8	32	22	0.36	11.59	69.2	290.2	0	<1	No	[Maximum] < ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	32	32	7390	15866	31400	NESV	---	---	Yes	Essential Nutrient
Magnesium	7439-95-4	32	32	7010	9819	12100	NESV	---	---	Yes	Essential Nutrient
Potassium	7440-09-7	32	32	279	669	1160	NESV	---	---	Yes	Essential Nutrient
Sodium	7440-23-5	32	15	39.9	94.6	198	NESV	---	---	Yes	Essential Nutrient
Pesticides (mg/kg)											
Aldrin	309-00-2	9	0	---	---	---	0.002	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	9	0	---	---	---	0.006	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	9	0	---	---	---	0.00000642	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	9	0	---	---	---	0.005	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	9	0	---	---	---	0.00000642	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	9	0	---	---	---	0.138810616	---	---	No	100% Non-Detect
Dieldrin	60-57-1	9	0	---	---	---	0.0019	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	9	0	---	---	---	0.00000642	---	---	No	100% Non-Detect
Endrin	72-20-8	9	0	---	---	---	0.00222	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	9	0	---	---	---	0.004428	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Gamma Bhc (Lindane)	58-89-9	9	0	---	---	---	0.00237	---	---	No	100% Non-Detect
Heptachlor	76-44-8	9	0	---	---	---	0.0006	---	---	No	100% Non-Detect

Table B-22
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
Flathead River Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Heptachlor Epoxide	1024-57-3	9	0	---	---	---	0.00247	---	---	No	100% Non-Detect
Methoxychlor	72-43-5	9	0	---	---	---	0.0136	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	9	0	---	---	---	0.00488	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	9	0	---	---	---	0.00316	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	9	0	---	---	---	0.00416	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	9	0	---	---	---	0.000077	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)	12672-29-6	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1254 (Aroclor 1254)	11097-69-1	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1260 (Aroclor 1260)	11096-82-5	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	9	0	---	---	---	0.032	---	---	No	100% Non-Detect
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	32	0	---	---	---	0.0202	---	---	No	100% Non-Detect
Acenaphthene	83-32-9	32	5	0.0011	0.0123	0.033	0.00671	2	4.9	Yes	[Maximum] > ESV
Acenaphthylene	208-96-8	32	0	---	---	---	0.00587	---	---	No	100% Non-Detect
Anthracene	120-12-7	32	9	0.0012	0.0474	0.16	0.01	5	16	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	32	22	0.0011	0.7677	6.5	0.031	14	209.7	Yes	[Maximum] > ESV
Fluorene	86-73-7	32	1	0.03	0.03	0.03	0.01	1	3	Yes	[Maximum] > ESV
Naphthalene	91-20-3	32	2	0.016	0.018	0.019	0.015	2	1.3	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	32	21	0.0019	0.121	1	0.019	13	52.6	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	32	14	0.0014	0.1718	0.87	0.032	10	27.2	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	32	17	0.00095	0.3119	2.1	0.016	11	131.3	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	32	21	0.0012	0.5333	4.1	9.79	0	<1	No	[Maximum] < ESV
Benzo(G,H,I)Perylene	191-24-2	32	18	0.00098	0.18175	1.2	0.016	12	75	Yes	[Maximum] > ESV
Benzo(K)Fluoranthene	207-08-9	32	17	0.0015	0.312	1.9	0.24	5	7.9	Yes	[Maximum] > ESV
Chrysene	218-01-9	32	22	0.0013	0.7077	4.9	0.027	14	181.5	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	32	9	0.0013	0.1098	0.41	0.01	8	41	Yes	[Maximum] > ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	32	17	0.00098	0.2136	1.5	0.017	12	88.2	Yes	[Maximum] > ESV
Pyrene	129-00-0	32	21	0.0014	0.7137	6.8	0.044	14	154.5	Yes	[Maximum] > ESV
Total PAHs - 1/2MDL	---	32	22	0.01133	3.28688	26.829	0.26	14	103.2	Yes	[Maximum] > ESV
Total PAHs - MDL	---	32	22	0.01628	3.32628	26.836	0.26	14	103.2	Yes	[Maximum] > ESV
Total PAHs - Zero	---	32	22	0.00638	3.24747	26.822	0.26	14	103.2	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
1,2,4,5-Tetrachlorobenzene	95-94-3	27	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	27	0	---	---	---	NESV	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	27	0	---	---	---	0.129	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	27	0	---	---	---	0.288	---	---	No	100% Non-Detect

Table B-22
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
Flathead River Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
2,4,6-Trichlorophenol	88-06-2	27	0	---	---	---	0.208	---	---	No	100% Non-Detect
2,4-Dichlorophenol	120-83-2	27	0	---	---	---	0.0817	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	27	0	---	---	---	0.029	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	27	0	---	---	---	0.00621	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	27	0	---	---	---	0.0144	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	27	0	---	---	---	0.0398	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	27	0	---	---	---	0.417	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	27	0	---	---	---	0.02716	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	27	0	---	---	---	0.011856	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	27	0	---	---	---	NESV	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	27	0	---	---	---	NESV	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	106445	15	4	0.024	0.192	0.49	0.0202	4	24.3	Yes	[Maximum] > ESV
3,3'-Dichlorobenzidine	91-94-1	27	0	---	---	---	0.127	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	27	0	---	---	---	NESV	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	27	0	---	---	---	0.104	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	27	0	---	---	---	0.255	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	27	0	---	---	---	0.388	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	27	0	---	---	---	0.146	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	27	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	27	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	27	0	---	---	---	0.013	---	---	No	100% Non-Detect
Acetophenone	98-86-2	27	0	---	---	---	NESV	---	---	No	100% Non-Detect
Atrazine	1912-24-9	27	0	---	---	---	0.00662	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	27	2	0.0098	0.0474	0.085	NESV	---	---	Yes	No ESV Available
Benzyl Butyl Phthalate	85-68-7	27	1	0.044	0.044	0.044	1.97	0	<1	No	[Maximum] < ESV
Biphenyl (Diphenyl)	92-52-4	27	0	---	---	---	1.22	---	---	No	100% Non-Detect
Bis(2-Chloroethoxy) Methane	111-91-1	27	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	27	0	---	---	---	3.52	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	27	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	27	3	0.018	0.103	0.26	0.18	1	1.4	Yes	[Maximum] > ESV
Caprolactam	105-60-2	27	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	27	6	0.0028	0.1198	0.36	NESV	---	---	Yes	No ESV Available
Dibenzofuran	132-64-9	27	2	0.00082	0.01091	0.021	0.300736	0	<1	No	[Maximum] < ESV
Diethyl Phthalate	84-66-2	27	0	---	---	---	0.295	---	---	No	100% Non-Detect
Dimethyl Phthalate	131-11-3	27	0	---	---	---	NESV	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	27	0	---	---	---	1.1989	---	---	No	100% Non-Detect
Di-N-Octylphthalate	117-84-0	27	1	0.084	0.084	0.084	16.8858	0	<1	No	[Maximum] < ESV
Hexachlorobenzene	118-74-1	27	0	---	---	---	0.02	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	27	0	---	---	---	0.0265	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	27	0	---	---	---	0.901	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	27	0	---	---	---	0.2136	---	---	No	100% Non-Detect
Isophorone	78-59-1	27	0	---	---	---	0.432	---	---	No	100% Non-Detect
Nitrobenzene	98-95-3	27	0	---	---	---	0.145	---	---	No	100% Non-Detect

Table B-22
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
Flathead River Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
N-Nitrosodi-N-Propylamine	621-64-7	27	0	---	---	---	NESV	---	---	No	100% Non-Detect
N-Nitrosodiphenylamine	86-30-6	27	0	---	---	---	0.516	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	27	0	---	---	---	0.504	---	---	No	100% Non-Detect
Phenol	108-95-2	27	0	---	---	---	0.001152	---	---	No	100% Non-Detect
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)											
1,1,1-Trichloroethane	71-55-6	6	0	---	---	---	0.0302	---	---	No	100% Non-Detect
1,1,2,2-Tetrachloroethane	79-34-5	6	0	---	---	---	0.85	---	---	No	100% Non-Detect
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,1,2-Trichloroethane	79-00-5	6	0	---	---	---	0.518	---	---	No	100% Non-Detect
1,1-Dichloroethane	75-34-3	6	0	---	---	---	0.000575	---	---	No	100% Non-Detect
1,1-Dichloroethene	75-35-4	6	0	---	---	---	0.0194	---	---	No	100% Non-Detect
1,2,3-Trichlorobenzene	87-61-6	6	0	---	---	---	0.858	---	---	No	100% Non-Detect
1,2,4-Trichlorobenzene	120-82-1	6	0	---	---	---	2.1	---	---	No	100% Non-Detect
1,2-Dibromo-3-Chloropropane	96-12-8	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,2-Dichlorobenzene	95-50-1	6	0	---	---	---	0.0165	---	---	No	100% Non-Detect
1,2-Dichloroethane	107-06-2	6	0	---	---	---	0.26	---	---	No	100% Non-Detect
1,2-Dichloropropane	78-87-5	6	0	---	---	---	0.333	---	---	No	100% Non-Detect
1,3-Dichlorobenzene	541-73-1	6	0	---	---	---	1.315	---	---	No	100% Non-Detect
1,4-Dichlorobenzene	106-46-7	6	0	---	---	---	0.318	---	---	No	100% Non-Detect
2-Hexanone	591-78-6	6	0	---	---	---	0.0582	---	---	No	100% Non-Detect
Acetone	67-64-1	6	6	0.018	0.045	0.089	0.0099	6	9	Yes	[Maximum] > ESV
Benzene	71-43-2	6	6	0.00085	0.00186	0.0035	0.14157	0	<1	No	[Maximum] < ESV
Bromochloromethane	74-97-5	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bromodichloromethane	75-27-4	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bromoform	75-25-2	6	0	---	---	---	0.492	---	---	No	100% Non-Detect
Bromomethane	74-83-9	6	0	---	---	---	0.00137	---	---	No	100% Non-Detect
Carbon Disulfide	75-15-0	6	6	0.00045	0.00417	0.014	0.000851	5	16.5	Yes	[Maximum] > ESV
Carbon Tetrachloride	56-23-5	6	0	---	---	---	0.0642	---	---	No	100% Non-Detect
Chlorobenzene	108-90-7	6	0	---	---	---	0.00842	---	---	No	100% Non-Detect
Chloroethane	75-00-3	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Chloroform	67-66-3	6	0	---	---	---	0.121	---	---	No	100% Non-Detect
Chloromethane	74-87-3	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Cis-1,2-Dichloroethylene	156-59-2	6	0	---	---	---	0.26	---	---	No	100% Non-Detect
Cis-1,3-Dichloropropene	10061-01-5	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Cyclohexane	110-82-7	6	6	0.0013	0.0025	0.0039	NESV	---	---	Yes	No ESV Available
Dibromochloromethane	124-48-1	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Dichlorodifluoromethane	75-71-8	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Ethylbenzene	100-41-4	6	6	0.00038	0.00071	0.0016	0.175	0	<1	No	[Maximum] < ESV
Isopropylbenzene (Cumene)	98-82-8	6	0	---	---	---	0.086	---	---	No	100% Non-Detect
Methyl Acetate	79-20-9	6	1	0.11	0.11	0.11	NESV	---	---	Yes	No ESV Available
Methyl Ethyl Ketone (2-Butanone)	78-93-3	6	6	0.0025	0.0066	0.013	0.0424	0	<1	No	[Maximum] < ESV
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	6	0	---	---	---	0.0251	---	---	No	100% Non-Detect

Table B-22
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
Flathead River Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Methylcyclohexane	108-87-2	6	6	0.0023	0.0049	0.0085	NESV	---	---	Yes	No ESV Available
Methylene Chloride	75-09-2	6	1	0.0011	0.0011	0.0011	0.159	0	<1	No	[Maximum] < ESV
Styrene	100-42-5	6	0	---	---	---	0.254	---	---	No	100% Non-Detect
Tert-Butyl Methyl Ether	1634-04-4	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Tetrachloroethylene (PCE)	127-18-4	6	1	0.00021	0.00021	0.00021	0.468	0	<1	No	[Maximum] < ESV
Toluene	108-88-3	6	6	0.0019	0.0046	0.011	1.22	0	<1	No	[Maximum] < ESV
Trans-1,2-Dichloroethene	156-60-5	6	0	---	---	---	0.654	---	---	No	100% Non-Detect
Trans-1,3-Dichloropropene	10061-02-6	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Trichloroethylene (TCE)	79-01-6	6	0	---	---	---	0.0969	---	---	No	100% Non-Detect
Trichlorofluoromethane	75-69-4	6	0	---	---	---	NESV	---	---	No	100% Non-Detect
Vinyl Chloride	75-01-4	6	0	---	---	---	0.202	---	---	No	100% Non-Detect
M,P-Xylene	179601-23-1	6	6	0.00065	0.00184	0.0043	0.0252	0	<1	No	[Maximum] < ESV
O-Xylene (1,2-Dimethylbenzene)	95-47-6	6	6	0.00019	0.00055	0.0012	0.433	0	<1	No	[Maximum] < ESV
Total Xylene - 1/2MDL	1330-20-7	6	6	0.00084	0.00239	0.0055	0.433	0	<1	No	[Maximum] < ESV
Total Xylene - MDL	1330-20-7	6	6	0.00084	0.00239	0.0055	0.433	0	<1	No	[Maximum] < ESV
Total Xylene - Zero	1330-20-7	6	6	0.00084	0.00239	0.0055	0.433	0	<1	No	[Maximum] < ESV
Physicochemical Parameters											
Moisture, Percent	---	8	8	5	32	72	NESV	---	---	---	---
pH (s.u.)	---	6	6	7.5	7.7	8	NESV	---	---	---	---
Total Organic Carbon	7440440	32	27	153	13278	61800	NESV	---	---	---	---

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
TAL: Target Analyte List
TCL: Target Compound List

Table B-23
Screening-Level Ecological Exposure Estimate for Surface Water
Cedar Creek Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (ug/L)												
Aluminum	7429-90-5	U	28	18	17.6	34.5	85.5	87	0	<1	No	[Maximum] < ESV
Aluminum	7429-90-5	F	16	0	---	---	---	87	---	---	No	100% Non-Detect
Antimony	7440-36-0	U	28	4	0.64	0.71	0.78	30	0	<1	No	[Maximum] < ESV
Antimony	7440-36-0	F	16	0	---	---	---	30	---	---	No	100% Non-Detect
Arsenic	7440-38-2	U	28	0	---	---	---	5	---	---	No	100% Non-Detect
Arsenic	7440-38-2	F	16	0	---	---	---	3.1	---	---	No	100% Non-Detect
Barium	7440-39-3	U	28	28	85.9	104.7	130	4	28	32.5	Yes	[Maximum] > ESV
Barium	7440-39-3	F	16	16	85.9	99.7	117	4	16	29.3	Yes	[Maximum] > ESV
Beryllium	7440-41-7	U	28	0	---	---	---	0.66	---	---	No	100% Non-Detect
Beryllium	7440-41-7	F	16	0	---	---	---	0.66	---	---	No	100% Non-Detect
Cadmium	7440-43-9	U	28	0	---	---	---	0.233	---	---	No	100% Non-Detect
Cadmium	7440-43-9	F	16	0	---	---	---	0.233	---	---	No	100% Non-Detect
Chromium, Total	7440-47-3	U	28	2	8.9	23.3	37.7	8.9	1	4.2	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	F	16	0	---	---	---	8.9	---	---	No	100% Non-Detect
Cobalt	7440-48-4	U	28	0	---	---	---	5.1	---	---	No	100% Non-Detect
Cobalt	7440-48-4	F	16	0	---	---	---	5.1	---	---	No	100% Non-Detect
Copper	7440-50-8	U	28	9	1.9	4.3	8.5	0.23	9	37	Yes	[Maximum] > ESV
Copper	7440-50-8	F	16	0	---	---	---	0.23	---	---	No	100% Non-Detect
Iron	7439-89-6	U	28	3	100	178	304	300	1	1	Yes	[Maximum] > ESV
Iron	7439-89-6	F	16	0	---	---	---	158	---	---	No	100% Non-Detect
Lead	7439-92-1	U	28	1	0.41	0.41	0.41	5.741	0	<1	No	[Maximum] < ESV
Lead	7439-92-1	F	16	0	---	---	---	4.143	---	---	No	100% Non-Detect
Manganese	7439-96-5	U	28	28	3.5	8.4	14.7	120	0	<1	No	[Maximum] < ESV
Manganese	7439-96-5	F	16	13	2.7	3.9	5.5	120	0	<1	No	[Maximum] < ESV
Mercury	7439-97-6	U	28	0	---	---	---	0.026	---	---	No	100% Non-Detect
Mercury	7439-97-6	F	16	0	---	---	---	0.026	---	---	No	100% Non-Detect
Nickel	7440-02-0	U	28	0	---	---	---	77.223	---	---	No	100% Non-Detect
Nickel	7440-02-0	F	16	0	---	---	---	5	---	---	No	100% Non-Detect
Selenium	7782-49-2	U	28	0	---	---	---	1	---	---	No	100% Non-Detect
Selenium	7782-49-2	F	16	0	---	---	---	3.1	---	---	No	100% Non-Detect
Silver	7440-22-4	U	28	0	---	---	---	0.25	---	---	No	100% Non-Detect
Silver	7440-22-4	F	16	0	---	---	---	0.12	---	---	No	100% Non-Detect
Thallium	7440-28-0	U	28	0	---	---	---	0.8	---	---	No	100% Non-Detect
Thallium	7440-28-0	F	16	0	---	---	---	12	---	---	No	100% Non-Detect
Vanadium	7440-62-2	U	28	0	---	---	---	NESV	---	---	No	100% Non-Detect
Vanadium	7440-62-2	F	16	0	---	---	---	20	---	---	No	100% Non-Detect
Zinc	7440-66-6	U	28	2	13.5	14.9	16.4	177.484	0	<1	No	[Maximum] < ESV
Zinc	7440-66-6	F	16	1	25.4	25.4	25.4	7	1	3.6	Yes	[Maximum] > ESV
Other Inorganic Parameters (ug/L unless otherwise noted)												
Chloride (As Cl)	16887-00-6	U	28	28	1370	2021	3100	120000	0	<1	No	[Maximum] < ESV
Cyanide	57-12-5	U	32	7	2	5	15	5.2	2	2.9	Yes	[Maximum] > ESV
Cyanide	57-12-5	F	8	0	---	---	---	5.2	---	---	No	100% Non-Detect
Cyanide (Free)	FREE CN	U	20	2	1.9	4.8	7.7	5	1	1.5	Yes	[Maximum] > ESV
Cyanide (Free)	FREE CN	F	2	0	---	---	---	5	---	---	No	100% Non-Detect
Fluoride	16984-48-8	U	28	22	55.8	113.9	137	120	11	1.1	Yes	[Maximum] > ESV
Fluoride	16984-48-8	F	4	4	121	128	131	120	4	1.1	Yes	[Maximum] > ESV
Nitrogen, Ammonia (As N)	7664-41-7	U	28	7	47.4	67	125	718.038	0	<1	No	[Maximum] < ESV
Essential Nutrients (ug/L)												

Table B-23
Screening-Level Ecological Exposure Estimate for Surface Water
Cedar Creek Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Calcium	7440-70-2	U	28	28	43100	50525	56800	116000	0	<1	No	Essential Nutrient
Calcium	7440-70-2	F	16	16	44500	48538	50900	116000	0	<1	No	Essential Nutrient
Magnesium	7439-95-4	U	28	28	10700	13221	16800	82000	0	<1	No	Essential Nutrient
Magnesium	7439-95-4	F	16	16	10500	12381	14800	82000	0	<1	No	Essential Nutrient
Potassium	7440-09-7	U	28	28	367	473	656	53000	0	<1	No	Essential Nutrient
Potassium	7440-09-7	F	16	16	389	426	478	53000	0	<1	No	Essential Nutrient
Sodium	7440-23-5	U	28	28	2010	2758	5530	680000	0	<1	No	Essential Nutrient
Sodium	7440-23-5	F	16	16	1910	2519	5570	680000	0	<1	No	Essential Nutrient
Physicochemical Parameters												
Alkalinity, Total (As CaCO3)	---	U	28	28	165000	186714	208000	NESV	---	---	---	---
Dissolved Organic Carbon	---	F	15	15	1070	1332	1740	NESV	---	---	---	---
Dissolved Oxygen	---	U	32	32	3850	12254	19020	NESV	---	---	---	---
Hardness (As CaCO3)	---	U	28	28	159000	182071	208000	NESV	---	---	---	---
Oxidation-Reduction Potential (mv)	---	U	32	32	49	152	278	NESV	---	---	---	---
pH (s.u.)	---	U	28	28	6.22	7.46	8.28	NESV	---	---	---	---
Specific Conductance (ms/cm)	---	U	32	32	0.208	0.345	0.395	NESV	---	---	---	---
Temperature (°C)	---	U	32	32	2.57	8.63	18.83	NESV	---	---	---	---
Total Organic Carbon	---	U	12	12	1100	1383	1700	NESV	---	---	---	---
Total Dissolved Solids	---	U	28	28	128000	196357	281000	NESV	---	---	---	---
Total Suspended Solids	---	U	28	16	1000	3331	19000	NESV	---	---	---	---
Turbidity (NTU)	---	U	28	28	0	1	9	NESV	---	---	---	---
Other Nutrients (ug/L)												
Nitrogen, Nitrite + Nitrate	NO3NO2N	U	28	16	113	526	2580	NESV	---	---	No	Other Nutrient
Phosphorus, Total Orthophosphate (As P)	---	U	24	4	136	140	143	NESV	---	---	No	Other Nutrient
Sulfate (As SO4)	14808-79-8	U	28	28	1590	2300	3320	NESV	---	---	No	Other Nutrient
Sulfide	18496-25-8	U	16	0	---	---	---	NESV	---	---	No	Other Nutrient

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
[Maximum]: Maximum concentration
NESV: No Ecological Screening Value
MDL: Method Detection Limit
SW: Surface Water
TAL: Target Analyte List
U: Unfiltered
F: Filtered

Table B-24
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
Cedar Creek Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	9	9	6900	10157	12600	26000	0	<1	No	[Maximum] < ESV
Antimony	7440-36-0	9	0	---	---	---	2	---	---	No	100% Non-Detect
Arsenic	7440-38-2	9	9	1.8	2.6	4.2	9.79	0	<1	No	[Maximum] < ESV
Barium	7440-39-3	9	9	20.2	122.8	249	NESV	---	---	Yes	No ESV Available
Beryllium	7440-41-7	9	9	0.21	0.36	0.68	NESV	---	---	Yes	No ESV Available
Cadmium	7440-43-9	9	0	---	---	---	0.583	---	---	No	100% Non-Detect
Chromium, Total	7440-47-3	9	9	6.9	10.1	13	36.2	0	<1	No	[Maximum] < ESV
Cobalt	7440-48-4	9	9	3.2	5	6.5	50	0	<1	No	[Maximum] < ESV
Copper	7440-50-8	9	9	3.3	9.2	20.8	28	0	<1	No	[Maximum] < ESV
Iron	7439-89-6	9	9	7770	12317	16400	20000	0	<1	No	[Maximum] < ESV
Lead	7439-92-1	9	9	4.9	6.4	10.3	35.8	0	<1	No	[Maximum] < ESV
Manganese	7439-96-5	9	9	67.3	252.3	571	460	1	1.2	Yes	[Maximum] > ESV
Mercury	7439-97-6	9	3	0.032	0.037	0.044	0.174	0	<1	No	[Maximum] < ESV
Nickel	7440-02-0	9	9	6.9	10	13.8	19.5	0	<1	No	[Maximum] < ESV
Selenium	7782-49-2	9	1	1.8	1.8	1.8	2	0	<1	No	[Maximum] < ESV
Silver	7440-22-4	9	0	---	---	---	0.5	---	---	No	100% Non-Detect
Thallium	7440-28-0	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Vanadium	7440-62-2	9	9	4.6	7.1	8.8	NESV	---	---	Yes	No ESV Available
Zinc	7440-66-6	9	9	37.3	47.6	58.5	98	0	<1	No	[Maximum] < ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	9	4	0.1	0.2	0.2	0.0001	4	2400	Yes	[Maximum] > ESV
Fluoride	16984-48-8	9	3	1.41	1.58	1.71	290.2	0	<1	No	[Maximum] < ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	9	9	1120	15558	37000	NESV	---	---	Yes	Essential Nutrient
Magnesium	7439-95-4	9	9	5410	9070	13700	NESV	---	---	Yes	Essential Nutrient
Potassium	7440-09-7	9	9	177	658	1230	NESV	---	---	Yes	Essential Nutrient
Sodium	7440-23-5	9	5	40.2	103.3	154	NESV	---	---	Yes	Essential Nutrient
Pesticides (mg/kg)											
Aldrin	309-00-2	3	0	---	---	---	0.002	---	---	No	100% Non-Detect
Alpha Bhc (Alpha Hexachlorocyclohexane)	319-84-6	3	0	---	---	---	0.006	---	---	No	100% Non-Detect
Alpha Endosulfan	959-98-8	3	0	---	---	---	0.00000642	---	---	No	100% Non-Detect
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	3	0	---	---	---	0.005	---	---	No	100% Non-Detect
Beta Endosulfan	33213-65-9	3	0	---	---	---	0.00000642	---	---	No	100% Non-Detect
cis-Chlordane	5103-71-9	3	0	---	---	---	NESV	---	---	No	100% Non-Detect
Delta BHC (Delta Hexachlorocyclohexane)	319-86-8	3	0	---	---	---	0.1388	---	---	No	100% Non-Detect
Dieldrin	60-57-1	3	0	---	---	---	0.0019	---	---	No	100% Non-Detect
Endosulfan Sulfate	1031-07-8	3	0	---	---	---	0.00000642	---	---	No	100% Non-Detect
Endrin	72-20-8	3	0	---	---	---	0.00222	---	---	No	100% Non-Detect
Endrin Aldehyde	7421-93-4	3	0	---	---	---	0.004428	---	---	No	100% Non-Detect
Endrin Ketone	53494-70-5	3	0	---	---	---	NESV	---	---	No	100% Non-Detect
Gamma Bhc (Lindane)	58-89-9	3	0	---	---	---	0.00237	---	---	No	100% Non-Detect
Heptachlor	76-44-8	3	0	---	---	---	0.0006	---	---	No	100% Non-Detect
Heptachlor Epoxide	1024-57-3	3	0	---	---	---	0.00247	---	---	No	100% Non-Detect

Table B-24
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
Cedar Creek Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Methoxychlor	72-43-5	3	0	---	---	---	0.0136	---	---	No	100% Non-Detect
P,P'-DDD	72-54-8	3	0	---	---	---	0.00488	---	---	No	100% Non-Detect
P,P'-DDE	72-55-9	3	0	---	---	---	0.00316	---	---	No	100% Non-Detect
P,P'-DDT	50-29-3	3	0	---	---	---	0.00416	---	---	No	100% Non-Detect
Toxaphene	8001-35-2	3	0	---	---	---	0.000077	---	---	No	100% Non-Detect
trans-Chlordane	5103-74-2	3	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1016 (Aroclor 1016)	12674-11-2	3	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1221 (Aroclor 1221)	11104-28-2	3	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1232 (Aroclor 1232)	11141-16-5	3	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1242 (Aroclor 1242)	53469-21-9	3	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1248 (Aroclor 1248)	12672-29-6	3	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1254 (Aroclor 1254)	11097-69-1	3	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1260 (Aroclor 1260)	11096-82-5	3	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1262 (Aroclor 1262)	37324-23-5	3	0	---	---	---	NESV	---	---	No	100% Non-Detect
PCB-1268 (Aroclor 1268)	11100-14-4	3	0	---	---	---	NESV	---	---	No	100% Non-Detect
Polychlorinated Biphenyl (PCBs)	1336-36-3	3	0	---	---	---	0.032	---	---	No	100% Non-Detect
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	9	1	0.0038	0.0038	0.0038	0.0202	0	<1	No	[Maximum] < ESV
Acenaphthene	83-32-9	9	2	0.0058	0.0084	0.011	0.00671	1	1.6	Yes	[Maximum] > ESV
Acenaphthylene	208-96-8	9	3	0.011	0.022	0.033	0.00587	3	5.6	Yes	[Maximum] > ESV
Anthracene	120-12-7	9	3	0.026	0.042	0.051	0.01	3	5.1	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	9	9	0.0023	0.0832	0.19	0.031	6	6.1	Yes	[Maximum] > ESV
Fluorene	86-73-7	9	2	0.013	0.021	0.028	0.01	2	2.8	Yes	[Maximum] > ESV
Naphthalene	91-20-3	9	0	---	---	---	0.015	---	---	No	100% Non-Detect
Phenanthrene	85-01-8	9	8	0.0028	0.0989	0.21	0.019	6	11.1	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	9	6	0.0032	0.0547	0.094	0.032	5	2.9	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	9	5	0.0034	0.0655	0.12	0.016	4	7.5	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	9	5	0.0035	0.0649	0.12	9.79	0	<1	No	[Maximum] < ESV
Benzo(G,H,I)Perylene	191-24-2	9	4	0.03	0.06	0.08	0.016	4	5.1	Yes	[Maximum] > ESV
Benzo(K)Fluoranthene	207-08-9	9	3	0.014	0.028	0.04	0.24	0	<1	No	[Maximum] < ESV
Chrysene	218-01-9	9	8	0.0052	0.0644	0.13	0.027	6	4.8	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	9	2	0.0066	0.007	0.0075	0.01	0	<1	No	[Maximum] < ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	9	4	0.022	0.049	0.087	0.017	4	5.1	Yes	[Maximum] > ESV
Pyrene	129-00-0	9	7	0.0058	0.0867	0.16	0.044	5	3.6	Yes	[Maximum] > ESV
Total PAHs - 1/2MDL	---	9	9	0.01685	0.54528	1.1885	0.26	6	4.6	Yes	[Maximum] > ESV
Total PAHs - MDL	---	9	9	0.0286	0.6361	1.345	0.26	6	5.2	Yes	[Maximum] > ESV
Total PAHs - Zero	---	9	9	0.0051	0.4545	1.085	0.26	5	4.2	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
1,2,4,5-Tetrachlorobenzene	95-94-3	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
1,4-Dioxane (P-Dioxane)	123-91-1	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
2,3,4,6-Tetrachlorophenol	58-90-2	9	0	---	---	---	0.129	---	---	No	100% Non-Detect
2,4,5-Trichlorophenol	95-95-4	9	0	---	---	---	0.288	---	---	No	100% Non-Detect
2,4,6-Trichlorophenol	88-06-2	9	0	---	---	---	0.208	---	---	No	100% Non-Detect

Table B-24
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
Cedar Creek Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
2,4-Dichlorophenol	120-83-2	9	0	---	---	---	0.0817	---	---	No	100% Non-Detect
2,4-Dimethylphenol	105-67-9	9	0	---	---	---	0.029	---	---	No	100% Non-Detect
2,4-Dinitrophenol	51-28-5	9	0	---	---	---	0.00621	---	---	No	100% Non-Detect
2,4-Dinitrotoluene	121-14-2	9	0	---	---	---	0.0144	---	---	No	100% Non-Detect
2,6-Dinitrotoluene	606-20-2	9	0	---	---	---	0.0398	---	---	No	100% Non-Detect
2-Chloronaphthalene	91-58-7	9	0	---	---	---	0.417	---	---	No	100% Non-Detect
2-Chlorophenol	95-57-8	9	0	---	---	---	0.02716	---	---	No	100% Non-Detect
2-Methylphenol (O-Cresol)	95-48-7	9	0	---	---	---	0.011856	---	---	No	100% Non-Detect
2-Nitroaniline	88-74-4	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
2-Nitrophenol	88-75-5	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
3- And 4- Methylphenol (Total)	106445	3	0	---	---	---	0.0202	---	---	No	100% Non-Detect
3,3'-Dichlorobenzidine	91-94-1	9	0	---	---	---	0.127	---	---	No	100% Non-Detect
3-Nitroaniline	99-09-2	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
4,6-Dinitro-2-Methylphenol	534-52-1	9	0	---	---	---	0.104	---	---	No	100% Non-Detect
4-Bromophenyl Phenyl Ether	101-55-3	9	0	---	---	---	0.255	---	---	No	100% Non-Detect
4-Chloro-3-Methylphenol	59-50-7	9	0	---	---	---	0.388	---	---	No	100% Non-Detect
4-Chloroaniline	106-47-8	9	0	---	---	---	0.146	---	---	No	100% Non-Detect
4-Chlorophenyl Phenyl Ether	7005-72-3	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitroaniline	100-01-6	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
4-Nitrophenol	100-02-7	9	0	---	---	---	0.013	---	---	No	100% Non-Detect
Acetophenone	98-86-2	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Atrazine	1912-24-9	9	0	---	---	---	0.00662	---	---	No	100% Non-Detect
Benzaldehyde	100-52-7	9	3	0.15	0.16	0.17	NESV	---	---	Yes	No ESV Available
Benzyl Butyl Phthalate	85-68-7	9	0	---	---	---	1.97	---	---	No	100% Non-Detect
Biphenyl (Diphenyl)	92-52-4	9	0	---	---	---	1.22	---	---	No	100% Non-Detect
Bis(2-Chloroethoxy) Methane	111-91-1	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	9	0	---	---	---	3.52	---	---	No	100% Non-Detect
Bis(2-Chloroisopropyl) Ether	108-60-1	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Bis(2-Ethylhexyl) Phthalate	117-81-7	9	1	0.04	0.04	0.04	0.18	0	<1	No	[Maximum] < ESV
Caprolactam	105-60-2	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Carbazole	86-74-8	9	2	0.0049	0.0073	0.0098	NESV	---	---	Yes	No ESV Available
Dibenzofuran	132-64-9	9	1	0.0031	0.0031	0.0031	0.300736	0	<1	No	[Maximum] < ESV
Diethyl Phthalate	84-66-2	9	0	---	---	---	0.295	---	---	No	100% Non-Detect
Dimethyl Phthalate	131-11-3	9	0	---	---	---	NESV	---	---	No	100% Non-Detect
Di-N-Butyl Phthalate	84-74-2	9	0	---	---	---	1.1989	---	---	No	100% Non-Detect
Di-N-Octylphthalate	117-84-0	9	0	---	---	---	16.8858	---	---	No	100% Non-Detect
Hexachlorobenzene	118-74-1	9	0	---	---	---	0.02	---	---	No	100% Non-Detect
Hexachlorobutadiene	87-68-3	9	0	---	---	---	0.0265	---	---	No	100% Non-Detect
Hexachlorocyclopentadiene	77-47-4	9	0	---	---	---	0.901	---	---	No	100% Non-Detect
Hexachloroethane	67-72-1	9	0	---	---	---	0.2136	---	---	No	100% Non-Detect
Isophorone	78-59-1	9	2	0.06	0.07	0.08	0.432	0	<1	No	[Maximum] < ESV
Nitrobenzene	98-95-3	9	0	---	---	---	0.145	---	---	No	100% Non-Detect
N-Nitrosodi-N-Propylamine	621-64-7	9	0	---	---	---	NESV	---	---	No	100% Non-Detect

Table B-24
Screening-Level Ecological Exposure Estimate for Bulk Sediment (0-0.5 feet)
Cedar Creek Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Screening-Level Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
N-Nitrosodiphenylamine	86-30-6	9	0	---	---	---	0.516	---	---	No	100% Non-Detect
Pentachlorophenol	87-86-5	9	0	---	---	---	0.504	---	---	No	100% Non-Detect
Phenol	108-95-2	9	0	---	---	---	0.001152	---	---	No	100% Non-Detect
Physicochemical Parameters											
Moisture, Percent	---	3	3	34.9	45.6	52.8	NESV	---	---	---	---
Total Organic Carbon	7440440	9	9	1830	93702	277000	NESV	---	---	---	---

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
TAL: Target Analyte List
TCL: Target Compound List

Appendix C Calculated Dioxin Toxicity Equivalence Concentrations

Table C-1
Summary of Toxic Equivalency Factors
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Dioxin/Furan Compound	Toxicity Equivalency Factor (TEF)	
	TEF_{mammal}	TEF_{bird}
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1	1
1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1	1
1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	0.1	0.05
1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	0.1	0.01
1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	0.1	0.1
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	0.01	0.001
Octachlorodibenzo-P-Dioxin	0.0003	0.0001
2,3,7,8-Tetrachlorodibenzofuran	0.1	1
1,2,3,7,8-Pentachlorodibenzofuran	0.03	0.1
2,3,4,7,8-Pentachlorodibenzofuran	0.3	1
1,2,3,4,7,8-Hexachlorodibenzofuran	0.1	0.1
1,2,3,6,7,8-Hexachlorodibenzofuran	0.1	0.1
1,2,3,7,8,9-Hexachlorodibenzofuran	0.1	0.1
2,3,4,6,7,8-Hexachlorodibenzofuran	0.1	0.1
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.01	0.01
1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.01	0.01
Octachlorodibenzofuran	0.0003	0.0001

Notes:
TEF: Toxicity Equivalency Factor

Table C-2
Summary of Toxic Equivalency Concentration Results
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Detection (Y/N)	Constituent	TEC Result Value
Main Plant Area						
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.205E-07
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.706E-07
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	7.046E-08
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	8.645E-08
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.271E-07
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	4.583E-08
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.891E-07
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	2.426E-07
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.356E-07
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.342E-07
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.766E-07
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	9.184E-08
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	8.929E-08
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.649E-07
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.530E-08
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	6.089E-08
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.118E-07
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.591E-08
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.044E-05
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.046E-05
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.043E-05
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	6.079E-06
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	6.091E-06
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	6.067E-06
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.036E-07
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	2.032E-07
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	7.092E-09
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	8.387E-08
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.579E-07
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.314E-08
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.844E-06
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	3.502E-06
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	2.186E-06
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	2.541E-06
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	3.080E-06
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	2.002E-06
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.919E-07
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	2.651E-07
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.233E-07
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.198E-07
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.794E-07
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	6.489E-08
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	3.398E-06
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	4.218E-06
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	2.578E-06
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	2.802E-06
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	2.904E-06
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	2.700E-06
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	3.885E-07
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	3.981E-07
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	3.788E-07

Table C-2
Summary of Toxic Equivalency Concentration Results
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Detection (Y/N)	Constituent	TEC Result Value
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.716E-07
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.807E-07
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.625E-07
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.042E-06
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	2.484E-06
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.600E-06
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.170E-06
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.531E-06
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	8.086E-07
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	N	TEC2,3,7,8-TCDD-Bird-1/2MDL	8.774E-08
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	N	TEC2,3,7,8-TCDD-Bird-MDL	1.775E-07
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	N	TEC2,3,7,8-TCDD-Bird-Zero	0
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	N	TEC2,3,7,8-TCDD-Mammal-1/2MDL	5.843E-08
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	N	TEC2,3,7,8-TCDD-Mammal-MDL	1.208E-07
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	N	TEC2,3,7,8-TCDD-Mammal-Zero	0
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	8.936E-08
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.781E-07
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	6.700E-09
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	6.458E-08
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.310E-07
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	6.700E-09
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	8.679E-06
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	9.384E-06
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	7.975E-06
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.018E-05
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.089E-05
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	9.477E-06
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	6.549E-08
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.336E-07
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	4.400E-09
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	4.724E-08
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.021E-07
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	4.400E-09
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.085E-07
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	2.852E-07
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.457E-07
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.089E-07
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.810E-07
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	5.981E-08
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	3.108E-06
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	3.398E-06
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	2.817E-06
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	3.607E-06
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	3.897E-06
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	3.316E-06
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	6.674E-07
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	7.266E-07
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	6.099E-07
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	3.813E-07
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	4.237E-07
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	3.406E-07
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	3.504E-06

Table C-2
Summary of Toxic Equivalency Concentration Results
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Detection (Y/N)	Constituent	TEC Result Value
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	3.819E-06
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	3.189E-06
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.644E-06
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.959E-06
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.329E-06
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	3.340E-07
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	4.094E-07
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	2.654E-07
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.649E-07
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	2.271E-07
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.097E-07
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.181E-06
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	2.750E-06
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.612E-06
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.215E-06
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.703E-06
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	7.280E-07
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.375E-06
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.429E-06
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.321E-06
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	4.338E-07
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	4.894E-07
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	3.790E-07
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	3.184E-06
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	3.473E-06
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	2.896E-06
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.126E-06
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.418E-06
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	8.329E-07
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.077E-06
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	2.790E-06
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.365E-06
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.260E-06
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.818E-06
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	7.008E-07
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.957E-06
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	2.268E-06
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.647E-06
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.068E-06
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.313E-06
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	8.223E-07
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.261E-06
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.268E-06
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.257E-06
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	7.642E-07
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	7.696E-07
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	7.609E-07
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.029E-06
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	2.038E-06
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	2.021E-06
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.113E-06
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.122E-06

Table C-2
Summary of Toxic Equivalency Concentration Results
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Detection (Y/N)	Constituent	TEC Result Value
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.105E-06
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	5.725E-07
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	9.407E-07
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	5.246E-07
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	3.225E-07
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	6.943E-07
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	2.734E-07
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.550E-07
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	7.527E-07
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.174E-07
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	6.257E-07
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.049E-06
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	5.242E-07
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.719E-07
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	6.928E-07
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.079E-07
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	2.056E-07
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	5.849E-07
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.615E-07
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.637E-06
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	2.038E-06
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.595E-06
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.054E-06
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.439E-06
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.012E-06
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	9.588E-08
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	6.313E-07
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.517E-08
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.024E-07
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	3.810E-07
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	4.080E-08
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	6.148E-07
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	9.608E-07
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	5.916E-07
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	3.468E-07
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	6.008E-07
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	3.318E-07
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.042E-07
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	9.054E-07
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	4.983E-09
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	7.016E-08
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	4.249E-07
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	6.349E-09
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.003E-06
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	2.385E-06
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	9.118E-07
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	8.646E-07
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.465E-06
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	8.041E-07
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.085E-07
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	4.356E-07
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	2.923E-08

Table C-2
Summary of Toxic Equivalency Concentration Results
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Detection (Y/N)	Constituent	TEC Result Value
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.080E-07
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	2.387E-07
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	5.049E-08
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	4.623E-07
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.015E-06
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	4.290E-07
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	4.453E-07
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	5.603E-07
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	4.237E-07
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	3.634E-07
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	7.203E-07
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	3.227E-07
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	4.079E-07
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	5.058E-07
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	3.764E-07
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	5.045E-07
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.006E-06
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	4.748E-07
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	5.801E-07
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	6.797E-07
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	5.599E-07
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.045E-07
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.382E-06
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.321E-07
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	2.021E-07
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	6.613E-07
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.639E-07
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	5.718E-07
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.973E-06
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	4.867E-07
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	8.638E-07
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.312E-06
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	8.238E-07
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	4.224E-07
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.201E-06
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	3.885E-07
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	4.344E-07
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	5.767E-07
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	4.090E-07
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.449E-06
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	2.526E-06
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	2.385E-06
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.543E-06
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.620E-06
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.480E-06
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.449E-07
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	3.451E-07
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.307E-07
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.230E-07
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.878E-07
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.118E-07
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	3.425E-07

Table C-2
Summary of Toxic Equivalency Concentration Results
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Detection (Y/N)	Constituent	TEC Result Value
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	7.943E-07
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	3.285E-07
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	3.041E-07
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	4.042E-07
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	2.942E-07
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	4.382E-07
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	7.353E-07
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	4.278E-07
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	4.427E-07
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	5.158E-07
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	4.385E-07
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.813E-06
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.863E-06
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.804E-06
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.076E-06
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.135E-06
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.067E-06
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	3.194E-06
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	3.203E-06
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	3.187E-06
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	3.509E-06
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	3.518E-06
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	3.502E-06
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	5.516E-06
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	5.809E-06
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	5.494E-06
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	7.832E-06
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	8.125E-06
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	7.810E-06
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.766E-06
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.817E-06
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.761E-06
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.039E-06
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.072E-06
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.033E-06
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.702E-06
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	2.720E-06
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	2.697E-06
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.759E-06
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.777E-06
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.754E-06
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	3.740E-06
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	4.244E-06
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	3.627E-06
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	6.752E-06
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	6.860E-06
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	6.684E-06
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	7.738E-06
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	8.523E-06
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	7.654E-06
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.551E-05
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.561E-05

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Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Detection (Y/N)	Constituent	TEC Result Value
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.548E-05
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	3.022E-06
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	4.068E-06
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	2.984E-06
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	7.937E-07
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.835E-06
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	7.563E-07
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.179E-05
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.235E-05
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.177E-05
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	3.964E-06
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	4.546E-06
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	3.947E-06
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.551E-06
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.945E-06
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.489E-06
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	4.727E-07
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	8.643E-07
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	4.103E-07
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.841E-06
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	2.261E-06
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.767E-06
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	6.275E-07
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.033E-06
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	5.548E-07
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.316E-07
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	7.347E-07
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.618E-07
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.622E-07
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	5.898E-07
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.005E-07
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.375E-07
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	6.556E-07
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	6.283E-08
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.316E-07
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	5.380E-07
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	7.843E-08
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	4.237E-07
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.183E-06
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.947E-07
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	6.952E-07
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	Y	TEC2,3,7,8-TCDD-Mammal-MDL	9.376E-07
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	Y	TEC2,3,7,8-TCDD-Mammal-Zero	5.294E-07
Central Landfills Area						
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.608E-06
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	2.533E-06
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.473E-06
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.866E-06
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	2.753E-06
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.732E-06
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.614E-07
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	6.291E-07

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Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Detection (Y/N)	Constituent	TEC Result Value
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	2.027E-08
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.376E-07
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	5.767E-07
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	3.446E-08
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	9.616E-07
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.278E-06
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	9.415E-07
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	5.456E-07
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	8.544E-07
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	5.263E-07
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	3.669E-06
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	4.394E-06
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	3.598E-06
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.905E-06
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	2.587E-06
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.835E-06
Western Undeveloped Area						
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	7.789E-07
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.213E-06
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	7.400E-07
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	6.845E-07
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.112E-06
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	6.630E-07
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.167E-06
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.846E-06
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.152E-06
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.176E-06
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	1.662E-06
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.170E-06
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.061E-07
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	5.249E-07
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	3.266E-08
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.121E-07
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	3.965E-07
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	5.449E-08
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.843E-07
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	5.874E-07
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.156E-07
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.935E-07
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	4.419E-07
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.448E-07
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.679E-07
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	5.781E-07
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.321E-07
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.257E-07
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	4.851E-07
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	9.473E-08
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.294E-07
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	6.621E-07
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.942E-07
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	2.123E-07
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	5.675E-07

Table C-2
Summary of Toxic Equivalency Concentration Results
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Detection (Y/N)	Constituent	TEC Result Value
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.821E-07
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	N	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.481E-07
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	N	TEC2,3,7,8-TCDD-Bird-MDL	8.949E-07
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	N	TEC2,3,7,8-TCDD-Bird-Zero	0
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	N	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.010E-07
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	N	TEC2,3,7,8-TCDD-Mammal-MDL	2.917E-07
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	N	TEC2,3,7,8-TCDD-Mammal-Zero	0
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	3.272E-07
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.410E-06
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	2.319E-07
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	3.077E-07
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	8.718E-07
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	2.587E-07
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.030E-06
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	3.054E-06
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.840E-06
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.954E-06
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	2.176E-06
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.840E-06
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.490E-07
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.255E-06
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	6.962E-09
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	2.206E-07
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	5.577E-07
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	5.246E-08
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.823E-07
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.060E-06
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	2.733E-09
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.401E-07
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	3.428E-07
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	2.038E-08
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	N	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.393E-07
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	N	TEC2,3,7,8-TCDD-Bird-MDL	6.210E-07
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	N	TEC2,3,7,8-TCDD-Bird-Zero	0
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	N	TEC2,3,7,8-TCDD-Mammal-1/2MDL	9.739E-08
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	N	TEC2,3,7,8-TCDD-Mammal-MDL	2.345E-07
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	N	TEC2,3,7,8-TCDD-Mammal-Zero	0
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.622E-07
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.358E-06
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	3.742E-08
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.549E-07
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	5.423E-07
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	7.300E-08
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	9.965E-08
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.131E-06
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	7.874E-09
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	7.236E-08
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	4.538E-07
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	8.622E-09
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	N	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.055E-07
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	N	TEC2,3,7,8-TCDD-Bird-MDL	8.414E-07
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	N	TEC2,3,7,8-TCDD-Bird-Zero	0

Table C-2
Summary of Toxic Equivalency Concentration Results
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Detection (Y/N)	Constituent	TEC Result Value
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	N	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.431E-07
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	N	TEC2,3,7,8-TCDD-Mammal-MDL	3.939E-07
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	N	TEC2,3,7,8-TCDD-Mammal-Zero	0
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.053E-07
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	1.144E-06
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.922E-08
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	2.138E-07
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	5.241E-07
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	8.359E-08
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.640E-07
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	6.357E-07
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.259E-07
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	1.591E-07
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	4.377E-07
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	1.329E-07
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.710E-07
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	8.730E-07
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	2.325E-07
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	3.286E-07
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	6.398E-07
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	3.037E-07
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	1.114E-07
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	5.209E-07
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	6.546E-08
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	9.965E-08
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	4.649E-07
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	6.639E-08
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.357E-07
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-MDL	7.957E-07
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Bird-Zero	1.934E-07
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	2.861E-07
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-MDL	6.835E-07
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	Y	TEC2,3,7,8-TCDD-Mammal-Zero	2.617E-07
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	Y	TEC2,3,7,8-TCDD-Bird-1/2MDL	2.988E-07
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	Y	TEC2,3,7,8-TCDD-Bird-MDL	7.456E-07
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	Y	TEC2,3,7,8-TCDD-Bird-Zero	2.603E-07
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	Y	TEC2,3,7,8-TCDD-Mammal-1/2MDL	2.786E-07
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	Y	TEC2,3,7,8-TCDD-Mammal-MDL	6.464E-07
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	Y	TEC2,3,7,8-TCDD-Mammal-Zero	2.478E-07

Notes:
FD: Field Duplicate
N: Primary (Normal) sample
TEC: Toxic Equivalency Concentration

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
Main Plant Area										
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.60E-07	Y	0.01	0.01	2.60E-09	2.60E-09
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.03E-06	Y	0.01	0.00	1.03E-08	1.03E-09
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	4.10E-08	Y	0.01	0.01	4.10E-10	4.10E-10
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	7.30E-08	Y	0.10	0.10	7.30E-09	7.30E-09
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.05E-08	N	0.10	0.05	1.05E-09	5.25E-10
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.20E-08	N	0.10	0.10	1.20E-09	1.20E-09
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	7.50E-08	Y	0.10	0.01	7.50E-09	7.50E-10
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.30E-08	N	0.10	0.10	1.30E-09	1.30E-09
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	9.10E-08	Y	0.10	0.10	9.10E-09	9.10E-09
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.25E-08	N	0.03	0.10	3.75E-10	1.25E-09
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.75E-08	N	1.00	1.00	1.75E-08	1.75E-08
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.30E-08	N	0.10	0.10	1.30E-09	1.30E-09
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.30E-08	N	0.30	1.00	3.90E-09	1.30E-08
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	4.80E-08	Y	0.10	1.00	4.80E-09	4.80E-08
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.40E-08	N	1.00	1.00	1.40E-08	1.40E-08
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	Octachlorodibenzofuran	9.30E-07	Y	0.00	0.00	2.79E-10	9.30E-11
CFMW-038-SO-0.5-2	6/25/2016	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	1.18E-05	Y	0.00	0.00	3.54E-09	1.18E-09
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	4.80E-07	Y	0.01	0.01	4.80E-09	4.80E-09
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.01E-06	Y	0.01	0.00	2.01E-08	2.01E-09
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	7.80E-08	Y	0.01	0.01	7.80E-10	7.80E-10
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	1.40E-07	Y	0.10	0.10	1.40E-08	1.40E-08
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	5.70E-08	Y	0.10	0.05	5.70E-09	2.85E-09
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	7.60E-08	Y	0.10	0.10	7.60E-09	7.60E-09
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.20E-07	Y	0.10	0.01	1.20E-08	1.20E-09
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.30E-08	N	0.10	0.10	1.30E-09	1.30E-09
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.10E-07	Y	0.10	0.10	1.10E-08	1.10E-08
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	1.40E-08	N	0.03	0.10	4.20E-10	1.40E-09
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.05E-08	N	1.00	1.00	2.05E-08	2.05E-08
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.30E-08	N	0.10	0.10	1.30E-09	1.30E-09
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	1.45E-08	N	0.30	1.00	4.35E-09	1.45E-08
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	8.90E-08	Y	0.10	1.00	8.90E-09	8.90E-08
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.45E-08	N	1.00	1.00	1.45E-08	1.45E-08
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	Octachlorodibenzofuran	1.99E-06	Y	0.00	0.00	5.97E-10	1.99E-10
CFMW-038-SO-0-0.5	6/25/2016	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	2.12E-05	Y	0.00	0.00	6.36E-09	2.12E-09
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.10E-08	N	0.01	0.01	1.10E-10	1.10E-10
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.30E-08	N	0.01	0.00	1.30E-10	1.30E-11
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.35E-08	N	0.01	0.01	1.35E-10	1.35E-10
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	4.80E-08	Y	0.10	0.10	4.80E-09	4.80E-09
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.05E-08	N	0.10	0.05	1.05E-09	5.25E-10
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	8.50E-09	N	0.10	0.10	8.50E-10	8.50E-10
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.00E-08	N	0.10	0.01	1.00E-09	1.00E-10
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	9.00E-09	N	0.10	0.10	9.00E-10	9.00E-10
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	7.10E-08	Y	0.10	0.10	7.10E-09	7.10E-09
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.35E-08	N	0.03	0.10	4.05E-10	1.35E-09
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.70E-08	N	1.00	1.00	1.70E-08	1.70E-08
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	3.10E-08	Y	0.10	0.10	3.10E-09	3.10E-09
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.40E-08	N	0.30	1.00	4.20E-09	1.40E-08
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	2.20E-08	N	0.10	1.00	2.20E-09	2.20E-08

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.70E-08	N	1.00	1.00	1.70E-08	1.70E-08
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	Octachlorodibenzofuran	1.35E-08	N	0.00	0.00	4.05E-12	1.35E-12
CFMW-040-SO-0.5-2	6/28/2016	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	3.02E-06	Y	0.00	0.00	9.06E-10	3.02E-10
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.69E-05	Y	0.01	0.01	2.69E-07	2.69E-07
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	9.98E-05	Y	0.01	0.00	9.98E-07	9.98E-08
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.70E-07	N	0.01	0.01	1.70E-09	1.70E-09
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	2.56E-06	Y	0.10	0.10	2.56E-07	2.56E-07
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	3.42E-06	Y	0.10	0.05	3.42E-07	1.71E-07
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	7.60E-07	Y	0.10	0.10	7.60E-08	7.60E-08
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	5.07E-06	Y	0.10	0.01	5.07E-07	5.07E-08
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.05E-07	N	0.10	0.10	1.05E-08	1.05E-08
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	4.60E-06	Y	0.10	0.10	4.60E-07	4.60E-07
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	1.59E-06	Y	0.03	0.10	4.77E-08	1.59E-07
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.21E-06	Y	1.00	1.00	1.21E-06	1.21E-06
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	5.40E-07	Y	0.10	0.10	5.40E-08	5.40E-08
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	1.71E-06	Y	0.30	1.00	5.13E-07	1.71E-06
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	5.26E-06	Y	0.10	1.00	5.26E-07	5.26E-06
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	5.80E-07	Y	1.00	1.00	5.80E-07	5.80E-07
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	Octachlorodibenzofuran	9.72E-05	Y	0.00	0.00	2.92E-08	9.72E-09
CFMW-040-SO-0-0.5	6/28/2016	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	6.64E-04	Y	0.00	0.00	1.99E-07	6.64E-08
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.40E-08	N	0.01	0.01	1.40E-10	1.40E-10
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	5.80E-07	Y	0.01	0.00	5.80E-09	5.80E-10
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.65E-08	N	0.01	0.01	1.65E-10	1.65E-10
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	2.30E-08	N	0.10	0.10	2.30E-09	2.30E-09
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.60E-08	N	0.10	0.05	1.60E-09	8.00E-10
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	2.10E-08	N	0.10	0.10	2.10E-09	2.10E-09
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.50E-08	N	0.10	0.01	1.50E-09	1.50E-10
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	2.20E-08	N	0.10	0.10	2.20E-09	2.20E-09
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	6.10E-08	Y	0.10	0.10	6.10E-09	6.10E-09
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.90E-08	N	0.03	0.10	5.70E-10	1.90E-09
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.60E-08	N	1.00	1.00	2.60E-08	2.60E-08
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	2.25E-08	N	0.10	0.10	2.25E-09	2.25E-09
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	2.00E-08	N	0.30	1.00	6.00E-09	2.00E-08
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	1.40E-08	N	0.10	1.00	1.40E-09	1.40E-08
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.45E-08	N	1.00	1.00	2.45E-08	2.45E-08
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	Octachlorodibenzofuran	2.05E-08	N	0.00	0.00	6.15E-12	2.05E-12
CFSB-073-SO-0.5-2	6/1/2016	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	4.12E-06	Y	0.00	0.00	1.24E-09	4.12E-10
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.55E-05	Y	0.01	0.01	1.55E-07	1.55E-07
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	5.09E-05	Y	0.01	0.00	5.09E-07	5.09E-08
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	9.45E-07	N	0.01	0.01	9.45E-09	9.45E-09
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	1.77E-06	Y	0.10	0.10	1.77E-07	1.77E-07
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.52E-06	Y	0.10	0.05	1.52E-07	7.60E-08
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.05E-06	Y	0.10	0.10	1.05E-07	1.05E-07
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	2.72E-06	Y	0.10	0.01	2.72E-07	2.72E-08
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	2.35E-07	N	0.10	0.10	2.35E-08	2.35E-08
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2.47E-06	Y	0.10	0.10	2.47E-07	2.47E-07
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	1.50E-07	N	0.03	0.10	4.50E-09	1.50E-08
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.90E-07	N	1.00	1.00	2.90E-07	2.90E-07
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.47E-06	Y	0.10	0.10	1.47E-07	1.47E-07

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	1.55E-07	N	0.30	1.00	4.65E-08	1.55E-07
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	1.16E-06	Y	0.10	1.00	1.16E-07	1.16E-06
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.65E-07	N	1.00	1.00	1.65E-07	1.65E-07
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	Octachlorodibenzofuran	3.68E-05	Y	0.00	0.00	1.10E-08	3.68E-09
CFSB-073-SO-0-0.5	6/1/2016	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	3.69E-04	Y	0.00	0.00	1.11E-07	3.69E-08
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.00E-08	N	0.01	0.01	1.00E-10	1.00E-10
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.72E-06	Y	0.01	0.00	1.72E-08	1.72E-09
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.20E-08	N	0.01	0.01	1.20E-10	1.20E-10
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	8.80E-08	Y	0.10	0.10	8.80E-09	8.80E-09
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.70E-08	N	0.10	0.05	1.70E-09	8.50E-10
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	2.00E-08	N	0.10	0.10	2.00E-09	2.00E-09
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.50E-07	Y	0.10	0.01	1.50E-08	1.50E-09
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	2.10E-08	N	0.10	0.10	2.10E-09	2.10E-09
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	9.90E-08	Y	0.10	0.10	9.90E-09	9.90E-09
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.85E-08	N	0.03	0.10	5.55E-10	1.85E-09
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.35E-08	N	1.00	1.00	2.35E-08	2.35E-08
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	2.15E-08	N	0.10	0.10	2.15E-09	2.15E-09
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.90E-08	N	0.30	1.00	5.70E-09	1.90E-08
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	1.00E-07	Y	0.10	1.00	1.00E-08	1.00E-07
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.70E-08	N	1.00	1.00	1.70E-08	1.70E-08
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	Octachlorodibenzofuran	1.55E-08	N	0.00	0.00	4.65E-12	1.55E-12
CFSB-074-SO-0.5-2	6/1/2016	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	1.33E-05	Y	0.00	0.00	3.99E-09	1.33E-09
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.27E-05	Y	0.01	0.01	1.27E-07	1.27E-07
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	4.71E-05	Y	0.01	0.00	4.71E-07	4.71E-08
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.77E-06	Y	0.01	0.01	1.77E-08	1.77E-08
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	2.04E-06	Y	0.10	0.10	2.04E-07	2.04E-07
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	4.55E-08	N	0.10	0.05	4.55E-09	2.28E-09
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	9.60E-07	Y	0.10	0.10	9.60E-08	9.60E-08
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	3.13E-06	Y	0.10	0.01	3.13E-07	3.13E-08
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	9.00E-08	N	0.10	0.10	9.00E-09	9.00E-09
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.71E-06	Y	0.10	0.10	1.71E-07	1.71E-07
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	9.00E-07	Y	0.03	0.10	2.70E-08	9.00E-08
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	4.40E-07	Y	1.00	1.00	4.40E-07	4.40E-07
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	8.50E-08	N	0.10	0.10	8.50E-09	8.50E-09
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	8.70E-07	Y	0.30	1.00	2.61E-07	8.70E-07
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	8.00E-07	N	0.10	1.00	8.00E-08	8.00E-07
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	4.40E-07	Y	1.00	1.00	4.40E-07	4.40E-07
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	Octachlorodibenzofuran	4.14E-05	Y	0.00	0.00	1.24E-08	4.14E-09
CFSB-074-SO-0-0.5	6/1/2016	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	4.00E-04	Y	0.00	0.00	1.20E-07	4.00E-08
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	7.20E-07	Y	0.01	0.01	7.20E-09	7.20E-09
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.91E-06	Y	0.01	0.00	2.91E-08	2.91E-09
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	8.00E-09	N	0.01	0.01	8.00E-11	8.00E-11
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	1.10E-07	Y	0.10	0.10	1.10E-08	1.10E-08
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	3.70E-08	Y	0.10	0.05	3.70E-09	1.85E-09
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	6.20E-08	Y	0.10	0.10	6.20E-09	6.20E-09
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.30E-07	Y	0.10	0.01	1.30E-08	1.30E-09
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	8.00E-09	N	0.10	0.10	8.00E-10	8.00E-10
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	8.70E-08	Y	0.10	0.10	8.70E-09	8.70E-09
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	7.50E-09	N	0.03	0.10	2.25E-10	7.50E-10

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.80E-08	Y	1.00	1.00	2.80E-08	2.80E-08
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	4.00E-08	Y	0.10	0.10	4.00E-09	4.00E-09
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	6.50E-08	Y	0.30	1.00	1.95E-08	6.50E-08
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	2.40E-07	Y	0.10	1.00	2.40E-08	2.40E-07
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	8.00E-09	N	1.00	1.00	8.00E-09	8.00E-09
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	Octachlorodibenzofuran	1.95E-06	Y	0.00	0.00	5.85E-10	1.95E-10
CFSB-075-SO-0.5-2	6/1/2016	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	2.49E-05	Y	0.00	0.00	7.47E-09	2.49E-09
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	6.16E-06	Y	0.01	0.01	6.16E-08	6.16E-08
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.62E-05	Y	0.01	0.00	1.62E-07	1.62E-08
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	5.70E-07	N	0.01	0.01	5.70E-09	5.70E-09
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	5.80E-07	Y	0.10	0.10	5.80E-08	5.80E-08
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	6.70E-07	Y	0.10	0.05	6.70E-08	3.35E-08
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	4.50E-07	Y	0.10	0.10	4.50E-08	4.50E-08
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.15E-06	Y	0.10	0.01	1.15E-07	1.15E-08
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.85E-07	N	0.10	0.10	1.85E-08	1.85E-08
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.42E-06	Y	0.10	0.10	1.42E-07	1.42E-07
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	1.05E-07	N	0.03	0.10	3.15E-09	1.05E-08
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.70E-07	N	1.00	1.00	1.70E-07	1.70E-07
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.75E-07	N	0.10	0.10	1.75E-08	1.75E-08
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	1.05E-07	N	0.30	1.00	3.15E-08	1.05E-07
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	1.22E-06	Y	0.10	1.00	1.22E-07	1.22E-06
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.15E-07	N	1.00	1.00	1.15E-07	1.15E-07
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	Octachlorodibenzofuran	1.19E-05	Y	0.00	0.00	3.57E-09	1.19E-09
CFSB-075-SO-0-0.5	6/1/2016	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	1.08E-04	Y	0.00	0.00	3.24E-08	1.08E-08
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.05E-08	N	0.01	0.01	1.05E-10	1.05E-10
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	9.00E-09	N	0.01	0.00	9.00E-11	9.00E-12
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.35E-08	N	0.01	0.01	1.35E-10	1.35E-10
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	1.40E-08	N	0.10	0.10	1.40E-09	1.40E-09
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.15E-08	N	0.10	0.05	1.15E-09	5.75E-10
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.30E-08	N	0.10	0.10	1.30E-09	1.30E-09
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.10E-08	N	0.10	0.01	1.10E-09	1.10E-10
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.45E-08	N	0.10	0.10	1.45E-09	1.45E-09
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	9.50E-09	N	0.10	0.10	9.50E-10	9.50E-10
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.80E-08	N	0.03	0.10	5.40E-10	1.80E-09
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.95E-08	N	1.00	1.00	1.95E-08	1.95E-08
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.40E-08	N	0.10	0.10	1.40E-09	1.40E-09
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.80E-08	N	0.30	1.00	5.40E-09	1.80E-08
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	1.90E-08	N	0.10	1.00	1.90E-09	1.90E-08
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.20E-08	N	1.00	1.00	2.20E-08	2.20E-08
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	Octachlorodibenzofuran	1.25E-08	N	0.00	0.00	3.75E-12	1.25E-12
CFSB-079-SO-0.5-2	6/1/2016	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	1.20E-08	N	0.00	0.00	3.60E-12	1.20E-12
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.50E-08	N	0.01	0.01	1.50E-10	1.50E-10
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.45E-08	N	0.01	0.00	1.45E-10	1.45E-11
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.95E-08	N	0.01	0.01	1.95E-10	1.95E-10
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	1.85E-08	N	0.10	0.10	1.85E-09	1.85E-09
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.50E-08	N	0.10	0.05	1.50E-09	7.50E-10
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	6.70E-08	Y	0.10	0.10	6.70E-09	6.70E-09
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.45E-08	N	0.10	0.01	1.45E-09	1.45E-10
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.85E-08	N	0.10	0.10	1.85E-09	1.85E-09

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.30E-08	N	0.10	0.10	1.30E-09	1.30E-09
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	2.10E-08	N	0.03	0.10	6.30E-10	2.10E-09
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.50E-08	N	1.00	1.00	2.50E-08	2.50E-08
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.80E-08	N	0.10	0.10	1.80E-09	1.80E-09
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	2.10E-08	N	0.30	1.00	6.30E-09	2.10E-08
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	1.20E-08	N	0.10	1.00	1.20E-09	1.20E-08
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.45E-08	N	1.00	1.00	1.45E-08	1.45E-08
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	Octachlorodibenzofuran	1.25E-08	N	0.00	0.00	3.75E-12	1.25E-12
CFSB-079-SO-0-0.5	6/1/2016	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	1.25E-08	N	0.00	0.00	3.75E-12	1.25E-12
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	6.64E-05	Y	0.01	0.01	6.64E-07	6.64E-07
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	3.12E-04	Y	0.01	0.00	3.12E-06	3.12E-07
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	8.35E-07	N	0.01	0.01	8.35E-09	8.35E-09
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	9.63E-06	Y	0.10	0.10	9.63E-07	9.63E-07
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	2.34E-06	Y	0.10	0.05	2.34E-07	1.17E-07
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	2.86E-06	Y	0.10	0.10	2.86E-07	2.86E-07
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.08E-05	Y	0.10	0.01	1.08E-06	1.08E-07
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	6.10E-07	N	0.10	0.10	6.10E-08	6.10E-08
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	5.14E-06	Y	0.10	0.10	5.14E-07	5.14E-07
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	2.10E-06	Y	0.03	0.10	6.30E-08	2.10E-07
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	3.45E-07	N	1.00	1.00	3.45E-07	3.45E-07
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	4.58E-06	Y	0.10	0.10	4.58E-07	4.58E-07
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.88E-06	Y	0.30	1.00	5.64E-07	1.88E-06
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	2.02E-06	Y	0.10	1.00	2.02E-07	2.02E-06
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.90E-07	N	1.00	1.00	2.90E-07	2.90E-07
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	Octachlorodibenzofuran	7.96E-05	Y	0.00	0.00	2.39E-08	7.96E-09
CFSB-080-SO-0.5-2	6/1/2016	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	4.35E-03	Y	0.00	0.00	1.31E-06	4.35E-07
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.35E-08	N	0.01	0.01	1.35E-10	1.35E-10
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.15E-08	N	0.01	0.00	1.15E-10	1.15E-11
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.70E-08	N	0.01	0.01	1.70E-10	1.70E-10
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	1.15E-08	N	0.10	0.10	1.15E-09	1.15E-09
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.55E-08	N	0.10	0.05	1.55E-09	7.75E-10
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	4.40E-08	Y	0.10	0.10	4.40E-09	4.40E-09
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.50E-08	N	0.10	0.01	1.50E-09	1.50E-10
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.20E-08	N	0.10	0.10	1.20E-09	1.20E-09
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.30E-08	N	0.10	0.10	1.30E-09	1.30E-09
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	1.55E-08	N	0.03	0.10	4.65E-10	1.55E-09
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.75E-08	N	1.00	1.00	1.75E-08	1.75E-08
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.15E-08	N	0.10	0.10	1.15E-09	1.15E-09
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	1.55E-08	N	0.30	1.00	4.65E-09	1.55E-08
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	9.50E-09	N	0.10	1.00	9.50E-10	9.50E-09
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.10E-08	N	1.00	1.00	1.10E-08	1.10E-08
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	Octachlorodibenzofuran	1.05E-08	N	0.00	0.00	3.15E-12	1.05E-12
CFSB-080-SO-0-0.5	6/1/2016	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	1.10E-08	N	0.00	0.00	3.30E-12	1.10E-12
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.35E-08	N	0.01	0.01	1.35E-10	1.35E-10
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.15E-08	N	0.01	0.00	1.15E-10	1.15E-11
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.75E-08	N	0.01	0.01	1.75E-10	1.75E-10
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	1.40E-07	Y	0.10	0.10	1.40E-08	1.40E-08
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.20E-08	N	0.10	0.05	1.20E-09	6.00E-10
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.10E-07	Y	0.10	0.10	1.10E-08	1.10E-08

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.10E-07	Y	0.10	0.01	1.10E-08	1.10E-09
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	7.70E-08	Y	0.10	0.10	7.70E-09	7.70E-09
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.00E-08	N	0.10	0.10	1.00E-09	1.00E-09
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.10E-07	Y	0.03	0.10	3.30E-09	1.10E-08
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.75E-08	N	1.00	1.00	1.75E-08	1.75E-08
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.85E-08	N	0.10	0.10	1.85E-09	1.85E-09
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	2.05E-08	N	0.30	1.00	6.15E-09	2.05E-08
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	1.00E-07	Y	0.10	1.00	1.00E-08	1.00E-07
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.10E-08	N	1.00	1.00	2.10E-08	2.10E-08
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	Octachlorodibenzofuran	1.35E-08	N	0.00	0.00	4.05E-12	1.35E-12
CFSB-082-SO-0.5-2	6/1/2016	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	9.36E-06	Y	0.00	0.00	2.81E-09	9.36E-10
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.17E-05	Y	0.01	0.01	2.17E-07	2.17E-07
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.11E-04	Y	0.01	0.00	1.11E-06	1.11E-07
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	6.45E-07	N	0.01	0.01	6.45E-09	6.45E-09
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	3.07E-06	Y	0.10	0.10	3.07E-07	3.07E-07
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	8.60E-07	Y	0.10	0.05	8.60E-08	4.30E-08
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	9.80E-07	Y	0.10	0.10	9.80E-08	9.80E-08
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	3.13E-06	Y	0.10	0.01	3.13E-07	3.13E-08
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.90E-07	N	0.10	0.10	1.90E-08	1.90E-08
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2.08E-06	Y	0.10	0.10	2.08E-07	2.08E-07
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	6.60E-07	Y	0.03	0.10	1.98E-08	6.60E-08
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.50E-07	N	1.00	1.00	1.50E-07	1.50E-07
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.70E-06	Y	0.10	0.10	1.70E-07	1.70E-07
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	6.00E-07	Y	0.30	1.00	1.80E-07	6.00E-07
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	7.90E-07	Y	0.10	1.00	7.90E-08	7.90E-07
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.15E-07	N	1.00	1.00	1.15E-07	1.15E-07
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	Octachlorodibenzofuran	3.10E-05	Y	0.00	0.00	9.30E-09	3.10E-09
CFSB-082-SO-0-0.5	6/1/2016	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	1.73E-03	Y	0.00	0.00	5.19E-07	1.73E-07
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.85E-06	Y	0.01	0.01	1.85E-08	1.85E-08
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	5.06E-06	Y	0.01	0.00	5.06E-08	5.06E-09
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.95E-08	N	0.01	0.01	2.95E-10	2.95E-10
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	3.30E-07	Y	0.10	0.10	3.30E-08	3.30E-08
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	2.05E-08	N	0.10	0.05	2.05E-09	1.03E-09
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	3.25E-08	N	0.10	0.10	3.25E-09	3.25E-09
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	4.50E-07	Y	0.10	0.01	4.50E-08	4.50E-09
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	3.45E-08	N	0.10	0.10	3.45E-09	3.45E-09
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	3.10E-07	Y	0.10	0.10	3.10E-08	3.10E-08
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.70E-07	Y	0.03	0.10	5.10E-09	1.70E-08
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	9.40E-08	Y	1.00	1.00	9.40E-08	9.40E-08
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.30E-07	Y	0.10	0.10	1.30E-08	1.30E-08
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	2.55E-08	N	0.30	1.00	7.65E-09	2.55E-08
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	3.90E-07	Y	0.10	1.00	3.90E-08	3.90E-07
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.40E-08	N	1.00	1.00	2.40E-08	2.40E-08
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	Octachlorodibenzofuran	4.06E-06	Y	0.00	0.00	1.22E-09	4.06E-10
CFSB-084-SO-0.5-2	5/27/2016	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	3.41E-05	Y	0.00	0.00	1.02E-08	3.41E-09
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	9.64E-06	Y	0.01	0.01	9.64E-08	9.64E-08
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.48E-05	Y	0.01	0.00	2.48E-07	2.48E-08
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	8.60E-07	Y	0.01	0.01	8.60E-09	8.60E-09
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	1.35E-06	Y	0.10	0.10	1.35E-07	1.35E-07

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	6.10E-07	Y	0.10	0.05	6.10E-08	3.05E-08
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	7.80E-07	Y	0.10	0.10	7.80E-08	7.80E-08
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.44E-06	Y	0.10	0.01	1.44E-07	1.44E-08
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.50E-07	N	0.10	0.10	1.50E-08	1.50E-08
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	8.00E-07	Y	0.10	0.10	8.00E-08	8.00E-08
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	6.10E-07	Y	0.03	0.10	1.83E-08	6.10E-08
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.55E-07	N	1.00	1.00	1.55E-07	1.55E-07
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	5.00E-07	Y	0.10	0.10	5.00E-08	5.00E-08
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	4.50E-07	Y	0.30	1.00	1.35E-07	4.50E-07
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	2.14E-06	Y	0.10	1.00	2.14E-07	2.14E-06
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.45E-07	N	1.00	1.00	1.45E-07	1.45E-07
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	Octachlorodibenzofuran	2.22E-05	Y	0.00	0.00	6.66E-09	2.22E-09
CFSB-084-SO-0-0.5	5/27/2016	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	1.79E-04	Y	0.00	0.00	5.37E-08	1.79E-08
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.00E-08	N	0.01	0.01	1.00E-10	1.00E-10
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.46E-06	Y	0.01	0.00	2.46E-08	2.46E-09
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.20E-08	N	0.01	0.01	1.20E-10	1.20E-10
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	1.50E-07	Y	0.10	0.10	1.50E-08	1.50E-08
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	6.40E-08	Y	0.10	0.05	6.40E-09	3.20E-09
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	9.10E-08	Y	0.10	0.10	9.10E-09	9.10E-09
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.50E-07	Y	0.10	0.01	1.50E-08	1.50E-09
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.65E-08	N	0.10	0.10	1.65E-09	1.65E-09
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	8.40E-08	Y	0.10	0.10	8.40E-09	8.40E-09
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.70E-08	N	0.03	0.10	5.10E-10	1.70E-09
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	3.05E-08	N	1.00	1.00	3.05E-08	3.05E-08
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	4.00E-08	Y	0.10	0.10	4.00E-09	4.00E-09
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.75E-08	N	0.30	1.00	5.25E-09	1.75E-08
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	2.20E-07	Y	0.10	1.00	2.20E-08	2.20E-07
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.70E-08	N	1.00	1.00	1.70E-08	1.70E-08
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	Octachlorodibenzofuran	1.10E-08	N	0.00	0.00	3.30E-12	1.10E-12
CFSB-086-SO-0.5-2	5/26/2016	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	1.74E-05	Y	0.00	0.00	5.22E-09	1.74E-09
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	4.94E-06	Y	0.01	0.01	4.94E-08	4.94E-08
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.34E-05	Y	0.01	0.00	2.34E-07	2.34E-08
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	6.50E-07	Y	0.01	0.01	6.50E-09	6.50E-09
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	2.00E-07	N	0.10	0.10	2.00E-08	2.00E-08
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.25E-07	N	0.10	0.05	1.25E-08	6.25E-09
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.80E-07	N	0.10	0.10	1.80E-08	1.80E-08
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.57E-06	Y	0.10	0.01	1.57E-07	1.57E-08
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.95E-07	N	0.10	0.10	1.95E-08	1.95E-08
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	9.00E-07	Y	0.10	0.10	9.00E-08	9.00E-08
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	1.10E-07	N	0.03	0.10	3.30E-09	1.10E-08
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.95E-07	N	1.00	1.00	1.95E-07	1.95E-07
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.95E-07	N	0.10	0.10	1.95E-08	1.95E-08
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	1.15E-07	N	0.30	1.00	3.45E-08	1.15E-07
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	1.41E-06	Y	0.10	1.00	1.41E-07	1.41E-06
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.65E-07	N	1.00	1.00	1.65E-07	1.65E-07
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	Octachlorodibenzofuran	1.11E-05	Y	0.00	0.00	3.33E-09	1.11E-09
CFSB-086-SO-0-0.5	5/26/2016	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	1.56E-04	Y	0.00	0.00	4.68E-08	1.56E-08
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.29E-06	Y	0.01	0.01	1.29E-08	1.29E-08
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	5.19E-06	Y	0.01	0.00	5.19E-08	5.19E-09

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.40E-08	N	0.01	0.01	2.40E-10	2.40E-10
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	4.00E-07	Y	0.10	0.10	4.00E-08	4.00E-08
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	2.00E-08	N	0.10	0.05	2.00E-09	1.00E-09
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.40E-07	Y	0.10	0.10	1.40E-08	1.40E-08
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	3.70E-07	Y	0.10	0.01	3.70E-08	3.70E-09
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	5.20E-08	Y	0.10	0.10	5.20E-09	5.20E-09
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.90E-07	Y	0.10	0.10	1.90E-08	1.90E-08
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	2.30E-07	Y	0.03	0.10	6.90E-09	2.30E-08
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	3.30E-08	N	1.00	1.00	3.30E-08	3.30E-08
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.40E-07	Y	0.10	0.10	1.40E-08	1.40E-08
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	2.40E-07	Y	0.30	1.00	7.20E-08	2.40E-07
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	9.40E-07	Y	0.10	1.00	9.40E-08	9.40E-07
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.95E-08	N	1.00	1.00	1.95E-08	1.95E-08
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	Octachlorodibenzofuran	3.09E-06	Y	0.00	0.00	9.27E-10	3.09E-10
CFSB-087-SO-0.5-2	5/26/2016	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	3.74E-05	Y	0.00	0.00	1.12E-08	3.74E-09
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	3.10E-06	Y	0.01	0.01	3.10E-08	3.10E-08
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.64E-05	Y	0.01	0.00	1.64E-07	1.64E-08
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	7.50E-08	N	0.01	0.01	7.50E-10	7.50E-10
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	1.40E-07	N	0.10	0.10	1.40E-08	1.40E-08
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	8.50E-08	N	0.10	0.05	8.50E-09	4.25E-09
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.25E-07	N	0.10	0.10	1.25E-08	1.25E-08
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.19E-06	Y	0.10	0.01	1.19E-07	1.19E-08
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.35E-07	N	0.10	0.10	1.35E-08	1.35E-08
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	9.80E-07	Y	0.10	0.10	9.80E-08	9.80E-08
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	4.70E-07	Y	0.03	0.10	1.41E-08	4.70E-08
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.30E-07	N	1.00	1.00	1.30E-07	1.30E-07
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.35E-07	N	0.10	0.10	1.35E-08	1.35E-08
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	5.20E-07	Y	0.30	1.00	1.56E-07	5.20E-07
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	2.16E-06	Y	0.10	1.00	2.16E-07	2.16E-06
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.00E-07	N	1.00	1.00	1.00E-07	1.00E-07
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	Octachlorodibenzofuran	7.90E-06	Y	0.00	0.00	2.37E-09	7.90E-10
CFSB-087-SO-0-0.5	5/26/2016	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	1.08E-04	Y	0.00	0.00	3.24E-08	1.08E-08
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	5.63E-06	Y	0.01	0.01	5.63E-08	5.63E-08
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.96E-05	Y	0.01	0.00	1.96E-07	1.96E-08
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.10E-07	N	0.01	0.01	1.10E-09	1.10E-09
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	5.20E-07	Y	0.10	0.10	5.20E-08	5.20E-08
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	5.60E-07	Y	0.10	0.05	5.60E-08	2.80E-08
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.50E-07	N	0.10	0.10	1.50E-08	1.50E-08
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	9.60E-07	Y	0.10	0.01	9.60E-08	9.60E-09
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.60E-07	N	0.10	0.10	1.60E-08	1.60E-08
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	9.70E-07	Y	0.10	0.10	9.70E-08	9.70E-08
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.90E-07	N	0.03	0.10	5.70E-09	1.90E-08
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.35E-07	N	1.00	1.00	2.35E-07	2.35E-07
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.60E-07	N	0.10	0.10	1.60E-08	1.60E-08
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	2.00E-07	N	0.30	1.00	6.00E-08	2.00E-07
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	1.09E-06	Y	0.10	1.00	1.09E-07	1.09E-06
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.10E-07	N	1.00	1.00	2.10E-07	2.10E-07
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	Octachlorodibenzofuran	1.73E-05	Y	0.00	0.00	5.19E-09	1.73E-09
CFSB-088-SO-0.5-2	5/26/2016	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	1.11E-04	Y	0.00	0.00	3.33E-08	1.11E-08

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	7.18E-06	Y	0.01	0.01	7.18E-08	7.18E-08
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.13E-05	Y	0.01	0.00	2.13E-07	2.13E-08
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	8.50E-08	N	0.01	0.01	8.50E-10	8.50E-10
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	9.20E-07	Y	0.10	0.10	9.20E-08	9.20E-08
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	3.30E-07	Y	0.10	0.05	3.30E-08	1.65E-08
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.05E-07	N	0.10	0.10	1.05E-08	1.05E-08
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.25E-06	Y	0.10	0.01	1.25E-07	1.25E-08
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.10E-07	N	0.10	0.10	1.10E-08	1.10E-08
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	7.80E-07	Y	0.10	0.10	7.80E-08	7.80E-08
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	8.00E-08	N	0.03	0.10	2.40E-09	8.00E-09
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.05E-07	N	1.00	1.00	1.05E-07	1.05E-07
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	2.80E-07	Y	0.10	0.10	2.80E-08	2.80E-08
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	8.50E-08	N	0.30	1.00	2.55E-08	8.50E-08
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	1.31E-06	Y	0.10	1.00	1.31E-07	1.31E-06
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	9.00E-08	N	1.00	1.00	9.00E-08	9.00E-08
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	Octachlorodibenzofuran	2.32E-05	Y	0.00	0.00	6.96E-09	2.32E-09
CFSB-088-SO-0-0.5	5/26/2016	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	1.45E-04	Y	0.00	0.00	4.35E-08	1.45E-08
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.43E-06	Y	0.01	0.01	2.43E-08	2.43E-08
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	9.04E-06	Y	0.01	0.00	9.04E-08	9.04E-09
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.30E-08	N	0.01	0.01	2.30E-10	2.30E-10
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	3.10E-07	Y	0.10	0.10	3.10E-08	3.10E-08
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	2.50E-07	Y	0.10	0.05	2.50E-08	1.25E-08
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.90E-07	Y	0.10	0.10	1.90E-08	1.90E-08
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	5.30E-07	Y	0.10	0.01	5.30E-08	5.30E-09
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	2.50E-08	N	0.10	0.10	2.50E-09	2.50E-09
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	4.60E-07	Y	0.10	0.10	4.60E-08	4.60E-08
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.90E-08	N	0.03	0.10	5.70E-10	1.90E-09
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.20E-07	Y	1.00	1.00	2.20E-07	2.20E-07
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.20E-07	Y	0.10	0.10	1.20E-08	1.20E-08
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.60E-07	Y	0.30	1.00	4.80E-08	1.60E-07
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	6.00E-07	Y	0.10	1.00	6.00E-08	6.00E-07
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.10E-07	Y	1.00	1.00	1.10E-07	1.10E-07
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	Octachlorodibenzofuran	6.02E-06	Y	0.00	0.00	1.81E-09	6.02E-10
CFSB-092-SO-0.5-2	5/26/2016	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	6.81E-05	Y	0.00	0.00	2.04E-08	6.81E-09
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	4.18E-06	Y	0.01	0.01	4.18E-08	4.18E-08
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.47E-05	Y	0.01	0.00	1.47E-07	1.47E-08
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	4.90E-07	Y	0.01	0.01	4.90E-09	4.90E-09
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	4.50E-08	N	0.10	0.10	4.50E-09	4.50E-09
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	3.80E-07	Y	0.10	0.05	3.80E-08	1.90E-08
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	4.20E-07	Y	0.10	0.10	4.20E-08	4.20E-08
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	9.70E-07	Y	0.10	0.01	9.70E-08	9.70E-09
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	4.30E-08	N	0.10	0.10	4.30E-09	4.30E-09
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	6.70E-07	Y	0.10	0.10	6.70E-08	6.70E-08
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	2.90E-07	Y	0.03	0.10	8.70E-09	2.90E-08
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.60E-07	Y	1.00	1.00	2.60E-07	2.60E-07
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	3.10E-07	Y	0.10	0.10	3.10E-08	3.10E-08
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	2.90E-07	Y	0.30	1.00	8.70E-08	2.90E-07
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	1.06E-06	Y	0.10	1.00	1.06E-07	1.06E-06
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.40E-07	Y	1.00	1.00	1.40E-07	1.40E-07

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	Octachlorodibenzofuran	1.01E-05	Y	0.00	0.00	3.03E-09	1.01E-09
CFSB-092-SO-0-0.5	5/26/2016	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	1.04E-04	Y	0.00	0.00	3.12E-08	1.04E-08
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.37E-06	Y	0.01	0.01	1.37E-08	1.37E-08
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	5.59E-06	Y	0.01	0.00	5.59E-08	5.59E-09
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	3.65E-08	N	0.01	0.01	3.65E-10	3.65E-10
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	4.75E-08	N	0.10	0.10	4.75E-09	4.75E-09
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.90E-08	N	0.10	0.05	1.90E-09	9.50E-10
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	2.20E-07	Y	0.10	0.10	2.20E-08	2.20E-08
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.75E-08	N	0.10	0.01	1.75E-09	1.75E-10
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	5.50E-08	N	0.10	0.10	5.50E-09	5.50E-09
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.70E-08	N	0.10	0.10	1.70E-09	1.70E-09
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.85E-08	N	0.03	0.10	5.55E-10	1.85E-09
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	9.60E-08	Y	1.00	1.00	9.60E-08	9.60E-08
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	4.60E-08	N	0.10	0.10	4.60E-09	4.60E-09
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.30E-07	Y	0.30	1.00	3.90E-08	1.30E-07
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	2.50E-07	Y	0.10	1.00	2.50E-08	2.50E-07
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.80E-08	N	1.00	1.00	2.80E-08	2.80E-08
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzofuran	6.20E-06	Y	0.00	0.00	1.86E-09	6.20E-10
CFSB-189-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	6.65E-05	Y	0.00	0.00	2.00E-08	6.65E-09
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.18E-06	Y	0.01	0.01	2.18E-08	2.18E-08
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.82E-05	Y	0.01	0.00	2.82E-07	2.82E-08
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	4.60E-08	N	0.01	0.01	4.60E-10	4.60E-10
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	5.50E-08	N	0.10	0.10	5.50E-09	5.50E-09
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.85E-08	N	0.10	0.05	1.85E-09	9.25E-10
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	4.95E-08	N	0.10	0.10	4.95E-09	4.95E-09
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	2.60E-07	Y	0.10	0.01	2.60E-08	2.60E-09
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	6.50E-08	N	0.10	0.10	6.50E-09	6.50E-09
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.65E-08	N	0.10	0.10	1.65E-09	1.65E-09
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	2.65E-08	N	0.03	0.10	7.95E-10	2.65E-09
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.85E-08	N	1.00	1.00	2.85E-08	2.85E-08
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	5.00E-08	N	0.10	0.10	5.00E-09	5.00E-09
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	2.65E-08	N	0.30	1.00	7.95E-09	2.65E-08
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	1.85E-08	N	0.10	1.00	1.85E-09	1.85E-08
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	3.65E-08	N	1.00	1.00	3.65E-08	3.65E-08
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzofuran	2.20E-05	Y	0.00	0.00	6.60E-09	2.20E-09
CFSB-189-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	6.26E-04	Y	0.00	0.00	1.88E-07	6.26E-08
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.45E-08	N	0.01	0.01	2.45E-10	2.45E-10
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	4.81E-06	Y	0.01	0.00	4.81E-08	4.81E-09
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.95E-08	N	0.01	0.01	2.95E-10	2.95E-10
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	3.90E-08	N	0.10	0.10	3.90E-09	3.90E-09
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.45E-08	N	0.10	0.05	1.45E-09	7.25E-10
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.80E-07	Y	0.10	0.10	1.80E-08	1.80E-08
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.35E-08	N	0.10	0.01	1.35E-09	1.35E-10
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	4.60E-08	N	0.10	0.10	4.60E-09	4.60E-09
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.30E-08	N	0.10	0.10	1.30E-09	1.30E-09
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.55E-08	N	0.03	0.10	4.65E-10	1.55E-09
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	8.00E-08	Y	1.00	1.00	8.00E-08	8.00E-08
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	3.75E-08	N	0.10	0.10	3.75E-09	3.75E-09
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.55E-08	N	0.30	1.00	4.65E-09	1.55E-08

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	1.10E-08	N	0.10	1.00	1.10E-09	1.10E-08
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.10E-08	N	1.00	1.00	2.10E-08	2.10E-08
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzofuran	4.33E-06	Y	0.00	0.00	1.30E-09	4.33E-10
CFSB-190-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	4.69E-05	Y	0.00	0.00	1.41E-08	4.69E-09
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	6.61E-06	Y	0.01	0.01	6.61E-08	6.61E-08
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.26E-05	Y	0.01	0.00	2.26E-07	2.26E-08
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	7.00E-08	N	0.01	0.01	7.00E-10	7.00E-10
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	7.10E-07	Y	0.10	0.10	7.10E-08	7.10E-08
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	2.35E-08	N	0.10	0.05	2.35E-09	1.18E-09
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	4.80E-07	Y	0.10	0.10	4.80E-08	4.80E-08
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	8.90E-07	Y	0.10	0.01	8.90E-08	8.90E-09
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	7.50E-08	N	0.10	0.10	7.50E-09	7.50E-09
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	8.60E-07	Y	0.10	0.10	8.60E-08	8.60E-08
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	2.00E-08	N	0.03	0.10	6.00E-10	2.00E-09
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.90E-07	Y	1.00	1.00	1.90E-07	1.90E-07
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	6.00E-08	N	0.10	0.10	6.00E-09	6.00E-09
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	3.00E-07	Y	0.30	1.00	9.00E-08	3.00E-07
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	7.80E-07	Y	0.10	1.00	7.80E-08	7.80E-07
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.45E-08	N	1.00	1.00	2.45E-08	2.45E-08
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzofuran	2.39E-05	Y	0.00	0.00	7.17E-09	2.39E-09
CFSB-190-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	2.03E-04	Y	0.00	0.00	6.09E-08	2.03E-08
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.20E-08	N	0.01	0.01	2.20E-10	2.20E-10
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.47E-06	Y	0.01	0.00	2.47E-08	2.47E-09
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.65E-08	N	0.01	0.01	2.65E-10	2.65E-10
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	3.25E-08	N	0.10	0.10	3.25E-09	3.25E-09
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.80E-08	N	0.10	0.05	1.80E-09	9.00E-10
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.10E-07	Y	0.10	0.10	1.10E-08	1.10E-08
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.70E-08	N	0.10	0.01	1.70E-09	1.70E-10
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	3.85E-08	N	0.10	0.10	3.85E-09	3.85E-09
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.65E-08	N	0.10	0.10	1.65E-09	1.65E-09
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.75E-08	N	0.03	0.10	5.25E-10	1.75E-09
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.90E-08	N	1.00	1.00	1.90E-08	1.90E-08
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	3.15E-08	N	0.10	0.10	3.15E-09	3.15E-09
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.75E-08	N	0.30	1.00	5.25E-09	1.75E-08
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	9.00E-09	N	0.10	1.00	9.00E-10	9.00E-09
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.00E-08	N	1.00	1.00	2.00E-08	2.00E-08
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	Octachlorodibenzofuran	2.15E-08	N	0.00	0.00	6.45E-12	2.15E-12
CFSB-205-SO-0.5-2	9/26/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	1.70E-05	Y	0.00	0.00	5.10E-09	1.70E-09
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.45E-08	N	0.01	0.01	1.45E-10	1.45E-10
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	3.63E-06	Y	0.01	0.00	3.63E-08	3.63E-09
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.70E-08	N	0.01	0.01	1.70E-10	1.70E-10
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	3.05E-08	N	0.10	0.10	3.05E-09	3.05E-09
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.35E-08	N	0.10	0.05	1.35E-09	6.75E-10
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.40E-07	Y	0.10	0.10	1.40E-08	1.40E-08
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	2.80E-07	Y	0.10	0.01	2.80E-08	2.80E-09
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	3.60E-08	N	0.10	0.10	3.60E-09	3.60E-09
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2.60E-07	Y	0.10	0.10	2.60E-08	2.60E-08
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	1.15E-08	N	0.03	0.10	3.45E-10	1.15E-09
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.30E-07	Y	1.00	1.00	1.30E-07	1.30E-07

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	2.95E-08	N	0.10	0.10	2.95E-09	2.95E-09
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	1.15E-08	N	0.30	1.00	3.45E-09	1.15E-08
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	3.60E-07	Y	0.10	1.00	3.60E-08	3.60E-07
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	5.20E-08	Y	1.00	1.00	5.20E-08	5.20E-08
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	Octachlorodibenzofuran	1.35E-08	N	0.00	0.00	4.05E-12	1.35E-12
CFSB-205-SO-0-0.5	9/26/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	3.15E-05	Y	0.00	0.00	9.45E-09	3.15E-09
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.30E-08	N	0.01	0.01	1.30E-10	1.30E-10
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.70E-08	N	0.01	0.00	1.70E-10	1.70E-11
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.50E-08	N	0.01	0.01	1.50E-10	1.50E-10
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	4.30E-08	Y	0.10	0.10	4.30E-09	4.30E-09
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	2.40E-08	N	0.10	0.05	2.40E-09	1.20E-09
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.30E-08	N	0.10	0.10	1.30E-09	1.30E-09
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	2.10E-08	N	0.10	0.01	2.10E-09	2.10E-10
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.35E-08	N	0.10	0.10	1.35E-09	1.35E-09
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.95E-08	N	0.10	0.10	1.95E-09	1.95E-09
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	2.05E-08	N	0.03	0.10	6.15E-10	2.05E-09
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.25E-08	N	1.00	1.00	2.25E-08	2.25E-08
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.35E-08	N	0.10	0.10	1.35E-09	1.35E-09
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	2.10E-08	N	0.30	1.00	6.30E-09	2.10E-08
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	2.50E-08	N	0.10	1.00	2.50E-09	2.50E-08
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.10E-08	N	1.00	1.00	2.10E-08	2.10E-08
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	Octachlorodibenzofuran	1.91E-06	Y	0.00	0.00	5.73E-10	1.91E-10
CFSB-206-SO-0.5-2	6/22/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	4.92E-06	Y	0.00	0.00	1.48E-09	4.92E-10
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.92E-06	Y	0.01	0.01	1.92E-08	1.92E-08
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.36E-05	Y	0.01	0.00	1.36E-07	1.36E-08
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	4.55E-08	N	0.01	0.01	4.55E-10	4.55E-10
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	4.90E-07	Y	0.10	0.10	4.90E-08	4.90E-08
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	3.40E-08	N	0.10	0.05	3.40E-09	1.70E-09
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	3.80E-07	Y	0.10	0.10	3.80E-08	3.80E-08
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	3.00E-08	N	0.10	0.01	3.00E-09	3.00E-10
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	2.55E-08	N	0.10	0.10	2.55E-09	2.55E-09
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	7.50E-07	Y	0.10	0.10	7.50E-08	7.50E-08
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	2.70E-08	N	0.03	0.10	8.10E-10	2.70E-09
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	3.00E-07	Y	1.00	1.00	3.00E-07	3.00E-07
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	4.60E-07	Y	0.10	0.10	4.60E-08	4.60E-08
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	3.60E-07	Y	0.30	1.00	1.08E-07	3.60E-07
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	3.70E-08	N	0.10	1.00	3.70E-09	3.70E-08
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	4.65E-08	N	1.00	1.00	4.65E-08	4.65E-08
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	Octachlorodibenzofuran	3.82E-06	Y	0.00	0.00	1.15E-09	3.82E-10
CFSB-206-SO-0-0.5	6/22/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	1.06E-04	Y	0.00	0.00	3.18E-08	1.06E-08
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	4.60E-07	Y	0.01	0.01	4.60E-09	4.60E-09
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.00E-06	Y	0.01	0.00	2.00E-08	2.00E-09
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.40E-08	N	0.01	0.01	1.40E-10	1.40E-10
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	8.00E-08	Y	0.10	0.10	8.00E-09	8.00E-09
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.50E-08	N	0.10	0.05	1.50E-09	7.50E-10
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	2.35E-08	N	0.10	0.10	2.35E-09	2.35E-09
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.35E-08	N	0.10	0.01	1.35E-09	1.35E-10
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	2.65E-08	N	0.10	0.10	2.65E-09	2.65E-09
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.30E-07	Y	0.10	0.10	1.30E-08	1.30E-08

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.80E-08	N	0.03	0.10	5.40E-10	1.80E-09
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.50E-08	N	1.00	1.00	2.50E-08	2.50E-08
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	2.40E-08	N	0.10	0.10	2.40E-09	2.40E-09
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.85E-08	N	0.30	1.00	5.55E-09	1.85E-08
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	1.05E-08	N	0.10	1.00	1.05E-09	1.05E-08
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.50E-08	N	1.00	1.00	1.50E-08	1.50E-08
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	Octachlorodibenzofuran	1.20E-06	Y	0.00	0.00	3.60E-10	1.20E-10
CFSB-207-SO-0.5-2	4/28/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	1.51E-05	Y	0.00	0.00	4.53E-09	1.51E-09
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.86E-06	Y	0.01	0.01	1.86E-08	1.86E-08
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	7.19E-06	Y	0.01	0.00	7.19E-08	7.19E-09
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.05E-08	N	0.01	0.01	2.05E-10	2.05E-10
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	2.50E-07	Y	0.10	0.10	2.50E-08	2.50E-08
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.65E-08	N	0.10	0.05	1.65E-09	8.25E-10
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.80E-07	Y	0.10	0.10	1.80E-08	1.80E-08
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	4.10E-07	Y	0.10	0.01	4.10E-08	4.10E-09
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	4.45E-08	N	0.10	0.10	4.45E-09	4.45E-09
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	3.50E-07	Y	0.10	0.10	3.50E-08	3.50E-08
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	1.85E-08	N	0.03	0.10	5.55E-10	1.85E-09
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.30E-07	Y	1.00	1.00	1.30E-07	1.30E-07
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.50E-07	Y	0.10	0.10	1.50E-08	1.50E-08
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	1.70E-07	Y	0.30	1.00	5.10E-08	1.70E-07
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	1.25E-08	N	0.10	1.00	1.25E-09	1.25E-08
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.35E-08	N	1.00	1.00	1.35E-08	1.35E-08
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	Octachlorodibenzofuran	4.99E-06	Y	0.00	0.00	1.50E-09	4.99E-10
CFSB-207-SO-0-0.5	4/28/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	5.58E-05	Y	0.00	0.00	1.67E-08	5.58E-09
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.70E-06	Y	0.01	0.01	2.70E-08	2.70E-08
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	9.78E-06	Y	0.01	0.00	9.78E-08	9.78E-09
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	3.50E-08	N	0.01	0.01	3.50E-10	3.50E-10
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	3.80E-08	N	0.10	0.10	3.80E-09	3.80E-09
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.90E-08	N	0.10	0.05	1.90E-09	9.50E-10
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	3.65E-08	N	0.10	0.10	3.65E-09	3.65E-09
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	4.40E-07	Y	0.10	0.01	4.40E-08	4.40E-09
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	4.10E-08	N	0.10	0.10	4.10E-09	4.10E-09
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	3.30E-07	Y	0.10	0.10	3.30E-08	3.30E-08
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.60E-08	N	0.03	0.10	4.80E-10	1.60E-09
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.10E-07	Y	1.00	1.00	1.10E-07	1.10E-07
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	3.70E-08	N	0.10	0.10	3.70E-09	3.70E-09
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.30E-07	Y	0.30	1.00	3.90E-08	1.30E-07
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	1.00E-08	N	0.10	1.00	1.00E-09	1.00E-08
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.25E-08	N	1.00	1.00	1.25E-08	1.25E-08
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	Octachlorodibenzofuran	1.42E-05	Y	0.00	0.00	4.26E-09	1.42E-09
CFSB-208-SO-0.5-2	4/28/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	7.11E-05	Y	0.00	0.00	2.13E-08	7.11E-09
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	3.27E-06	Y	0.01	0.01	3.27E-08	3.27E-08
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.43E-05	Y	0.01	0.00	1.43E-07	1.43E-08
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	3.65E-08	N	0.01	0.01	3.65E-10	3.65E-10
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	2.60E-07	Y	0.10	0.10	2.60E-08	2.60E-08
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	2.50E-08	N	0.10	0.05	2.50E-09	1.25E-09
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.90E-07	Y	0.10	0.10	1.90E-08	1.90E-08
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	5.70E-07	Y	0.10	0.01	5.70E-08	5.70E-09

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	2.80E-08	N	0.10	0.10	2.80E-09	2.80E-09
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	5.00E-07	Y	0.10	0.10	5.00E-08	5.00E-08
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	1.35E-08	N	0.03	0.10	4.05E-10	1.35E-09
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.30E-07	Y	1.00	1.00	1.30E-07	1.30E-07
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.50E-07	Y	0.10	0.10	1.50E-08	1.50E-08
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	1.70E-07	Y	0.30	1.00	5.10E-08	1.70E-07
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	1.10E-08	N	0.10	1.00	1.10E-09	1.10E-08
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.30E-08	N	1.00	1.00	1.30E-08	1.30E-08
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	Octachlorodibenzofuran	1.38E-05	Y	0.00	0.00	4.14E-09	1.38E-09
CFSB-208-SO-0-0.5	4/28/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	1.07E-04	Y	0.00	0.00	3.21E-08	1.07E-08
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.85E-08	N	0.01	0.01	1.85E-10	1.85E-10
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	3.08E-06	Y	0.01	0.00	3.08E-08	3.08E-09
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.15E-08	N	0.01	0.01	2.15E-10	2.15E-10
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	2.70E-07	Y	0.10	0.10	2.70E-08	2.70E-08
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	2.50E-08	N	0.10	0.05	2.50E-09	1.25E-09
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.40E-07	Y	0.10	0.10	1.40E-08	1.40E-08
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	2.20E-08	N	0.10	0.01	2.20E-09	2.20E-10
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	2.05E-08	N	0.10	0.10	2.05E-09	2.05E-09
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2.05E-08	N	0.10	0.10	2.05E-09	2.05E-09
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	2.35E-08	N	0.03	0.10	7.05E-10	2.35E-09
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	8.60E-08	Y	1.00	1.00	8.60E-08	8.60E-08
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	2.05E-08	N	0.10	0.10	2.05E-09	2.05E-09
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	2.40E-08	N	0.30	1.00	7.20E-09	2.40E-08
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	2.10E-08	N	0.10	1.00	2.10E-09	2.10E-08
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.70E-08	N	1.00	1.00	1.70E-08	1.70E-08
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	Octachlorodibenzofuran	1.31E-06	Y	0.00	0.00	3.93E-10	1.31E-10
CFSB-213-SO-0.5-2	6/22/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	1.89E-05	Y	0.00	0.00	5.67E-09	1.89E-09
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	3.64E-06	Y	0.01	0.01	3.64E-08	3.64E-08
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.13E-05	Y	0.01	0.00	2.13E-07	2.13E-08
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	4.85E-08	N	0.01	0.01	4.85E-10	4.85E-10
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	6.20E-07	Y	0.10	0.10	6.20E-08	6.20E-08
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	2.65E-08	N	0.10	0.05	2.65E-09	1.33E-09
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	3.10E-07	Y	0.10	0.10	3.10E-08	3.10E-08
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.22E-06	Y	0.10	0.01	1.22E-07	1.22E-08
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	2.75E-08	N	0.10	0.10	2.75E-09	2.75E-09
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	6.80E-07	Y	0.10	0.10	6.80E-08	6.80E-08
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	3.00E-08	N	0.03	0.10	9.00E-10	3.00E-09
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.10E-07	Y	1.00	1.00	2.10E-07	2.10E-07
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	2.80E-07	Y	0.10	0.10	2.80E-08	2.80E-08
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	3.05E-08	N	0.30	1.00	9.15E-09	3.05E-08
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	2.55E-08	N	0.10	1.00	2.55E-09	2.55E-08
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.15E-08	N	1.00	1.00	2.15E-08	2.15E-08
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	Octachlorodibenzofuran	6.08E-06	Y	0.00	0.00	1.82E-09	6.08E-10
CFSB-213-SO-0-0.5	6/22/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	1.72E-04	Y	0.00	0.00	5.16E-08	1.72E-08
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.50E-06	Y	0.01	0.01	1.50E-08	1.50E-08
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	9.29E-06	Y	0.01	0.00	9.29E-08	9.29E-09
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.65E-08	N	0.01	0.01	1.65E-10	1.65E-10
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	3.10E-07	Y	0.10	0.10	3.10E-08	3.10E-08
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	2.10E-08	N	0.10	0.05	2.10E-09	1.05E-09

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.70E-07	Y	0.10	0.10	1.70E-08	1.70E-08
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	4.50E-07	Y	0.10	0.01	4.50E-08	4.50E-09
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	2.75E-08	N	0.10	0.10	2.75E-09	2.75E-09
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	3.20E-07	Y	0.10	0.10	3.20E-08	3.20E-08
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.40E-08	N	0.03	0.10	4.20E-10	1.40E-09
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.90E-08	N	1.00	1.00	1.90E-08	1.90E-08
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.20E-07	Y	0.10	0.10	1.20E-08	1.20E-08
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.70E-07	Y	0.30	1.00	5.10E-08	1.70E-07
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	9.50E-09	N	0.10	1.00	9.50E-10	9.50E-09
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	9.00E-08	Y	1.00	1.00	9.00E-08	9.00E-08
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	Octachlorodibenzofuran	2.00E-06	Y	0.00	0.00	6.00E-10	2.00E-10
CFSB-231-SO-0.5-2	4/28/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	7.50E-05	Y	0.00	0.00	2.25E-08	7.50E-09
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	4.16E-06	Y	0.01	0.01	4.16E-08	4.16E-08
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	3.74E-05	Y	0.01	0.00	3.74E-07	3.74E-08
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	3.95E-08	N	0.01	0.01	3.95E-10	3.95E-10
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	1.09E-06	Y	0.10	0.10	1.09E-07	1.09E-07
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	4.70E-07	Y	0.10	0.05	4.70E-08	2.35E-08
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	3.70E-08	N	0.10	0.10	3.70E-09	3.70E-09
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.82E-06	Y	0.10	0.01	1.82E-07	1.82E-08
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	4.20E-08	N	0.10	0.10	4.20E-09	4.20E-09
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.03E-06	Y	0.10	0.10	1.03E-07	1.03E-07
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	7.40E-07	Y	0.03	0.10	2.22E-08	7.40E-08
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	5.50E-08	N	1.00	1.00	5.50E-08	5.50E-08
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	2.80E-07	Y	0.10	0.10	2.80E-08	2.80E-08
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	5.00E-07	Y	0.30	1.00	1.50E-07	5.00E-07
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	1.21E-06	Y	0.10	1.00	1.21E-07	1.21E-06
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.10E-07	Y	1.00	1.00	2.10E-07	2.10E-07
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	Octachlorodibenzofuran	7.02E-06	Y	0.00	0.00	2.11E-09	7.02E-10
CFSB-231-SO-0-0.5	4/28/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	2.99E-04	Y	0.00	0.00	8.97E-08	2.99E-08
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	8.50E-09	N	0.01	0.01	8.50E-11	8.50E-11
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.93E-06	Y	0.01	0.00	1.93E-08	1.93E-09
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.05E-08	N	0.01	0.01	1.05E-10	1.05E-10
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	8.80E-08	Y	0.10	0.10	8.80E-09	8.80E-09
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.05E-08	N	0.10	0.05	1.05E-09	5.25E-10
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.10E-08	N	0.10	0.10	1.10E-09	1.10E-09
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	9.50E-09	N	0.10	0.01	9.50E-10	9.50E-11
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.25E-08	N	0.10	0.10	1.25E-09	1.25E-09
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	8.10E-08	Y	0.10	0.10	8.10E-09	8.10E-09
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	8.00E-09	N	0.03	0.10	2.40E-10	8.00E-10
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	5.10E-08	Y	1.00	1.00	5.10E-08	5.10E-08
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	3.40E-08	Y	0.10	0.10	3.40E-09	3.40E-09
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	5.60E-08	Y	0.30	1.00	1.68E-08	5.60E-08
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	4.20E-09	N	0.10	1.00	4.20E-10	4.20E-09
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	6.00E-09	N	1.00	1.00	6.00E-09	6.00E-09
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	Octachlorodibenzofuran	5.00E-09	N	0.00	0.00	1.50E-12	5.00E-13
CFSB-232-SO-0.5-2	4/28/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	1.48E-05	Y	0.00	0.00	4.44E-09	1.48E-09
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	5.10E-07	Y	0.01	0.01	5.10E-09	5.10E-09
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	4.05E-06	Y	0.01	0.00	4.05E-08	4.05E-09
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.35E-08	N	0.01	0.01	1.35E-10	1.35E-10

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	1.95E-08	N	0.10	0.10	1.95E-09	1.95E-09
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.50E-08	N	0.10	0.05	1.50E-09	7.50E-10
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.85E-08	N	0.10	0.10	1.85E-09	1.85E-09
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.40E-08	N	0.10	0.01	1.40E-09	1.40E-10
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	2.10E-08	N	0.10	0.10	2.10E-09	2.10E-09
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2.10E-07	Y	0.10	0.10	2.10E-08	2.10E-08
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	1.10E-08	N	0.03	0.10	3.30E-10	1.10E-09
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.30E-07	Y	1.00	1.00	1.30E-07	1.30E-07
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	4.20E-08	Y	0.10	0.10	4.20E-09	4.20E-09
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	1.10E-07	Y	0.30	1.00	3.30E-08	1.10E-07
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	6.00E-09	N	0.10	1.00	6.00E-10	6.00E-09
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	5.10E-08	Y	1.00	1.00	5.10E-08	5.10E-08
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	Octachlorodibenzofuran	6.50E-09	N	0.00	0.00	1.95E-12	6.50E-13
CFSB-232-SO-0-0.5	4/28/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	3.13E-05	Y	0.00	0.00	9.39E-09	3.13E-09
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	7.00E-07	Y	0.01	0.01	7.00E-09	7.00E-09
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	3.74E-06	Y	0.01	0.00	3.74E-08	3.74E-09
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.40E-08	N	0.01	0.01	1.40E-10	1.40E-10
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	1.30E-07	Y	0.10	0.10	1.30E-08	1.30E-08
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.45E-08	N	0.10	0.05	1.45E-09	7.25E-10
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.10E-07	Y	0.10	0.10	1.10E-08	1.10E-08
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	3.90E-07	Y	0.10	0.01	3.90E-08	3.90E-09
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.65E-08	N	0.10	0.10	1.65E-09	1.65E-09
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	5.70E-07	Y	0.10	0.10	5.70E-08	5.70E-08
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	9.00E-09	N	0.03	0.10	2.70E-10	9.00E-10
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.50E-07	Y	1.00	1.00	1.50E-07	1.50E-07
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	9.30E-08	Y	0.10	0.10	9.30E-09	9.30E-09
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	9.10E-08	Y	0.30	1.00	2.73E-08	9.10E-08
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	7.00E-09	N	0.10	1.00	7.00E-10	7.00E-09
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	7.90E-08	Y	1.00	1.00	7.90E-08	7.90E-08
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	Octachlorodibenzofuran	1.99E-06	Y	0.00	0.00	5.97E-10	1.99E-10
CFSB-233-SO-0.5-2	4/28/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	2.63E-05	Y	0.00	0.00	7.89E-09	2.63E-09
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	3.76E-06	Y	0.01	0.01	3.76E-08	3.76E-08
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.11E-05	Y	0.01	0.00	2.11E-07	2.11E-08
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	4.20E-08	N	0.01	0.01	4.20E-10	4.20E-10
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	5.90E-07	Y	0.10	0.10	5.90E-08	5.90E-08
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	3.05E-08	N	0.10	0.05	3.05E-09	1.53E-09
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	2.70E-07	Y	0.10	0.10	2.70E-08	2.70E-08
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	9.40E-07	Y	0.10	0.01	9.40E-08	9.40E-09
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	4.40E-08	N	0.10	0.10	4.40E-09	4.40E-09
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	8.00E-07	Y	0.10	0.10	8.00E-08	8.00E-08
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	2.60E-08	N	0.03	0.10	7.80E-10	2.60E-09
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.20E-07	Y	1.00	1.00	2.20E-07	2.20E-07
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.60E-07	Y	0.10	0.10	1.60E-08	1.60E-08
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	2.60E-07	Y	0.30	1.00	7.80E-08	2.60E-07
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	9.60E-07	Y	0.10	1.00	9.60E-08	9.60E-07
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	9.60E-08	Y	1.00	1.00	9.60E-08	9.60E-08
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	Octachlorodibenzofuran	9.42E-06	Y	0.00	0.00	2.83E-09	9.42E-10
CFSB-233-SO-0-0.5	4/28/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	1.66E-04	Y	0.00	0.00	4.98E-08	1.66E-08
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.01E-05	Y	0.01	0.01	1.01E-07	1.01E-07

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.14E-04	Y	0.01	0.00	1.14E-06	1.14E-07
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	7.10E-07	Y	0.01	0.01	7.10E-09	7.10E-09
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	1.39E-06	Y	0.10	0.10	1.39E-07	1.39E-07
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.11E-06	Y	0.10	0.05	1.11E-07	5.55E-08
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	6.20E-07	Y	0.10	0.10	6.20E-08	6.20E-08
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	4.16E-06	Y	0.10	0.01	4.16E-07	4.16E-08
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	6.50E-08	N	0.10	0.10	6.50E-09	6.50E-09
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2.42E-06	Y	0.10	0.10	2.42E-07	2.42E-07
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	5.40E-07	Y	0.03	0.10	1.62E-08	5.40E-08
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	5.40E-07	Y	1.00	1.00	5.40E-07	5.40E-07
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	4.90E-07	Y	0.10	0.10	4.90E-08	4.90E-08
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	4.90E-07	Y	0.30	1.00	1.47E-07	4.90E-07
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	1.05E-06	Y	0.10	1.00	1.05E-07	1.05E-06
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.50E-07	Y	1.00	1.00	1.50E-07	1.50E-07
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	Octachlorodibenzofuran	1.99E-05	Y	0.00	0.00	5.97E-09	1.99E-09
CFSB-234-SO-0.5-2	4/28/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	9.03E-04	Y	0.00	0.00	2.71E-07	9.03E-08
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.06E-05	Y	0.01	0.01	2.06E-07	2.06E-07
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.81E-04	Y	0.01	0.00	2.81E-06	2.81E-07
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.14E-06	Y	0.01	0.01	1.14E-08	1.14E-08
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	2.57E-06	Y	0.10	0.10	2.57E-07	2.57E-07
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	2.36E-06	Y	0.10	0.05	2.36E-07	1.18E-07
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.34E-06	Y	0.10	0.10	1.34E-07	1.34E-07
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.17E-05	Y	0.10	0.01	1.17E-06	1.17E-07
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.20E-07	N	0.10	0.10	1.20E-08	1.20E-08
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	6.11E-06	Y	0.10	0.10	6.11E-07	6.11E-07
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	9.60E-07	Y	0.03	0.10	2.88E-08	9.60E-08
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.20E-06	Y	1.00	1.00	1.20E-06	1.20E-06
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	8.80E-07	Y	0.10	0.10	8.80E-08	8.80E-08
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	8.50E-07	Y	0.30	1.00	2.55E-07	8.50E-07
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	1.30E-06	Y	0.10	1.00	1.30E-07	1.30E-06
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.00E-08	N	1.00	1.00	1.00E-08	1.00E-08
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	Octachlorodibenzofuran	3.41E-05	Y	0.00	0.00	1.02E-08	3.41E-09
CFSB-234-SO-0-0.5	4/28/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	2.21E-03	Y	0.00	0.00	6.63E-07	2.21E-07
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.40E-06	Y	0.01	0.01	2.40E-08	2.40E-08
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.88E-05	Y	0.01	0.00	1.88E-07	1.88E-08
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	3.35E-08	N	0.01	0.01	3.35E-10	3.35E-10
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	5.70E-07	Y	0.10	0.10	5.70E-08	5.70E-08
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	2.50E-08	N	0.10	0.05	2.50E-09	1.25E-09
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	2.90E-07	Y	0.10	0.10	2.90E-08	2.90E-08
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	9.40E-07	Y	0.10	0.01	9.40E-08	9.40E-09
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	2.75E-08	N	0.10	0.10	2.75E-09	2.75E-09
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	9.40E-07	Y	0.10	0.10	9.40E-08	9.40E-08
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.35E-08	N	0.03	0.10	4.05E-10	1.35E-09
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.40E-07	Y	1.00	1.00	2.40E-07	2.40E-07
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	2.30E-07	Y	0.10	0.10	2.30E-08	2.30E-08
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	2.70E-07	Y	0.30	1.00	8.10E-08	2.70E-07
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	9.10E-07	Y	0.10	1.00	9.10E-08	9.10E-07
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	7.20E-08	Y	1.00	1.00	7.20E-08	7.20E-08
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	Octachlorodibenzofuran	4.21E-06	Y	0.00	0.00	1.26E-09	4.21E-10

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-235-SO-0.5-2	4/28/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	1.29E-04	Y	0.00	0.00	3.87E-08	1.29E-08
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	4.05E-06	Y	0.01	0.01	4.05E-08	4.05E-08
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	3.56E-05	Y	0.01	0.00	3.56E-07	3.56E-08
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	4.55E-08	N	0.01	0.01	4.55E-10	4.55E-10
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	1.00E-06	Y	0.10	0.10	1.00E-07	1.00E-07
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	7.50E-07	Y	0.10	0.05	7.50E-08	3.75E-08
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	5.10E-07	Y	0.10	0.10	5.10E-08	5.10E-08
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.75E-06	Y	0.10	0.01	1.75E-07	1.75E-08
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	4.20E-08	N	0.10	0.10	4.20E-09	4.20E-09
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.36E-06	Y	0.10	0.10	1.36E-07	1.36E-07
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	6.10E-07	Y	0.03	0.10	1.83E-08	6.10E-08
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	3.30E-07	Y	1.00	1.00	3.30E-07	3.30E-07
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	3.20E-07	Y	0.10	0.10	3.20E-08	3.20E-08
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	5.40E-07	Y	0.30	1.00	1.62E-07	5.40E-07
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	1.21E-06	Y	0.10	1.00	1.21E-07	1.21E-06
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	8.10E-08	Y	1.00	1.00	8.10E-08	8.10E-08
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	Octachlorodibenzofuran	6.71E-06	Y	0.00	0.00	2.01E-09	6.71E-10
CFSB-235-SO-0-0.5	4/28/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	2.47E-04	Y	0.00	0.00	7.41E-08	2.47E-08
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	3.45E-05	Y	0.01	0.01	3.45E-07	3.45E-07
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.46E-04	Y	0.01	0.00	2.46E-06	2.46E-07
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.11E-06	Y	0.01	0.01	2.11E-08	2.11E-08
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	3.14E-06	Y	0.10	0.10	3.14E-07	3.14E-07
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.84E-06	Y	0.10	0.05	1.84E-07	9.20E-08
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.44E-06	Y	0.10	0.10	1.44E-07	1.44E-07
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	7.80E-06	Y	0.10	0.01	7.80E-07	7.80E-08
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.45E-07	N	0.10	0.10	1.45E-08	1.45E-08
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	4.81E-06	Y	0.10	0.10	4.81E-07	4.81E-07
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	6.40E-07	Y	0.03	0.10	1.92E-08	6.40E-08
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	7.30E-07	Y	1.00	1.00	7.30E-07	7.30E-07
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.07E-06	Y	0.10	0.10	1.07E-07	1.07E-07
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	7.10E-07	Y	0.30	1.00	2.13E-07	7.10E-07
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	4.90E-08	N	0.10	1.00	4.90E-09	4.90E-08
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	4.90E-08	N	1.00	1.00	4.90E-08	4.90E-08
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	Octachlorodibenzofuran	1.02E-04	Y	0.00	0.00	3.06E-08	1.02E-08
CFSB-236-SO-0.5-2	4/28/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	2.85E-03	Y	0.00	0.00	8.55E-07	2.85E-07
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	6.97E-05	Y	0.01	0.01	6.97E-07	6.97E-07
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	6.04E-04	Y	0.01	0.00	6.04E-06	6.04E-07
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	4.13E-06	Y	0.01	0.01	4.13E-08	4.13E-08
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	5.47E-06	Y	0.10	0.10	5.47E-07	5.47E-07
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	4.07E-06	Y	0.10	0.05	4.07E-07	2.04E-07
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	2.85E-06	Y	0.10	0.10	2.85E-07	2.85E-07
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.92E-05	Y	0.10	0.01	1.92E-06	1.92E-07
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	2.45E-07	N	0.10	0.10	2.45E-08	2.45E-08
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	9.54E-06	Y	0.10	0.10	9.54E-07	9.54E-07
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	1.17E-06	Y	0.03	0.10	3.51E-08	1.17E-07
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.53E-06	Y	1.00	1.00	1.53E-06	1.53E-06
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	2.58E-06	Y	0.10	0.10	2.58E-07	2.58E-07
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	1.22E-06	Y	0.30	1.00	3.66E-07	1.22E-06
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	6.00E-08	N	0.10	1.00	6.00E-09	6.00E-08

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	3.10E-07	Y	1.00	1.00	3.10E-07	3.10E-07
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	Octachlorodibenzofuran	1.90E-04	Y	0.00	0.00	5.70E-08	1.90E-08
CFSB-236-SO-0-0.5	4/28/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	6.76E-03	Y	0.00	0.00	2.03E-06	6.76E-07
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.95E-08	N	0.01	0.01	1.95E-10	1.95E-10
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	8.83E-06	Y	0.01	0.00	8.83E-08	8.83E-09
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.30E-08	N	0.01	0.01	2.30E-10	2.30E-10
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	3.50E-08	N	0.10	0.10	3.50E-09	3.50E-09
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.20E-08	N	0.10	0.05	1.20E-09	6.00E-10
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	3.25E-08	N	0.10	0.10	3.25E-09	3.25E-09
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.10E-08	N	0.10	0.01	1.10E-09	1.10E-10
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	4.10E-08	N	0.10	0.10	4.10E-09	4.10E-09
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.05E-08	N	0.10	0.10	1.05E-09	1.05E-09
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	3.05E-08	N	0.03	0.10	9.15E-10	3.05E-09
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	8.70E-08	Y	1.00	1.00	8.70E-08	8.70E-08
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	3.35E-08	N	0.10	0.10	3.35E-09	3.35E-09
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.34E-06	Y	0.30	1.00	4.02E-07	1.34E-06
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	1.54E-06	Y	0.10	1.00	1.54E-07	1.54E-06
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.85E-08	N	1.00	1.00	1.85E-08	1.85E-08
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzofuran	1.15E-08	N	0.00	0.00	3.45E-12	1.15E-12
CFSB-288-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	8.32E-05	Y	0.00	0.00	2.50E-08	8.32E-09
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	8.06E-06	Y	0.01	0.01	8.06E-08	8.06E-08
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.87E-05	Y	0.01	0.00	2.87E-07	2.87E-08
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	6.50E-08	N	0.01	0.01	6.50E-10	6.50E-10
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	4.75E-06	Y	0.10	0.10	4.75E-07	4.75E-07
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	2.90E-08	N	0.10	0.05	2.90E-09	1.45E-09
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	4.00E-06	Y	0.10	0.10	4.00E-07	4.00E-07
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.58E-06	Y	0.10	0.01	1.58E-07	1.58E-08
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.40E-07	N	0.10	0.10	1.40E-08	1.40E-08
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.28E-06	Y	0.10	0.10	1.28E-07	1.28E-07
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	2.84E-06	Y	0.03	0.10	8.52E-08	2.84E-07
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.50E-07	Y	1.00	1.00	2.50E-07	2.50E-07
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.24E-06	Y	0.10	0.10	1.24E-07	1.24E-07
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	3.65E-06	Y	0.30	1.00	1.10E-06	3.65E-06
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	6.15E-06	Y	0.10	1.00	6.15E-07	6.15E-06
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.50E-07	Y	1.00	1.00	1.50E-07	1.50E-07
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzofuran	1.05E-05	Y	0.00	0.00	3.15E-09	1.05E-09
CFSB-288-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	3.19E-04	Y	0.00	0.00	9.57E-08	3.19E-08
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.36E-06	Y	0.01	0.01	1.36E-08	1.36E-08
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	4.11E-06	Y	0.01	0.00	4.11E-08	4.11E-09
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	3.30E-08	N	0.01	0.01	3.30E-10	3.30E-10
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	6.40E-07	Y	0.10	0.10	6.40E-08	6.40E-08
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.50E-08	N	0.10	0.05	1.50E-09	7.50E-10
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	4.40E-07	Y	0.10	0.10	4.40E-08	4.40E-08
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.40E-08	N	0.10	0.01	1.40E-09	1.40E-10
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	7.00E-08	N	0.10	0.10	7.00E-09	7.00E-09
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	3.00E-07	Y	0.10	0.10	3.00E-08	3.00E-08
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	2.35E-08	N	0.03	0.10	7.05E-10	2.35E-09
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.75E-08	N	1.00	1.00	2.75E-08	2.75E-08
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	6.00E-08	N	0.10	0.10	6.00E-09	6.00E-09

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	3.70E-07	Y	0.30	1.00	1.11E-07	3.70E-07
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	9.60E-07	Y	0.10	1.00	9.60E-08	9.60E-07
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.80E-08	N	1.00	1.00	1.80E-08	1.80E-08
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzofuran	3.44E-06	Y	0.00	0.00	1.03E-09	3.44E-10
CFSB-293-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	3.18E-05	Y	0.00	0.00	9.54E-09	3.18E-09
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.07E-06	Y	0.01	0.01	2.07E-08	2.07E-08
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	7.22E-06	Y	0.01	0.00	7.22E-08	7.22E-09
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	3.80E-08	N	0.01	0.01	3.80E-10	3.80E-10
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	6.70E-07	Y	0.10	0.10	6.70E-08	6.70E-08
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.90E-08	N	0.10	0.05	1.90E-09	9.50E-10
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	4.00E-07	Y	0.10	0.10	4.00E-08	4.00E-08
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	4.50E-07	Y	0.10	0.01	4.50E-08	4.50E-09
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	8.00E-08	N	0.10	0.10	8.00E-09	8.00E-09
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	4.10E-07	Y	0.10	0.10	4.10E-08	4.10E-08
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	2.95E-08	N	0.03	0.10	8.85E-10	2.95E-09
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	3.40E-08	N	1.00	1.00	3.40E-08	3.40E-08
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	6.50E-08	N	0.10	0.10	6.50E-09	6.50E-09
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	4.60E-07	Y	0.30	1.00	1.38E-07	4.60E-07
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	1.12E-06	Y	0.10	1.00	1.12E-07	1.12E-06
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.10E-08	N	1.00	1.00	2.10E-08	2.10E-08
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzofuran	5.29E-06	Y	0.00	0.00	1.59E-09	5.29E-10
CFSB-293-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	5.78E-05	Y	0.00	0.00	1.73E-08	5.78E-09
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.15E-08	N	0.01	0.01	2.15E-10	2.15E-10
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.43E-06	Y	0.01	0.00	1.43E-08	1.43E-09
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.55E-08	N	0.01	0.01	2.55E-10	2.55E-10
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	4.80E-08	N	0.10	0.10	4.80E-09	4.80E-09
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.35E-08	N	0.10	0.05	1.35E-09	6.75E-10
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	4.90E-07	Y	0.10	0.10	4.90E-08	4.90E-08
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.25E-08	N	0.10	0.01	1.25E-09	1.25E-10
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	5.50E-08	N	0.10	0.10	5.50E-09	5.50E-09
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.25E-08	N	0.10	0.10	1.25E-09	1.25E-09
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.85E-08	N	0.03	0.10	5.55E-10	1.85E-09
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.80E-08	N	1.00	1.00	1.80E-08	1.80E-08
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	4.60E-08	N	0.10	0.10	4.60E-09	4.60E-09
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.10E-07	Y	0.30	1.00	3.30E-08	1.10E-07
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	9.50E-09	N	0.10	1.00	9.50E-10	9.50E-09
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.30E-08	N	1.00	1.00	2.30E-08	2.30E-08
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzofuran	2.55E-06	Y	0.00	0.00	7.65E-10	2.55E-10
CFSB-294-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	1.14E-05	Y	0.00	0.00	3.42E-09	1.14E-09
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.50E-08	N	0.01	0.01	2.50E-10	2.50E-10
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.42E-06	Y	0.01	0.00	1.42E-08	1.42E-09
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	3.00E-08	N	0.01	0.01	3.00E-10	3.00E-10
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	4.45E-08	N	0.10	0.10	4.45E-09	4.45E-09
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.45E-08	N	0.10	0.05	1.45E-09	7.25E-10
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.80E-07	Y	0.10	0.10	1.80E-08	1.80E-08
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.30E-08	N	0.10	0.01	1.30E-09	1.30E-10
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	5.50E-08	N	0.10	0.10	5.50E-09	5.50E-09
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.30E-08	N	0.10	0.10	1.30E-09	1.30E-09
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	1.70E-08	N	0.03	0.10	5.10E-10	1.70E-09

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	4.20E-08	Y	1.00	1.00	4.20E-08	4.20E-08
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	4.30E-08	N	0.10	0.10	4.30E-09	4.30E-09
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	1.70E-08	N	0.30	1.00	5.10E-09	1.70E-08
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	1.15E-08	N	0.10	1.00	1.15E-09	1.15E-08
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.75E-08	N	1.00	1.00	2.75E-08	2.75E-08
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzofuran	3.50E-08	N	0.00	0.00	1.05E-11	3.50E-12
CFSB-294-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	1.41E-05	Y	0.00	0.00	4.23E-09	1.41E-09
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	1,2,3,4,6,7,8-Heptachlorodibenzofuran	5.85E-06	Y	0.01	0.01	5.85E-08	5.85E-08
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.36E-05	Y	0.01	0.00	2.36E-07	2.36E-08
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.55E-07	N	0.01	0.01	1.55E-09	1.55E-09
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	1,2,3,4,7,8-Hexachlorodibenzofuran	9.50E-08	N	0.10	0.10	9.50E-09	9.50E-09
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	5.50E-08	N	0.10	0.05	5.50E-09	2.75E-09
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	1,2,3,6,7,8-Hexachlorodibenzofuran	8.00E-08	N	0.10	0.10	8.00E-09	8.00E-09
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	9.30E-07	Y	0.10	0.01	9.30E-08	9.30E-09
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	1,2,3,7,8,9-Hexachlorodibenzofuran	9.50E-08	N	0.10	0.10	9.50E-09	9.50E-09
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	8.40E-07	Y	0.10	0.10	8.40E-08	8.40E-08
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	1,2,3,7,8-Pentachlorodibenzofuran	4.20E-08	N	0.03	0.10	1.26E-09	4.20E-09
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	5.50E-08	N	1.00	1.00	5.50E-08	5.50E-08
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	2,3,4,6,7,8-Hexachlorodibenzofuran	9.00E-08	N	0.10	0.10	9.00E-09	9.00E-09
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	2,3,4,7,8-Pentachlorodibenzofuran	4.30E-08	N	0.30	1.00	1.29E-08	4.30E-08
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	2,3,7,8-Tetrachlorodibenzofuran	3.65E-08	N	0.10	1.00	3.65E-09	3.65E-08
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	5.00E-08	N	1.00	1.00	5.00E-08	5.00E-08
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	Octachlorodibenzofuran	2.59E-05	Y	0.00	0.00	7.77E-09	2.59E-09
CFSB-DUP25-SO	4/28/2018	0.00-0.50	FD	Octachlorodibenzo-P-Dioxin	1.67E-04	Y	0.00	0.00	5.01E-08	1.67E-08
Central Landfills Area										
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	5.13E-06	Y	0.01	0.01	5.13E-08	5.13E-08
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	7.63E-05	Y	0.01	0.00	7.63E-07	7.63E-08
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	6.50E-08	N	0.01	0.01	6.50E-10	6.50E-10
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	1.06E-06	Y	0.10	0.10	1.06E-07	1.06E-07
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	3.40E-08	N	0.10	0.05	3.40E-09	1.70E-09
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	6.40E-07	Y	0.10	0.10	6.40E-08	6.40E-08
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	2.46E-06	Y	0.10	0.01	2.46E-07	2.46E-08
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.35E-07	N	0.10	0.10	1.35E-08	1.35E-08
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	7.00E-07	Y	0.10	0.10	7.00E-08	7.00E-08
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	3.35E-08	N	0.03	0.10	1.01E-09	3.35E-09
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	4.50E-08	N	1.00	1.00	4.50E-08	4.50E-08
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.10E-07	N	0.10	0.10	1.10E-08	1.10E-08
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	3.00E-07	Y	0.30	1.00	9.00E-08	3.00E-07
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	6.90E-07	Y	0.10	1.00	6.90E-08	6.90E-07
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	6.00E-08	N	1.00	1.00	6.00E-08	6.00E-08
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzofuran	1.68E-05	Y	0.00	0.00	5.04E-09	1.68E-09
CFSB-289-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	8.91E-04	Y	0.00	0.00	2.67E-07	8.91E-08
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.40E-08	N	0.01	0.01	2.40E-10	2.40E-10
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.38E-06	Y	0.01	0.00	1.38E-08	1.38E-09
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.85E-08	N	0.01	0.01	2.85E-10	2.85E-10
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	6.00E-08	N	0.10	0.10	6.00E-09	6.00E-09
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	2.05E-08	N	0.10	0.05	2.05E-09	1.03E-09
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.80E-07	Y	0.10	0.10	1.80E-08	1.80E-08
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.90E-08	N	0.10	0.01	1.90E-09	1.90E-10

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	7.00E-08	N	0.10	0.10	7.00E-09	7.00E-09
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.85E-08	N	0.10	0.10	1.85E-09	1.85E-09
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	2.55E-08	N	0.03	0.10	7.65E-10	2.55E-09
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.75E-08	N	1.00	1.00	2.75E-08	2.75E-08
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	5.50E-08	N	0.10	0.10	5.50E-09	5.50E-09
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	2.55E-08	N	0.30	1.00	7.65E-09	2.55E-08
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	2.35E-08	N	0.10	1.00	2.35E-09	2.35E-08
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	4.00E-08	N	1.00	1.00	4.00E-08	4.00E-08
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzofuran	5.00E-08	N	0.00	0.00	1.50E-11	5.00E-12
CFSB-289-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	8.87E-06	Y	0.00	0.00	2.66E-09	8.87E-10
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.55E-08	N	0.01	0.01	2.55E-10	2.55E-10
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	4.54E-06	Y	0.01	0.00	4.54E-08	4.54E-09
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	3.05E-08	N	0.01	0.01	3.05E-10	3.05E-10
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	4.80E-08	N	0.10	0.10	4.80E-09	4.80E-09
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.65E-08	N	0.10	0.05	1.65E-09	8.25E-10
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.70E-07	Y	0.10	0.10	1.70E-08	1.70E-08
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	3.00E-07	Y	0.10	0.01	3.00E-08	3.00E-09
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	5.50E-08	N	0.10	0.10	5.50E-09	5.50E-09
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.50E-08	N	0.10	0.10	1.50E-09	1.50E-09
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	2.35E-08	N	0.03	0.10	7.05E-10	2.35E-09
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	7.30E-08	Y	1.00	1.00	7.30E-08	7.30E-08
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	4.60E-08	N	0.10	0.10	4.60E-09	4.60E-09
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.10E-07	Y	0.30	1.00	3.30E-08	1.10E-07
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	4.60E-07	Y	0.10	1.00	4.60E-08	4.60E-07
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.70E-07	Y	1.00	1.00	2.70E-07	2.70E-07
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzofuran	3.70E-08	N	0.00	0.00	1.11E-11	3.70E-12
CFSB-290-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	3.95E-05	Y	0.00	0.00	1.19E-08	3.95E-09
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	5.37E-06	Y	0.01	0.01	5.37E-08	5.37E-08
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	3.13E-05	Y	0.01	0.00	3.13E-07	3.13E-08
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	5.50E-08	N	0.01	0.01	5.50E-10	5.50E-10
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	1.67E-06	Y	0.10	0.10	1.67E-07	1.67E-07
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	3.15E-08	N	0.10	0.05	3.15E-09	1.58E-09
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	7.80E-07	Y	0.10	0.10	7.80E-08	7.80E-08
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.84E-06	Y	0.10	0.01	1.84E-07	1.84E-08
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.50E-07	N	0.10	0.10	1.50E-08	1.50E-08
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.14E-06	Y	0.10	0.10	1.14E-07	1.14E-07
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	3.95E-08	N	0.03	0.10	1.19E-09	3.95E-09
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	3.20E-07	Y	1.00	1.00	3.20E-07	3.20E-07
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	5.70E-07	Y	0.10	0.10	5.70E-08	5.70E-08
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	9.50E-07	Y	0.30	1.00	2.85E-07	9.50E-07
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	1.78E-06	Y	0.10	1.00	1.78E-07	1.78E-06
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	5.00E-08	N	1.00	1.00	5.00E-08	5.00E-08
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzofuran	7.31E-06	Y	0.00	0.00	2.19E-09	7.31E-10
CFSB-290-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	2.77E-04	Y	0.00	0.00	8.31E-08	2.77E-08
Western Undeveloped Area										
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.05E-08	N	0.01	0.01	2.05E-10	2.05E-10
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.55E-08	N	0.01	0.00	1.55E-10	1.55E-11
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.45E-08	N	0.01	0.01	2.45E-10	2.45E-10
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	4.70E-08	N	0.10	0.10	4.70E-09	4.70E-09

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.75E-08	N	0.10	0.05	1.75E-09	8.75E-10
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	2.30E-07	Y	0.10	0.10	2.30E-08	2.30E-08
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.60E-08	N	0.10	0.01	1.60E-09	1.60E-10
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	5.50E-08	N	0.10	0.10	5.50E-09	5.50E-09
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	3.70E-07	Y	0.10	0.10	3.70E-08	3.70E-08
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	2.65E-08	N	0.03	0.10	7.95E-10	2.65E-09
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.10E-07	Y	1.00	1.00	1.10E-07	1.10E-07
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	4.50E-08	N	0.10	0.10	4.50E-09	4.50E-09
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.10E-07	Y	0.30	1.00	3.30E-08	1.10E-07
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	2.00E-08	N	0.10	1.00	2.00E-09	2.00E-08
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	4.60E-07	Y	1.00	1.00	4.60E-07	4.60E-07
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzofuran	3.85E-08	N	0.00	0.00	1.16E-11	3.85E-12
CFSB-168-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	1.90E-08	N	0.00	0.00	5.70E-12	1.90E-12
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.03E-06	Y	0.01	0.01	2.03E-08	2.03E-08
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	5.89E-06	Y	0.01	0.00	5.89E-08	5.89E-09
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	4.00E-08	N	0.01	0.01	4.00E-10	4.00E-10
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	8.00E-07	Y	0.10	0.10	8.00E-08	8.00E-08
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.07E-06	Y	0.10	0.05	1.07E-07	5.35E-08
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	7.60E-07	Y	0.10	0.10	7.60E-08	7.60E-08
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.11E-06	Y	0.10	0.01	1.11E-07	1.11E-08
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	4.45E-08	N	0.10	0.10	4.45E-09	4.45E-09
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.29E-06	Y	0.10	0.10	1.29E-07	1.29E-07
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	1.75E-08	N	0.03	0.10	5.25E-10	1.75E-09
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	3.10E-07	Y	1.00	1.00	3.10E-07	3.10E-07
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	9.20E-07	Y	0.10	0.10	9.20E-08	9.20E-08
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	2.80E-07	Y	0.30	1.00	8.40E-08	2.80E-07
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	7.50E-09	N	0.10	1.00	7.50E-10	7.50E-09
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	9.10E-08	Y	1.00	1.00	9.10E-08	9.10E-08
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzofuran	7.38E-06	Y	0.00	0.00	2.21E-09	7.38E-10
CFSB-168-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	2.93E-05	Y	0.00	0.00	8.79E-09	2.93E-09
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	9.60E-07	Y	0.01	0.01	9.60E-09	9.60E-09
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.96E-06	Y	0.01	0.00	1.96E-08	1.96E-09
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.80E-08	N	0.01	0.01	2.80E-10	2.80E-10
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	3.30E-08	N	0.10	0.10	3.30E-09	3.30E-09
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.60E-08	N	0.10	0.05	1.60E-09	8.00E-10
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.90E-07	Y	0.10	0.10	1.90E-08	1.90E-08
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.50E-08	N	0.10	0.01	1.50E-09	1.50E-10
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	3.90E-08	N	0.10	0.10	3.90E-09	3.90E-09
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.45E-08	N	0.10	0.10	1.45E-09	1.45E-09
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.40E-08	N	0.03	0.10	4.20E-10	1.40E-09
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.80E-08	N	1.00	1.00	1.80E-08	1.80E-08
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	3.20E-08	N	0.10	0.10	3.20E-09	3.20E-09
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.40E-08	N	0.30	1.00	4.20E-09	1.40E-08
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	8.00E-09	N	0.10	1.00	8.00E-10	8.00E-09
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.90E-08	N	1.00	1.00	1.90E-08	1.90E-08
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	Octachlorodibenzofuran	2.78E-06	Y	0.00	0.00	8.34E-10	2.78E-10
CFSB-172-SO-0.5-2	9/26/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	1.82E-05	Y	0.00	0.00	5.46E-09	1.82E-09
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.05E-08	N	0.01	0.01	2.05E-10	2.05E-10
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.87E-06	Y	0.01	0.00	2.87E-08	2.87E-09

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.45E-08	N	0.01	0.01	2.45E-10	2.45E-10
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	3.80E-08	N	0.10	0.10	3.80E-09	3.80E-09
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.80E-08	N	0.10	0.05	1.80E-09	9.00E-10
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	3.50E-08	N	0.10	0.10	3.50E-09	3.50E-09
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.65E-08	N	0.10	0.01	1.65E-09	1.65E-10
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	4.45E-08	N	0.10	0.10	4.45E-09	4.45E-09
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2.60E-07	Y	0.10	0.10	2.60E-08	2.60E-08
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	1.80E-08	N	0.03	0.10	5.40E-10	1.80E-09
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	8.50E-08	Y	1.00	1.00	8.50E-08	8.50E-08
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	3.65E-08	N	0.10	0.10	3.65E-09	3.65E-09
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	1.80E-08	N	0.30	1.00	5.40E-09	1.80E-08
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	9.50E-09	N	0.10	1.00	9.50E-10	9.50E-09
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.25E-08	N	1.00	1.00	2.25E-08	2.25E-08
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	Octachlorodibenzofuran	2.60E-08	N	0.00	0.00	7.80E-12	2.60E-12
CFSB-172-SO-0-0.5	9/26/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	1.69E-05	Y	0.00	0.00	5.07E-09	1.69E-09
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.95E-08	N	0.01	0.01	1.95E-10	1.95E-10
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	9.70E-07	Y	0.01	0.00	9.70E-09	9.70E-10
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.35E-08	N	0.01	0.01	2.35E-10	2.35E-10
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	2.55E-08	N	0.10	0.10	2.55E-09	2.55E-09
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.10E-08	N	0.10	0.05	1.10E-09	5.50E-10
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.60E-07	Y	0.10	0.10	1.60E-08	1.60E-08
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.00E-08	N	0.10	0.01	1.00E-09	1.00E-10
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	3.00E-08	N	0.10	0.10	3.00E-09	3.00E-09
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.00E-08	N	0.10	0.10	1.00E-09	1.00E-09
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.20E-08	N	0.03	0.10	3.60E-10	1.20E-09
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	4.50E-08	Y	1.00	1.00	4.50E-08	4.50E-08
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	2.45E-08	N	0.10	0.10	2.45E-09	2.45E-09
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	6.90E-08	Y	0.30	1.00	2.07E-08	6.90E-08
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	6.00E-09	N	0.10	1.00	6.00E-10	6.00E-09
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.85E-08	N	1.00	1.00	1.85E-08	1.85E-08
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzofuran	2.30E-08	N	0.00	0.00	6.90E-12	2.30E-12
CFSB-196-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	1.11E-05	Y	0.00	0.00	3.33E-09	1.11E-09
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.85E-08	N	0.01	0.01	1.85E-10	1.85E-10
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	3.80E-06	Y	0.01	0.00	3.80E-08	3.80E-09
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.20E-08	N	0.01	0.01	2.20E-10	2.20E-10
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	3.15E-08	N	0.10	0.10	3.15E-09	3.15E-09
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.25E-08	N	0.10	0.05	1.25E-09	6.25E-10
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.50E-07	Y	0.10	0.10	1.50E-08	1.50E-08
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.15E-08	N	0.10	0.01	1.15E-09	1.15E-10
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	3.70E-08	N	0.10	0.10	3.70E-09	3.70E-09
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	3.20E-07	Y	0.10	0.10	3.20E-08	3.20E-08
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	1.20E-08	N	0.03	0.10	3.60E-10	1.20E-09
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	6.80E-08	Y	1.00	1.00	6.80E-08	6.80E-08
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	3.05E-08	N	0.10	0.10	3.05E-09	3.05E-09
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	7.30E-08	Y	0.30	1.00	2.19E-08	7.30E-08
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	6.50E-09	N	0.10	1.00	6.50E-10	6.50E-09
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.65E-08	N	1.00	1.00	1.65E-08	1.65E-08
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzofuran	1.55E-08	N	0.00	0.00	4.65E-12	1.55E-12
CFSB-196-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	2.39E-05	Y	0.00	0.00	7.17E-09	2.39E-09

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.70E-08	N	0.01	0.01	1.70E-10	1.70E-10
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.10E-08	N	0.01	0.00	2.10E-10	2.10E-11
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.95E-08	N	0.01	0.01	1.95E-10	1.95E-10
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	2.85E-08	N	0.10	0.10	2.85E-09	2.85E-09
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	2.85E-08	N	0.10	0.05	2.85E-09	1.43E-09
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	2.60E-08	N	0.10	0.10	2.60E-09	2.60E-09
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	2.50E-08	N	0.10	0.01	2.50E-09	2.50E-10
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	2.65E-08	N	0.10	0.10	2.65E-09	2.65E-09
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2.30E-08	N	0.10	0.10	2.30E-09	2.30E-09
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	2.95E-08	N	0.03	0.10	8.85E-10	2.95E-09
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	3.50E-08	N	1.00	1.00	3.50E-08	3.50E-08
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	2.65E-08	N	0.10	0.10	2.65E-09	2.65E-09
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	3.00E-08	N	0.30	1.00	9.00E-09	3.00E-08
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	3.10E-08	N	0.10	1.00	3.10E-09	3.10E-08
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	3.40E-08	N	1.00	1.00	3.40E-08	3.40E-08
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	Octachlorodibenzofuran	2.80E-08	N	0.00	0.00	8.40E-12	2.80E-12
CFSB-215-SO-0.5-2	6/21/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	3.15E-08	N	0.00	0.00	9.45E-12	3.15E-12
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.35E-08	N	0.01	0.01	2.35E-10	2.35E-10
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.73E-06	Y	0.01	0.00	2.73E-08	2.73E-09
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.70E-08	N	0.01	0.01	2.70E-10	2.70E-10
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	2.30E-07	Y	0.10	0.10	2.30E-08	2.30E-08
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	2.70E-08	N	0.10	0.05	2.70E-09	1.35E-09
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.90E-07	Y	0.10	0.10	1.90E-08	1.90E-08
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	2.35E-08	N	0.10	0.01	2.35E-09	2.35E-10
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	3.10E-08	N	0.10	0.10	3.10E-09	3.10E-09
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2.15E-08	N	0.10	0.10	2.15E-09	2.15E-09
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	2.45E-08	N	0.03	0.10	7.35E-10	2.45E-09
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.70E-07	Y	1.00	1.00	1.70E-07	1.70E-07
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.60E-07	Y	0.10	0.10	1.60E-08	1.60E-08
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	2.50E-08	N	0.30	1.00	7.50E-09	2.50E-08
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	3.40E-08	N	0.10	1.00	3.40E-09	3.40E-08
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.65E-08	N	1.00	1.00	2.65E-08	2.65E-08
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	Octachlorodibenzofuran	2.50E-08	N	0.00	0.00	7.50E-12	2.50E-12
CFSB-215-SO-0-0.5	6/21/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	1.14E-05	Y	0.00	0.00	3.42E-09	1.14E-09
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.25E-08	N	0.01	0.01	2.25E-10	2.25E-10
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	3.75E-08	N	0.01	0.00	3.75E-10	3.75E-11
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.60E-08	N	0.01	0.01	2.60E-10	2.60E-10
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	2.75E-08	N	0.10	0.10	2.75E-09	2.75E-09
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	3.85E-08	N	0.10	0.05	3.85E-09	1.93E-09
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	2.50E-08	N	0.10	0.10	2.50E-09	2.50E-09
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	3.40E-08	N	0.10	0.01	3.40E-09	3.40E-10
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	2.60E-08	N	0.10	0.10	2.60E-09	2.60E-09
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	3.15E-08	N	0.10	0.10	3.15E-09	3.15E-09
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	5.00E-08	N	0.03	0.10	1.50E-09	5.00E-09
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	7.00E-08	N	1.00	1.00	7.00E-08	7.00E-08
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	2.60E-08	N	0.10	0.10	2.60E-09	2.60E-09
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	5.50E-08	N	0.30	1.00	1.65E-08	5.50E-08
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	4.35E-08	N	0.10	1.00	4.35E-09	4.35E-08
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.84E-06	Y	1.00	1.00	1.84E-06	1.84E-06

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	Octachlorodibenzofuran	4.15E-08	N	0.00	0.00	1.25E-11	4.15E-12
CFSB-216-SO-0.5-2	6/21/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	6.00E-08	N	0.00	0.00	1.80E-11	6.00E-12
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.65E-08	N	0.01	0.01	2.65E-10	2.65E-10
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	4.51E-06	Y	0.01	0.00	4.51E-08	4.51E-09
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	3.00E-08	N	0.01	0.01	3.00E-10	3.00E-10
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	4.20E-08	N	0.10	0.10	4.20E-09	4.20E-09
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	3.75E-08	N	0.10	0.05	3.75E-09	1.88E-09
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	3.85E-08	N	0.10	0.10	3.85E-09	3.85E-09
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	3.30E-08	N	0.10	0.01	3.30E-09	3.30E-10
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	3.95E-08	N	0.10	0.10	3.95E-09	3.95E-09
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	3.05E-08	N	0.10	0.10	3.05E-09	3.05E-09
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	4.30E-08	N	0.03	0.10	1.29E-09	4.30E-09
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	7.50E-08	N	1.00	1.00	7.50E-08	7.50E-08
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	3.95E-08	N	0.10	0.10	3.95E-09	3.95E-09
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	4.40E-08	N	0.30	1.00	1.32E-08	4.40E-08
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	5.00E-08	N	0.10	1.00	5.00E-09	5.00E-08
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	4.70E-08	N	1.00	1.00	4.70E-08	4.70E-08
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	Octachlorodibenzofuran	1.22E-06	Y	0.00	0.00	3.66E-10	1.22E-10
CFSB-216-SO-0-0.5	6/21/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	2.33E-05	Y	0.00	0.00	6.99E-09	2.33E-09
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.00E-08	N	0.01	0.01	2.00E-10	2.00E-10
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.74E-06	Y	0.01	0.00	1.74E-08	1.74E-09
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.30E-08	N	0.01	0.01	2.30E-10	2.30E-10
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	3.55E-08	N	0.10	0.10	3.55E-09	3.55E-09
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	3.40E-08	N	0.10	0.05	3.40E-09	1.70E-09
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	3.25E-08	N	0.10	0.10	3.25E-09	3.25E-09
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	2.95E-08	N	0.10	0.01	2.95E-09	2.95E-10
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	3.35E-08	N	0.10	0.10	3.35E-09	3.35E-09
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2.75E-08	N	0.10	0.10	2.75E-09	2.75E-09
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	3.45E-08	N	0.03	0.10	1.04E-09	3.45E-09
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	4.45E-08	N	1.00	1.00	4.45E-08	4.45E-08
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	3.30E-08	N	0.10	0.10	3.30E-09	3.30E-09
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	3.50E-08	N	0.30	1.00	1.05E-08	3.50E-08
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	4.15E-08	N	0.10	1.00	4.15E-09	4.15E-08
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	3.65E-08	N	1.00	1.00	3.65E-08	3.65E-08
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	Octachlorodibenzofuran	3.05E-08	N	0.00	0.00	9.15E-12	3.05E-12
CFSB-217-SO-0.5-2	6/21/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	9.93E-06	Y	0.00	0.00	2.98E-09	9.93E-10
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.70E-08	N	0.01	0.01	1.70E-10	1.70E-10
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.35E-08	N	0.01	0.00	2.35E-10	2.35E-11
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.95E-08	N	0.01	0.01	1.95E-10	1.95E-10
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	3.50E-08	N	0.10	0.10	3.50E-09	3.50E-09
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	3.55E-08	N	0.10	0.05	3.55E-09	1.78E-09
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	3.20E-08	N	0.10	0.10	3.20E-09	3.20E-09
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	3.10E-08	N	0.10	0.01	3.10E-09	3.10E-10
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	3.30E-08	N	0.10	0.10	3.30E-09	3.30E-09
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2.85E-08	N	0.10	0.10	2.85E-09	2.85E-09
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	2.75E-08	N	0.03	0.10	8.25E-10	2.75E-09
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	3.80E-08	N	1.00	1.00	3.80E-08	3.80E-08
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	3.25E-08	N	0.10	0.10	3.25E-09	3.25E-09
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	2.80E-08	N	0.30	1.00	8.40E-09	2.80E-08

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	2.80E-08	N	0.10	1.00	2.80E-09	2.80E-08
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.40E-08	N	1.00	1.00	2.40E-08	2.40E-08
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	Octachlorodibenzofuran	2.70E-08	N	0.00	0.00	8.10E-12	2.70E-12
CFSB-217-SO-0-0.5	6/21/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	2.60E-08	N	0.00	0.00	7.80E-12	2.60E-12
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.75E-08	N	0.01	0.01	1.75E-10	1.75E-10
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	3.45E-06	Y	0.01	0.00	3.45E-08	3.45E-09
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.95E-08	N	0.01	0.01	1.95E-10	1.95E-10
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	1.20E-07	Y	0.10	0.10	1.20E-08	1.20E-08
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	2.70E-08	N	0.10	0.05	2.70E-09	1.35E-09
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	9.70E-08	Y	0.10	0.10	9.70E-09	9.70E-09
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	2.35E-08	N	0.10	0.01	2.35E-09	2.35E-10
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	2.15E-08	N	0.10	0.10	2.15E-09	2.15E-09
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2.20E-08	N	0.10	0.10	2.20E-09	2.20E-09
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	2.00E-08	N	0.03	0.10	6.00E-10	2.00E-09
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	3.25E-08	N	1.00	1.00	3.25E-08	3.25E-08
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.00E-07	Y	0.10	0.10	1.00E-08	1.00E-08
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	2.05E-08	N	0.30	1.00	6.15E-09	2.05E-08
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	3.40E-08	N	0.10	1.00	3.40E-09	3.40E-08
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.95E-08	N	1.00	1.00	2.95E-08	2.95E-08
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	Octachlorodibenzofuran	2.96E-06	Y	0.00	0.00	8.88E-10	2.96E-10
CFSB-218-SO-0.5-2	6/21/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	1.97E-05	Y	0.00	0.00	5.91E-09	1.97E-09
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.65E-08	N	0.01	0.01	1.65E-10	1.65E-10
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.75E-08	N	0.01	0.00	1.75E-10	1.75E-11
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.90E-08	N	0.01	0.01	1.90E-10	1.90E-10
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	7.50E-08	Y	0.10	0.10	7.50E-09	7.50E-09
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	2.05E-08	N	0.10	0.05	2.05E-09	1.03E-09
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.55E-08	N	0.10	0.10	1.55E-09	1.55E-09
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.75E-08	N	0.10	0.01	1.75E-09	1.75E-10
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	1.60E-08	N	0.10	0.10	1.60E-09	1.60E-09
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	1.65E-08	N	0.10	0.10	1.65E-09	1.65E-09
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	1.85E-08	N	0.03	0.10	5.55E-10	1.85E-09
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2.45E-08	N	1.00	1.00	2.45E-08	2.45E-08
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	1.55E-08	N	0.10	0.10	1.55E-09	1.55E-09
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	1.90E-08	N	0.30	1.00	5.70E-09	1.90E-08
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	1.80E-08	N	0.10	1.00	1.80E-09	1.80E-08
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.05E-08	N	1.00	1.00	2.05E-08	2.05E-08
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	Octachlorodibenzofuran	1.60E-08	N	0.00	0.00	4.80E-12	1.60E-12
CFSB-218-SO-0-0.5	6/21/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	3.74E-06	Y	0.00	0.00	1.12E-09	3.74E-10
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.95E-08	N	0.01	0.01	2.95E-10	2.95E-10
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.65E-08	N	0.01	0.00	2.65E-10	2.65E-11
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	3.40E-08	N	0.01	0.01	3.40E-10	3.40E-10
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	2.50E-08	N	0.10	0.10	2.50E-09	2.50E-09
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	3.35E-08	N	0.10	0.05	3.35E-09	1.68E-09
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	2.30E-08	N	0.10	0.10	2.30E-09	2.30E-09
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	2.95E-08	N	0.10	0.01	2.95E-09	2.95E-10
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	2.35E-08	N	0.10	0.10	2.35E-09	2.35E-09
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2.70E-08	N	0.10	0.10	2.70E-09	2.70E-09
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	4.70E-08	N	0.03	0.10	1.41E-09	4.70E-09
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	6.50E-08	N	1.00	1.00	6.50E-08	6.50E-08

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	2.35E-08	N	0.10	0.10	2.35E-09	2.35E-09
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	4.80E-08	N	0.30	1.00	1.44E-08	4.80E-08
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	3.35E-08	N	0.10	1.00	3.35E-09	3.35E-08
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	3.95E-08	N	1.00	1.00	3.95E-08	3.95E-08
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	Octachlorodibenzofuran	4.25E-08	N	0.00	0.00	1.28E-11	4.25E-12
CFSB-237-SO-0.5-2	6/21/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	4.75E-08	N	0.00	0.00	1.43E-11	4.75E-12
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	9.30E-07	Y	0.01	0.01	9.30E-09	9.30E-09
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	6.36E-06	Y	0.01	0.00	6.36E-08	6.36E-09
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.90E-08	N	0.01	0.01	2.90E-10	2.90E-10
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	2.50E-08	N	0.10	0.10	2.50E-09	2.50E-09
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	3.45E-08	N	0.10	0.05	3.45E-09	1.73E-09
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	2.30E-08	N	0.10	0.10	2.30E-09	2.30E-09
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	3.00E-08	N	0.10	0.01	3.00E-09	3.00E-10
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	2.40E-08	N	0.10	0.10	2.40E-09	2.40E-09
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2.80E-08	N	0.10	0.10	2.80E-09	2.80E-09
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	3.95E-08	N	0.03	0.10	1.19E-09	3.95E-09
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	6.50E-08	N	1.00	1.00	6.50E-08	6.50E-08
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	2.35E-08	N	0.10	0.10	2.35E-09	2.35E-09
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	4.05E-08	N	0.30	1.00	1.22E-08	4.05E-08
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	3.25E-08	N	0.10	1.00	3.25E-09	3.25E-08
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2.95E-08	N	1.00	1.00	2.95E-08	2.95E-08
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	Octachlorodibenzofuran	2.13E-06	Y	0.00	0.00	6.39E-10	2.13E-10
CFSB-237-SO-0-0.5	6/21/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	3.35E-05	Y	0.00	0.00	1.01E-08	3.35E-09
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.65E-08	N	0.01	0.01	1.65E-10	1.65E-10
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	4.50E-07	Y	0.01	0.00	4.50E-09	4.50E-10
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.00E-08	N	0.01	0.01	2.00E-10	2.00E-10
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	2.85E-08	N	0.10	0.10	2.85E-09	2.85E-09
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.15E-08	N	0.10	0.05	1.15E-09	5.75E-10
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.30E-07	Y	0.10	0.10	1.30E-08	1.30E-08
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.05E-08	N	0.10	0.01	1.05E-09	1.05E-10
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	3.35E-08	N	0.10	0.10	3.35E-09	3.35E-09
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2.60E-07	Y	0.10	0.10	2.60E-08	2.60E-08
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.10E-08	N	0.03	0.10	3.30E-10	1.10E-09
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	8.50E-08	Y	1.00	1.00	8.50E-08	8.50E-08
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	2.75E-08	N	0.10	0.10	2.75E-09	2.75E-09
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.10E-08	N	0.30	1.00	3.30E-09	1.10E-08
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	5.50E-09	N	0.10	1.00	5.50E-10	5.50E-09
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.05E-08	N	1.00	1.00	1.05E-08	1.05E-08
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	Octachlorodibenzofuran	1.35E-08	N	0.00	0.00	4.05E-12	1.35E-12
CFSB-238-SO-0.5-2	9/25/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	1.47E-05	Y	0.00	0.00	4.41E-09	1.47E-09
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	8.60E-07	Y	0.01	0.01	8.60E-09	8.60E-09
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	4.14E-06	Y	0.01	0.00	4.14E-08	4.14E-09
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.65E-08	N	0.01	0.01	1.65E-10	1.65E-10
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	2.55E-08	N	0.10	0.10	2.55E-09	2.55E-09
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.30E-08	N	0.10	0.05	1.30E-09	6.50E-10
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	2.40E-07	Y	0.10	0.10	2.40E-08	2.40E-08
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	3.20E-07	Y	0.10	0.01	3.20E-08	3.20E-09
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	3.00E-08	N	0.10	0.10	3.00E-09	3.00E-09
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	4.00E-07	Y	0.10	0.10	4.00E-08	4.00E-08

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	1.15E-08	N	0.03	0.10	3.45E-10	1.15E-09
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.50E-07	Y	1.00	1.00	1.50E-07	1.50E-07
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	2.45E-08	N	0.10	0.10	2.45E-09	2.45E-09
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	1.15E-08	N	0.30	1.00	3.45E-09	1.15E-08
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	6.00E-09	N	0.10	1.00	6.00E-10	6.00E-09
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.10E-08	N	1.00	1.00	1.10E-08	1.10E-08
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	Octachlorodibenzofuran	1.96E-06	Y	0.00	0.00	5.88E-10	1.96E-10
CFSB-238-SO-0-0.5	9/25/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	2.38E-05	Y	0.00	0.00	7.14E-09	2.38E-09
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.00E-08	N	0.01	0.01	2.00E-10	2.00E-10
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.15E-08	N	0.01	0.00	1.15E-10	1.15E-11
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.40E-08	N	0.01	0.01	2.40E-10	2.40E-10
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzofuran	2.80E-08	N	0.10	0.10	2.80E-09	2.80E-09
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.05E-08	N	0.10	0.05	1.05E-09	5.25E-10
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzofuran	1.90E-07	Y	0.10	0.10	1.90E-08	1.90E-08
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	1.00E-08	N	0.10	0.01	1.00E-09	1.00E-10
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzofuran	3.30E-08	N	0.10	0.10	3.30E-09	3.30E-09
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	9.50E-09	N	0.10	0.10	9.50E-10	9.50E-10
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzofuran	1.15E-08	N	0.03	0.10	3.45E-10	1.15E-09
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	4.60E-08	Y	1.00	1.00	4.60E-08	4.60E-08
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,6,7,8-Hexachlorodibenzofuran	2.70E-08	N	0.10	0.10	2.70E-09	2.70E-09
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,4,7,8-Pentachlorodibenzofuran	1.15E-08	N	0.30	1.00	3.45E-09	1.15E-08
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzofuran	6.00E-09	N	0.10	1.00	6.00E-10	6.00E-09
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.65E-08	N	1.00	1.00	1.65E-08	1.65E-08
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzofuran	1.90E-08	N	0.00	0.00	5.70E-12	1.90E-12
CFSB-239-SO-0.5-2	9/27/2018	0.50-2.00	N	Octachlorodibenzo-P-Dioxin	4.64E-06	Y	0.00	0.00	1.39E-09	4.64E-10
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.25E-08	N	0.01	0.01	2.25E-10	2.25E-10
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	4.16E-06	Y	0.01	0.00	4.16E-08	4.16E-09
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.70E-08	N	0.01	0.01	2.70E-10	2.70E-10
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzofuran	4.05E-08	N	0.10	0.10	4.05E-09	4.05E-09
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.55E-08	N	0.10	0.05	1.55E-09	7.75E-10
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzofuran	3.75E-08	N	0.10	0.10	3.75E-09	3.75E-09
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	2.90E-07	Y	0.10	0.01	2.90E-08	2.90E-09
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzofuran	4.80E-08	N	0.10	0.10	4.80E-09	4.80E-09
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2.80E-07	Y	0.10	0.10	2.80E-08	2.80E-08
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzofuran	1.55E-08	N	0.03	0.10	4.65E-10	1.55E-09
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	8.80E-08	Y	1.00	1.00	8.80E-08	8.80E-08
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,6,7,8-Hexachlorodibenzofuran	3.90E-08	N	0.10	0.10	3.90E-09	3.90E-09
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,4,7,8-Pentachlorodibenzofuran	1.55E-08	N	0.30	1.00	4.65E-09	1.55E-08
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzofuran	7.50E-09	N	0.10	1.00	7.50E-10	7.50E-09
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	6.80E-08	Y	1.00	1.00	6.80E-08	6.80E-08
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzofuran	2.55E-08	N	0.00	0.00	7.65E-12	2.55E-12
CFSB-239-SO-0-0.5	9/27/2018	0.00-0.50	N	Octachlorodibenzo-P-Dioxin	2.35E-05	Y	0.00	0.00	7.05E-09	2.35E-09
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.95E-08	N	0.01	0.01	1.95E-10	1.95E-10
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2.85E-06	Y	0.01	0.00	2.85E-08	2.85E-09
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.35E-08	N	0.01	0.01	2.35E-10	2.35E-10
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	1,2,3,4,7,8-Hexachlorodibenzofuran	3.15E-08	N	0.10	0.10	3.15E-09	3.15E-09
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	1.60E-08	N	0.10	0.05	1.60E-09	8.00E-10
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	1,2,3,6,7,8-Hexachlorodibenzofuran	2.30E-07	Y	0.10	0.10	2.30E-08	2.30E-08
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	2.70E-07	Y	0.10	0.01	2.70E-08	2.70E-09

Table C-3
Toxic Equivalency Concentration Calculations
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Sample Date	Depth Interval (ft)	Sample Type	Constituent	Result Value (ug/L)	Detect (Y/N)	Mammalian TEF	Avian TEF	Mammalian TEC (1/2 MDL)	Avian TEC (1/2 MDL)
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	1,2,3,7,8,9-Hexachlorodibenzofuran	3.70E-08	N	0.10	0.10	3.70E-09	3.70E-09
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2.60E-07	Y	0.10	0.10	2.60E-08	2.60E-08
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	1,2,3,7,8-Pentachlorodibenzofuran	1.45E-08	N	0.03	0.10	4.35E-10	1.45E-09
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	1.10E-07	Y	1.00	1.00	1.10E-07	1.10E-07
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	2,3,4,6,7,8-Hexachlorodibenzofuran	3.05E-08	N	0.10	0.10	3.05E-09	3.05E-09
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	2,3,4,7,8-Pentachlorodibenzofuran	9.40E-08	Y	0.30	1.00	2.82E-08	9.40E-08
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	2,3,7,8-Tetrachlorodibenzofuran	8.50E-09	N	0.10	1.00	8.50E-10	8.50E-09
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1.75E-08	N	1.00	1.00	1.75E-08	1.75E-08
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	Octachlorodibenzofuran	1.85E-08	N	0.00	0.00	5.55E-12	1.85E-12
CFSB-DUP50-SO	9/27/2018	0.00-0.50	FD	Octachlorodibenzo-P-Dioxin	1.71E-05	Y	0.00	0.00	5.13E-09	1.71E-09

Notes:
1/2 MDL: Non-detected dioxin and furan results were substituted with one-half the method detection limit
FD: Field Duplicate
N: Primary (Normal) sample
TEC: Toxic Equivalency Concentration
TEF: Toxic Equivalency Factor

Appendix D Calculated Ecological Screening Values for Hardness- and pH-Dependent Constituents

Table D-1
Summary of Ecological Screening Values Adjusted for Hardness
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

		Constituent	Cadmium				Chromium, Total		Copper	Fluoride		Lead				Nickel			Zinc		
		Fraction	F		U		F	U	U	F	U	F		U		F	U		F	U	
Sample Name	Sample Date	Hardness (as $CaCO_3$) (mg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Refined ESV (µg/L)		Refined ESV (µg/L)	Refined ESV (µg/L)		Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Refined ESV (µg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Refined ESV (µg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)
CFSWP-014-SW	3/13/2017	200	---	---	0.28	1.37	---	152.0	21.61	---	3974	---	---	7.69	7.69	---	93.76	93.76	---	215.57	215.57
CFSWP-014-SW	6/11/2018	159	0.23	1.02	0.23	1.14	108.35	126.0	17.76	---	3228	4.14	4.14	5.74	5.74	76.99	77.22	77.22	175.00	177.48	177.48
CFSWP-014-SW	6/13/2017	176	0.25	1.10	0.25	1.24	117.75	136.9	19.37	3539	3539	4.62	4.62	6.53	6.53	83.90	84.15	84.15	190.73	193.44	193.44
CFSWP-014-SW	8/29/2016	164	---	---	0.24	1.17	---	129.2	18.24	---	3319	---	---	5.97	5.97	---	79.27	79.27	---	182.20	182.20
CFSWP-014-SW	10/10/2018	172	0.25	1.08	0.25	1.22	115.56	134.4	18.99	---	3466	4.51	4.51	6.35	6.35	82.28	82.53	82.53	187.05	189.71	189.71
CFSWP-014-SW	11/30/2016	196	---	---	0.28	1.35	---	149.5	21.24	---	3902	---	---	7.49	7.49	---	92.17	92.17	---	211.91	211.91
CFSWP-015-SW	3/13/2017	202	---	---	0.28	1.38	---	153.3	21.79	---	4010	---	---	7.79	7.79	---	94.56	94.56	---	217.39	217.39
CFSWP-015-SW	6/11/2018	163	0.24	1.04	0.24	1.17	110.58	128.6	18.14	---	3301	4.25	4.25	5.93	5.93	78.63	78.86	78.86	178.72	181.26	181.26
CFSWP-015-SW	6/13/2017	180	0.26	1.12	0.26	1.26	119.94	139.5	19.75	3612	3612	4.73	4.73	6.72	6.72	85.51	85.77	85.77	194.40	197.16	197.16
CFSWP-015-SW	8/29/2016	178	---	---	0.26	1.25	---	138.2	19.56	---	3575	---	---	6.63	6.63	---	84.96	84.96	---	195.30	195.30
CFSWP-015-SW	10/9/2018	180	0.26	1.12	0.26	1.26	119.94	139.5	19.75	---	3612	4.73	4.73	6.72	6.72	85.51	85.77	85.77	194.40	197.16	197.16
CFSWP-015-SW	11/30/2016	196	---	---	0.28	1.35	---	149.5	21.24	---	3902	---	---	7.49	7.49	---	92.17	92.17	---	211.91	211.91
CFSWP-015-SW	12/20/2016	208	---	---	0.29	1.42	---	157.0	22.34	---	4118	---	---	8.08	8.08	---	96.93	96.93	---	222.85	222.85
CFSWP-016-SW	3/13/2017	202	---	---	0.28	1.38	---	153.3	21.79	---	4010	---	---	7.79	7.79	---	94.56	94.56	---	217.39	217.39
CFSWP-016-SW	6/12/2017	180	0.26	1.12	0.26	1.26	119.94	139.5	19.75	3612	3612	4.73	4.73	6.72	6.72	85.51	85.77	85.77	194.40	197.16	197.16
CFSWP-016-SW	6/12/2018	167	0.24	1.06	0.24	1.19	112.80	131.2	18.52	---	3374	4.37	4.37	6.11	6.11	80.26	80.50	80.50	182.43	185.02	185.02
CFSWP-016-SW	8/29/2016	172	---	---	0.25	1.22	---	134.4	18.99	---	3466	---	---	6.35	6.35	---	82.53	82.53	---	189.71	189.71
CFSWP-016-SW	10/9/2018	188	0.27	1.15	0.27	1.31	124.29	144.5	20.49	---	3757	4.95	4.95	7.11	7.11	88.71	88.98	88.98	201.69	204.56	204.56
CFSWP-016-SW	11/30/2016	200	---	---	0.28	1.37	---	152.0	21.61	---	3974	---	---	7.69	7.69	---	93.76	93.76	---	215.57	215.57
CFSWP-025-SW	3/13/2017	204	---	---	0.29	1.40	---	154.5	21.98	---	4046	---	---	7.89	7.89	---	95.35	95.35	---	219.21	219.21
CFSWP-025-SW	6/12/2018	159	0.23	1.02	0.23	1.14	108.35	126.0	17.76	---	3228	4.14	4.14	5.74	5.74	76.99	77.22	77.22	175.00	177.48	177.48
CFSWP-025-SW	6/13/2017	176	0.25	1.10	0.25	1.24	117.75	136.9	19.37	3539	3539	4.62	4.62	6.53	6.53	83.90	84.15	84.15	190.73	193.44	193.44
CFSWP-025-SW	10/10/2018	180	0.26	1.12	0.26	1.26	119.94	139.5	19.75	---	3612	4.73	4.73	6.72	6.72	85.51	85.77	85.77	194.40	197.16	197.16
CFSWP-025-SW	12/20/2016	206	---	---	0.29	1.41	---	155.8	22.16	---	4082	---	---	7.98	7.98	---	96.14	96.14	---	221.03	221.03
CFSWP-044-SW	6/11/2018	159	0.23	1.02	0.23	1.14	108.35	126.0	17.76	---	3228	4.14	4.14	5.74	5.74	76.99	77.22	77.22	175.00	177.48	177.48
CFSWP-044-SW	10/10/2018	184	0.26	1.14	0.26	1.29	122.12	142.0	20.12	---	3685	4.84	4.84	6.91	6.91	87.12	87.38	87.38	198.05	200.86	200.86
CFSWP-045-SW	6/11/2018	163	0.24	1.04	0.24	1.17	110.58	128.6	18.14	---	3301	4.25	4.25	5.93	5.93	78.63	78.86	78.86	178.72	181.26	181.26
CFSWP-045-SW	10/9/2018	184	0.26	1.14	0.26	1.29	122.12	142.0	20.12	---	3685	4.84	4.84	6.91	6.91	87.12	87.38	87.38	198.05	200.86	200.86
CFSWP-009-SW	4/3/2017	170	---	---	0.25	1.21	---	133.1	18.81	---	3429	---	---	6.25	6.25	---	81.72	81.72	---	187.83	187.83
CFSWP-009-SW	6/7/2016	170	---	---	0.25	1.21	---	133.1	18.81	---	3429	---	---	6.25	6.25	---	81.72	81.72	---	187.83	187.83
CFSWP-009-SW	6/12/2017	188	0.27	1.15	0.27	1.31	124.29	144.5	20.49	3757	3757	4.95	4.95	7.11	7.11	88.71	88.98	88.98	201.69	204.56	204.56
CFSWP-009-SW	6/14/2018	163	0.24	1.04	0.24	1.17	110.58	128.6	18.14	---	3301	4.25	4.25	5.93	5.93	78.63	78.86	78.86	178.72	181.26	181.26
CFSWP-010-SW	3/15/2017	138	---	---	0.21	1.02	---	112.2	15.74	---	2838	---	---	4.79	4.79	---	68.50	68.50	---	157.41	157.41
CFSWP-010-SW	6/7/2016	164	---	---	0.24	1.17	---	129.2	18.24	---	3319	---	---	5.97	5.97	---	79.27	79.27	---	182.20	182.20
CFSWP-010-SW	6/12/2017	180	0.26	1.12	0.26	1.26	119.94	139.5	19.75	3612	3612	4.73	4.73	6.72	6.72	85.51	85.77	85.77	194.40	197.16	197.16
CFSWP-010-SW	6/14/2018	167	0.24	1.06	0.24	1.19	112.80	131.2	18.52	---	3374	4.37	4.37	6.11	6.11	80.26	80.50	80.50	182.43	185.02	185.02
CFSWP-011-SW	4/3/2017	170	---	---	0.25	1.21	---	133.1	18.81	---	3429	---	---	6.25	6.25	---	81.72	81.72	---	187.83	187.83
CFSWP-011-SW	6/7/2016	156	---	---	0.23	1.13	---	124.0	17.47	---	3172	---	---	5.60	5.60	---	75.99	75.99	---	174.64	174.64
CFSWP-011-SW	6/12/2017	168	0.24	1.06	0.24	1.20	113.35	131.8	18.62	3393	3393	4.39	4.39	6.16	6.16	80.66	80.90	80.90	183.36	185.96	185.96
CFSWP-011-SW	6/14/2018	159	0.23	1.02	0.23	1.14	108.35	126.0	17.76	---	3228	4.14	4.14	5.74	5.74	76.99	77.22	77.22	175.00	177.48	177.48
CFSWP-012-SW	4/3/2017	168	---	---	0.24	1.20	---	131.8	18.62	---	3393	---	---	6.16	6.16	---	80.90	80.90	---	185.96	185.96
CFSWP-012-SW	6/7/2016	152	---	---	0.22	1.10	---	121.4	17.09	---	3098	---	---	5.42	5.42	---	74.34	74.34	---	170.84	170.84
CFSWP-012-SW	6/12/2017	164	0.24	1.04	0.24	1.17	111.14	129.2	18.24	3319	3319	4.28	4.28	5.97	5.97	79.03	79.27	79.27	179.65	182.20	182.20
CFSWP-012-SW	6/14/2018	155	0.23	1.00	0.23	1.12	106.12	123.4	17.38	---	3154	4.03	4.03	5.56	5.56	75.35	75.58	75.58	171.26	173.69	173.69
CFSWP-013-SW	3/15/2017	158	---	---	0.23	1.14	---	125.3	17.67	---	3209	---	---	5.70	5.70	---	76.81	76.81	---	176.54	176.54
CFSWP-013-SW	6/7/2016	156	---	---	0.23	1.13	---	124.0	17.47	---	3172	---	---	5.60	5.60	---	75.99	75.99	---	174.64	174.64
CFSWP-013-SW	6/12/2017	172	0.25	1.08	0.25	1.22	115.56	134.4	18.99	3466	3466	4.51	4.51	6.35	6.35	82.28	82.53	82.53	187.05	189.71	189.71
CFSWP-013-SW	6/14/2018	159	0.23	1.02	0.23	1.14	108.35	126.0	17.76	---	3228	4.14	4.14	5.74	5.74	76.99	77.22	77.22	175.00	177.48	177.48
CFSWP-013-SW	11/30/2016	170	---	---	0.25	1.21	---	133.1	18.81	---	3429	---	---	6.25	6.25	---	81.72	81.72	---	187.83	187.83
CFSWP-039-SW	6/15/2018	163	0.24	1.04	0.24	1.17	110.58	128.6	18.14	---	3301	4.25	4.25	5.93	5.93	78.63	78.86	78.86	178.72	181.26	181.26
CFSWP-039-SW	10/11/2018	204	0.29	1.23	0.29	1.40	132.89	154.5	21.98	---	4046	5.40	5.40	7.89	7.89	95.06	95.35	95.35	216.14	219.21	219.21
CFSWP-040-SW	6/15/2018	155	0.23	1.00	0.23	1.12	106.12	123.4	17.38	---	3154	4.03	4.03	5.56	5.56	75.35	75.58	75.58	171.26	173.69	173.69
CFSWP-041-SW	6/14/2018	159	0.23	1.02	0.23	1.14	108.35	126.0	17.76	---	3228	4.14	4.14	5.74	5.74	76.99	77.22	77.22	175.00	177.48	177.48
CFSWP-042-SW	6/14/2018	159	0.23	1.02	0.23	1.14	108.35	126.0	17.76	---	3228	4.14	4.14	5.74	5.74	76.99	77.22	77.22	175.00	177.48	177.48
CFSWP-043-SW	6/14/2018	163	0.24	1.04	0.24	1.17	110.58	128.6	18.14	---	3301	4.25	4.25	5.93	5.93	78.63	78.86	78.86	178.72	181.26	181.26
CFSWP-018-SW	4/3/2017	184	---	---	0.26	1.29	---	142.0	20.12	---	3685	---	---	6.91	6.91	---	87.38	87.38	---	200.86	200.86
CFSWP-018-SW	6/6/2016	180	---	---	0.26	1.26	---	139.5	19.75	---	3612	---	---	6.72	6.72	---	85.77	85.77	---	197.16	197.16
CFSWP-018-SW	6/15/2017	216	0.30	1.28	0.30	1.46	139.26	161.9	23.08	4261	4261	5.74	5.74	8.48	8.48	99.77	100.07	100.07	226.87	230.09	230.09
CFSWP-018-SW	6/21/2018	218	0.30	1.29	0.30	1.47	140.31	163.2	23.26	---	4297	5.80	5.80	8.58	8.58	100.55	100.85	100.85	228.65	231.89	231.89
CFSWP-018-SW	10/17/2018	176	0.25	1.10	0.25	1.24	117.75	136.9	19.37	---	3539	4.62	4.62	6.53	6.53	83.90	84.15	84.15	190.73	193.44	193.44
CFSWP-018-SW	12/1/2016	260	---	---	0.35	1.69	---	188.5	27.04	---	5042	---	---	10.74	10.74	---	117.07	117.07	---	269.23	269.23

Table D-1
Summary of Ecological Screening Values Adjusted for Hardness
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

		Constituent	Cadmium				Chromium, Total		Copper	Fluoride		Lead				Nickel			Zinc		
		Fraction	F		U		F	U	U	F	U	F		U		F	U		F	U	
Sample Name	Sample Date	Hardness (as $CaCO_3$) (mg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Refined ESV (µg/L)		Refined ESV (µg/L)	Refined ESV (µg/L)		Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Refined ESV (µg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Refined ESV (µg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)
CFSWP-019-SW	4/3/2017	180	---	---	0.26	1.26	---	139.5	19.75	---	3612	---	---	6.72	6.72	---	85.77	85.77	---	197.16	197.16
CFSWP-019-SW	6/6/2016	180	---	---	0.26	1.26	---	139.5	19.75	---	3612	---	---	6.72	6.72	---	85.77	85.77	---	197.16	197.16
CFSWP-019-SW	6/15/2017	168	0.24	1.06	0.24	1.20	113.35	131.8	18.62	3393	3393	4.39	4.39	6.16	6.16	80.66	80.90	80.90	183.36	185.96	185.96
CFSWP-019-SW	6/21/2018	171	0.25	1.07	0.25	1.21	115.01	133.7	18.90	---	3448	4.48	4.48	6.30	6.30	81.88	82.13	82.13	186.13	188.77	188.77
CFSWP-019-SW	10/16/2018	168	0.24	1.06	0.24	1.20	113.35	131.8	18.62	---	3393	4.39	4.39	6.16	6.16	80.66	80.90	80.90	183.36	185.96	185.96
CFSWP-019-SW	11/7/2017	535	0.64	2.53	0.64	3.01	292.70	340.4	50.09	---	9701	14.66	14.66	26.91	26.91	214.90	215.55	215.55	489.25	496.19	496.19
CFSWP-019-SW	12/1/2016	208	---	---	0.29	1.42	---	157.0	22.34	---	4118	---	---	8.08	8.08	---	96.93	96.93	---	222.85	222.85
CFSWP-020-SW	3/16/2017	160	---	---	0.23	1.15	---	126.6	17.86	---	3246	---	---	5.79	5.79	---	77.63	77.63	---	178.43	178.43
CFSWP-020-SW	6/6/2016	176	---	---	0.25	1.24	---	136.9	19.37	---	3539	---	---	6.53	6.53	---	84.15	84.15	---	193.44	193.44
CFSWP-020-SW	6/15/2017	160	0.23	1.02	0.23	1.15	108.91	126.6	17.86	3246	3246	4.17	4.17	5.79	5.79	77.40	77.63	77.63	175.93	178.43	178.43
CFSWP-020-SW	6/21/2018	155	0.23	1.00	0.23	1.12	106.12	123.4	17.38	---	3154	4.03	4.03	5.56	5.56	75.35	75.58	75.58	171.26	173.69	173.69
CFSWP-020-SW	10/11/2018	144	0.21	0.94	0.21	1.06	99.91	116.2	16.32	---	2950	3.73	3.73	5.06	5.06	70.80	71.01	71.01	160.91	163.19	163.19
CFSWP-020-SW	11/7/2017	1740	1.70	6.09	1.70	7.71	768.98	894.2	137.22	---	28274	45.03	45.03	120.74	120.74	582.86	584.61	584.61	1328.96	1347.83	1347.83
CFSWP-020-SW	12/1/2016	256	---	---	0.35	1.67	---	186.1	26.68	---	4971	---	---	10.53	10.53	---	115.54	115.54	---	265.72	265.72
CFSWP-058-SW	6/21/2018	159	0.23	1.02	0.23	1.14	108.35	126.0	17.76	---	3228	4.14	4.14	5.74	5.74	76.99	77.22	77.22	175.00	177.48	177.48
CFSWP-058-SW	10/11/2018	224	0.31	1.32	0.31	1.50	143.47	166.8	23.80	---	4404	5.97	5.97	8.88	8.88	102.89	103.20	103.20	233.97	237.29	237.29
CFSWP-059-SW	6/22/2018	159	0.23	1.02	0.23	1.14	108.35	126.0	17.76	---	3228	4.14	4.14	5.74	5.74	76.99	77.22	77.22	175.00	177.48	177.48
CFSWP-059-SW	10/11/2018	188	0.27	1.15	0.27	1.31	124.29	144.5	20.49	---	3757	4.95	4.95	7.11	7.11	88.71	88.98	88.98	201.69	204.56	204.56
CFSWP-060-SW	6/22/2018	159	0.23	1.02	0.23	1.14	108.35	126.0	17.76	---	3228	4.14	4.14	5.74	5.74	76.99	77.22	77.22	175.00	177.48	177.48
CFSWP-060-SW	10/16/2018	152	0.22	0.98	0.22	1.10	104.43	121.4	17.09	---	3098	3.95	3.95	5.42	5.42	74.11	74.34	74.34	168.45	170.84	170.84
CFSWP-021-SW	3/15/2017	204	---	---	0.29	1.40	---	154.5	21.98	---	4046	---	---	7.89	7.89	---	95.35	95.35	---	219.21	219.21
CFSWP-021-SW	6/6/2016	168	---	---	0.24	1.20	---	131.8	18.62	---	3393	---	---	6.16	6.16	---	80.90	80.90	---	185.96	185.96
CFSWP-021-SW	6/15/2017	184	0.26	1.14	0.26	1.29	122.12	142.0	20.12	3685	3685	4.84	4.84	6.91	6.91	87.12	87.38	87.38	198.05	200.86	200.86
CFSWP-021-SW	6/19/2018	187	0.27	1.15	0.27	1.30	123.75	143.9	20.40	---	3739	4.93	4.93	7.06	7.06	88.32	88.58	88.58	200.78	203.63	203.63
CFSWP-021-SW	11/30/2016	304	---	---	0.40	1.92	---	214.2	30.90	---	5810	---	---	13.10	13.10	---	133.62	133.62	---	307.37	307.37
CFSWP-022-SW	4/3/2017	166	---	---	0.24	1.18	---	130.5	18.43	---	3356	---	---	6.07	6.07	---	80.09	80.09	---	184.08	184.08
CFSWP-022-SW	6/6/2016	172	---	---	0.25	1.22	---	134.4	18.99	---	3466	---	---	6.35	6.35	---	82.53	82.53	---	189.71	189.71
CFSWP-022-SW	6/20/2018	167	0.24	1.06	0.24	1.19	112.80	131.2	18.52	---	3374	4.37	4.37	6.11	6.11	80.26	80.50	80.50	182.43	185.02	185.02
CFSWP-046-SW	6/19/2018	270	0.36	1.51	0.36	1.75	167.18	194.4	27.92	---	5217	7.26	7.26	11.27	11.27	120.50	120.86	120.86	274.09	277.98	277.98
CFSWP-047-SW	6/19/2018	179	0.26	1.11	0.26	1.26	119.40	138.8	19.65	---	3594	4.70	4.70	6.68	6.68	85.11	85.36	85.36	193.48	196.23	196.23
CFSWP-048-SW	6/20/2018	175	0.25	1.09	0.25	1.23	117.21	136.3	19.28	---	3521	4.59	4.59	6.49	6.49	83.50	83.75	83.75	189.81	192.51	192.51
CFSWP-049-SW	6/20/2018	226	0.31	1.32	0.31	1.51	144.52	168.0	23.99	---	4440	6.02	6.02	8.98	8.98	103.67	103.98	103.98	235.74	239.09	239.09
CFSWP-050-SW	6/21/2018	183	0.26	1.13	0.26	1.28	121.58	141.4	20.03	---	3666	4.81	4.81	6.87	6.87	86.71	86.98	86.98	197.14	199.94	199.94
CFSWP-051-SW	6/21/2018	187	0.27	1.15	0.27	1.30	123.75	143.9	20.40	---	3739	4.93	4.93	7.06	7.06	88.32	88.58	88.58	200.78	203.63	203.63
CFSWP-052-SW	6/18/2018	246	0.33	1.41	0.33	1.62	154.91	180.1	25.79	---	4795	6.58	6.58	10.01	10.01	111.38	111.71	111.71	253.30	256.89	256.89
CFSWP-053-SW	6/18/2018	171	0.25	1.07	0.25	1.21	115.01	133.7	18.90	---	3448	4.48	4.48	6.30	6.30	81.88	82.13	82.13	186.13	188.77	188.77
CFSWP-023-SW	4/3/2017	224	---	---	0.31	1.50	---	166.8	23.80	---	4404	---	---	8.88	8.88	---	103.20	103.20	---	237.29	237.29
CFSWP-024-SW	6/15/2017	50	0.09	0.43	0.09	0.45	42.01	48.8	6.61	1130	1130	1.17	1.17	1.32	1.32	28.93	29.02	29.02	65.66	66.60	66.60
CFSWP-029-SW	6/22/2018	214	0.30	1.27	0.30	1.45	138.20	160.7	22.89	---	4226	5.68	5.68	8.38	8.38	98.99	99.29	99.29	225.09	228.28	228.28
CFSWP-029-SW	10/18/2018	224	0.31	1.32	0.31	1.50	143.47	166.8	23.80	---	4404	5.97	5.97	8.88	8.88	102.89	103.20	103.20	233.97	237.29	237.29
CFSWP-029-SW	11/1/2017	230	0.32	1.34	0.32	1.54	146.61	170.5	24.35	---	4511	6.13	6.13	9.19	9.19	105.22	105.53	105.53	239.27	242.67	242.67
CFSWP-030-SW	6/22/2018	202	0.28	1.22	0.28	1.38	131.82	153.3	21.79	---	4010	5.35	5.35	7.79	7.79	94.27	94.56	94.56	214.35	217.39	217.39
CFSWP-030-SW	10/18/2018	156	0.23	1.00	0.23	1.13	106.68	124.0	17.47	---	3172	4.06	4.06	5.60	5.60	75.76	75.99	75.99	172.20	174.64	174.64
CFSWP-030-SW	11/3/2017	176	0.25	1.10	0.25	1.24	117.75	136.9	19.37	---	3539	4.62	4.62	6.53	6.53	83.90	84.15	84.15	190.73	193.44	193.44
CFSWP-031-SW	6/22/2018	218	0.30	1.29	0.30	1.47	140.31	163.2	23.26	---	4297	5.80	5.80	8.58	8.58	100.55	100.85	100.85	228.65	231.89	231.89
CFSWP-031-SW	10/18/2018	200	0.28	1.21	0.28	1.37	130.75	152.0	21.61	---	3974	5.29	5.29	7.69	7.69	93.48	93.76	93.76	212.55	215.57	215.57
CFSWP-031-SW	11/3/2017	329	0.43	1.76	0.43	2.04	196.56	228.6	33.06	---	6242	8.92	8.92	14.49	14.49	142.43	142.86	142.86	324.05	328.65	328.65
CFSWP-032-SW	6/22/2018	226	0.31	1.32	0.31	1.51	144.52	168.0	23.99	---	4440	6.02	6.02	8.98	8.98	103.67	103.98	103.98	235.74	239.09	239.09
CFSWP-032-SW	10/17/2018	208	0.29	1.24	0.29	1.42	135.02	157.0	22.34	---	4118	5.52	5.52	8.08	8.08	96.64	96.93	96.93	219.73	222.85	222.85
CFSWP-032-SW	11/3/2017	257	0.35	1.46	0.35	1.68	160.56	186.7	26.77	---	4989	6.89	6.89	10.58	10.58	115.57	115.92	115.92	262.86	266.60	266.60
CFSWP-033-SW	6/22/2018	218	0.30	1.29	0.30	1.47	140.31	163.2	23.26	---	4297	5.80	5.80	8.58	8.58	100.55	100.85	100.85	228.65	231.89	231.89
CFSWP-033-SW	10/17/2018	256	0.35	1.45	0.35	1.67	160.05	186.1	26.68	---	4971	6.87	6.87	10.53	10.53	115.19	115.54	115.54	262.00	265.72	265.72
CFSWP-033-SW	11/3/2017	238	0.33	1.38	0.33	1.58	150.77	175.3	25.07	---	4653	6.36	6.36	9.59	9.59	108.30	108.63	108.63	246.30	249.80	249.80
CFSWP-001-SW	4/4/2017	86	---	---	0.14	0.70	---	76.2	10.51	---	1848	---	---	2.63	2.63	---	45.91	45.91	---	105.44	105.44
CFSWP-001-SW	6/7/2018	71.5	0.12	0.56	0.12	0.60	56.31	65.5	8.97	---	1563	1.74	1.74	2.08	2.08	39.16	39.27	39.27	88.91	90.17	90.17
CFSWP-001-SW	6/14/2017	72	0.12	0.56	0.12	0.61	56.63	65.9	9.03	1573	1573	1.75	1.75	2.09	2.09	39.39	39.51	39.51	89.44	90.71	90.71
CFSWP-001-SW	9/16/2016	88	---	---	0.14	0.71	---	77.6	10.71	---	1887	---	---	2.70	2.70	---	46.82	46.82	---	107.52	107.52
CFSWP-001-SW	10/5/2018	160	0.23	1.02	0.23	1.15	108.91	126.6	17.86	---	3246	4.17	4.17	5.79	5.79	77.40	77.63	77.63	175.93	178.43	178.43
CFSWP-001-SW	12/2/2016	90	---	---	0.15	0.73	---	79.1	10.92	---	1926	---	---	2.78	2.78	---	47.71	47.71	---	109.58	109.58
CFSWP-002-SW	4/4/2017	84	---	---	0.14	0.69	---	74.7	10.30	---	1809	---	---	2.55	2.55	---	45.01	45.01	---	103.36	103.36
CFSWP-002-SW	6/7/2018	71.5	0.12	0.56	0.12	0.60	56.31	65.5	8.97	---	1563	1.74	1.74	2.08	2.08	39.16	39.27	39.27	88.91	90.17	90.17

Table D-1
Summary of Ecological Screening Values Adjusted for Hardness
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

		Constituent	Cadmium				Chromium, Total		Copper	Fluoride		Lead				Nickel			Zinc		
		Fraction	F		U		F	U	U	F	U	F		U		F	U		F	U	
Sample Name	Sample Date	Hardness (as $CaCO_3$) (mg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Refined ESV (µg/L)		Refined ESV (µg/L)	Refined ESV (µg/L)		Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Refined ESV (µg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Refined ESV (µg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)
CFSWP-002-SW	6/14/2017	72	0.12	0.56	0.12	0.61	56.63	65.9	9.03	1573	1573	1.75	1.75	2.09	2.09	39.39	39.51	39.51	89.44	90.71	90.71
CFSWP-002-SW	9/16/2016	86	---	---	0.14	0.70	---	76.2	10.51	---	1848	---	---	2.63	2.63	---	45.91	45.91	---	105.44	105.44
CFSWP-002-SW	10/5/2018	82	0.13	0.62	0.13	0.67	63.00	73.3	10.09	---	1770	2.02	2.02	2.47	2.47	43.97	44.10	44.10	99.85	101.27	101.27
CFSWP-002-SW	12/2/2016	92	---	---	0.15	0.74	---	80.5	11.13	---	1965	---	---	2.86	2.86	---	48.61	48.61	---	111.64	111.64
CFSWP-003-SW	3/16/2017	88	---	---	0.14	0.71	---	77.6	10.71	---	1887	---	---	2.70	2.70	---	46.82	46.82	---	107.52	107.52
CFSWP-003-SW	6/6/2018	79.4	0.13	0.60	0.13	0.66	61.36	71.3	9.81	---	1719	1.95	1.95	2.37	2.37	42.79	42.92	42.92	97.17	98.54	98.54
CFSWP-003-SW	6/14/2017	74	0.12	0.57	0.12	0.62	57.92	67.3	9.24	1613	1613	1.81	1.81	2.17	2.17	40.31	40.43	40.43	91.54	92.84	92.84
CFSWP-003-SW	9/9/2016	90	---	---	0.15	0.73	---	79.1	10.92	---	1926	---	---	2.78	2.78	---	47.71	47.71	---	109.58	109.58
CFSWP-003-SW	10/4/2018	132	0.20	0.88	0.20	0.99	93.04	108.2	15.15	---	2726	3.39	3.39	4.53	4.53	65.78	65.97	65.97	149.47	151.59	151.59
CFSWP-003-SW	10/31/2017	125	0.19	0.85	0.19	0.94	88.98	103.5	14.46	---	2595	3.20	3.20	4.23	4.23	62.81	63.00	63.00	142.73	144.75	144.75
CFSWP-003-SW	12/1/2016	108	---	---	0.17	0.84	---	91.8	12.76	---	2273	---	---	3.51	3.51	---	55.67	55.67	---	127.89	127.89
CFSWP-004-SW	3/16/2017	104	---	---	0.16	0.82	---	89.0	12.36	---	2196	---	---	3.34	3.34	---	53.92	53.92	---	123.87	123.87
CFSWP-004-SW	6/6/2018	111	0.17	0.78	0.17	0.86	80.73	93.9	13.06	---	2330	2.81	2.81	3.63	3.63	56.81	56.98	56.98	129.06	130.89	130.89
CFSWP-004-SW	6/14/2017	70	0.12	0.55	0.12	0.59	55.34	64.3	8.81	1534	1534	1.70	1.70	2.02	2.02	38.46	38.58	38.58	87.33	88.57	88.57
CFSWP-004-SW	9/9/2016	222	---	---	0.31	1.49	---	165.6	23.62	---	4369	---	---	8.78	8.78	---	102.42	102.42	---	235.49	235.49
CFSWP-004-SW	10/4/2018	250	0.34	1.43	0.34	1.64	156.97	182.5	26.15	---	4866	6.70	6.70	10.21	10.21	112.91	113.25	113.25	256.78	260.43	260.43
CFSWP-004-SW	10/31/2017	222	0.31	1.31	0.31	1.49	142.42	165.6	23.62	---	4369	5.91	5.91	8.78	8.78	102.11	102.42	102.42	232.20	235.49	235.49
CFSWP-004-SW	12/1/2016	216	---	---	0.30	1.46	---	161.9	23.08	---	4261	---	---	8.48	8.48	---	100.07	100.07	---	230.09	230.09
CFSWP-005-SW	3/16/2017	106	---	---	0.17	0.83	---	90.4	12.56	---	2234	---	---	3.43	3.43	---	54.80	54.80	---	125.88	125.88
CFSWP-005-SW	6/6/2018	107	0.17	0.76	0.17	0.83	78.34	91.1	12.66	---	2253	2.70	2.70	3.47	3.47	55.07	55.24	55.24	125.11	126.89	126.89
CFSWP-005-SW	6/14/2017	130	0.20	0.87	0.20	0.97	91.88	106.8	14.95	2689	2689	3.34	3.34	4.44	4.44	64.93	65.13	65.13	147.55	149.64	149.64
CFSWP-005-SW	9/9/2016	218	---	---	0.30	1.47	---	163.2	23.26	---	4297	---	---	8.58	8.58	---	100.85	100.85	---	231.89	231.89
CFSWP-005-SW	10/18/2018	228	0.31	1.33	0.31	1.52	145.56	169.3	24.17	---	4476	6.08	6.08	9.08	9.08	104.44	104.76	104.76	237.50	240.88	240.88
CFSWP-005-SW	11/1/2017	222	0.31	1.31	0.31	1.49	142.42	165.6	23.62	---	4369	5.91	5.91	8.78	8.78	102.11	102.42	102.42	232.20	235.49	235.49
CFSWP-005-SW	12/1/2016	252	---	---	0.34	1.65	---	183.7	26.33	---	4901	---	---	10.32	10.32	---	114.01	114.01	---	262.19	262.19
CFSWP-006-SW	3/16/2017	88	---	---	0.14	0.71	---	77.6	10.71	---	1887	---	---	2.70	2.70	---	46.82	46.82	---	107.52	107.52
CFSWP-006-SW	6/6/2018	73.4	0.12	0.57	0.12	0.62	57.53	66.9	9.18	---	1601	1.79	1.79	2.15	2.15	40.03	40.16	40.16	90.91	92.20	92.20
CFSWP-006-SW	6/14/2017	70	0.12	0.55	0.12	0.59	55.34	64.3	8.81	1534	1534	1.70	1.70	2.02	2.02	38.46	38.58	38.58	87.33	88.57	88.57
CFSWP-006-SW	9/9/2016	90	---	---	0.15	0.73	---	79.1	10.92	---	1926	---	---	2.78	2.78	---	47.71	47.71	---	109.58	109.58
CFSWP-006-SW	10/4/2018	80	0.13	0.61	0.13	0.66	61.74	71.8	9.88	---	1731	1.97	1.97	2.39	2.39	43.06	43.19	43.19	97.79	99.18	99.18
CFSWP-006-SW	12/1/2016	150	---	---	0.22	1.09	---	120.1	16.90	---	3061	---	---	5.33	5.33	---	73.51	73.51	---	168.93	168.93
CFSWP-007-SW	3/16/2017	82	---	---	0.13	0.67	---	73.3	10.09	---	1770	---	---	2.47	2.47	---	44.10	44.10	---	101.27	101.27
CFSWP-007-SW	6/7/2018	75.4	0.13	0.58	0.13	0.63	58.81	68.4	9.39	---	1641	1.84	1.84	2.22	2.22	40.96	41.08	41.08	93.00	94.32	94.32
CFSWP-007-SW	6/14/2017	72	0.12	0.56	0.12	0.61	56.63	65.9	9.03	1573	1573	1.75	1.75	2.09	2.09	39.39	39.51	39.51	89.44	90.71	90.71
CFSWP-007-SW	9/16/2016	86	---	---	0.14	0.70	---	76.2	10.51	---	1848	---	---	2.63	2.63	---	45.91	45.91	---	105.44	105.44
CFSWP-007-SW	10/3/2018	89.6	0.14	0.66	0.14	0.72	67.74	78.8	10.88	---	1918	2.23	2.23	2.77	2.77	47.39	47.54	47.54	107.64	109.17	109.17
CFSWP-007-SW	12/2/2016	90	---	---	0.15	0.73	---	79.1	10.92	---	1926	---	---	2.78	2.78	---	47.71	47.71	---	109.58	109.58
CFSWP-008-SW	4/4/2017	84	---	---	0.14	0.69	---	74.7	10.30	---	1809	---	---	2.55	2.55	---	45.01	45.01	---	103.36	103.36
CFSWP-008-SW	6/7/2018	75.4	0.13	0.58	0.13	0.63	58.81	68.4	9.39	---	1641	1.84	1.84	2.22	2.22	40.96	41.08	41.08	93.00	94.32	94.32
CFSWP-008-SW	6/14/2017	70	0.12	0.55	0.12	0.59	55.34	64.3	8.81	1534	1534	1.70	1.70	2.02	2.02	38.46	38.58	38.58	87.33	88.57	88.57
CFSWP-008-SW	9/16/2016	84	---	---	0.14	0.69	---	74.7	10.30	---	1809	---	---	2.55	2.55	---	45.01	45.01	---	103.36	103.36
CFSWP-008-SW	10/3/2018	91.5	0.15	0.67	0.15	0.74	68.91	80.1	11.08	---	1955	2.28	2.28	2.84	2.84	48.24	48.39	48.39	109.57	111.13	111.13
CFSWP-008-SW	12/2/2016	92	---	---	0.15	0.74	---	80.5	11.13	---	1965	---	---	2.86	2.86	---	48.61	48.61	---	111.64	111.64
CFSWP-017-SW	4/4/2017	88	---	---	0.14	0.71	---	77.6	10.71	---	1887	---	---	2.70	2.70	---	46.82	46.82	---	107.52	107.52
CFSWP-017-SW	6/7/2018	73.4	0.12	0.57	0.12	0.62	57.53	66.9	9.18	---	1601	1.79	1.79	2.15	2.15	40.03	40.16	40.16	90.91	92.20	92.20
CFSWP-017-SW	6/14/2017	66	0.11	0.53	0.11	0.57	52.74	61.3	8.38	1454	1454	1.59	1.59	1.87	1.87	36.59	36.70	36.70	83.08	84.26	84.26
CFSWP-017-SW	9/16/2016	124	---	---	0.19	0.94	---	102.8	14.36	---	2576	---	---	4.18	4.18	---	62.57	62.57	---	143.77	143.77
CFSWP-017-SW	10/3/2018	127	0.19	0.86	0.19	0.96	90.14	104.8	14.66	---	2632	3.25	3.25	4.31	4.31	63.66	63.85	63.85	144.66	146.71	146.71
CFSWP-017-SW	12/2/2016	92	---	---	0.15	0.74	---	80.5	11.13	---	1965	---	---	2.86	2.86	---	48.61	48.61	---	111.64	111.64
CFSWP-026-SW	6/7/2018	75.4	0.13	0.58	0.13	0.63	58.81	68.4	9.39	---	1641	1.84	1.84	2.22	2.22	40.96	41.08	41.08	93.00	94.32	94.32
CFSWP-026-SW	10/5/2018	92	0.15	0.67	0.15	0.74	69.22	80.5	11.13	---	1965	2.29	2.29	2.86	2.86	48.46	48.61	48.61	110.08	111.64	111.64
CFSWP-026-SW	10/31/2017	107	0.17	0.76	0.17	0.83	78.34	91.1	12.66	---	2253	2.70	2.70	3.47	3.47	55.07	55.24	55.24	125.11	126.89	126.89
CFSWP-027-SW	6/6/2018	71.5	0.12	0.56	0.12	0.60	56.31	65.5	8.97	---	1563	1.74	1.74	2.08	2.08	39.16	39.27	39.27	88.91	90.17	90.17
CFSWP-027-SW	10/5/2018	98	0.16	0.71	0.16	0.78	72.90	84.8	11.75	---	2081	2.46	2.46	3.10	3.10	51.13	51.28	51.28	116.13	117.78	117.78
CFSWP-027-SW	10/31/2017	101	0.16	0.72	0.16	0.80	74.72	86.9	12.05	---	2139	2.54	2.54	3.22	3.22	52.45	52.60	52.60	119.14	120.83	120.83
CFSWP-028-SW	6/6/2018	69.5	0.12	0.55	0.12	0.59	55.02	64.0	8.76	---	1524	1.69	1.69	2.00	2.00	38.23	38.34	38.34	86.80	88.03	88.03
CFSWP-028-SW	10/4/2018	100	0.16	0.72	0.16	0.79	74.11	86.2	11.95	---	2119	2.51	2.51	3.18	3.18	52.01	52.16	52.16	118.14	119.82	119.82
CFSWP-028-SW	10/31/2017	103	0.16	0.73	0.16	0.81	75.93	88.3	12.26	---	2177	2.59	2.59	3.30	3.30	53.32	53.48	53.48	121.14	122.86	122.86
CFSWP-034-SW	6/7/2018	71.5	0.12	0.56	0.12	0.60	56.31	65.5	8.97	---	1563	1.74	1.74	2.08	2.08	39.16	39.27	39.27	88.91	90.17	90.17
CFSWP-034-SW	10/5/2018	80	0.13	0.61	0.13	0.66	61.74	71.8	9.88	---	1731	1.97	1.97	2.39	2.39	43.06	43.19	43.19	97.79	99.18	99.18
CFSWP-035-SW	6/7/2018	71.5	0.12	0.56	0.12	0.60	56.31	65.5	8.97	---	1563	1.74	1.74	2.08	2.08	39.16	39.27	39.27	88.91	90.17	90.17

Table D-1
Summary of Ecological Screening Values Adjusted for Hardness
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

		Constituent	Cadmium				Chromium, Total		Copper	Fluoride		Lead				Nickel			Zinc		
		Fraction	F		U		F	U	U	F	U	F		U		F	U		F	U	
Sample Name	Sample Date	Hardness (as $CaCO_3$) (mg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Refined ESV (µg/L)		Refined ESV (µg/L)	Refined ESV (µg/L)		Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Refined ESV (µg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)	Refined ESV (µg/L)	Screening-Level ESV (µg/L)	Refined ESV (µg/L)
CFSWP-035-SW	10/5/2018	80	0.13	0.61	0.13	0.66	61.74	71.8	9.88	---	1731	1.97	1.97	2.39	2.39	43.06	43.19	43.19	97.79	99.18	99.18
CFSWP-036-SW	6/6/2018	67.5	0.11	0.53	0.11	0.58	53.72	62.5	8.54	---	1484	1.63	1.63	1.93	1.93	37.29	37.41	37.41	84.68	85.88	85.88
CFSWP-036-SW	10/4/2018	88	0.14	0.65	0.14	0.71	66.75	77.6	10.71	---	1887	2.18	2.18	2.70	2.70	46.68	46.82	46.82	106.01	107.52	107.52
CFSWP-037-SW	6/6/2018	57.6	0.10	0.47	0.10	0.51	47.17	54.9	7.46	---	1285	1.37	1.37	1.58	1.58	32.61	32.71	32.71	74.03	75.08	75.08
CFSWP-037-SW	10/3/2018	89.6	0.14	0.66	0.14	0.72	67.74	78.8	10.88	---	1918	2.23	2.23	2.77	2.77	47.39	47.54	47.54	107.64	109.17	109.17
CFSWP-038-SW	6/7/2018	71.5	0.12	0.56	0.12	0.60	56.31	65.5	8.97	---	1563	1.74	1.74	2.08	2.08	39.16	39.27	39.27	88.91	90.17	90.17
CFSWP-038-SW	10/3/2018	91.5	0.15	0.67	0.15	0.74	68.91	80.1	11.08	---	1955	2.28	2.28	2.84	2.84	48.24	48.39	48.39	109.57	111.13	111.13

Notes:
F: filtered
mg/L: milligram per kilogram
U: unfiltered
µg/L: microgram per liter

Table D-2
Summary of Ecological Screening Values Adjusted for pH and Temperature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

			Constituent	Nitrogen, Ammonia (As N)		Pentachlorophenol
			Fraction	U		U
Sample Name	Sample Date	pH (s.u.)	Water Temperature (°C)	Screening-Level ESV (ug/L)	Refined ESV (ug/L)	Refined ESV (ug/L)
CFSWP-014-SW	3/13/2017	8.28	4.17	1163	1163	---
CFSWP-014-SW	6/11/2018	6.68	10.36	3846	3846	---
CFSWP-014-SW	6/13/2017	8.22	12.32	910	910	---
CFSWP-014-SW	8/29/2016	7.35	18.83	1690	1690	---
CFSWP-014-SW	10/10/2018	7.61	7.81	2758	2758	---
CFSWP-014-SW	11/30/2016	8.14	4.1	1455	1455	---
CFSWP-015-SW	3/13/2017	8.28	4.79	1163	1163	---
CFSWP-015-SW	6/11/2018	7.29	10.25	3059	3059	---
CFSWP-015-SW	6/13/2017	7.85	12.86	1512	1512	---
CFSWP-015-SW	8/29/2016	7.38	18.45	1695	1695	---
CFSWP-015-SW	10/9/2018	7.55	8.33	2827	2827	---
CFSWP-015-SW	11/30/2016	8.21	3.92	1303	1303	---
CFSWP-015-SW	12/20/2016	7.48	2.57	3278	3278	---
CFSWP-016-SW	3/13/2017	8.28	4.99	1163	1163	---
CFSWP-016-SW	6/12/2017	8.27	14.73	718	718	---
CFSWP-016-SW	6/12/2018	7.54	9.51	2644	2644	---
CFSWP-016-SW	8/29/2016	7.44	17.71	1698	1698	---
CFSWP-016-SW	10/9/2018	6.27	10.15	4118	4118	---
CFSWP-016-SW	11/30/2016	8	3.85	1797	1797	---
CFSWP-025-SW	3/13/2017	8.28	4.83	1163	1163	---
CFSWP-025-SW	6/12/2018	7.12	9.58	3510	3510	---
CFSWP-025-SW	6/13/2017	8.28	12.3	826	826	---
CFSWP-025-SW	10/10/2018	7.13	5.91	4125	4125	---
CFSWP-025-SW	12/20/2016	7.35	2.61	3624	3624	---
CFSWP-044-SW	6/11/2018	7.78	10.74	1892	1892	---
CFSWP-044-SW	10/10/2018	6.22	8.36	4639	4639	---
CFSWP-045-SW	6/11/2018	7.81	10.41	1862	1862	---
CFSWP-045-SW	10/9/2018	7.42	7.29	3378	3378	---
CFSWP-009-SW	4/3/2017	7.79	4.05	2378	2378	---
CFSWP-009-SW	6/7/2016	8	11.66	1330	1330	---
CFSWP-009-SW	6/12/2017	7.86	11.99	1578	1578	---
CFSWP-009-SW	6/14/2018	6.34	12.33	3555	3555	---
CFSWP-010-SW	3/15/2017	8.39	1.86	968	968	---
CFSWP-010-SW	6/7/2016	8.06	12.58	1148	1148	---
CFSWP-010-SW	6/12/2017	8.36	16.86	539	539	---
CFSWP-010-SW	6/14/2018	7.39	11.86	2574	2574	---
CFSWP-011-SW	4/3/2017	7.94	4.87	1956	1956	---
CFSWP-011-SW	6/7/2016	7.94	12.26	1393	1393	---
CFSWP-011-SW	6/12/2017	8.3	17.37	577	577	---
CFSWP-011-SW	6/14/2018	7.68	12.07	1948	1948	---
CFSWP-012-SW	4/3/2017	7.46	4.23	3333	3333	---
CFSWP-012-SW	6/7/2016	7.88	11.95	1542	1542	---
CFSWP-012-SW	6/12/2017	8.39	16.81	514	514	---
CFSWP-012-SW	6/14/2018	7.44	11.34	2561	2561	---
CFSWP-013-SW	3/15/2017	8.39	3.12	968	968	---
CFSWP-013-SW	6/7/2016	7.81	11.82	1701	1701	---
CFSWP-013-SW	6/12/2017	8.28	15.87	656	656	---
CFSWP-013-SW	6/14/2018	7.71	10.66	2063	2063	---
CFSWP-013-SW	11/30/2016	7.72	3.02	2583	2583	---
CFSWP-039-SW	6/15/2018	6.29	10.44	4035	4035	---
CFSWP-039-SW	10/11/2018	7.04	6.33	4294	4294	---
CFSWP-040-SW	6/15/2018	7.4	11.72	2578	2578	---
CFSWP-041-SW	6/14/2018	7.4	12.3	2483	2483	---
CFSWP-042-SW	6/14/2018	7.48	10.7	2582	2582	---
CFSWP-043-SW	6/14/2018	7.41	11.15	2654	2654	---

Table D-2
Summary of Ecological Screening Values Adjusted for pH and Temperature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

			Constituent	Nitrogen, Ammonia (As N)		Pentachlorophenol
			Fraction	U		U
Sample Name	Sample Date	pH (s.u.)	Water Temperature (°C)	Screening-Level ESV (ug/L)	Refined ESV (ug/L)	Refined ESV (ug/L)
CFSWP-018-SW	4/3/2017	7.22	5.41	3935	3935	---
CFSWP-018-SW	6/6/2016	7.29	17.09	1968	1968	8.96
CFSWP-018-SW	6/15/2017	8.06	11.56	1226	1226	---
CFSWP-018-SW	6/21/2018	7.03	15.33	2520	2520	---
CFSWP-018-SW	10/17/2018	7.84	10.25	1812	1812	---
CFSWP-018-SW	12/1/2016	7.46	1.18	3333	3333	---
CFSWP-019-SW	4/3/2017	7.26	6.32	3844	3844	---
CFSWP-019-SW	6/6/2016	7.54	15.37	1812	1812	11.52
CFSWP-019-SW	6/15/2017	8.27	12.68	819	819	---
CFSWP-019-SW	6/21/2018	7.77	17.61	1229	1229	---
CFSWP-019-SW	10/16/2018	7.81	10.25	1882	1882	---
CFSWP-019-SW	11/7/2017	7.78	0.71	2407	2407	14.66
CFSWP-019-SW	12/1/2016	7.39	3	3521	3521	---
CFSWP-020-SW	3/16/2017	8.64	1.87	635	635	---
CFSWP-020-SW	6/6/2016	7.69	11.08	2053	2053	13.39
CFSWP-020-SW	6/15/2017	8.03	11.3	1303	1303	---
CFSWP-020-SW	6/21/2018	7.67	16.1	1518	1518	---
CFSWP-020-SW	10/11/2018	8.64	6.24	635	635	---
CFSWP-020-SW	11/7/2017	6.34	1.03	5013	5013	3.45
CFSWP-020-SW	12/1/2016	7.58	4.19	2993	2993	---
CFSWP-058-SW	6/21/2018	7.92	17.11	1048	1048	---
CFSWP-058-SW	10/11/2018	7.67	6.4	2730	2730	---
CFSWP-059-SW	6/22/2018	7.4	16.66	1875	1875	---
CFSWP-059-SW	10/11/2018	8.15	6.29	1433	1433	---
CFSWP-060-SW	6/22/2018	7.73	16.38	1395	1395	---
CFSWP-060-SW	10/16/2018	7.63	5.55	2848	2848	---
CFSWP-021-SW	3/15/2017	8.37	3.69	1001	1001	---
CFSWP-021-SW	6/6/2016	7.7	10.26	2141	2141	---
CFSWP-021-SW	6/15/2017	7.64	7.45	2738	2738	---
CFSWP-021-SW	6/19/2018	6.16	10.99	3932	3932	---
CFSWP-021-SW	11/30/2016	8.37	3.19	1001	1001	---
CFSWP-022-SW	4/3/2017	7.09	3.96	4203	4203	---
CFSWP-022-SW	6/6/2016	7.62	11.39	2168	2168	---
CFSWP-022-SW	6/20/2018	7.11	16.15	2309	2309	---
CFSWP-046-SW	6/19/2018	6.93	12.67	3104	3104	---
CFSWP-047-SW	6/19/2018	6.77	10.78	3669	3669	---
CFSWP-048-SW	6/20/2018	6.19	12.48	3565	3565	---
CFSWP-049-SW	6/20/2018	7.25	15.56	2227	2227	---
CFSWP-050-SW	6/21/2018	5.93	14.59	3154	3154	---
CFSWP-051-SW	6/21/2018	7.57	11.33	2286	2286	---
CFSWP-052-SW	6/18/2018	7.27	16.65	2051	2051	---
CFSWP-053-SW	6/18/2018	6.91	13.35	2990	2990	---
CFSWP-023-SW	4/3/2017	7.14	5.34	4105	4105	---
CFSWP-024-SW	6/15/2017	5.37	13.95	3327	3327	1.30
CFSWP-029-SW	6/22/2018	6.53	11.57	3650	3650	---
CFSWP-029-SW	10/18/2018	6.77	6.99	4682	4682	5.31
CFSWP-029-SW	11/1/2017	7.34	7.24	3594	3594	9.42
CFSWP-030-SW	6/22/2018	6.84	11.92	3348	3348	---
CFSWP-030-SW	10/18/2018	7.43	3.48	3415	3415	---
CFSWP-030-SW	11/3/2017	7.02	2.81	4329	4329	6.83
CFSWP-031-SW	6/22/2018	6.96	12.69	3068	3068	---
CFSWP-031-SW	10/18/2018	6.69	6.97	4766	4766	---
CFSWP-031-SW	11/3/2017	6.92	0.7	4488	4488	6.18
CFSWP-032-SW	6/22/2018	5.93	11.63	3817	3817	---
CFSWP-032-SW	10/17/2018	6.77	4.42	4682	4682	---

Table D-2
Summary of Ecological Screening Values Adjusted for pH and Temperature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

			Constituent	Nitrogen, Ammonia (As N)		Pentachlorophenol
			Fraction	U		U
Sample Name	Sample Date	pH (s.u.)	Water Temperature (°C)	Screening-Level ESV (ug/L)	Refined ESV (ug/L)	Refined ESV (ug/L)
CFSWP-032-SW	11/3/2017	7.32	0.18	3699	3699	9.23
CFSWP-033-SW	6/22/2018	6.98	12.41	3101	3101	---
CFSWP-033-SW	10/17/2018	6.78	5.92	4671	4671	---
CFSWP-033-SW	11/3/2017	7.31	1.55	3724	3724	9.14
CFSWP-001-SW	4/4/2017	7.08	3.59	4222	4222	---
CFSWP-001-SW	6/7/2018	5.48	9.89	4317	4317	---
CFSWP-001-SW	6/14/2017	7.43	6.23	3415	3415	---
CFSWP-001-SW	9/16/2016	7.71	12.86	1790	1790	---
CFSWP-001-SW	10/5/2018	7.83	9.67	1905	1905	---
CFSWP-001-SW	12/2/2016	7.98	4.65	1849	1849	---
CFSWP-002-SW	4/4/2017	7.26	3.55	3844	3844	---
CFSWP-002-SW	6/7/2018	6.29	9.9	4177	4177	---
CFSWP-002-SW	6/14/2017	8.18	6.25	1367	1367	---
CFSWP-002-SW	9/16/2016	7.69	12.8	1838	1838	---
CFSWP-002-SW	10/5/2018	7.88	9	1865	1865	---
CFSWP-002-SW	12/2/2016	8.04	4.38	1695	1695	---
CFSWP-003-SW	3/16/2017	8.24	4.45	1241	1241	---
CFSWP-003-SW	6/6/2018	5.65	10.59	4115	4115	---
CFSWP-003-SW	6/14/2017	8.22	6.86	1282	1282	---
CFSWP-003-SW	9/9/2016	6.18	11.72	3746	3746	---
CFSWP-003-SW	10/4/2018	6.97	8.18	4088	4088	---
CFSWP-003-SW	10/31/2017	7.71	6.01	2612	2612	13.66
CFSWP-003-SW	12/1/2016	7.78	4.05	2407	2407	---
CFSWP-004-SW	3/16/2017	8.24	5.07	1241	1241	---
CFSWP-004-SW	6/6/2018	6.18	12.09	3658	3658	---
CFSWP-004-SW	6/14/2017	8.23	6.9	1261	1261	---
CFSWP-004-SW	9/9/2016	6.75	10.66	3715	3715	---
CFSWP-004-SW	10/4/2018	6.75	9.15	4095	4095	---
CFSWP-004-SW	10/31/2017	7.64	8.01	2641	2641	12.73
CFSWP-004-SW	12/1/2016	7.52	6.74	3165	3165	---
CFSWP-005-SW	3/16/2017	8.24	5.18	1241	1241	---
CFSWP-005-SW	6/6/2018	6.57	11.07	3747	3747	---
CFSWP-005-SW	6/14/2017	7.87	7.8	2041	2041	---
CFSWP-005-SW	9/9/2016	6.75	10.6	3730	3730	---
CFSWP-005-SW	10/18/2018	6.81	5.64	4635	4635	5.53
CFSWP-005-SW	11/1/2017	7.07	8.76	3785	3785	7.18
CFSWP-005-SW	12/1/2016	7.5	7.53	3114	3114	---
CFSWP-006-SW	3/16/2017	8.24	2.22	1241	1241	---
CFSWP-006-SW	6/6/2018	7.36	9.25	3113	3113	---
CFSWP-006-SW	6/14/2017	8.2	6.24	1324	1324	---
CFSWP-006-SW	9/9/2016	7.53	12.36	2220	2220	---
CFSWP-006-SW	10/4/2018	5.91	8.41	4702	4702	---
CFSWP-006-SW	12/1/2016	8.23	4.15	1261	1261	---
CFSWP-007-SW	3/16/2017	8.24	2.28	1241	1241	---
CFSWP-007-SW	6/7/2018	7	9.69	3668	3668	---
CFSWP-007-SW	6/14/2017	8.24	6.28	1241	1241	---
CFSWP-007-SW	9/16/2016	7.46	12.49	2339	2339	---
CFSWP-007-SW	10/3/2018	7.01	7.76	4138	4138	---
CFSWP-007-SW	12/2/2016	8.02	4.26	1745	1745	---
CFSWP-008-SW	4/4/2017	7.14	3.95	4105	4105	---
CFSWP-008-SW	6/7/2018	7.18	9.56	3410	3410	---
CFSWP-008-SW	6/14/2017	7.92	6.27	2010	2010	---
CFSWP-008-SW	9/16/2016	7.31	12.36	2636	2636	---
CFSWP-008-SW	10/3/2018	6.7	8.51	4315	4315	---
CFSWP-008-SW	12/2/2016	8.05	3.82	1670	1670	---

Table D-2
Summary of Ecological Screening Values Adjusted for pH and Temperature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

			Constituent	Nitrogen, Ammonia (As N)		Pentachlorophenol
			Fraction	U		U
Sample Name	Sample Date	pH (s.u.)	Water Temperature (°C)	Screening-Level ESV (ug/L)	Refined ESV (ug/L)	Refined ESV (ug/L)
CFSWP-017-SW	4/4/2017	8.24	4.3	1241	1241	---
CFSWP-017-SW	6/7/2018	7.35	9.57	3071	3071	---
CFSWP-017-SW	6/14/2017	8.17	6.31	1388	1388	---
CFSWP-017-SW	9/16/2016	7.28	10.77	2977	2977	---
CFSWP-017-SW	10/3/2018	6.26	7.46	4901	4901	---
CFSWP-017-SW	12/2/2016	7.69	3.79	2671	2671	---
CFSWP-026-SW	6/7/2018	6.96	9.75	3708	3708	---
CFSWP-026-SW	10/5/2018	6.76	8.44	4277	4277	5.26
CFSWP-026-SW	10/31/2017	7.19	5.9	4001	4001	8.10
CFSWP-027-SW	6/6/2018	7	9.39	3740	3740	---
CFSWP-027-SW	10/5/2018	6.54	8.47	4451	4451	4.22
CFSWP-027-SW	10/31/2017	7.56	5.78	3051	3051	11.75
CFSWP-028-SW	6/6/2018	6.93	9.43	3825	3825	---
CFSWP-028-SW	10/4/2018	7.15	9.31	3519	3519	7.78
CFSWP-028-SW	10/31/2017	7.87	5.46	2149	2149	16.04
CFSWP-034-SW	6/7/2018	6.16	9.89	4221	4221	---
CFSWP-034-SW	10/5/2018	7.99	9.2	1582	1582	---
CFSWP-035-SW	6/7/2018	6.73	9.79	3948	3948	---
CFSWP-035-SW	10/5/2018	7.74	9.16	2196	2196	14.08
CFSWP-036-SW	6/6/2018	7.15	9.63	3448	3448	---
CFSWP-036-SW	10/4/2018	6.94	8.09	4156	4156	---
CFSWP-037-SW	6/6/2018	7.18	9.36	3454	3454	---
CFSWP-037-SW	10/3/2018	7.19	8.52	3627	3627	---
CFSWP-038-SW	6/7/2018	7.22	9.52	3345	3345	---
CFSWP-038-SW	10/3/2018	6.96	8.4	4045	4045	---

Notes:
U: unfiltered
µg/L: microgram per liter

Appendix E Refined COPEC Identification Tables

Table E-1
Refined Ecological Screening for Bulk Soil (0-2 feet)
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Soil Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)														
Aluminum	7429-90-5	152	152	100%	5540	12606	51200	15645	10794	NESV	---	---	No	pH > 5.5
Antimony	7440-36-0	152	9	6%	0.31	0.44	0.61	0.27	0.13	0.27	9	2.3	Yes	[Maximum] > ESV
Arsenic	7440-38-2	152	152	100%	1.6	4.4	8.8	4.8	3.9	6.8	7	1.3	Yes	[Maximum] > ESV
Barium	7440-39-3	152	152	100%	32.6	106.1	392	121.1	154.9	110	45	3.6	No	95% UCL < Background
Cadmium	7440-43-9	152	19	13%	0.29	0.56	1.7	0.35	0.15	0.27	19	6.3	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	154	154	100%	5.3	11.8	80.8	15.6	9.1	26	8	3.1	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	154	150	97%	0.14	0.31	2.16	0.41	---	0.34	20	6.4	No	See Text
Chromium, Trivalent	16065-83-1	154	154	100%	5.09	11.53	78.64	15.23	---	26	8	3	No	See Text
Cobalt	7440-48-4	152	152	100%	2.8	5.1	9.6	5.3	5.8	13	0	<1	No	95% UCL < Background
Copper	7440-50-8	152	152	100%	5.6	14.9	52.6	16.4	11.6	14	73	3.8	Yes	[Maximum] > ESV
Iron	7439-89-6	152	152	100%	6170	13337	21500	13815	13150	NESV	---	---	No	pH > 5
Lead	7439-92-1	152	152	100%	2.9	13.7	57.7	22	10.4	11	67	5.2	Yes	[Maximum] > ESV
Manganese	7439-96-5	152	152	100%	161	411	1270	437	465	220	147	5.8	No	95% UCL < Background
Mercury	7439-97-6	152	130	86%	0.0094	0.0228	0.27	0.0208	0.0162	0.013	122	20.8	Yes	[Maximum] > ESV
Nickel	7440-02-0	152	152	100%	6.3	17.9	140	31.7	11.1	38	11	3.7	Yes	[Maximum] > ESV
Selenium	7782-49-2	152	9	6%	0.32	0.47	0.66	0.26	0.13	0.52	3	1.3	Yes	[Maximum] > ESV
Thallium	7440-28-0	152	1	1%	0.13	0.13	0.13	---	0.06	0.05	1	2.6	No	< 5% Detected
Vanadium	7440-62-2	152	152	100%	4.1	11.5	31.8	13.6	11.2	4.7	149	6.8	Yes	[Maximum] > ESV
Zinc	7440-66-6	152	152	100%	22.2	50.4	244	58.8	47.7	46	67	5.3	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)														
Cyanide	57-12-5	152	126	83%	0.017	0.153	2.4	0.239	0.141	0.098	48	24.5	Yes	[Maximum] > ESV
Fluoride	16984-48-8	152	152	100%	1.55	60.69	571	118.82	1.17	120	19	4.8	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)														
Calcium	7440-70-2	152	152	100%	1430	21052	81500	22490	3741	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	152	152	100%	4610	9739	27500	10300	7003	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	152	152	100%	324	802	1580	889	1540	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	152	108	71%	26.5	198.3	4750	480.9	32.7	NESV	---	---	No	Essential Nutrient
Dioxins and Furans (mg/kg)														
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	58	41	71%	2.60E-07	9.23E-06	6.97E-05	1.56E-05	1.48E-06	NESV	---	---	Yes	No ESV Available
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	35822-46-9	58	52	90%	5.80E-07	4.53E-05	6.04E-04	1.50E-04	9.23E-06	NESV	---	---	Yes	No ESV Available
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	58	10	17%	4.10E-08	1.20E-06	4.13E-06	7.12E-07	2.60E-08	NESV	---	---	Yes	No ESV Available
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	58	41	71%	4.30E-08	1.20E-06	9.63E-06	5.47E-06	1.40E-07	NESV	---	---	Yes	No ESV Available
1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	39227-28-6	58	19	33%	3.70E-08	1.14E-06	4.07E-06	1.14E-06	1.60E-08	NESV	---	---	Yes	No ESV Available
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	58	40	69%	4.40E-08	6.12E-07	4.00E-06	1.03E-06	6.10E-08	NESV	---	---	Yes	No ESV Available
1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	57653-85-7	58	40	69%	7.50E-08	2.27E-06	1.92E-05	5.41E-06	5.26E-07	NESV	---	---	Yes	No ESV Available
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	58	2	3%	5.20E-08	6.40E-08	7.70E-08	---	2.80E-08	NESV	---	---	No	< 5% Detected
1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	19408-74-3	58	45	78%	6.10E-08	1.29E-06	9.54E-06	3.08E-06	5.13E-07	NESV	---	---	Yes	No ESV Available
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	58	17	29%	1.10E-07	8.60E-07	2.84E-06	6.00E-07	1.00E-08	NESV	---	---	Yes	No ESV Available
1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	40321-76-4	58	29	50%	2.80E-08	3.18E-07	1.53E-06	5.83E-07	1.07E-07	NESV	---	---	Yes	No ESV Available
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	58	30	52%	3.10E-08	6.15E-07	4.58E-06	2.58E-06	1.16E-07	NESV	---	---	Yes	No ESV Available
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	58	33	57%	5.60E-08	5.83E-07	3.65E-06	3.65E-06	1.40E-08	NESV	---	---	Yes	No ESV Available
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	58	33	57%	4.80E-08	1.22E-06	6.15E-06	2.27E-06	1.00E-08	NESV	---	---	Yes	No ESV Available
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1746-01-6	58	15	26%	5.10E-08	1.74E-07	5.80E-07	1.48E-07	1.19E-07	NESV	---	---	Yes	No ESV Available
Octachlorodibenzofuran	39001-02-0	58	44	76%	9.30E-07	2.07E-05	1.90E-04	4.24E-05	3.81E-06	NESV	---	---	Yes	No ESV Available
Octachlorodibenzo-P-Dioxin	3268-87-9	58	55	95%	3.02E-06	4.44E-04	6.76E-03	1.58E-03	7.17E-05	NESV	---	---	Yes	No ESV Available
$TEC_{2,3,7,8\text{-TCDD-Bird-1/2MDL}}$	---	58	57	98%	6.55E-08	1.86E-06	1.18E-05	3.86E-06	---	2.08E-07	43	56.7	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Bird-MDL}}$	---	58	57	98%	1.34E-07	2.25E-06	1.23E-05	4.18E-06	---	2.08E-07	52	59.4	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Bird-Zero}}$	---	58	57	98%	4.40E-09	1.73E-06	1.18E-05	3.86E-06	---	2.08E-07	40	56.6	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Mammal-1/2MDL}}$	---	58	57	98%	4.72E-08	1.56E-06	1.55E-05	3.18E-06	---	2.90E-07	39	53.5	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Mammal-MDL}}$	---	58	57	98%	1.02E-07	1.80E-06	1.56E-05	4.86E-06	---	2.90E-07	45	53.8	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Mammal-Zero}}$	---	58	57	98%	4.40E-09	1.46E-06	1.55E-05	3.17E-06	---	2.90E-07	38	53.4	Yes	[Maximum] > ESV

Table E-1
Refined Ecological Screening for Bulk Soil (0-2 feet)
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Soil Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Polychlorinated Biphenyls (PCBs) (mg/kg)														
PCB-1254 (Aroclor 1254)	11097-69-1	136	4	3%	0.056	0.073	0.11	---	---	0.041	4	2.7	No	< 5% Detected
Polychlorinated Biphenyl (PCBs)	1336-36-3	136	4	3%	0.056	0.073	0.11	---	---	0.000332	4	331.3	No	< 5% Detected
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)														
Acenaphthene	83-32-9	152	112	74%	0.0026	0.4436	15	1.4773	0.0013	0.25	26	60	Yes	[Maximum] > ESV
Anthracene	120-12-7	152	99	65%	0.002	0.983	22	2.581	0.002	6.8	4	3.2	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	152	145	95%	0.0021	5.807	170	20.49	0.0226	10	19	17	Yes	[Maximum] > ESV
Fluorene	86-73-7	152	106	70%	0.0018	0.3234	10	1.00	0.0012	3.7	1	2.7	Yes	[Maximum] > ESV
Naphthalene	91-20-3	152	84	55%	0.0017	0.2584	4	0.52	0.0012	0.0994	28	40.2	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	152	143	94%	0.0027	3.4346	120	13.16	0.0117	5.5	22	21.8	Yes	[Maximum] > ESV
Total LMW PAHs - 1/2MDL	---	152	145	95%	0.00795	10.68	341.6	39.85	0.04218	29	12	11.8	Yes	[Maximum] > ESV
Total LMW PAHs - MDL	---	152	145	95%	0.0138	10.69	341.9	39.89	0.0422	29	12	11.8	Yes	[Maximum] > ESV
Total LMW PAHs - Zero	---	152	145	95%	0.0021	10.66	341.4	39.82	0.0422	29	12	11.8	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	152	143	94%	0.0015	3.953	130	14.91	0.0181	62	1	2.1	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	152	134	88%	0.0013	3.671	110	12.85	0.0111	0.73	47	150.7	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	152	145	95%	0.002	5.044	150	18.272	0.032	18	9	8.3	Yes	[Maximum] > ESV
Benzo(G,H,I)Perylene	191-24-2	152	139	91%	0.0015	3.880	99	12.857	0.0234	25	4	4	Yes	[Maximum] > ESV
Chrysene	218-01-9	152	145	95%	0.0015	4.35	130	15.734	0.0227	3.1	28	41.9	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	152	112	74%	0.0017	1.140	28	3.286	0.0033	14	1	2	Yes	[Maximum] > ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	152	137	90%	0.0029	3.731	100	12.330	0.0183	71	1	1.4	Yes	[Maximum] > ESV
Pyrene	129-00-0	152	144	95%	0.0017	6.428	220	25.132	0.0184	10	19	22	Yes	[Maximum] > ESV
Total HMW PAHs - 1/2MDL	---	152	145	95%	0.01205	33.20	1035	124.4	0.1591	1.1	103	940.9	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	152	145	95%	0.0146	33.21	1035	124.4	0.1591	1.1	103	940.9	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	152	145	95%	0.0095	33.20	1035	124.4	0.1591	1.1	103	940.9	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)														
3- And 4- Methylphenol (Total)	106445	120	4	3%	0.011	0.023	0.036	---	---	NESV	---	---	No	< 5% Detected
Benzaldehyde	100-52-7	152	6	4%	0.0049	0.0302	0.093	0.0103	0.0237	NESV	---	---	No	< 5% Detected
Benzyl Butyl Phthalate	85-68-7	152	30	20%	0.013	0.516	5.6	0.591	0.016	90	0	<1	No	[Maximum] < ESV
Bis(2-Ethylhexyl) Phthalate	117-81-7	152	47	31%	0.016	0.268	5.8	0.532	0.033	0.02	44	290	Yes	[Maximum] > ESV
Di-N-Butyl Phthalate	84-74-2	152	21	14%	0.013	0.038	0.19	0.019	0.01	0.011	21	17.3	Yes	[Maximum] > ESV
Hexachlorobenzene	118-74-1	152	1	1%	0.091	0.091	0.091	---	0.002	0.079	1	1.2	No	< 5% Detected
Pentachlorophenol	87-86-5	151	4	3%	0.17	0.32	0.53	---	0.04	0.36	1	1.5	No	< 5% Detected
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)														
Cyclohexane	110-82-7	64	17	27%	0.00039	0.0011	0.0055	---	---	NESV	---	---	Yes	No ESV Available
Isopropylbenzene (Cumene)	98-82-8	64	1	2%	0.0003	0.0003	0.0003	---	---	NESV	---	---	No	< 5% Detected
Methyl Acetate	79-20-9	64	12	19%	0.0016	0.033	0.32	---	---	NESV	---	---	Yes	No ESV Available
Methylcyclohexane	108-87-2	64	29	45%	0.00045	0.00128	0.0076	---	---	NESV	---	---	Yes	No ESV Available
M,P-Xylene	179601-23-1	64	41	64%	0.000091	0.000652	0.0042	---	---	NESV	---	---	Yes	No ESV Available
O-Xylene (1,2-Dimethylbenzene)	95-47-6	64	20	31%	0.00015	0.00058	0.0051	---	---	NESV	---	---	Yes	No ESV Available

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List
TEC: Toxic Equivalency Concentration

Table E-2
Refined Ecological Screening for Bulk Soil (0-2 feet)
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Soil Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)														
Aluminum	7429-90-5	110	110	100%	4500	13702	36800	15561	10794	NESV	---	---	No	pH > 5.5
Antimony	7440-36-0	110	4	4%	0.37	0.91	1.5	---	0.13	0.27	4	5.6	No	< 5% Detected
Arsenic	7440-38-2	110	110	100%	2.8	6.2	17.9	6.6	3.9	6.8	33	2.6	Yes	[Maximum] > ESV
Barium	7440-39-3	110	110	100%	40.7	133.5	436	196.6	154.9	110	51	4	Yes	[Maximum] > ESV
Beryllium	7440-41-7	110	108	98%	0.24	0.6	4.7	0.6	0.51	2.5	2	1.9	Yes	[Maximum] > ESV
Cadmium	7440-43-9	110	5	5%	0.27	0.77	1.6	---	0.15	0.27	4	5.9	No	< 5% Detected
Chromium, Total	7440-47-3	118	117	99%	2.4	11	84.8	13.8	9.1	26	1	3.3	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	118	110	93%	0.06	0.29	2.27	0.36	---	0.34	18	6.7	No	See Text
Chromium, Trivalent	16065-83-1	118	117	99%	2.34	10.7	82.53	13.44	---	26	1	3.2	No	See Text
Cobalt	7440-48-4	110	110	100%	1.5	5.7	13	5.7	5.8	13	0	1	No	95% UCL < Background
Copper	7440-50-8	110	110	100%	5.9	81	7260	720.9	11.6	14	48	518.6	Yes	[Maximum] > ESV
Iron	7439-89-6	110	110	100%	2940	14944	37100	16333	13150	NESV	---	---	No	pH > 5
Lead	7439-92-1	110	110	100%	5.9	12.9	63.7	14.8	10.4	11	52	5.8	Yes	[Maximum] > ESV
Manganese	7439-96-5	110	110	100%	129	455	1140	511	465	220	106	5.2	Yes	[Maximum] > ESV
Nickel	7440-02-0	110	110	100%	4.9	23.8	534	23.5	11.1	38	7	14.1	Yes	[Maximum] > ESV
Selenium	7782-49-2	110	16	15%	0.34	0.83	3	0.33	0.13	0.52	7	5.8	Yes	[Maximum] > ESV
Thallium	7440-28-0	110	16	15%	0.11	0.25	1.1	0.11	0.06	0.05	16	22	Yes	[Maximum] > ESV
Vanadium	7440-62-2	110	110	100%	3	14	151	15	11	4.7	108	32.1	Yes	[Maximum] > ESV
Zinc	7440-66-6	110	110	100%	28.7	49.5	114	56	47.7	46	51	2.5	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)														
Cyanide	57-12-5	110	75	68%	0.016	0.576	13	1.18	0.141	0.098	40	132.7	Yes	[Maximum] > ESV
Fluoride	16984-48-8	110	110	100%	3.24	60.9	796	140.05	1.17	120	10	6.6	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)														
Calcium	7440-70-2	110	110	100%	921	29670	313000	33545	3741	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	110	110	100%	2890	10283	18800	10507	7003	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	110	110	100%	332	1095	10900	1077	1540	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	110	76	69%	33	370	5170	618	33	NESV	---	---	No	Essential Nutrient
Dioxins and Furans (mg/kg)														
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	4	2	50%	5.13E-06	5.25E-06	5.37E-06	---	1.48E-06	NESV	---	---	Yes	No ESV Available
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (H	35822-46-9	4	4	100%	1.38E-06	2.84E-05	7.63E-05	---	9.23E-06	NESV	---	---	Yes	No ESV Available
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	4	2	50%	1.06E-06	1.36E-06	1.67E-06	---	1.40E-07	NESV	---	---	Yes	No ESV Available
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	4	4	100%	1.70E-07	4.40E-07	7.80E-07	---	6.00E-08	NESV	---	---	Yes	No ESV Available
1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	57653-85-7	4	3	75%	3.00E-07	1.50E-06	2.50E-06	---	5.00E-07	NESV	---	---	Yes	No ESV Available
1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	19408-74-3	4	2	50%	7.00E-07	9.00E-07	1.10E-06	---	5.00E-07	NESV	---	---	Yes	No ESV Available
1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	40321-76-4	4	2	50%	7.30E-08	1.96E-07	3.20E-07	---	1.07E-07	NESV	---	---	Yes	No ESV Available
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	4	1	25%	5.70E-07	5.70E-07	5.70E-07	---	1.20E-07	NESV	---	---	Yes	No ESV Available
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	4	3	75%	1.10E-07	4.50E-07	9.50E-07	---	1.00E-08	NESV	---	---	Yes	No ESV Available
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	4	3	75%	4.60E-07	9.80E-07	1.78E-06	---	1.00E-08	NESV	---	---	Yes	No ESV Available
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1746-01-6	4	1	25%	2.70E-07	2.70E-07	2.70E-07	---	1.20E-07	NESV	---	---	Yes	No ESV Available
Octachlorodibenzofuran	39001-02-0	4	2	50%	7.31E-06	1.21E-05	1.68E-05	---	3.81E-06	NESV	---	---	Yes	No ESV Available
Octachlorodibenzo-P-Dioxin	3268-87-9	4	4	100%	8.87E-06	3.04E-04	8.91E-04	---	7.17E-05	NESV	---	---	Yes	No ESV Available
$TEC_{2,3,7,8\text{-TCDD-Bird-1/2MDL}}$	---	4	4	100%	1.61E-07	1.60E-06	3.67E-06	---	---	2.08E-07	3	17.6	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Bird-MDL}}$	---	4	4	100%	6.29E-07	2.21E-06	4.39E-06	---	---	2.08E-07	4	21.1	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Bird-Zero}}$	---	4	4	100%	2.03E-08	1.51E-06	3.60E-06	---	---	2.08E-07	3	17.3	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Mammal-1/2MDL}}$	---	4	4	100%	1.38E-07	1.11E-06	1.90E-06	---	---	2.90E-07	3	6.6	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Mammal-MDL}}$	---	4	4	100%	5.77E-07	1.69E-06	2.75E-06	---	---	2.90E-07	4	9.5	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Mammal-Zero}}$	---	4	4	100%	3.45E-08	1.03E-06	1.83E-06	---	---	2.90E-07	3	6.3	Yes	[Maximum] > ESV
Polychlorinated Biphenyls (PCBs) (mg/kg)														
PCB-1254 (Aroclor 1254)	11097-69-1	70	6	9%	0.062	0.472	1.2	---	---	0.041	6	29.3	Yes	[Maximum] > ESV
Polychlorinated Biphenyl (PCBs)	1336-36-3	70	6	9%	0.062	0.472	1.2	---	---	0.000332	6	3614.5	Yes	[Maximum] > ESV
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)														
2-Methylnaphthalene	91-57-6	110	27	25%	0.0016	0.2564	3.9	0.2127	0.0011	3.24	1	1.2	Yes	[Maximum] > ESV

Table E-2
Refined Ecological Screening for Bulk Soil (0-2 feet)
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Soil Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Acenaphthene	83-32-9	110	68	62%	0.0022	0.8178	28	2.2378	0.0013	0.25	6	112	Yes	[Maximum] > ESV
Anthracene	120-12-7	110	72	65%	0.002	1.471	48	4.755	0.002	6.8	2	7.1	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	110	108	98%	0.01	5.6	240	25.01	0.02	10	5	24	Yes	[Maximum] > ESV
Fluorene	86-73-7	110	69	63%	0.0014	0.6958	25	1.9173	0.0012	3.7	2	6.8	Yes	[Maximum] > ESV
Naphthalene	91-20-3	110	47	43%	0.0014	0.3476	10	0.4838	0.0012	0.0994	5	100.6	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	110	106	96%	0.0052	4.4839	240	18.3935	0.0117	5.5	5	43.6	Yes	[Maximum] > ESV
Total LMW PAHs - 1/2MDL	---	110	108	98%	0.02055	12.18888	595.9	54.00052	0.04218	29	3	20.5	Yes	[Maximum] > ESV
Total LMW PAHs - MDL	---	110	108	98%	0.0256	12.2059	595.9	54.0108	0.0422	29	3	20.5	Yes	[Maximum] > ESV
Total LMW PAHs - Zero	---	110	108	98%	0.0155	12.1719	595.9	53.9902	0.0422	29	3	20.5	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	110	105	95%	0.0057	2.4132	100	10.919	0.0181	62	2	1.6	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	110	102	93%	0.005	2.571	100	10.661	0.011	0.73	14	137	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	110	106	96%	0.0093	3.4379	120	13.4047	0.0321	18	4	6.7	Yes	[Maximum] > ESV
Benzo(G,H,I)Perylene	191-24-2	110	102	93%	0.0051	1.9895	62	7.3325	0.0234	25	2	2.5	Yes	[Maximum] > ESV
Chrysene	218-01-9	110	109	99%	0.007	3.353	110	12.08	0.023	3.1	7	35.5	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	110	89	81%	0.0016	0.7165	21	2.3409	0.0033	14	2	1.5	Yes	[Maximum] > ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	110	101	92%	0.0031	2.1718	76	8.6843	0.0183	71	1	1.1	Yes	[Maximum] > ESV
Pyrene	129-00-0	110	105	95%	0.0083	3.718	150	16.3431	0.0184	10	5	15	Yes	[Maximum] > ESV
Total HMW PAHs - 1/2MDL	---	110	109	99%	0.0477	20.7267	789	87.2203	0.1591	1.1	61	717.3	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	110	109	99%	0.0485	20.7321	789	87.2236	0.1591	1.1	62	717.3	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	110	109	99%	0.011	20.721	789	87.217	0.159	1.1	61	717.3	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)														
3- And 4- Methylphenol (Total)	106445	54	4	7%	0.012	0.271	1	---	---	NESV	---	---	Yes	No ESV Available
Benzaldehyde	100-52-7	110	10	9%	0.0049	0.0171	0.082	0.0106	0.0237	NESV	---	---	No	95% UCL < Background
Benzyl Butyl Phthalate	85-68-7	110	7	6%	0.013	0.198	0.98	0.097	0.016	90	0	<1	No	[Maximum] < ESV
Bis(2-Ethylhexyl) Phthalate	117-81-7	110	14	13%	0.025	0.252	2.5	0.279	0.033	0.02	14	125	Yes	[Maximum] > ESV
Caprolactam	105-60-2	110	2	2%	0.039	0.052	0.066	---	0.015	NESV	---	---	No	< 5% Detected
Dibenzofuran	132-64-9	110	52	47%	0.0016	0.5221	15	1.0126	0.0011	6.1	2	2.5	Yes	[Maximum] > ESV
Di-N-Butyl Phthalate	84-74-2	110	6	5%	0.013	0.033	0.056	0.016	0.01	0.011	6	5.1	Yes	[Maximum] > ESV
Phenol	108-95-2	110	4	4%	0.016	0.349	1.2	---	0.007	0.79	1	1.5	No	< 5% Detected
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)														
Cyclohexane	110-82-7	27	1	4%	0.00052	0.00052	0.00052	---	---	NESV	---	---	No	< 5% Detected
Isopropylbenzene (Cumene)	98-82-8	27	1	4%	0.00034	0.00034	0.00034	---	---	NESV	---	---	No	< 5% Detected
Methyl Acetate	79-20-9	27	7	26%	0.0028	0.0088	0.017	---	---	NESV	---	---	Yes	No ESV Available
Methylcyclohexane	108-87-2	27	5	19%	0.00042	0.00067	0.001	---	---	NESV	---	---	Yes	No ESV Available
M,P-Xylene	179601-23-1	27	10	37%	0.00012	0.00063	0.0038	---	---	NESV	---	---	Yes	No ESV Available
O-Xylene (1,2-Dimethylbenzene)	95-47-6	27	2	7%	0.00022	0.00091	0.0016	---	---	NESV	---	---	Yes	No ESV Available

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List
TEC: Toxic Equivalency Concentration

Table E-3
Refined Ecological Screening for Bulk Soil (0-2 feet)
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Soil Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)														
Aluminum	7429-90-5	6	6	100%	9660	20377	38900	29605	10794	NESV	---	---	No	pH > 5.5
Antimony	7440-36-0	6	3	50%	0.32	1.15	2.8	---	0.13	0.27	3	10.4	Yes	[Maximum] > ESV
Arsenic	7440-38-2	6	6	100%	4.5	9	23.5	21.8	3.9	6.8	3	3.5	Yes	[Maximum] > ESV
Barium	7440-39-3	6	6	100%	64.2	122.9	227	221.4	154.9	110	2	2.1	Yes	[Maximum] > ESV
Beryllium	7440-41-7	6	6	100%	0.3	1.6	7.2	6.5	0.5	2.5	1	2.9	Yes	[Maximum] > ESV
Cadmium	7440-43-9	6	2	33%	0.36	0.65	0.94	---	0.15	0.27	2	3.5	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	6	6	100%	8.4	16	39.2	35.8	9.1	26	1	1.5	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	6	6	100%	0.22	0.43	1.05	0.96	---	0.34	3	3.1	No	See Text
Chromium, Trivalent	16065-83-1	6	6	100%	8.17	15.59	38.15	34.8	---	26	1	1.5	No	See Text
Cobalt	7440-48-4	6	6	100%	5.1	7.4	16	10.9	5.8	13	1	1.2	Yes	[Maximum] > ESV
Copper	7440-50-8	6	6	100%	11.3	23.5	54.6	50.6	11.6	14	5	3.9	Yes	[Maximum] > ESV
Iron	7439-89-6	6	6	100%	12100	15850	20600	18180	13150	NESV	---	---	No	pH > 5
Lead	7439-92-1	6	6	100%	7.6	13.3	19.4	16.7	10.4	11	5	1.8	Yes	[Maximum] > ESV
Manganese	7439-96-5	6	6	100%	303	369	481	422	465	220	6	2.2	No	95% UCL < Background
Nickel	7440-02-0	6	6	100%	12.4	98.7	463	417.8	11.1	38	2	12.2	Yes	[Maximum] > ESV
Selenium	7782-49-2	6	3	50%	0.37	0.5	0.75	---	0.13	0.52	1	1.4	Yes	[Maximum] > ESV
Thallium	7440-28-0	6	2	33%	0.14	0.16	0.17	---	0.06	0.05	2	3.4	Yes	[Maximum] > ESV
Vanadium	7440-62-2	6	6	100%	7.4	40.6	169	153.2	11.2	4.7	6	36	Yes	[Maximum] > ESV
Zinc	7440-66-6	6	6	100%	36.9	54.6	67	65	47.7	46	4	1.5	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)														
Cyanide	57-12-5	6	1	17%	0.19	0.19	0.19	---	0.14	0.098	1	1.9	Yes	[Maximum] > ESV
Fluoride	16984-48-8	6	6	100%	4.23	79.03	398	357.58	1.17	120	1	3.3	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)														
Calcium	7440-70-2	6	6	100%	3160	31610	46700	45432	3741	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	6	6	100%	7260	10967	13400	13268	7003	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	6	6	100%	658	1830	6760	6140	1540	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	6	6	100%	38.3	8272.9	49200	43952.4	32.7	NESV	---	---	No	Essential Nutrient
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)														
Acenaphthene	83-32-9	6	6	100%	0.0093	0.9612	3.4	2.7666	0.0013	0.25	2	13.6	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	6	6	100%	0.19	16.85	71	67.3	0.02	10	2	7.1	Yes	[Maximum] > ESV
Naphthalene	91-20-3	6	5	83%	0.0077	0.3949	1.8	1.6398	0.0012	0.0994	2	18.1	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	6	6	100%	0.067	8.308	40	36.472	0.012	5.5	2	7.3	Yes	[Maximum] > ESV
Total LMW PAHs - 1/2MDL	---	6	6	100%	0.29	28.58	125.75	117.4	0.04	29	2	4.3	Yes	[Maximum] > ESV
Total LMW PAHs - MDL	---	6	6	100%	0.2923	28.5893	125.787	117.4372	0.0422	29	2	4.3	Yes	[Maximum] > ESV
Total LMW PAHs - Zero	---	6	6	100%	0.2877	28.5608	125.71	117.3562	0.0422	29	2	4.3	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	6	6	100%	0.17	13.28	53	51.32	0.02	62	0	<1	No	[Maximum] < ESV
Benzo(A)Anthracene	56-55-3	6	6	100%	0.15	10.82	43	41.75	0.01	0.73	4	58.9	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	6	6	100%	0.27	14.68	60	57.45	0.03	18	2	3.3	Yes	[Maximum] > ESV
Benzo(G,H,I)Perylene	191-24-2	6	6	100%	0.22	11.49	43	42.78	0.02	25	1	1.7	Yes	[Maximum] > ESV
Chrysene	218-01-9	6	6	100%	0.19	12.6	51	49.01	0.02	3.1	2	16.5	Yes	[Maximum] > ESV
Pyrene	129-00-0	6	6	100%	0.19	16.04	67	63.63	0.02	10	2	6.7	Yes	[Maximum] > ESV
Total HMW PAHs - 1/2MDL	---	6	6	100%	1.509	97.025	388	375.069	0.159	1.1	6	352.7	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	6	6	100%	1.509	97.025	388	375.069	0.159	1.1	6	352.7	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	6	6	100%	1.509	97.025	388	375.069	0.159	1.1	6	352.7	Yes	[Maximum] > ESV

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List

Table E-4
Refined Ecological Screening for Bulk Soil (0-2 feet)
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Soil Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)														
Aluminum	7429-90-5	37	37	100%	5350	16218	30300	18806	10794	NESV	---	---	No	pH > 5.5
Arsenic	7440-38-2	37	37	100%	2	5	12	6	4	6.8	5	1.8	Yes	[Maximum] > ESV
Barium	7440-39-3	37	37	100%	45.3	371.3	1060	579.4	154.9	110	31	9.6	Yes	[Maximum] > ESV
Cadmium	7440-43-9	37	6	16%	0.38	0.59	0.7	0.42	0.15	0.27	6	2.6	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	37	37	100%	0.15	0.22	0.42	0.26	---	0.34	1	1.2	No	See Text
Cobalt	7440-48-4	37	37	100%	3	5	7	5	6	13	0	<1	No	95% UCL < Background
Copper	7440-50-8	37	37	100%	4.7	11.1	25.5	13.3	11.6	14	7	1.8	Yes	[Maximum] > ESV
Iron	7439-89-6	37	37	100%	8490	12383	21800	13988	13150	NESV	---	---	No	pH > 5
Lead	7439-92-1	37	37	100%	4.5	13.4	36.2	18.5	10.4	11	21	3.3	Yes	[Maximum] > ESV
Manganese	7439-96-5	37	37	100%	169	818	3950	1443	465	220	35	18	Yes	[Maximum] > ESV
Mercury	7439-97-6	37	34	92%	0.011	0.028	0.12	0.046	0.016	0.013	29	9.2	Yes	[Maximum] > ESV
Nickel	7440-02-0	37	37	100%	7.4	18.3	68.9	40.7	11.1	38	5	1.8	Yes	[Maximum] > ESV
Selenium	7782-49-2	37	2	5%	0.52	0.58	0.64	---	0.13	0.52	1	1.2	Yes	[Maximum] > ESV
Thallium	7440-28-0	37	7	19%	0.11	0.13	0.15	0.12	0.06	0.05	7	3	Yes	[Maximum] > ESV
Vanadium	7440-62-2	37	37	100%	4.9	12.3	25.7	16.5	11.2	4.7	37	5.5	Yes	[Maximum] > ESV
Zinc	7440-66-6	37	37	100%	25.3	58.9	150	80.4	47.7	46	24	3.3	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)														
Cyanide	57-12-5	37	21	57%	0.06	0.23	0.64	0.3	0.14	0.098	17	6.5	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)														
Calcium	7440-70-2	37	37	100%	1620	11273	54100	15670	3741	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	37	37	100%	2700	7718	15500	8868	7003	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	37	37	100%	327	1057	2070	1284	1540	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	37	26	70%	38.2	93.1	189	86.7	32.7	NESV	---	---	No	Essential Nutrient
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)														
Benzo(A)Pyrene	50-32-8	37	37	100%	0.0026	0.2573	1.9	0.6724	0.0181	62	0	<1	No	[Maximum] < ESV
Benzo(A)Anthracene	56-55-3	37	35	95%	0.0023	0.1813	1.5	0.474	0.0111	0.73	2	2.1	Yes	[Maximum] > ESV
Total HMW PAHs - 1/2MDL	---	37	37	100%	0.02445	2.72233	21.42	7.19722	0.15913	1.1	17	19.5	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	37	37	100%	0.0263	2.7244	21.42	7.1844	0.1591	1.1	17	19.5	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	37	37	100%	0.0226	2.7203	21.42	7.2114	0.1591	1.1	17	19.5	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)														
3- And 4- Methylphenol (Total)	106445	7	2	29%	0.01	0.04	0.07	---	---	NESV	---	---	Yes	No ESV Available
Benzaldehyde	100-52-7	37	14	38%	0.0048	0.0129	0.06	0.0183	0.0237	NESV	---	---	No	95% UCL < Background
Bis(2-Ethylhexyl) Phthalate	117-81-7	37	8	22%	0.016	0.091	0.15	---	0.033	0.02	7	7.5	Yes	[Maximum] > ESV
Di-N-Butyl Phthalate	84-74-2	37	1	3%	0.22	0.22	0.22	---	0.01	0.011	1	20	No	< 5% Detected

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List

Table E-5
Refined Ecological Screening for Bulk Soil (0-2 feet)
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Soil Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)														
Aluminum	7429-90-5	54	54	100%	6230	15154	29400	17635	10794	NESV	---	---	No	pH > 5.5
Arsenic	7440-38-2	54	54	100%	2.4	6	15.3	6.3	3.9	6.8	15	2.3	Yes	[Maximum] > ESV
Barium	7440-39-3	54	54	100%	57.9	208.7	482	295.5	154.9	110	38	4.4	Yes	[Maximum] > ESV
Cadmium	7440-43-9	54	2	4%	0.3	0.3	0.4	---	0.2	0.27	2	1.4	No	< 5% Detected
Chromium, Hexavalent	18540-29-9	54	54	100%	0.12	0.26	0.36	0.27	---	0.34	3	1.1	No	See Text
Cobalt	7440-48-4	54	54	100%	2.7	5.5	8.6	5.8	5.8	13	0	<1	No	[Maximum] < ESV
Copper	7440-50-8	54	54	100%	3.5	12.9	26.7	13.5	11.6	14	20	1.9	Yes	[Maximum] > ESV
Iron	7439-89-6	54	54	100%	6880	15309	23400	16252	13150	NESV	---	---	No	pH > 5
Lead	7439-92-1	54	54	100%	7	12	22	13	10	11	34	2	Yes	[Maximum] > ESV
Manganese	7439-96-5	54	54	100%	175	586	2620	1140	465	220	52	11.9	Yes	[Maximum] > ESV
Nickel	7440-02-0	54	54	100%	5.1	12.3	35.7	15.1	11.1	38	0	<1	No	[Maximum] < ESV
Selenium	7782-49-2	54	8	15%	0.26	0.38	0.5	0.3	0.13	0.52	0	<1	No	[Maximum] < ESV
Thallium	7440-28-0	54	3	6%	0.11	0.14	0.19	---	0.06	0.05	3	3.8	Yes	[Maximum] > ESV
Vanadium	7440-62-2	54	54	100%	4.6	11.6	20.4	13.4	11.2	4.7	53	4.3	Yes	[Maximum] > ESV
Zinc	7440-66-6	54	54	100%	30.5	54.9	116	67.7	47.7	46	31	2.5	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)														
Cyanide	57-12-5	54	26	48%	0.042	0.153	0.42	0.158	0.141	0.098	16	4.3	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)														
Calcium	7440-70-2	54	54	100%	1120	11984	170000	42371	3741	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	54	54	100%	3280	8571	14800	8562	7003	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	54	54	100%	400	942	1620	1098	1540	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	54	36	67%	34.3	58.1	168	63.3	32.7	NESV	---	---	No	Essential Nutrient
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)														
Total HMW PAHs - 1/2MDL	---	54	49	91%	0.01105	0.52283	4.14	1.1373	0.15913	1.1	6	3.8	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	54	49	91%	0.0153	0.5277	4.14	1.1388	0.1591	1.1	6	3.8	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	54	49	91%	0.0068	0.518	4.14	1.1368	0.1591	1.1	6	3.8	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)														
Benzaldehyde	100-52-7	54	15	28%	0.0052	0.0099	0.018	0.0087	0.0237	NESV	---	---	No	95% UCL < Background
Bis(2-Ethylhexyl) Phthalate	117-81-7	54	21	39%	0.043	0.159	0.66	0.121	0.033	0.02	21	33	Yes	[Maximum] > ESV
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)														
Methyl Acetate	79-20-9	4	3	75%	0.0019	0.0926	0.27	---	---	NESV	---	---	Yes	#N/A

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List

Table E-6
Refined Ecological Screening for Bulk Soil (0-2 feet)
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Soil Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)														
Aluminum	7429-90-5	82	82	100%	5230	17154	30900	18989	10794	NESV	---	---	No	pH > 5.5
Antimony	7440-36-0	82	1	1%	0.36	0.36	0.36	---	0.13	0.27	1	1.3	No	< 5% Detected
Arsenic	7440-38-2	82	82	100%	2	5	16	6	4	6.8	14	2.3	Yes	[Maximum] > ESV
Barium	7440-39-3	82	82	100%	74.5	248.7	533	306.7	154.9	110	72	4.8	Yes	[Maximum] > ESV
Beryllium	7440-41-7	82	81	99%	0.21	0.65	1.2	0.73	0.51	2.5	0	<1	No	[Maximum] < ESV
Cadmium	7440-43-9	82	3	4%	0.48	0.64	0.78	---	0.15	0.27	3	2.9	No	< 5% Detected
Chromium, Hexavalent	18540-29-9	82	82	100%	0.11	0.29	0.56	0.32	---	0.34	23	1.6	No	See Text
Cobalt	7440-48-4	82	82	100%	2.2	5.5	7.4	5.8	5.8	13	0	<1	No	95% UCL < Background
Copper	7440-50-8	82	82	100%	6.6	15.6	33.2	17.7	11.6	14	43	2.4	Yes	[Maximum] > ESV
Iron	7439-89-6	82	82	100%	5720	14693	21100	15367	13150	NESV	---	---	No	pH > 5
Lead	7439-92-1	82	82	100%	4.3	12.4	44.8	15.6	10.4	11	46	4.1	Yes	[Maximum] > ESV
Manganese	7439-96-5	82	82	100%	36.1	426.8	2210	625.9	464.9	220	65	10	Yes	[Maximum] > ESV
Nickel	7440-02-0	82	82	100%	4.2	11	17.4	12	11.1	38	0	<1	No	[Maximum] < ESV
Selenium	7782-49-2	82	23	28%	0.29	0.62	1.1	0.45	0.13	0.52	14	2.1	Yes	[Maximum] > ESV
Thallium	7440-28-0	82	3	4%	0.12	0.22	0.41	---	0.06	0.05	3	8.2	No	< 5% Detected
Vanadium	7440-62-2	82	82	100%	4	12	21	13	11	4.7	79	4.6	Yes	[Maximum] > ESV
Zinc	7440-66-6	82	82	100%	10.1	51.1	238	67.2	47.7	46	41	5.2	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)														
Cyanide	57-12-5	82	55	67%	0.022	0.183	2.2	0.435	0.141	0.098	33	22.4	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)														
Calcium	7440-70-2	82	82	100%	988	9876	177000	30554	3741	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	82	82	100%	2110	7831	18300	8471	7003	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	82	82	100%	335	931	1530	1100	1540	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	82	67	82%	29.8	109.9	555	158.7	32.7	NESV	---	---	No	Essential Nutrient
Dioxins and Furans (mg/kg)														
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	20	4	20%	8.60E-07	1.19E-06	2.03E-06	---	1.48E-06	NESV	---	---	Yes	No ESV Available
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD	35822-46-9	20	13	65%	4.50E-07	3.31E-06	6.36E-06	4.70E-06	9.23E-06	NESV	---	---	No	95% UCL < Background
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	20	4	20%	7.50E-08	3.06E-07	8.00E-07	---	1.40E-07	NESV	---	---	Yes	No ESV Available
1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	39227-28-6	20	1	5%	1.07E-06	1.07E-06	1.07E-06	---	2.00E-08	NESV	---	---	Yes	No ESV Available
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	20	10	50%	9.70E-08	2.34E-07	7.60E-07	---	6.10E-08	NESV	---	---	Yes	No ESV Available
1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	57653-85-7	20	3	15%	2.90E-07	5.70E-07	1.11E-06	---	5.30E-07	NESV	---	---	Yes	No ESV Available
1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	19408-74-3	20	7	35%	2.60E-07	4.50E-07	1.29E-06	8.60E-07	5.10E-07	NESV	---	---	Yes	No ESV Available
1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	40321-76-4	20	10	50%	4.50E-08	1.16E-07	3.10E-07	1.61E-07	1.07E-07	NESV	---	---	Yes	No ESV Available
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	20	3	15%	1.00E-07	4.00E-07	9.00E-07	---	1.00E-07	NESV	---	---	Yes	No ESV Available
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	20	4	20%	6.90E-08	1.33E-07	2.80E-07	---	1.40E-08	NESV	---	---	Yes	No ESV Available
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1746-01-6	20	4	20%	6.80E-08	6.15E-07	1.84E-06	---	1.19E-07	NESV	---	---	Yes	No ESV Available
Octachlorodibenzofuran	39001-02-0	20	6	30%	1.22E-06	3.07E-06	7.38E-06	2.82E-06	3.81E-06	NESV	---	---	No	95% UCL < Background
Octachlorodibenzo-P-Dioxin	3268-87-9	20	15	75%	3.74E-06	1.78E-05	3.35E-05	2.52E-05	7.17E-05	NESV	---	---	No	95% UCL < Background
$TEC_{2,3,7,8\text{-TCDD-Bird-1/2MDL}}$	---	20	17	85%	9.96E-08	3.92E-07	2.03E-06	7.39E-07	---	2.08E-07	8	9.8	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Bird-MDL}}$	---	20	17	85%	5.21E-07	1.10E-06	3.05E-06	1.27E-06	---	2.08E-07	17	14.7	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Bird-Zero}}$	---	20	17	85%	2.73E-09	3.02E-07	1.84E-06	7.16E-07	---	2.08E-07	5	8.8	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Mammal-1/2MDL}}$	---	20	17	85%	7.24E-08	3.79E-07	1.95E-06	7.50E-07	---	2.90E-07	5	6.7	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Mammal-MDL}}$	---	20	17	85%	3.43E-07	7.27E-07	2.18E-06	1.06E-06	---	2.90E-07	17	7.5	Yes	[Maximum] > ESV
$TEC_{2,3,7,8\text{-TCDD-Mammal-Zero}}$	---	20	17	85%	8.62E-09	3.18E-07	1.84E-06	7.13E-07	---	2.90E-07	4	6.3	Yes	[Maximum] > ESV
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)														
Total HMW PAHs - 1/2MDL	---	82	54	66%	0.0144	0.3992	2.499	0.7333	0.1591	1.1	5	2.3	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	82	54	66%	0.0179	0.411	2.499	0.7381	0.1591	1.1	5	2.3	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	82	54	66%	0.0109	0.3874	2.499	0.7337	0.1591	1.1	5	2.3	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)														
Benzaldehyde	100-52-7	82	10	12%	0.0052	0.0106	0.044	0.0081	0.0237	NESV	---	---	No	95% UCL < Background
Bis(2-Ethylhexyl) Phthalate	117-81-7	82	13	16%	0.016	0.132	0.35	0.049	0.033	0.02	12	17.5	Yes	[Maximum] > ESV
Di-N-Butyl Phthalate	84-74-2	82	4	5%	0.011	0.129	0.48	---	0.01	0.011	3	43.6	No	< 5% Detected

Table E-6
Refined Ecological Screening for Bulk Soil (0-2 feet)
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Soil Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)														
Cyclohexane	110-82-7	17	1	6%	0.001	0.001	0.001	---	---	NESV	---	---	Yes	No ESV Available
Methyl Acetate	79-20-9	17	10	59%	0.002	0.08	0.4	---	---	NESV	---	---	Yes	No ESV Available
Methylcyclohexane	108-87-2	17	1	6%	0.0015	0.0015	0.0015	---	---	NESV	---	---	Yes	No ESV Available
M,P-Xylene	179601-23-1	17	1	6%	0.00051	0.00051	0.00051	---	---	NESV	---	---	Yes	No ESV Available

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List
TEC: Toxic Equivalency Concentration

Table E-7
Refined Ecological Screening for Bulk Soil (0-2 feet)
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Soil Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)														
Aluminum	7429-90-5	38	38	100%	6070	8796	10800	9480	8991	NESV	---	---	No	pH > 5.5
Arsenic	7440-38-2	38	38	100%	1.9	4.5	8.2	4.9	4.5	6.8	1	1.2	Yes	[Maximum] > ESV
Barium	7440-39-3	38	38	100%	67.6	130.7	236	158.1	141.7	110	24	2.1	Yes	[Maximum] > ESV
Cobalt	7440-48-4	38	38	100%	4	6	8	6	6	13	0	<1	No	[Maximum] < ESV
Copper	7440-50-8	38	38	100%	8.9	15.2	22.7	17.1	14.9	14	25	1.6	Yes	[Maximum] > ESV
Iron	7439-89-6	38	38	100%	9160	13882	17600	14681	13920	NESV	---	---	No	pH > 5
Lead	7439-92-1	38	38	100%	6.3	9.1	13.6	10.1	9.9	11	4	1.2	Yes	[Maximum] > ESV
Manganese	7439-96-5	38	38	100%	76.4	300.8	467	362.6	341.5	220	32	2.1	Yes	[Maximum] > ESV
Nickel	7440-02-0	38	38	100%	9.2	12.6	18.1	14.2	12.2	38	0	<1	No	[Maximum] < ESV
Selenium	7782-49-2	38	1	3%	0.65	0.65	0.65	---	0.15	0.52	1	1.3	No	< 5% Detected
Vanadium	7440-62-2	38	38	100%	7.6	13.5	17.3	14.4	14.9	4.7	38	3.7	No	95% UCL < Background
Zinc	7440-66-6	38	38	100%	27.7	42.1	56.3	47	41.9	46	12	1.2	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)														
Cyanide	57-12-5	38	25	66%	0.03	0.77	3.7	0.88	0.06	0.098	19	37.8	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)														
Calcium	7440-70-2	38	38	100%	7410	18067	35100	21120	6732	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	38	38	100%	7060	10582	14800	11399	8555	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	38	38	100%	436	885	1290	1036	1095	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	38	22	58%	42.1	108.5	249	117.4	41.6	NESV	---	---	No	Essential Nutrient
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)														
Naphthalene	91-20-3	38	6	16%	0.04	0.28	0.81	---	---	0.0994	3	8.1	Yes	[Maximum] > ESV
Total HMW PAHs - 1/2MDL	---	38	27	71%	0.1045	0.737	3.399	1.3219	0.0753	1.1	5	3.1	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	38	27	71%	0.166	0.766	3.399	1.427	0.075	1.1	5	3.1	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	38	27	71%	0.027	0.708	3.399	1.306	0.075	1.1	5	3.1	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)														
Benzaldehyde	100-52-7	38	4	11%	0.031	0.052	0.088	0.039	0.007	NESV	---	---	Yes	No ESV Available
Caprolactam	105-60-2	38	2	5%	0.042	0.044	0.046	---	0.016	NESV	---	---	Yes	No ESV Available
Di-N-Butyl Phthalate	84-74-2	38	4	11%	0.014	0.022	0.034	---	0.011	0.011	4	3.1	Yes	[Maximum] > ESV
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)														
Cyclohexane	110-82-7	19	18	95%	0.00047	0.00235	0.005	---	---	NESV	---	---	Yes	No ESV Available
Methyl Acetate	79-20-9	19	3	16%	0.011	0.324	0.6	---	---	NESV	---	---	Yes	No ESV Available
Methylcyclohexane	108-87-2	19	19	100%	0.00058	0.00422	0.011	---	---	NESV	---	---	Yes	No ESV Available
M,P-Xylene	179601-23-1	19	19	100%	0.00031	0.00144	0.0033	---	---	NESV	---	---	Yes	No ESV Available
O-Xylene (1,2-Dimethylbenzene)	95-47-6	19	18	95%	0.00011	0.00048	0.0011	---	---	NESV	---	---	Yes	No ESV Available

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List

Table E-8a
Refined Ecological Screening for Bulk Soil Using Upper RSD-Adjusted Results (0-2 feet)
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	86	86	9014	21350	39465	NESV	---	---	No	pH > 5.5
Antimony	7440-36-0	86	75	0.141	0.796	11.0	0.27	48	40.8	Yes	[Maximum] > ESV
Arsenic	7440-38-2	86	86	4.41	7.02	35.6	6.8	25	5.2	Yes	[Maximum] > ESV
Barium	7440-39-3	86	86	61.8	159	330	110	73	3	Yes	[Maximum] > ESV
Beryllium	7440-41-7	86	86	0.420	0.882	3.93	2.5	1	1.6	Yes	[Maximum] > ESV
Cadmium	7440-43-9	86	86	0.057	0.325	1.84	0.27	38	6.8	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	86	86	14.3	23.1	58.6	26	20	2.3	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	86	86	0.382	0.619	1.57	0.34	86	4.6	No	See text
Chromium, Trivalent	16065-83-1	86	86	13.9	22.5	57.0	26	19	2.2	No	See text
Cobalt	7440-48-4	86	86	5.59	6.64	14.0	13	1	1.1	Yes	[Maximum] > ESV
Copper	7440-50-8	86	86	14.8	69.5	996	14	86	71.1	Yes	[Maximum] > ESV
Iron	7439-89-6	86	86	14373	19400	68967	NESV	---	---	No	pH > 5
Lead	7439-92-1	86	86	8.89	46.5	603	11	82	54.8	Yes	[Maximum] > ESV
Manganese	7439-96-5	86	86	360	522	902	220	86	4.1	Yes	[Maximum] > ESV
Mercury	7439-97-6	86	60	0.020	0.037	0.140	0.013	60	10.7	Yes	[Maximum] > ESV
Nickel	7440-02-0	86	86	14.4	33.4	163	38	25	4.3	Yes	[Maximum] > ESV
Selenium	7782-49-2	86	86	0.214	1.74	16.0	0.52	74	30.7	Yes	[Maximum] > ESV
Thallium	7440-28-0	86	86	0.064	0.133	0.457	0.05	86	9.1	Yes	[Maximum] > ESV
Vanadium	7440-62-2	86	86	8.88	20.1	59.5	4.7	86	12.7	Yes	[Maximum] > ESV
Zinc	7440-66-6	86	86	46.8	125	1939	46	86	42.1	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	86	84	0.023	1.18	25.5	0.098	78	260.4	Yes	[Maximum] > ESV
Fluoride	16984-48-8	86	86	21.4	333	1218	120	49	10.2	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	86	86	2886	21316	50575	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	86	86	6979	10849	13590	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	86	86	771	1549	3272	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	86	82	55.8	1332	11767	NESV	---	---	No	Essential Nutrient
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1248 (Aroclor 1248)[1]	12672-29-6	86	1	0.200	0.200	0.200	0.0073	1	27.4	Yes	[Maximum] > ESV
PCB-1254 (Aroclor 1254)	11097-69-1	86	14	0.110	0.426	1.73	0.041	14	42.2	Yes	[Maximum] > ESV
Polychlorinated Biphenyl (PCBs)	1336-36-3	86	15	0.110	0.430	1.73	0.000332	15	5207.2	Yes	[Maximum] > ESV

Table E-8a
Refined Ecological Screening for Bulk Soil Using Upper RSD-Adjusted Results (0-2 feet)
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	86	72	0.003	1.04	39.9	3.24	4	12.3	Yes	[Maximum] > ESV
Acenaphthene	83-32-9	86	84	0.014	4.66	199	0.25	43	796.1	Yes	[Maximum] > ESV
Anthracene	120-12-7	86	80	0.027	7.98	274	6.8	10	40.2	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	86	86	0.036	29.0	754	10	23	75.4	Yes	[Maximum] > ESV
Fluorene	86-73-7	86	83	0.011	3.85	164	3.7	6	44.2	Yes	[Maximum] > ESV
Naphthalene	91-20-3	86	76	0.005	2.05	87.6	0.0994	34	881.5	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	86	86	0.020	25.6	801	5.5	22	145.7	Yes	[Maximum] > ESV
Total LMW PAHs - 1/2MDL	---	86	86	0.118	73.3	2339	29	20	80.6	Yes	[Maximum] > ESV
Total LMW PAHs - MDL	---	86	86	0.181	73.3	2339	29	20	80.6	Yes	[Maximum] > ESV
Total LMW PAHs - Zero	---	86	86	0.056	73.3	2339	29	20	80.6	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	86	85	0.030	16.7	401	62	4	6.5	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	86	84	0.139	16.4	405	0.73	61	554.9	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	86	86	0.035	20.0	432	18	16	24	Yes	[Maximum] > ESV
Benzo(G,H,I)Perylene	191-24-2	86	85	0.040	14.2	354	25	9	14.1	Yes	[Maximum] > ESV
Benzo(K)Fluoranthene	207-08-9	86	85	0.025	7.92	214	71	1	3	Yes	[Maximum] > ESV
Chrysene	218-01-9	86	86	0.036	18.6	407	3.1	46	131.4	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	86	82	0.034	3.98	83.6	14	4	6	Yes	[Maximum] > ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	86	84	0.110	12.9	275	71	4	3.9	Yes	[Maximum] > ESV
Pyrene	129-00-0	86	86	0.029	27.9	708	10	21	70.8	Yes	[Maximum] > ESV
Total HMW PAHs - 1/2MDL	---	86	86	0.222	133	3263	1.1	84	2966.4	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	86	86	0.313	133	3263	1.1	84	2966.4	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	86	86	0.130	133	3263	1.1	84	2966.4	Yes	[Maximum] > ESV
Total PAHs - 1/2MDL	---	86	86	0.269	185	5094	NESV	---	---	No	No ESV Available
Total PAHs - MDL	---	86	86	0.417	185	5094	NESV	---	---	No	No ESV Available
Total PAHs - Zero	---	86	86	0.121	185	5094	NESV	---	---	No	No ESV Available
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
2,4-Dimethylphenol[1]	105-67-9	86	2	0.250	0.480	0.710	0.01	2	71	Yes	[Maximum] > ESV
3- And 4- Methylphenol (Total)[1]	106445	62	2	0.011	0.014	0.017	NESV	---	---	No	No ESV Available
Benzaldehyde[1]	100-52-7	86	8	0.007	0.026	0.051	NESV	---	---	No	No ESV Available
Benzyl Butyl Phthalate	85-68-7	86	16	0.013	0.233	1.40	90	0	<1	No	[Maximum] < ESV
Bis(2-Ethylhexyl) Phthalate[1]	117-81-7	86	16	0.014	0.115	0.810	0.02	15	40.5	Yes	[Maximum] > ESV
Carbazole	86-74-8	86	84	0.021	4.09	137	79	1	1.7	Yes	[Maximum] > ESV
Dibenzofuran	132-64-9	86	78	0.006	2.30	93.5	6.1	4	15.3	Yes	[Maximum] > ESV
Di-N-Butyl Phthalate[1]	84-74-2	86	22	0.011	0.025	0.067	0.011	20	6.1	Yes	[Maximum] > ESV

Notes:

[1] No RSD adjustment or UCL substitution due to no detected results in replicate samples. Measured results used instead.

---, Not applicable.

COPEC: Constituent of Potential Ecological Concern

ESV, Ecological Screening Value

HMW, High molecular weight

HQ, Hazard Quotient

HQ_{Max}, Maximum hazard quotient,

LMW, Low molecular weight

[Maximum]: Maximum concentration

mg/kg, milligrams per kilograms

MDL: Method Detection Limit

NESV: No Ecological Screening Value

PAH, Polycyclic Aromatic Hydrocarbon

PCB, Polychlorinated Biphenyl

SVOC, Semi-Volatile Organic Compound

TAL: Target Analyte List

TCL: Target Compound List

TEC: Toxic Equivalency Concentration

Table E-8b
Refined Ecological Screening for Bulk Soil Using Measured Results (0-2 feet)
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	86	86	8620	20499	37700	NESV	---	---	No	pH > 5.5
Antimony	7440-36-0	86	75	0.092	0.588	8.60	0.27	30	31.9	Yes	[Maximum] > ESV
Arsenic	7440-38-2	86	86	4.10	6.39	31.3	6.8	15	4.6	Yes	[Maximum] > ESV
Barium	7440-39-3	86	86	59.4	150	302	110	69	2.7	Yes	[Maximum] > ESV
Beryllium	7440-41-7	86	86	0.400	0.839	3.70	2.5	1	1.5	Yes	[Maximum] > ESV
Cadmium	7440-43-9	86	86	0.054	0.291	1.60	0.27	30	5.9	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	86	86	12.9	21.3	54.4	26	17	2.1	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	86	86	0.345	0.571	1.46	0.34	86	4.3	No	See text
Chromium, Trivalent	16065-83-1	86	86	12.6	20.7	52.9	26	17	2	No	See text
Cobalt	7440-48-4	86	86	5.40	6.48	13.5	13	1	1	Yes	[Maximum] > ESV
Copper	7440-50-8	86	86	14.1	63.7	887	14	86	63.4	Yes	[Maximum] > ESV
Iron	7439-89-6	86	86	13900	18893	66700	NESV	---	---	No	pH > 5
Lead	7439-92-1	86	86	8.60	35.2	406	11	81	36.9	Yes	[Maximum] > ESV
Manganese	7439-96-5	86	86	341	494	902	220	86	4.1	Yes	[Maximum] > ESV
Mercury	7439-97-6	86	60	0.013	0.028	0.140	0.013	59	10.7	Yes	[Maximum] > ESV
Nickel	7440-02-0	86	86	13.4	30.1	142	38	21	3.7	Yes	[Maximum] > ESV
Selenium	7782-49-2	86	86	0.180	1.48	13.3	0.52	69	25.6	Yes	[Maximum] > ESV
Thallium	7440-28-0	86	86	0.060	0.122	0.400	0.05	86	8	Yes	[Maximum] > ESV
Vanadium	7440-62-2	86	86	8.60	19.0	54.5	4.7	86	11.6	Yes	[Maximum] > ESV
Zinc	7440-66-6	86	86	44.4	114	1720	46	84	37.4	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	86	84	0.017	0.928	18.2	0.098	76	185.7	Yes	[Maximum] > ESV
Fluoride	16984-48-8	86	86	16.6	272	976	120	47	8.1	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	86	86	2886	19082	45700	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	86	86	6830	10612	13300	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	86	86	721	1464	3080	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	86	82	46.1	1084	9000	NESV	---	---	No	Essential Nutrient
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1248 (Aroclor 1248)	12672-29-6	86	1	0.200	0.200	0.200	0.0073	1	27.4	Yes	[Maximum] > ESV
PCB-1254 (Aroclor 1254)	11097-69-1	86	14	0.046	0.310	1.73	0.041	14	42.2	Yes	[Maximum] > ESV
Polychlorinated Biphenyl (PCBs)	1336-36-3	86	15	0.046	0.303	1.73	0.000332	15	5207.2	Yes	[Maximum] > ESV

Table E-8b
Refined Ecological Screening for Bulk Soil Using Measured Results (0-2 feet)
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	86	72	0.003	0.706	27.0	3.24	4	8.3	Yes	[Maximum] > ESV
Acenaphthene	83-32-9	86	84	0.008	2.78	110	0.25	38	440	Yes	[Maximum] > ESV
Anthracene	120-12-7	86	80	0.027	4.86	150	6.8	8	22.1	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	86	86	0.021	19.1	440	10	17	44	Yes	[Maximum] > ESV
Fluorene	86-73-7	86	83	0.010	2.37	94.0	3.7	6	25.4	Yes	[Maximum] > ESV
Naphthalene	91-20-3	86	76	0.005	1.55	68.0	0.0994	27	684.1	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	86	86	0.011	16.3	450	5.5	20	81.8	Yes	[Maximum] > ESV
Total LMW PAHs - 1/2MDL	---	86	86	0.068	46.9	1342	29	16	46.3	Yes	[Maximum] > ESV
Total LMW PAHs - MDL	---	86	86	0.104	46.9	1342	29	16	46.3	Yes	[Maximum] > ESV
Total LMW PAHs - Zero	---	86	86	0.032	46.8	1342	29	16	46.3	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	86	85	0.018	11.2	240	62	4	3.9	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	86	84	0.084	11.1	240	0.73	56	328.8	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	86	86	0.022	14.2	270	18	13	15	Yes	[Maximum] > ESV
Benzo(G,H,I)Perylene	191-24-2	86	85	0.025	9.94	220	25	6	8.8	Yes	[Maximum] > ESV
Benzo(K)Fluoranthene	207-08-9	86	85	0.015	5.45	130	71	1	1.8	Yes	[Maximum] > ESV
Chrysene	218-01-9	86	86	0.022	12.9	250	3.1	38	80.6	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	86	82	0.021	2.70	51.0	14	4	3.6	Yes	[Maximum] > ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	86	84	0.076	9.07	170	71	3	2.4	Yes	[Maximum] > ESV
Pyrene	129-00-0	86	86	0.017	18.2	410	10	18	41	Yes	[Maximum] > ESV
Total HMW PAHs - 1/2MDL	---	86	86	0.135	93.5	1981	1.1	80	1800.9	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	86	86	0.190	93.5	1981	1.1	80	1800.9	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	86	86	0.079	93.5	1981	1.1	80	1800.9	Yes	[Maximum] > ESV
Total PAHs - 1/2MDL	---	86	86	0.160	126	3026	NESV	---	---	No	No ESV Available
Total PAHs - MDL	---	86	86	0.248	126	3026	NESV	---	---	No	No ESV Available
Total PAHs - Zero	---	86	86	0.072	126	3026	NESV	---	---	No	No ESV Available
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
2,4-Dimethylphenol	105-67-9	86	2	0.250	0.480	0.710	0.01	2	71	Yes	[Maximum] > ESV
3- And 4- Methylphenol (Total)	106445	62	2	0.011	0.014	0.017	NESV	---	---	No	No ESV Available
Benzaldehyde	100-52-7	86	8	0.007	0.026	0.051	NESV	---	---	No	No ESV Available
Benzyl Butyl Phthalate	85-68-7	86	16	0.010	0.230	1.40	90	0	<1	No	[Maximum] < ESV
Bis(2-Ethylhexyl) Phthalate	117-81-7	86	16	0.014	0.115	0.810	0.02	15	40.5	Yes	[Maximum] > ESV
Dibenzofuran	132-64-9	86	78	0.006	1.44	55.0	6.1	4	9	Yes	[Maximum] > ESV
Di-N-Butyl Phthalate	84-74-2	86	22	0.011	0.025	0.067	0.011	20	6.1	Yes	[Maximum] > ESV

Notes:

[1.] No UCL substitution due to no detected results in replicate samples. Measured results used instead.

---, Not applicable.

COPEC: Constituent of Potential Ecological Concern

ESV, Ecological Screening Value

HMW, High molecular weight

HQ, Hazard Quotient

HQ_{Max}, Maximum hazard quotient,

LMW, Low molecular weight

[Maximum]: Maximum concentration

mg/kg, milligrams per kilograms

MDL: Method Detection Limit

NESV: No Ecological Screening Value

PAH, Polycyclic Aromatic Hydrocarbon

PCB, Polychlorinated Biphenyl

SVOC, Semi-Volatile Organic Compound

TAL: Target Analyte List

TCL: Target Compound List

TEC: Toxic Equivalency Concentration

Table E-8c
Refined Ecological Screening for Bulk Soil Using Lower RSD-Adjusted Results (0-2 feet)
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)											
Aluminum	7429-90-5	86	86	8226	19649	35935	NESV	---	---	No	pH > 5.5
Antimony	7440-36-0	86	75	0.027	0.379	6.19	0.27	23	22.9	Yes	[Maximum] > ESV
Arsenic	7440-38-2	86	86	3.62	5.76	27.0	6.8	12	4	Yes	[Maximum] > ESV
Barium	7440-39-3	86	86	57.0	141	281	110	58	2.6	Yes	[Maximum] > ESV
Beryllium	7440-41-7	86	86	0.380	0.796	3.47	2.5	1	1.4	Yes	[Maximum] > ESV
Cadmium	7440-43-9	86	86	0.051	0.257	1.36	0.27	23	5	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	86	86	11.5	19.5	50.2	26	14	1.9	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	86	86	0.309	0.522	1.34	0.34	84	4	No	See text
Chromium, Trivalent	16065-83-1	86	86	11.2	19.0	48.8	26	12	1.9	No	See text
Cobalt	7440-48-4	86	86	5.21	6.31	13.0	13	1	1	Yes	[Maximum] > ESV
Copper	7440-50-8	86	86	13.4	57.9	778	14	82	55.6	Yes	[Maximum] > ESV
Iron	7439-89-6	86	86	13427	18386	64433	NESV	---	---	No	pH > 5
Lead	7439-92-1	86	86	6.18	24.0	253	11	59	23	Yes	[Maximum] > ESV
Manganese	7439-96-5	86	86	322	465	902	220	86	4.1	Yes	[Maximum] > ESV
Mercury	7439-97-6	86	60	0.006	0.018	0.140	0.013	36	10.7	Yes	[Maximum] > ESV
Nickel	7440-02-0	86	86	11.5	26.9	121	38	17	3.2	Yes	[Maximum] > ESV
Selenium	7782-49-2	86	86	0.146	1.21	10.6	0.52	67	20.5	Yes	[Maximum] > ESV
Thallium	7440-28-0	86	86	0.056	0.110	0.387	0.05	86	7.7	Yes	[Maximum] > ESV
Vanadium	7440-62-2	86	86	8.32	17.8	52.3	4.7	86	11.1	Yes	[Maximum] > ESV
Zinc	7440-66-6	86	86	42.0	103	1501	46	77	32.6	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)											
Cyanide	57-12-5	86	84	0.011	0.671	10.9	0.098	62	111.1	Yes	[Maximum] > ESV
Fluoride	16984-48-8	86	86	11.8	212	781	120	43	6.5	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)											
Calcium	7440-70-2	86	86	2886	16847	40825	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	86	86	6681	10374	13010	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	86	86	671	1379	3069	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	86	82	36.4	836	6298	NESV	---	---	No	Essential Nutrient
Polychlorinated Biphenyls (PCBs) (mg/kg)											
PCB-1248 (Aroclor 1248)[1]	12672-29-6	86	1	0.200	0.200	0.200	0.0073	1	27.4	Yes	[Maximum] > ESV
PCB-1254 (Aroclor 1254)	11097-69-1	86	14	-0.106856201	0.194	1.73	0.041	7	42.2	Yes	[Maximum] > ESV
Polychlorinated Biphenyl (PCBs)	1336-36-3	86	15	-0.106856201	0.176	1.73	0.000332	7	5207.2	Yes	[Maximum] > ESV

Table E-8c
Refined Ecological Screening for Bulk Soil Using Lower RSD-Adjusted Results (0-2 feet)
Operational Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)											
2-Methylnaphthalene	91-57-6	86	72	0.002	0.373	14.1	3.24	2	4.4	Yes	[Maximum] > ESV
Acenaphthene	83-32-9	86	84	0.002	0.897	22.0	0.25	20	88.2	Yes	[Maximum] > ESV
Anthracene	120-12-7	86	80	0.005	1.74	44.3	6.8	5	6.5	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	86	86	0.006	9.09	188	10	15	18.8	Yes	[Maximum] > ESV
Fluorene	86-73-7	86	83	0.002	0.897	24.3	3.7	4	6.6	Yes	[Maximum] > ESV
Naphthalene	91-20-3	86	76	0.005	1.05	48.4	0.0994	24	486.7	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	86	86	0.002	6.94	186	5.5	15	33.9	Yes	[Maximum] > ESV
Total LMW PAHs - 1/2MDL	---	86	86	0.017	20.4	474	29	11	16.4	Yes	[Maximum] > ESV
Total LMW PAHs - MDL	---	86	86	0.027	20.4	475	29	11	16.4	Yes	[Maximum] > ESV
Total LMW PAHs - Zero	---	86	86	0.008	20.4	474	29	11	16.3	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	86	85	0.006	5.67	83.0	62	3	1.3	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	86	84	0.026	5.79	95.1	0.73	47	130.3	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	86	86	0.009	8.49	108	18	10	6	Yes	[Maximum] > ESV
Benzo(G,H,I)Perylene	191-24-2	86	85	0.010	5.67	86.3	25	4	3.5	Yes	[Maximum] > ESV
Chrysene	218-01-9	86	86	0.008	7.17	103	3.1	28	33.1	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	86	82	0.008	1.41	18.4	14	3	1.3	Yes	[Maximum] > ESV
Pyrene	129-00-0	86	86	0.005	8.47	176	10	15	17.6	Yes	[Maximum] > ESV
Total HMW PAHs - 1/2MDL	---	86	86	0.047	53.7	828	1.1	72	752.7	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	86	86	0.067	53.7	828	1.1	72	752.7	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	86	86	0.028	53.7	828	1.1	72	752.7	Yes	[Maximum] > ESV
Total PAHs - 1/2MDL	---	86	86	0.051	65.9	1205	NESV	---	---	No	No ESV Available
Total PAHs - MDL	---	86	86	0.078	65.9	1205	NESV	---	---	No	No ESV Available
Total PAHs - Zero	---	86	86	0.023	65.8	1205	NESV	---	---	No	No ESV Available
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)											
2,4-Dimethylphenol[1]	105-67-9	86	2	0.250	0.480	0.710	0.01	2	71	Yes	[Maximum] > ESV
3- And 4- Methylphenol (Total)[1]	106445	62	2	0.011	0.014	0.017	NESV	---	---	No	No ESV Available
Benzaldehyde[1]	100-52-7	86	8	0.007	0.026	0.051	NESV	---	---	No	No ESV Available
Benzyl Butyl Phthalate	85-68-7	86	16	0.007	0.227	1.40	90	0	<1	No	[Maximum] < ESV
Bis(2-Ethylhexyl) Phthalate[1]	117-81-7	86	16	0.014	0.115	0.810	0.02	15	40.5	Yes	[Maximum] > ESV
Dibenzofuran	132-64-9	86	78	0.002	0.584	16.5	6.1	2	2.7	Yes	[Maximum] > ESV
Di-N-Butyl Phthalate[1]	84-74-2	86	22	0.011	0.025	0.067	0.011	20	6.1	Yes	[Maximum] > ESV

Notes:
[1] No RSD adjustment or UCL substitution due to no detected results in replicate samples. Measured results used instead.
---, Not applicable.
COPEC: Constituent of Potential Ecological Concern
ESV, Ecological Screening Value
HMW, High molecular weight
HQ, Hazard Quotient
HQ_{Max}, Maximum hazard quotient,
LMW, Low molecular weight
[Maximum]: Maximum concentration
mg/kg, milligrams per kilograms
MDL: Method Detection Limit
NESV: No Ecological Screening Value
PAH, Polycyclic Aromatic Hydrocarbon
PCB, Polychlorinated Biphenyl
SVOC, Semi-Volatile Organic Compound
TAL: Target Analyte List
TCL: Target Compound List
TEC: Toxic Equivalency Concentration

Table E-9
Refined Ecological Screening for Bulk Soil (0-2 feet)
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Soil Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)														
Aluminum	7429-90-5	42	42	100%	6290	35213	123000	50414	10794	NESV	---	---	No	pH > 5.5
Antimony	7440-36-0	42	10	24%	0.43	1.45	2.6	0.93	0.13	0.27	10	9.6	Yes	[Maximum] > ESV
Arsenic	7440-38-2	42	42	100%	2.4	11	34.1	13.5	3.9	6.8	29	5	Yes	[Maximum] > ESV
Barium	7440-39-3	42	42	100%	19.6	211.6	1560	244.6	154.9	110	28	14.2	Yes	[Maximum] > ESV
Beryllium	7440-41-7	42	42	100%	0.31	2.71	17.2	3.99	0.51	2.5	12	6.9	Yes	[Maximum] > ESV
Cadmium	7440-43-9	42	36	86%	0.29	2.48	9.6	3.62	0.15	0.27	36	35.6	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	46	46	100%	5.6	21.7	53	28.7	9.1	26	13	2	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	44	39	89%	0.19	0.55	1.38	0.69	---	0.34	29	4.1	No	See Text
Chromium, Trivalent	16065-83-1	44	44	100%	5.52	20.01	50.12	25.44	---	26	11	1.9	No	See Text
Cobalt	7440-48-4	42	42	100%	1.2	6.6	27.4	9.5	5.8	13	3	2.1	Yes	[Maximum] > ESV
Copper	7440-50-8	42	42	100%	6.4	28.3	83.6	44.3	11.6	14	30	6	Yes	[Maximum] > ESV
Iron	7439-89-6	42	42	100%	1330	9661	23600	9375	13150	NESV	---	---	No	pH > 5
Lead	7439-92-1	42	42	100%	6.4	48	238	110.7	10.4	11	36	21.6	Yes	[Maximum] > ESV
Manganese	7439-96-5	42	42	100%	12.8	172.2	762	211.1	464.9	220	12	3.5	No	95% UCL < Background
Mercury	7439-97-6	42	32	76%	0.012	0.035	0.12	0.063	0.016	0.013	31	9.2	Yes	[Maximum] > ESV
Nickel	7440-02-0	42	42	100%	10.3	188.2	1250	359.8	11.1	38	36	32.9	Yes	[Maximum] > ESV
Selenium	7782-49-2	42	26	62%	0.34	1.19	3.4	1.83	0.13	0.52	22	6.5	Yes	[Maximum] > ESV
Thallium	7440-28-0	42	35	83%	0.14	0.95	4.6	1.89	0.06	0.05	35	92	Yes	[Maximum] > ESV
Vanadium	7440-62-2	42	42	100%	6.1	62.6	348	110.4	11.2	4.7	42	74	Yes	[Maximum] > ESV
Zinc	7440-66-6	42	42	100%	29.2	216.1	871	342.4	47.7	46	38	18.9	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)														
Cyanide	57-12-5	42	41	98%	0.078	13.598	137	41.152	0.141	0.098	38	1398	Yes	[Maximum] > ESV
Fluoride	16984-48-8	42	42	100%	2.42	86.44	306	146.65	1.17	120	12	2.6	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)														
Calcium	7440-70-2	42	42	100%	427	21195	106000	33122	3741	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	42	42	100%	442	6561	21800	6051	7003	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	42	42	100%	101	868	3200	853	1540	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	42	38	90%	28.3	406	2390	862.8	32.7	NESV	---	---	No	Essential Nutrient
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)														
2-Methylnaphthalene	91-57-6	40	30	75%	0.0055	0.963	6.9	2.1586	0.0011	3.24	3	2.1	Yes	[Maximum] > ESV
Acenaphthene	83-32-9	41	40	98%	0.016	13.475	190	81.884	0.001	0.25	28	760	Yes	[Maximum] > ESV
Anthracene	120-12-7	41	40	98%	0.049	25.116	250	113.001	0.002	6.8	16	36.8	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	41	40	98%	0.029	309.111	3700	2235.36	0.023	10	27	370	Yes	[Maximum] > ESV
Fluorene	86-73-7	41	33	80%	0.012	8.238	82	25.694	0.001	3.7	11	22.2	Yes	[Maximum] > ESV
Naphthalene	91-20-3	41	28	68%	0.028	1.628	12	3.65	0.001	0.0994	23	120.7	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	41	40	98%	0.23	101.33	1300	285.2	0.01	5.5	25	236.4	Yes	[Maximum] > ESV
Total LMW PAHs - 1/2MDL	---	41	40	98%	1.26675	459.17222	5561.4	2317.6166	0.04218	29	23	191.8	Yes	[Maximum] > ESV
Total LMW PAHs - MDL	---	41	40	98%	1.2855	460.555	5593.9	2327.8441	0.0422	29	23	192.9	Yes	[Maximum] > ESV
Total LMW PAHs - Zero	---	41	40	98%	1.248	457.789	5528.9	2307.398	0.042	29	23	190.7	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	41	39	95%	0.95	202.76	3100	1269.12	0.02	62	14	50	Yes	[Maximum] > ESV
Benzo(A)Anthracene	56-55-3	41	39	95%	0.66	184.73	2700	1119.24	0.01	0.73	38	3698.6	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	41	39	95%	1.6	238.8	3000	1004.1	---	18	25	166.7	Yes	[Maximum] > ESV
Benzo(G,H,I)Perylene	191-24-2	41	39	95%	1.2	152	2200	699.3	---	25	18	88	Yes	[Maximum] > ESV
Benzo(K)Fluoranthene	207-08-9	41	39	95%	1.2	144.9	2400	720.2	---	71	8	33.8	Yes	[Maximum] > ESV
Chrysene	218-01-9	41	40	98%	0.011	208.761	2800	1166.308	0.023	3.1	35	903.2	Yes	[Maximum] > ESV
Dibenz(A,H)Anthracene	53-70-3	41	39	95%	0.35	50.01	740	236.63	---	14	13	52.9	Yes	[Maximum] > ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	41	39	95%	1.1	141.7	2000	643	---	71	9	28.2	Yes	[Maximum] > ESV
Pyrene	129-00-0	41	40	98%	0.058	272.596	3200	1964.634	0.018	10	26	320	Yes	[Maximum] > ESV
Total HMW PAHs - 1/2MDL	---	41	41	100%	0.0865	1530.144	22140	13432.84	0.1591	1.1	39	20127.3	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	41	41	100%	0.162	1530.148	22140	9208.326	0.159	1.1	39	20127.3	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	41	41	100%	0.011	1530.14	22140	13432.84	0.159	1.1	39	20127.3	Yes	[Maximum] > ESV

Table E-9
Refined Ecological Screening for Bulk Soil (0-2 feet)
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Soil Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)														
Benzyl Butyl Phthalate	85-68-7	40	1	3%	0.55	0.55	0.55	---	0.02	90	0	<1	No	< 5% Detected
Bis(2-Ethylhexyl) Phthalate	117-81-7	40	4	10%	0.17	1.62	5.9	---	0.03	0.02	4	295	Yes	[Maximum] > ESV
Carbazole	86-74-8	40	38	95%	0.0043	12.855	190	53.7367	0.0031	79	1	2.4	Yes	[Maximum] > ESV
Dibenzofuran	132-64-9	40	37	93%	0.019	2.566	28	7.704	0.001	6.1	5	4.6	Yes	[Maximum] > ESV
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)														
Cyclohexane	110-82-7	9	3	33%	0.0027	0.0048	0.0086	---	---	NESV	---	---	Yes	No ESV Available
Isopropylbenzene (Cumene)	98-82-8	9	2	22%	0.0002	0.0004	0.0005	---	---	NESV	---	---	Yes	No ESV Available
Methyl Acetate	79-20-9	9	5	56%	0.0022	0.0044	0.0065	---	---	NESV	---	---	Yes	No ESV Available
Methylcyclohexane	108-87-2	9	3	33%	0.0052	0.0086	0.015	---	---	NESV	---	---	Yes	No ESV Available
M,P-Xylene	179601-23-1	9	5	56%	0.00016	0.00359	0.0091	---	---	NESV	---	---	Yes	No ESV Available
O-Xylene (1,2-Dimethylbenzene)	95-47-6	9	3	33%	0.00094	0.00195	0.0032	---	---	NESV	---	---	Yes	No ESV Available

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List

Table E-10
Refined Ecological Screening for Bulk Sediment (0-0.5 feet)
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Sediment Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)														
Aluminum	7429-90-5	22	22	100%	7520	37392	112000	50414	10794	26000	11	4.3	No	pH > 5.5
Antimony	7440-36-0	22	7	32%	0.43	1.45	2.6	0.93	0.13	2	2	1.3	Yes	[Maximum] > ESV
Arsenic	7440-38-2	22	22	100%	2.5	10.6	26.4	13.5	3.9	9.79	9	2.7	Yes	[Maximum] > ESV
Barium	7440-39-3	22	22	100%	19.6	197.4	539	244.6	154.9	NESV	---	---	Yes	No ESV Available
Beryllium	7440-41-7	22	22	100%	0.34	2.62	17.2	3.99	0.51	NESV	---	---	Yes	No ESV Available
Cadmium	7440-43-9	22	21	95%	0.29	2.56	8.3	3.62	0.15	0.99	16	8.4	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	24	24	100%	7.2	24.2	53	28.7	9.1	43.4	2	1.2	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	22	20	91%	0.21	0.62	1.27	0.69	---	NESV	---	---	No	See Text
Chromium, Trivalent	16065-83-1	22	22	100%	6.805	21.509	46.229	25.437	---	NESV	---	---	No	See Text
Copper	7440-50-8	22	22	100%	6.4	36.3	83.6	44.3	11.6	31.6	11	2.6	Yes	[Maximum] > ESV
Lead	7439-92-1	22	22	100%	8.3	52.7	238	110.7	10.4	35.8	7	6.6	Yes	[Maximum] > ESV
Manganese	7439-96-5	22	22	100%	12.8	139.4	479	211.1	464.9	460	1	1	No	95% UCL < Background
Nickel	7440-02-0	22	22	100%	17.9	240	1250	359.8	11.1	22.7	21	55.1	Yes	[Maximum] > ESV
Selenium	7782-49-2	22	16	73%	0.34	1.23	3.4	1.83	0.13	2	3	1.7	Yes	[Maximum] > ESV
Silver	7440-22-4	22	2	9%	1	1	1	---	---	0.5	2	2	Yes	[Maximum] > ESV
Thallium	7440-28-0	22	19	86%	0.14	0.85	4.6	1.89	0.06	NESV	---	---	Yes	No ESV Available
Vanadium	7440-62-2	22	22	100%	13.3	76.6	348	110.4	11.2	NESV	---	---	Yes	No ESV Available
Zinc	7440-66-6	22	22	100%	42.2	260.4	871	342.4	47.7	121	19	7.2	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)														
Cyanide	57-12-5	22	22	100%	0.096	12.525	137	41.152	0.141	0.1	21	1370	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)														
Calcium	7440-70-2	22	22	100%	427	20180	106000	33122	3741	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	22	22	100%	442	4847	11800	6051	7003	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	22	22	100%	101	701	1900	853	1540	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	22	21	95%	28.4	385	2140	862.8	32.7	NESV	---	---	No	Essential Nutrient
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)														
2-Methylnaphthalene	91-57-6	22	18	82%	0.017	1.132	6.9	2.159	0.001	NESV	---	---	Yes	No ESV Available
Acenaphthene	83-32-9	22	22	100%	0.031	18.535	190	81.884	0.001	NESV	---	---	Yes	No ESV Available
Acenaphthylene	208-96-8	22	6	27%	0.033	0.548	1.2	0.32	0.001	NESV	---	---	Yes	No ESV Available
Anthracene	120-12-7	22	22	100%	0.049	29.153	250	113.001	0.002	NESV	---	---	Yes	No ESV Available
Fluoranthene	206-44-0	22	22	100%	0.029	370.351	3700	2235.36	0.023	NESV	---	---	Yes	No ESV Available
Fluorene	86-73-7	22	19	86%	0.012	9.478	82	25.694	0.001	NESV	---	---	Yes	No ESV Available
Naphthalene	91-20-3	22	16	73%	0.042	1.863	12	3.65	0.001	NESV	---	---	Yes	No ESV Available
Phenanthrene	85-01-8	22	22	100%	0.51	121.99	1300	285.2	0.01	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - 1/2MDL	---	22	22	100%	1.963	552.505	5561.4	2317.617	0.042	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - MDL	---	22	22	100%	1.963	554.362	5593.9	2327.844	0.042	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - Zero	---	22	22	100%	1.963	550.648	5528.9	2307.398	0.042	NESV	---	---	Yes	No ESV Available
Benzo(A)Pyrene	50-32-8	22	21	95%	2	285	3100	1269	---	NESV	---	---	Yes	No ESV Available
Benzo(A)Anthracene	56-55-3	22	21	95%	1.7	258.3	2700	1119.2	---	NESV	---	---	Yes	No ESV Available
Benzo(B)Fluoranthene	205-99-2	22	21	95%	5	324	3000	1004	---	NESV	---	---	Yes	No ESV Available
Benzo(G,H,I)Perylene	191-24-2	22	21	95%	2.2	211	2200	699.3	---	NESV	---	---	Yes	No ESV Available
Benzo(K)Fluoranthene	207-08-9	22	21	95%	2.4	206.2	2400	720.2	---	NESV	---	---	Yes	No ESV Available
Chrysene	218-01-9	22	21	95%	2.3	287.4	2800	1166.3	---	NESV	---	---	Yes	No ESV Available
Dibenz(A,H)Anthracene	53-70-3	22	21	95%	0.61	70.26	740	236.63	---	NESV	---	---	Yes	No ESV Available
Indeno(1,2,3-C,D)Pyrene	193-39-5	22	21	95%	2.7	197	2000	643	---	NESV	---	---	Yes	No ESV Available

Table E-10
Refined Ecological Screening for Bulk Sediment (0-0.5 feet)
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Sediment Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
Pyrene	129-00-0	22	22	100%	0.058	331.566	3200	1964.634	0.018	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - 1/2MDL	---	22	22	100%	0.1355	2087.4157	22140	13432.84	0.1591	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - MDL	---	22	22	100%	0.213	2087.419	22140	9208.326	0.159	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - Zero	---	22	22	100%	0.058	2087.412	22140	13432.84	0.159	NESV	---	---	Yes	No ESV Available
Total PAHs - 1/2MDL	---	22	22	100%	1.091	2329.252	24694.5	10217.908	0.168	NESV	---	---	Yes	No ESV Available
Total PAHs - MDL	---	22	22	100%	1.161	2330.88	24727	10227.261	0.168	NESV	---	---	Yes	No ESV Available
Total PAHs - Zero	---	22	22	100%	1.021	2327.625	24662	10208.559	0.168	NESV	---	---	Yes	No ESV Available
2-Methylnaphthalene	91-57-6	8	4	50%	0.018	1.944	6.9	2.159	0.001	NESV	---	---	Yes	No ESV Available
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)														
Acetophenone	98-86-2	22	1	5%	0.011	0.011	0.011	---	0.004	NESV	---	---	No	< 5% Detected
Carbazole	86-74-8	22	21	95%	0.11	16.24	190	53.74	---	NESV	---	---	Yes	No ESV Available
Dibenzofuran	132-64-9	22	21	95%	0.036	2.659	28	7.704	0.001	74.97	0	<1	No	[Maximum] < ESV

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List

Table E-11
Refined Ecological Screening for Surface Water
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Surface Water Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (µg/L)															
Aluminum	7429-90-5	U	2	2	100%	109	4370	8630	---	18	7.1	1	1215.5	Yes	[Maximum] > ESV
Aluminum	7429-90-5	F	1	1	100%	4780	4780	4780	---	8	87	1	54.9	Yes	[Maximum] > ESV
Barium	7440-39-3	U	2	2	100%	43.4	138.7	234	---	53.3	4	2	58.5	Yes	[Maximum] > ESV
Barium	7440-39-3	F	1	1	100%	26.4	26.4	26.4	---	53.5	4	1	6.6	Yes	[Maximum] > ESV
Beryllium	7440-41-7	U	2	1	50%	0.71	0.71	0.71	---	0.13	0.66	1	1.1	Yes	[Maximum] > ESV
Cadmium	7440-43-9	U	2	1	50%	3	3	3	---	0	0.455	1	6.6	Yes	[Maximum] > ESV
Cadmium	7440-43-9	F	1	1	100%	2.5	2.5	2.5	---	0.3	0.426	1	5.9	Yes	[Maximum] > ESV
Copper	7440-50-8	U	2	2	100%	3.8	10.2	16.5	---	2.1	6.609	1	2.5	Yes	[Maximum] > ESV
Copper	7440-50-8	F	1	1	100%	2	2	2	---	1	0.107	1	18.6	Yes	[Maximum] > ESV
Iron	7439-89-6	U	2	1	50%	817	817	817	---	34	1000	0	<1	No	[Maximum] < ESV
Lead	7439-92-1	U	2	1	50%	7.6	7.6	7.6	---	0.2	1.317	1	5.8	Yes	[Maximum] > ESV
Nickel	7440-02-0	U	2	2	100%	1.9	28.9	55.9	---	0.7	29.02	1	1.9	Yes	[Maximum] > ESV
Nickel	7440-02-0	F	1	1	100%	22.1	22.1	22.1	---	0.7	28.93	0	<1	No	[Maximum] < ESV
Vanadium	7440-62-2	U	2	2	100%	6.9	12.4	18	---	0.6	NESV	---	---	Yes	No ESV Available
Zinc	7440-66-6	U	2	1	50%	537	537	537	---	3	66.597	1	8.1	Yes	[Maximum] > ESV
Zinc	7440-66-6	F	1	1	100%	512	512	512	---	4	65.664	1	7.8	Yes	[Maximum] > ESV
Other Inorganic Parameters (µg/L unless otherwise noted)															
Cyanide	57-12-5	U	2	1	50%	7.6	7.6	7.6	---	1	5.2	1	1.5	Yes	[Maximum] > ESV
Fluoride	16984-48-8	U	2	2	100%	2150	12275	22400	---	44	1130	1	19.8	Yes	[Maximum] > ESV
Fluoride	16984-48-8	F	1	1	100%	21500	21500	21500	---	---	1130	1	19	Yes	[Maximum] > ESV
Polycyclic Aromatic Hydrocarbons (PAHs) (µg/L)															
Benzo(A)Anthracene	56-55-3	U	1	1	100%	3	3	3	---	0.0358	2.227	1	1.3	Yes	[Maximum] > ESV
Benzo(A)Pyrene	50-32-8	U	1	1	100%	3.9	3.9	3.9	---	0.0254	0.957	1	4.1	Yes	[Maximum] > ESV
Benzo(B)Fluoranthene	205-99-2	U	1	1	100%	10	10	10	---	0.0466	0.677	1	14.8	Yes	[Maximum] > ESV
Benzo(G,H,I)Perylene	191-24-2	U	1	1	100%	3.9	3.9	3.9	---	0.0331	0.439	1	8.9	Yes	[Maximum] > ESV
Chrysene	218-01-9	U	1	1	100%	7.6	7.6	7.6	---	0.0389	2.042	1	3.7	Yes	[Maximum] > ESV
Fluoranthene	206-44-0	U	1	1	100%	9.3	9.3	9.3	---	0.0289	7.109	1	1.3	Yes	[Maximum] > ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	U	1	1	100%	3.1	3.1	3.1	---	0.0409	0.275	1	11.3	Yes	[Maximum] > ESV
Phenanthrene	85-01-8	U	1	1	100%	1.5	1.5	1.5	---	0.0383	19.13	0	<1	No	[Maximum] < ESV
Pyrene	129-00-0	U	1	1	100%	7	7	7	---	0.0259	0.025	1	280	Yes	[Maximum] > ESV

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
[Maximum]: Maximum concentration
NESV: No Ecological Screening Value
MDL: Method Detection Limit
SW: Surface Water
TAL: Target Analyte List
U: Unfiltered
µg/L: microgram per liter
F: Filtered

Table E-12
Refined Ecological Screening for Bulk Soil (0-2 feet)
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Soil Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)														
Aluminum	7429-90-5	38	38	100%	2360	7567	16100	9034	8991	NESV	---	---	No	pH > 5.5
Antimony	7440-36-0	38	1	3%	0.67	0.67	0.67	---	0.15	0.27	1	2.5	No	< 5% Detected
Barium	7440-39-3	38	38	100%	43.1	431	972	640.1	141.7	110	32	8.8	Yes	[Maximum] > ESV
Cadmium	7440-43-9	38	4	11%	0.95	1.51	2.5	---	0.17	0.27	4	9.3	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	38	38	100%	2.6	9	32.8	11.4	9.9	26	1	1.3	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	24	24	100%	0.07	0.25	0.88	0.42	---	0.34	3	2.6	No	See Text
Chromium, Trivalent	16065-83-1	24	24	100%	2.53	9.12	31.92	15.44	---	26	1	1.2	No	See Text
Cobalt	7440-48-4	38	36	95%	1.2	3.9	7.2	4.3	6	13	0	<1	No	95% UCL < Background
Copper	7440-50-8	38	38	100%	3.3	80.8	694	203	14.9	14	31	49.6	Yes	[Maximum] > ESV
Iron	7439-89-6	38	38	100%	1490	8008	16300	8609	13920	NESV	---	---	No	pH > 5
Lead	7439-92-1	38	38	100%	2.1	14.9	116	34.4	9.9	11	14	10.5	Yes	[Maximum] > ESV
Manganese	7439-96-5	38	38	100%	10.7	86.3	226	111.2	341.5	220	1	1	No	95% UCL < Background
Mercury	7439-97-6	38	32	84%	0.015	0.134	1.4	0.349	0.031	0.013	32	107.7	Yes	[Maximum] > ESV
Nickel	7440-02-0	38	38	100%	4.3	14.4	53.9	19	12.2	38	1	1.4	Yes	[Maximum] > ESV
Selenium	7782-49-2	38	7	18%	0.4	0.8	1.3	0.6	0.1	0.52	6	2.5	Yes	[Maximum] > ESV
Silver	7440-22-4	38	3	8%	1.7	9.8	23.5	---	0.3	2.6	2	9	Yes	[Maximum] > ESV
Thallium	7440-28-0	38	1	3%	0.2	0.2	0.2	---	0.1	0.05	1	4	No	< 5% Detected
Vanadium	7440-62-2	38	38	100%	2.3	10.8	55.7	11.8	14.9	4.7	30	11.9	No	95% UCL < Background
Zinc	7440-66-6	38	38	100%	13.1	81.1	351	115.6	41.9	46	22	7.6	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)														
Cyanide	57-12-5	38	33	87%	0.038	1.243	16.4	4.429	0.063	0.098	29	167.3	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)														
Calcium	7440-70-2	38	38	100%	5140	125544	313000	196766	6732	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	38	38	100%	2510	7420	16200	8877	8555	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	38	38	100%	194	678	1790	871	1095	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	38	31	82%	40.3	173.3	434	237	41.6	NESV	---	---	No	Essential Nutrient
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)														
Benzo(A)Pyrene	50-32-8	38	31	82%	0.018	0.446	4	0.821	0.008	62	0	<1	No	[Maximum] < ESV
Benzo(A)Anthracene	56-55-3	38	30	79%	0.04	0.2	0.75	0.25	0.01	0.73	1	1	Yes	[Maximum] > ESV
Total HMW PAHs - 1/2MDL	---	38	35	92%	0.163	2.997	19.635	4.502	0.075	1.1	23	17.9	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	38	35	92%	0.221	3.028	20.17	4.547	0.075	1.1	23	18.3	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	38	35	92%	0.105	2.967	19.1	4.457	0.075	1.1	23	17.4	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)														
3- And 4- Methylphenol (Total)	106445	32	1	3%	0.13	0.13	0.13	---	---	NESV	---	---	No	< 5% Detected
4-Chloroaniline	106-47-8	38	4	11%	0.019	0.735	1.9	---	0.001	1	1	1.9	Yes	[Maximum] > ESV
Benzaldehyde	100-52-7	38	1	3%	0.038	0.038	0.038	---	0.007	NESV	---	---	No	< 5% Detected
Bis(2-Ethylhexyl) Phthalate	117-81-7	38	5	13%	0.074	0.596	2.2	---	0.027	0.02	5	110	Yes	[Maximum] > ESV
Di-N-Butyl Phthalate	84-74-2	38	6	16%	0.019	0.037	0.058	---	0.011	0.011	6	5.3	Yes	[Maximum] > ESV
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)														
Cyclohexane	110-82-7	17	7	41%	0.00066	0.00179	0.0046	---	---	NESV	---	---	Yes	No ESV Available
Methyl Acetate	79-20-9	17	3	18%	0.0043	0.0071	0.0089	---	---	NESV	---	---	Yes	No ESV Available
Methylcyclohexane	108-87-2	17	9	53%	0.00027	0.00229	0.0081	---	---	NESV	---	---	Yes	No ESV Available
M,P-Xylene	179601-23-1	17	11	65%	0.00025	0.00098	0.0033	---	---	NESV	---	---	Yes	No ESV Available
O-Xylene (1,2-Dimethylbenzene)	95-47-6	17	7	41%	0.00011	0.00043	0.0011	---	---	NESV	---	---	Yes	No ESV Available

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List

EHS Support

Table E-13
Refined Ecological Screening for Bulk Sediment (0-0.5 feet)
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Sediment Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)														
Barium	7440-39-3	26	26	100%	52.3	552.2	972	640.1	141.7	NESV	---	---	Yes	No ESV Available
Beryllium	7440-41-7	26	17	65%	0.16	0.45	0.79	0.42	0.49	NESV	---	---	No	95% UCL < Background
Cadmium	7440-43-9	26	3	12%	0.95	1.52	2.5	---	0.17	0.99	2	2.5	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	12	12	100%	0.07	0.29	0.88	0.42	---	NESV	---	---	No	See Text
Chromium, Trivalent	16065-83-1	12	12	100%	2.53	10.47	31.92	15.44	---	NESV	---	---	No	See Text
Copper	7440-50-8	26	26	100%	9	87	694	203	15	31.6	17	22	Yes	[Maximum] > ESV
Lead	7439-92-1	26	26	100%	3.4	16.1	116	34.4	9.9	35.8	1	3.2	Yes	[Maximum] > ESV
Mercury	7439-97-6	26	22	85%	0.016	0.135	1.4	0.349	0.031	0.18	3	7.8	Yes	[Maximum] > ESV
Nickel	7440-02-0	26	26	100%	4.4	15.9	53.9	19	12.2	22.7	3	2.4	Yes	[Maximum] > ESV
Silver	7440-22-4	26	2	8%	1.7	12.6	23.5	---	0.3	0.5	2	47	Yes	[Maximum] > ESV
Thallium	7440-28-0	26	1	4%	0.2	0.2	0.2	---	0.1	NESV	---	---	No	< 5% Detected
Vanadium	7440-62-2	26	26	100%	2.3	9.9	26.2	11.8	14.9	NESV	---	---	No	95% UCL < Background
Zinc	7440-66-6	26	26	100%	16.3	89.3	351	115.6	41.9	121	6	2.9	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)														
Cyanide	57-12-5	26	22	85%	0.12	1.72	16.4	4.43	0.06	0.1	22	164	Yes	[Maximum] > ESV
Cyanide (Free)	STL00131	2	1	50%	0.89	0.89	0.89	---	---	NESV	---	---	Yes	No ESV Available
Essential Nutrients (mg/kg)														
Calcium	7440-70-2	26	26	100%	8540	164548	313000	196766	6732	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	26	26	100%	2510	7771	16200	8877	8555	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	26	26	100%	228	740	1790	871	1095	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	26	22	85%	54.3	204.7	434	237	41.6	NESV	---	---	No	Essential Nutrient
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)														
Acenaphthene	83-32-9	26	3	12%	0.01	0.01	0.02	---	---	NESV	---	---	Yes	No ESV Available
Anthracene	120-12-7	26	5	19%	0.021	0.041	0.096	0.036	0.002	NESV	---	---	Yes	No ESV Available
Fluoranthene	206-44-0	26	25	96%	0.053	0.359	1.3	0.617	0.013	NESV	---	---	Yes	No ESV Available
Fluorene	86-73-7	26	2	8%	0.0087	0.0143	0.02	---	0.0015	NESV	---	---	Yes	No ESV Available
Phenanthrene	85-01-8	26	25	96%	0.037	0.155	0.55	0.201	0.009	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - 1/2MDL	---	26	25	96%	0.1434	0.6243	2.485	1.0862	0.0309	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - MDL	---	26	25	96%	0.1868	0.7218	3.12	1.2748	0.0309	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - Zero	---	26	25	96%	0.1	0.5	1.9	0.7	---	NESV	---	---	Yes	No ESV Available
Benzo(A)Pyrene	50-32-8	26	23	88%	0.059	0.401	2.8	0.821	0.008	NESV	---	---	Yes	No ESV Available
Benzo(A)Anthracene	56-55-3	26	24	92%	0.042	0.196	0.57	0.246	0.006	NESV	---	---	Yes	No ESV Available
Benzo(G,H,I)Perylene	191-24-2	26	24	92%	0.045	0.48	2.7	0.726	0.012	NESV	---	---	Yes	No ESV Available
Benzo(K)Fluoranthene	207-08-9	26	24	92%	0.022	0.171	0.64	0.234	0.005	NESV	---	---	Yes	No ESV Available
Chrysene	218-01-9	26	25	96%	0.067	0.455	2.6	0.912	0.011	NESV	---	---	Yes	No ESV Available
Dibenz(A,H)Anthracene	53-70-3	26	16	62%	0.035	0.097	0.28	0.132	0.001	NESV	---	---	Yes	No ESV Available
Indeno(1,2,3-C,D)Pyrene	193-39-5	26	24	92%	0.06	0.49	3.1	0.98	0.01	NESV	---	---	Yes	No ESV Available
Pyrene	129-00-0	26	24	92%	0.058	0.314	1.3	0.516	0.01	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - 1/2MDL	---	26	25	96%	0.4095	3.1973	19.635	4.5016	0.0753	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - MDL	---	26	25	96%	0.428	3.229	20.17	4.547	0.075	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - Zero	---	26	25	96%	0.391	3.166	19.1	4.457	0.075	NESV	---	---	Yes	No ESV Available
Total PAHs - 1/2MDL	---	26	25	96%	0.4589	3.1138	15.455	4.2413	0.0909	NESV	---	---	Yes	No ESV Available
Total PAHs - MDL	---	26	25	96%	0.5208	3.2308	16.56	4.3937	0.0909	NESV	---	---	Yes	No ESV Available
Total PAHs - Zero	---	26	25	96%	0.397	2.997	14.35	4.091	0.091	NESV	---	---	Yes	No ESV Available

Table E-13
Refined Ecological Screening for Bulk Sediment (0-0.5 feet)
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Sediment Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)														
3- And 4- Methylphenol (Total)	106445	20	1	5%	0.13	0.13	0.13	---	---	0.67	0	<1	No	[Maximum] < ESV
4-Chloroaniline	106-47-8	26	2	8%	0.13	1.01	1.9	---	---	0.146	1	13	Yes	[Maximum] > ESV
Benzaldehyde	100-52-7	26	1	4%	0.038	0.038	0.038	---	0.007	NESV	---	---	No	< 5% Detected
Bis(2-Ethylhexyl) Phthalate	117-81-7	26	2	8%	0.074	0.297	0.52	---	0.027	8012.133962	0	<1	No	[Maximum] < ESV
Carbazole	86-74-8	26	18	69%	0.016	0.113	0.97	0.244	0.003	NESV	---	---	Yes	No ESV Available
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)														
Acetone	67-64-1	5	5	100%	0.075	0.167	0.29	0.241	---	26.367	0	<1	No	[Maximum] < ESV
Carbon Disulfide	75-15-0	5	5	100%	0.0013	0.0051	0.011	0.0086	---	0.82467	0	<1	No	[Maximum] < ESV
Cyclohexane	110-82-7	5	2	40%	0.00093	0.00276	0.0046	---	---	NESV	---	---	Yes	No ESV Available
Methyl Ethyl Ketone (2-Butanone)	78-93-3	5	5	100%	0.013	0.038	0.08	0.065	---	26.741	0	<1	No	[Maximum] < ESV
Methylcyclohexane	108-87-2	5	2	40%	0.0014	0.0047	0.0081	---	---	NESV	---	---	Yes	No ESV Available

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List

Table E-14
Refined Ecological Screening for Surface Water
Southern Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Surface Water Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (µg/L)															
Aluminum	7429-90-5	U	26	22	85%	15.3	1760.6	24500	6017.9	108.8	85	5	288.2	Yes	[Maximum] > ESV
Aluminum	7429-90-5	F	17	9	53%	42.6	482.7	2360	907.1	7.9	87	6	27.1	Yes	[Maximum] > ESV
Barium	7440-39-3	U	26	26	100%	156	371	2710	788	93	4	26	677.5	Yes	[Maximum] > ESV
Barium	7440-39-3	F	17	17	100%	119	259	527	314	86	4	17	131.8	Yes	[Maximum] > ESV
Copper	7440-50-8	U	26	19	73%	1.6	19.5	183	46.9	1.1	16.3	4	11.2	Yes	[Maximum] > ESV
Copper	7440-50-8	F	17	7	41%	1.9	8.1	33.4	12.7	1	2.87	1	11.6	Yes	[Maximum] > ESV
Iron	7439-89-6	U	26	23	88%	43.1	1606	22500	5191.7	126.5	1000	4	22.5	Yes	[Maximum] > ESV
Iron	7439-89-6	F	17	10	59%	55.3	354	1430	640.1	22.9	158	3	9.1	Yes	[Maximum] > ESV
Manganese	7439-96-5	U	26	23	88%	3.2	41.2	337	88.7	5.9	120	3	2.8	Yes	[Maximum] > ESV
Vanadium	7440-62-2	U	26	8	31%	1.6	5.3	24.8	6.6	0.6	NESV	---	---	Yes	No ESV Available
Other Inorganic Parameters (µg/L unless otherwise noted)															
Cyanide	57-12-5	U	26	15	58%	3	26	139	43	1	5.2	11	26.7	Yes	[Maximum] > ESV
Cyanide	57-12-5	F	5	3	60%	5.3	44.1	68.2	---	---	5.2	3	13.1	Yes	[Maximum] > ESV
Cyanide (Free)	FREE CN	U	16	13	81%	1.8	4.4	10	5.6	0.9	5.2	4	1.9	Yes	[Maximum] > ESV
Nitrogen, Ammonia (As N)	7664-41-7	U	26	17	65%	53	740	8550	1943	72	635	1	13.5	Yes	[Maximum] > ESV
Polycyclic Aromatic Hydrocarbons (PAHs) (µg/L)															
Indeno(1,2,3-C,D)Pyrene	193-39-5	U	5	1	20%	0.28	0.28	0.28	---	0.04	0.275	1	1	Yes	[Maximum] > ESV

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
[Maximum]: Maximum concentration
NESV: No Ecological Screening Value
MDL: Method Detection Limit
SW: Surface Water
TAL: Target Analyte List
U: Unfiltered
µg/L; microgram per liter
F: Filtered

Table E-15
Refined Ecological Screening for Bulk Soil (0-2 feet)
Cedar Creek Reservoir Overflow Ditch Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Soil Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)														
Aluminum	7429-90-5	8	8	100%	14700	17950	22700	19985	10794	NESV	---	---	No	pH > 5.5
Arsenic	7440-38-2	8	8	100%	4.1	5.9	7.8	6.8	3.9	6.8	2	1.1	Yes	[Maximum] > ESV
Barium	7440-39-3	8	8	100%	148	240	295	274	155	110	8	2.7	Yes	[Maximum] > ESV
Chromium, Hexavalent	18540-29-9	3	3	100%	0.3	0.33	0.38	---	---	0.34	1	1.1	No	See Text
Cobalt	7440-48-4	8	8	100%	5.8	7.6	9	8.3	5.8	13	0	<1	No	[Maximum] < ESV
Copper	7440-50-8	8	8	100%	18.6	22	27.8	24.1	11.6	14	8	2	Yes	[Maximum] > ESV
Iron	7439-89-6	8	8	100%	14100	17313	20000	18632	13150	NESV	---	---	No	pH > 5
Lead	7439-92-1	8	8	100%	13	15	19	17	10	11	8	1.7	Yes	[Maximum] > ESV
Manganese	7439-96-5	8	8	100%	517	1070	1640	1349	465	220	8	7.5	Yes	[Maximum] > ESV
Nickel	7440-02-0	8	8	100%	16	26	44	32	11	38	1	1.2	Yes	[Maximum] > ESV
Selenium	7782-49-2	8	6	75%	0.34	0.64	1.4	0.79	0.13	0.52	4	2.7	Yes	[Maximum] > ESV
Vanadium	7440-62-2	8	8	100%	11.1	13.2	18	14.9	11.2	4.7	8	3.8	Yes	[Maximum] > ESV
Zinc	7440-66-6	8	8	100%	59	92	129	110	48	46	8	2.8	Yes	[Maximum] > ESV
Other Inorganic Parameters (mg/kg unless otherwise noted)														
Cyanide	57-12-5	8	8	100%	0.12	0.53	1.5	0.83	0.14	0.098	8	15.3	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)														
Calcium	7440-70-2	8	8	100%	8370	19034	30100	24617	3741	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	8	8	100%	8110	10608	12200	11615	7003	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	8	8	100%	872	1215	1700	1400	1540	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	8	5	63%	60	105	171	116	33	NESV	---	---	No	Essential Nutrient
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)														
Benzo(A)Anthracene	56-55-3	8	8	100%	0.093	0.564	1	0.781	0.011	0.73	3	1.4	Yes	[Maximum] > ESV
Total HMW PAHs - 1/2MDL	---	8	8	100%	0.9595	6.1449	10.28	8.5018	0.1591	1.1	6	9.3	Yes	[Maximum] > ESV
Total HMW PAHs - MDL	---	8	8	100%	0.975	6.148	10.28	8.501	0.159	1.1	6	9.3	Yes	[Maximum] > ESV
Total HMW PAHs - Zero	---	8	8	100%	0.944	6.142	10.28	8.502	0.159	1.1	6	9.3	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)														
Benzaldehyde	100-52-7	8	2	25%	0.056	0.062	0.069	---	0.024	NESV	---	---	Yes	No ESV Available
Bis(2-Ethylhexyl) Phthalate	117-81-7	8	1	13%	0.045	0.045	0.045	---	0.033	0.02	1	2.3	Yes	[Maximum] > ESV
Di-N-Butyl Phthalate	84-74-2	8	1	13%	0.039	0.039	0.039	---	0.01	0.011	1	3.5	Yes	[Maximum] > ESV

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List

Table E-16
Refined Ecological Screening for Bulk Sediment (0-0.5 feet)
Cedar Creek Reservoir Overflow Ditch Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Sediment Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)														
Barium	7440-39-3	8	8	100%	148	240	295	274	99	NESV	---	---	Yes	No ESV Available
Beryllium	7440-41-7	8	8	100%	0.46	0.75	1	0.87	0.53	NESV	---	---	Yes	No ESV Available
Chromium, Hexavalent	18540-29-9	3	3	100%	0.3	0.3	0.4	---	---	NESV	---	---	No	See Text
Chromium, Trivalent	16065-83-1	3	3	100%	10.8	11.9	13.7	---	---	NESV	---	---	No	See Text
Manganese	7439-96-5	8	8	100%	517	1070	1640	1349	322	460	8	3.6	Yes	[Maximum] > ESV
Nickel	7440-02-0	8	8	100%	16	26	44	32	12	22.7	5	1.9	Yes	[Maximum] > ESV
Vanadium	7440-62-2	8	8	100%	11.1	13.2	18	14.9	9.6	NESV	---	---	Yes	No ESV Available
Other Inorganic Parameters (mg/kg unless otherwise noted)														
Zinc	7440-66-6	8	8	100%	59	92	129	110	49	121	2	1.1	Yes	[Maximum] > ESV
Cyanide	57-12-5	8	8	100%	0.12	0.53	1.5	0.83	0.07	0.1	8	15	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)														
Calcium	7440-70-2	8	8	100%	8370	19034	30100	24617	9774	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	8	8	100%	8110	10608	12200	11615	12517	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	8	8	100%	872	1215	1700	1400	732	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	8	5	63%	60	105	171	116	30	NESV	---	---	No	Essential Nutrient
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)														
Acenaphthene	83-32-9	8	6	75%	0.034	0.055	0.075	0.061	0.003	NESV	---	---	Yes	No ESV Available
Anthracene	120-12-7	8	6	75%	0.066	0.107	0.14	0.118	0.003	NESV	---	---	Yes	No ESV Available
Fluoranthene	206-44-0	8	8	100%	0.13	0.93	1.8	1.3	---	NESV	---	---	Yes	No ESV Available
Fluorene	86-73-7	8	6	75%	0.022	0.035	0.053	0.039	0.002	NESV	---	---	Yes	No ESV Available
Naphthalene	91-20-3	8	6	75%	0.013	0.023	0.045	0.028	0.002	NESV	---	---	Yes	No ESV Available
Phenanthrene	85-01-8	8	8	100%	0.065	0.475	0.81	0.659	0.003	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - 1/2MDL	---	8	8	100%	0.23745	1.59287	2.89995	2.20764	0.03493	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - MDL	---	8	8	100%	0.2799	1.6119	2.9031	2.2132	0.0349	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - Zero	---	8	8	100%	0.195	1.574	2.897	2.202	0.035	NESV	---	---	Yes	No ESV Available
Benzo(A)Pyrene	50-32-8	8	8	100%	0.11	0.75	1.4	1.05	---	NESV	---	---	Yes	No ESV Available
Benzo(A)Anthracene	56-55-3	8	8	100%	0.093	0.564	1	0.781	0.002	NESV	---	---	Yes	No ESV Available
Benzo(G,H,I)Perylene	191-24-2	8	8	100%	0.11	0.74	1.3	1.05	---	NESV	---	---	Yes	No ESV Available
Benzo(K)Fluoranthene	207-08-9	8	8	100%	0.051	0.384	0.75	0.538	0.003	NESV	---	---	Yes	No ESV Available
Chrysene	218-01-9	8	8	100%	0.13	0.81	1.4	1.12	---	NESV	---	---	Yes	No ESV Available
Dibenz(A,H)Anthracene	53-70-3	8	6	75%	0.14	0.21	0.28	0.23	---	NESV	---	---	Yes	No ESV Available
Indeno(1,2,3-C,D)Pyrene	193-39-5	8	8	100%	0.11	0.69	1.3	0.97	---	NESV	---	---	Yes	No ESV Available
Pyrene	129-00-0	8	8	100%	0.13	0.97	1.5	1.34	---	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - 1/2MDL	---	8	8	100%	0.9595	6.1449	10.28	8.5018	0.0205	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - MDL	---	8	8	100%	0.975	6.148	10.28	8.501	0.02	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - Zero	---	8	8	100%	0.944	6.142	10.28	8.502	0.02	NESV	---	---	Yes	No ESV Available
Total PAHs - 1/2MDL	---	8	8	100%	1.0335	6.6549	11.4711	9.1962	0.0349	NESV	---	---	Yes	No ESV Available
Total PAHs - MDL	---	8	8	100%	1.106	6.674	11.474	9.199	0.035	NESV	---	---	Yes	No ESV Available
Total PAHs - Zero	---	8	8	100%	0.961	6.636	11.468	9.193	0.035	NESV	---	---	Yes	No ESV Available
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)														
Acetophenone	98-86-2	8	1	13%	0.011	0.011	0.011	---	0.003	NESV	---	---	Yes	No ESV Available
Benzaldehyde	100-52-7	8	2	25%	0.056	0.062	0.069	---	0.006	NESV	---	---	Yes	No ESV Available
Carbazole	86-74-8	8	8	100%	0.011	0.095	0.18	0.133	0.002	NESV	---	---	Yes	No ESV Available

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List

Table E-17
Refined Ecological Screening for Surface Water
Cedar Creek Overflow Ditch Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Surface Water Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (µg/L)															
Aluminum	7429-90-5	U	27	20	74%	16.7	133.6	1610	369.2	17.8	47	2	34.3	Yes	[Maximum] > ESV
Barium	7440-39-3	U	27	27	100%	63.4	90.8	209	101.4	53.3	4	27	52.3	Yes	[Maximum] > ESV
Barium	7440-39-3	F	16	16	100%	69.9	91	218	106.5	53.5	4	16	54.5	Yes	[Maximum] > ESV
Iron	7439-89-6	U	27	5	19%	49.3	696.3	2910	688.2	34.2	1000	1	2.9	Yes	[Maximum] > ESV
Manganese	7439-96-5	U	27	26	96%	3	150	3750	749	2	120	1	31.3	Yes	[Maximum] > ESV
Vanadium	7440-62-2	U	27	6	22%	1.9	2.1	2.2	1.5	0.6	NESV	---	---	Yes	No ESV Available
Other Inorganic Parameters (µg/L unless otherwise noted)															
Cyanide (Free)	FREE CN	U	11	3	27%	1.6	3.3	5.8	---	0.8	5.2	1	1.1	Yes	[Maximum] > ESV

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
[Maximum]: Maximum concentration
NESV: No Ecological Screening Value
MDL: Method Detection Limit
SW: Surface Water
TAL: Target Analyte List
U: Unfiltered
µg/L: micrograms per liter
F: Filtered

Table E-18
Refined Ecological Screening for Bulk Soil (0-0.5 feet)
Northern Surface Water Feature Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Soil Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)														
Aluminum	7429-90-5	12	12	100%	12100	20617	35400	25796	10794	NESV	---	---	No	pH > 5.5
Arsenic	7440-38-2	12	12	100%	3.2	7.4	14.5	9.3	3.9	6.8	6	2.1	Yes	[Maximum] > ESV
Barium	7440-39-3	12	12	100%	136	448	905	586	155	110	12	8.2	Yes	[Maximum] > ESV
Beryllium	7440-41-7	12	10	83%	0.32	0.67	1.1	0.76	0.51	2.5	0	<1	No	[Maximum] < ESV
Cobalt	7440-48-4	12	12	100%	1.9	4.8	6.6	5.6	5.8	13	0	<1	No	95% UCL < Background
Copper	7440-50-8	12	12	100%	10.1	20.4	42.5	26.1	11.6	14	6	3	Yes	[Maximum] > ESV
Iron	7439-89-6	12	12	100%	7770	14242	25200	16716	13150	NESV	---	---	No	pH > 5
Lead	7439-92-1	12	12	100%	6.1	11.6	17.6	13.5	10.4	11	7	1.6	Yes	[Maximum] > ESV
Manganese	7439-96-5	12	12	100%	34.1	317.6	988	479.9	464.9	220	6	4.5	Yes	[Maximum] > ESV
Nickel	7440-02-0	12	12	100%	6	11	15	12	11	38	0	<1	No	[Maximum] < ESV
Selenium	7782-49-2	12	4	33%	0.57	2.07	4.4	1.62	0.13	0.52	4	8.5	Yes	[Maximum] > ESV
Vanadium	7440-62-2	12	12	100%	7.9	11.6	17.2	12.9	11.2	4.7	12	3.7	Yes	[Maximum] > ESV
Zinc	7440-66-6	12	12	100%	16	36	65	43	48	46	2	1.4	No	95% UCL < Background
Other Inorganic Parameters (mg/kg unless otherwise noted)														
Cyanide	57-12-5	12	7	58%	0.11	0.41	0.84	0.41	0.14	0.098	7	8.6	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)														
Calcium	7440-70-2	12	12	100%	2500	8153	17800	10678	3741	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	12	12	100%	2570	6329	13800	8109	7003	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	12	12	100%	452	908	1200	1048	1540	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	12	11	92%	51	368	844	470	33	NESV	---	---	No	Essential Nutrient
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)														
Benzaldehyde	100-52-7	12	2	17%	0.039	0.069	0.1	---	0.024	NESV	---	---	Yes	No ESV Available

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List

Table E-19
Refined Ecological Screening for Bulk Sediment (0-0.5 feet)
Northern Surface Water Feature Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Sediment Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)														
Aluminum	7429-90-5	12	12	100%	12100	20617	35400	25796	10794	26000	3	1.4	No	pH > 5.5
Arsenic	7440-38-2	12	12	100%	3.2	7.4	14.5	9.3	3.9	9.79	3	1.5	Yes	[Maximum] > ESV
Barium	7440-39-3	12	12	100%	136	448	905	586	155	NESV	---	---	Yes	No ESV Available
Beryllium	7440-41-7	12	10	83%	0.32	0.67	1.1	0.76	0.51	NESV	---	---	Yes	No ESV Available
Copper	7440-50-8	12	12	100%	10.1	20.4	42.5	26.1	11.6	31.6	3	1.3	Yes	[Maximum] > ESV
Iron	7439-89-6	12	12	100%	7770	14242	25200	16716	13150	20000	2	1.3	No	pH > 5
Manganese	7439-96-5	12	12	100%	34.1	317.6	988	479.9	464.9	460	3	2.1	Yes	[Maximum] > ESV
Selenium	7782-49-2	12	4	33%	0.57	2.07	4.4	1.62	0.13	2	2	2.2	Yes	[Maximum] > ESV
Vanadium	7440-62-2	12	12	100%	7.9	11.6	17.2	12.9	11.2	NESV	---	---	Yes	No ESV Available
Other Inorganic Parameters (mg/kg unless otherwise noted)														
Cyanide	57-12-5	12	7	58%	0.11	0.41	0.84	0.41	0.14	0.1	7	8.4	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)														
Calcium	7440-70-2	12	12	100%	2500	8153	17800	10678	3741	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	12	12	100%	2570	6329	13800	8109	7003	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	12	12	100%	452	908	1200	1048	1540	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	12	11	92%	51	368	844	470	33	NESV	---	---	No	Essential Nutrient
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)														
Anthracene	120-12-7	12	3	25%	0.0098	0.0116	0.013	---	0.002	NESV	---	---	Yes	No ESV Available
Fluoranthene	206-44-0	12	11	92%	0.013	0.074	0.15	0.093	0.023	NESV	---	---	Yes	No ESV Available
Phenanthrene	85-01-8	12	11	92%	0.0058	0.0412	0.085	0.0519	0.0117	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - 1/2MDL	---	12	11	92%	0.02475	0.14272	0.241	0.1853	0.04218	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - MDL	---	12	11	92%	0.0307	0.1666	0.29	0.214	0.0422	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - Zero	---	12	11	92%	0.0188	0.1188	0.2068	0.158	0.0422	NESV	---	---	Yes	No ESV Available
Benzo(A)Pyrene	50-32-8	12	11	92%	0.007	0.05	0.091	0.064	0.018	NESV	---	---	Yes	No ESV Available
Benzo(A)Anthracene	56-55-3	12	10	83%	0.0061	0.0413	0.074	0.0494	0.0111	NESV	---	---	Yes	No ESV Available
Benzo(G,H,I)Perylene	191-24-2	12	11	92%	0.0076	0.0518	0.1	0.065	0.0234	NESV	---	---	Yes	No ESV Available
Chrysene	218-01-9	12	11	92%	0.016	0.074	0.2	0.098	0.023	NESV	---	---	Yes	No ESV Available
Dibenz(A,H)Anthracene	53-70-3	12	7	58%	0.0066	0.0126	0.021	0.0131	0.0033	NESV	---	---	Yes	No ESV Available
Indeno(1,2,3-C,D)Pyrene	193-39-5	12	11	92%	0.0061	0.0413	0.093	0.0523	0.0183	NESV	---	---	Yes	No ESV Available
Pyrene	129-00-0	12	11	92%	0.011	0.065	0.12	0.081	0.018	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - 1/2MDL	---	12	11	92%	0.07365	0.4428	0.8145	0.59205	0.15913	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - MDL	---	12	11	92%	0.0746	0.4475	0.828	0.596	0.1591	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - Zero	---	12	11	92%	0.0727	0.4381	0.812	0.5883	0.1591	NESV	---	---	Yes	No ESV Available
Total PAHs - 1/2MDL	---	12	11	92%	0.0824	0.5024	0.8925	0.6641	0.1681	NESV	---	---	Yes	No ESV Available
Total PAHs - MDL	---	12	11	92%	0.0883	0.5273	0.956	0.6916	0.1681	NESV	---	---	Yes	No ESV Available
Total PAHs - Zero	---	12	11	92%	0.0765	0.4775	0.8588	0.6375	0.1681	NESV	---	---	Yes	No ESV Available
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)														
Acetophenone	98-86-2	12	1	8%	0.0093	0.0093	0.0093	---	0.0045	NESV	---	---	Yes	No ESV Available
Benzaldehyde	100-52-7	12	2	17%	0.039	0.069	0.1	---	0.024	NESV	---	---	Yes	No ESV Available
Carbazole	86-74-8	12	9	75%	0.0023	0.0127	0.023	0.0148	0.0031	NESV	---	---	Yes	No ESV Available
Phenol	108-95-2	12	1	8%	0.13	0.13	0.13	---	0.01	0.24402	0	<1	No	[Maximum] < ESV

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List

Table E-20
Refined Ecological Screening for Surface Water
Northern Surface Water Feature Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Surface Water Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (µg/L)															
Aluminum	7429-90-5	U	16	15	94%	16.1	517.8	5750	2712.6	17.8	57	3	100.9	Yes	[Maximum] > ESV
Barium	7440-39-3	U	16	16	100%	77.9	124.9	245	146.5	53.3	4	16	61.3	Yes	[Maximum] > ESV
Barium	7440-39-3	F	11	11	100%	83.5	121.3	229	147.2	53.5	4	11	57.3	Yes	[Maximum] > ESV
Copper	7440-50-8	U	16	2	13%	2.6	4.2	5.7	---	2.1	18.4	0	<1	No	[Maximum] < ESV
Iron	7439-89-6	U	16	8	50%	50.2	703.9	4760	1696.2	34.2	1000	1	4.8	Yes	[Maximum] > ESV
Manganese	7439-96-5	U	16	13	81%	3	26	127	52	2	120	1	1.1	Yes	[Maximum] > ESV
Selenium	7782-49-2	U	16	1	6%	1.5	1.5	1.5	---	0.3	5	0	<1	No	[Maximum] < ESV
Vanadium	7440-62-2	U	16	3	19%	2.1	2.7	3.9	---	0.6	NESV	---	---	Yes	No ESV Available
Other Inorganic Parameters (µg/L unless otherwise noted)															
Fluoride	16984-48-8	U	16	16	100%	166	215	301	228	44	3356	0	<1	No	[Maximum] < ESV
Fluoride	16984-48-8	F	1	1	100%	188	188	188	---	---	3685	0	<1	No	[Maximum] < ESV

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
[Maximum]: Maximum concentration
NESV: No Ecological Screening Value
MDL: Method Detection Limit
SW: Surface Water
TAL: Target Analyte List
U: Unfiltered
µg/L; microgram per liter
F: Filtered

Table E-21
Refined Ecological Screening for Bulk Sediment (0-0.5 feet)
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Sediment Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)														
Barium	7440-39-3	10	10	100%	83.9	135.7	208	160.9	55.1	NESV	---	---	Yes	No ESV Available
Beryllium	7440-41-7	10	10	100%	0.27	0.48	0.74	0.57	0.26	NESV	---	---	Yes	No ESV Available
Thallium	7440-28-0	10	1	10%	0.18	0.18	0.18	---	0.07	NESV	---	---	Yes	No ESV Available
Vanadium	7440-62-2	10	10	100%	11.8	16.3	24.2	18.6	10.8	NESV	---	---	Yes	No ESV Available
Other Inorganic Parameters (mg/kg unless otherwise noted)														
Cyanide	57-12-5	10	10	100%	0.27	0.81	1.7	1.05	0.04	0.1	10	17	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)														
Calcium	7440-70-2	10	10	100%	12400	20260	41600	26325	11739	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	10	10	100%	9740	12134	15000	13193	8657	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	10	10	100%	591	1033	1560	1240	353	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	10	10	100%	55.2	107.4	192	135.1	20.3	NESV	---	---	No	Essential Nutrient
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)														
Fluoranthene	206-44-0	10	10	100%	0.023	0.156	0.94	0.553	0.001	NESV	---	---	Yes	No ESV Available
Phenanthrene	85-01-8	10	8	80%	0.0083	0.0365	0.14	0.0936	0.0012	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - 1/2MDL	---	10	10	100%	0.04055	0.21884	1.12515	0.67742	0.01103	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - MDL	---	10	10	100%	0.0481	0.251	1.1703	0.7163	0.011	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - Zero	---	10	10	100%	0.024	0.187	1.08	0.641	0.011	NESV	---	---	Yes	No ESV Available
Benzo(A)Pyrene	50-32-8	10	8	80%	0.0089	0.0421	0.091	0.0549	0.0007	NESV	---	---	Yes	No ESV Available
Benzo(A)Anthracene	56-55-3	10	6	60%	0.011	0.034	0.074	0.053	0.001	NESV	---	---	Yes	No ESV Available
Benzo(G,H,I)Perylene	191-24-2	10	8	80%	0.011	0.041	0.084	0.053	0.001	NESV	---	---	Yes	No ESV Available
Chrysene	218-01-9	10	10	100%	0.019	0.12	0.5	0.284	0.001	NESV	---	---	Yes	No ESV Available
Dibenz(A,H)Anthracene	53-70-3	10	6	60%	0.0032	0.0198	0.05	0.0247	0.0005	NESV	---	---	Yes	No ESV Available
Indeno(1,2,3-C,D)Pyrene	193-39-5	10	8	80%	0.0095	0.0564	0.12	0.0766	0.0004	NESV	---	---	Yes	No ESV Available
Pyrene	129-00-0	10	10	100%	0.019	0.106	0.52	0.321	0.001	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - 1/2MDL	---	10	10	100%	0.1162	0.5195	1.6585	1.0534	0.0068	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - MDL	---	10	10	100%	0.1162	0.5434	1.685	1.061	0.0068	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - Zero	---	10	10	100%	0.088	0.496	1.632	1.079	0.007	NESV	---	---	Yes	No ESV Available
Total PAHs - 1/2MDL	---	10	10	100%	0.13445	0.62593	2.43905	1.32828	0.01103	NESV	---	---	Yes	No ESV Available
Total PAHs - MDL	---	10	10	100%	0.1407	0.6783	2.5061	1.3667	0.011	NESV	---	---	Yes	No ESV Available
Total PAHs - Zero	---	10	10	100%	0.071	0.574	2.372	1.366	0.011	NESV	---	---	Yes	No ESV Available
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)														
Acetophenone	98-86-2	9	1	11%	0.0085	0.0085	0.0085	---	0.0006	NESV	---	---	Yes	No ESV Available
Benzaldehyde	100-52-7	9	3	33%	0.019	0.042	0.062	---	0.002	NESV	---	---	Yes	No ESV Available
Carbazole	86-74-8	9	5	56%	0.0031	0.0255	0.07	0.0319	0.0005	NESV	---	---	Yes	No ESV Available
Phenol	108-95-2	9	1	11%	0.043	0.043	0.043	---	0.003	0.09618	0	<1	No	[Maximum] < ESV
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)														
Acetone	67-64-1	5	5	100%	0.023	0.032	0.04	0.039	---	3.2289	0	<1	No	[Maximum] < ESV
Carbon Disulfide	75-15-0	5	5	100%	0.00076	0.00163	0.0026	0.00236	---	0.100989	0	<1	No	[Maximum] < ESV
Cyclohexane	110-82-7	5	5	100%	0.0014	0.0023	0.0032	0.0031	---	NESV	---	---	Yes	No ESV Available
Methylcyclohexane	108-87-2	5	5	100%	0.0028	0.0042	0.006	0.0054	---	NESV	---	---	Yes	No ESV Available

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List

Table E-22
Refined Ecological Screening for Surface Water
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Surface Water Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (µg/L)															
Aluminum	7429-90-5	U	15	15	100%	53.1	3591.6	32000	25297	108.8	370	6	86.5	Yes	[Maximum] > ESV
Aluminum	7429-90-5	F	15	11	73%	26.1	248	614	291.8	7.9	87	6	7.1	Yes	[Maximum] > ESV
Barium	7440-39-3	U	15	15	100%	122	328	1230	627	93	4	15	307.5	Yes	[Maximum] > ESV
Barium	7440-39-3	F	15	15	100%	117	231	401	267	86	4	15	100.3	Yes	[Maximum] > ESV
Beryllium	7440-41-7	U	15	3	20%	0.27	0.96	2	---	0.13	0.66	1	3	Yes	[Maximum] > ESV
Copper	7440-50-8	U	15	12	80%	2.1	12.3	67.7	29.8	1.1	17.475	2	3.9	Yes	[Maximum] > ESV
Iron	7439-89-6	U	15	15	100%	196	7172	52100	17093	126	1000	9	52.1	Yes	[Maximum] > ESV
Iron	7439-89-6	F	15	15	100%	48.7	1372.4	10200	8107.9	22.9	158	9	64.6	Yes	[Maximum] > ESV
Lead	7439-92-1	U	15	11	73%	0.37	5.6	38.5	20.6	0.19	5.604	2	6.9	Yes	[Maximum] > ESV
Manganese	7439-96-5	U	15	15	100%	6.1	678.9	2570	1404.2	5.9	120	12	21.4	Yes	[Maximum] > ESV
Manganese	7439-96-5	F	15	15	100%	4.2	509.1	2420	1121.5	2.1	1100	3	2.2	Yes	[Maximum] > ESV
Vanadium	7440-62-2	U	15	4	27%	1.8	18.4	46.8	12	0.6	NESV	---	---	Yes	No ESV Available
Other Inorganic Parameters (µg/L unless otherwise noted)															
Cyanide	57-12-5	U	15	15	100%	5.1	169	630	334.9	1	5.2	14	121.2	Yes	[Maximum] > ESV
Cyanide	57-12-5	F	5	5	100%	9.9	95.4	245	183.9	---	5.2	5	47.1	Yes	[Maximum] > ESV
Cyanide (Free)	FREE CN	U	15	14	93%	3.4	28.9	140	61.4	0.9	5.2	9	26.9	Yes	[Maximum] > ESV
Cyanide (Free)	FREE CN	F	5	5	100%	1.8	19.4	63.5	44.9	---	5.2	2	12.2	Yes	[Maximum] > ESV
Polycyclic Aromatic Hydrocarbons (PAHs) (µg/L)															
Pyrene	129-00-0	U	6	3	50%	0.19	1.13	1.8	---	0.03	0.025	3	72	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (µg/L)															
3- And 4- Methylphenol (Total)	MEPH3MEPH4	U	5	1	20%	7.5	7.5	7.5	---	---	NESV	---	---	Yes	No ESV Available
Benzaldehyde	100-52-7	U	6	1	17%	2.3	2.3	2.3	---	0.1	NESV	---	---	Yes	No ESV Available
Caprolactam	105-60-2	U	6	1	17%	0.97	0.97	0.97	---	1.14	NESV	---	---	Yes	No ESV Available
Carbazole	86-74-8	U	6	2	33%	1.9	2.4	2.9	---	0	NESV	---	---	Yes	No ESV Available

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
[Maximum]: Maximum concentration
NESV: No Ecological Screening Value
MDL: Method Detection Limit
SW: Surface Water
TAL: Target Analyte List
TCL: Target Compound List
U: Unfiltered
µg/L: microgram per liter
F: Filtered

Table E-23
Refined Ecological Screening for Bulk Sediment (0-0.5 feet)
Flathead River Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Sediment Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)														
Barium	7440-39-3	32	32	100%	38	89	151	100	55	NESV	---	---	Yes	No ESV Available
Beryllium	7440-41-7	32	31	97%	0.22	0.39	0.57	0.42	0.26	NESV	---	---	Yes	No ESV Available
Vanadium	7440-62-2	32	32	100%	7.5	14.3	25.5	15.6	10.8	NESV	---	---	Yes	No ESV Available
Other Inorganic Parameters (mg/kg unless otherwise noted)														
Cyanide	57-12-5	32	17	53%	0.067	1.601	8.3	1.686	0.038	0.1	15	83	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)														
Calcium	7440-70-2	32	32	100%	7390	15866	31400	17596	11739	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	32	32	100%	7010	9819	12100	10161	8657	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	32	32	100%	279	669	1160	736	353	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	32	15	47%	39.9	94.6	198	74.3	20.3	NESV	---	---	No	Essential Nutrient
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)														
Acenaphthene	83-32-9	32	5	16%	0.0011	0.0123	0.033	0.0054	0.0006	NESV	---	---	Yes	No ESV Available
Anthracene	120-12-7	32	9	28%	0.0012	0.0474	0.16	0.0365	0.0006	NESV	---	---	Yes	No ESV Available
Fluoranthene	206-44-0	32	22	69%	0.0011	0.7677	6.5	1.3831	0.0014	NESV	---	---	Yes	No ESV Available
Fluorene	86-73-7	32	1	3%	0.03	0.03	0.03	---	---	NESV	---	---	No	< 5% Detected
Naphthalene	91-20-3	32	2	6%	0.016	0.018	0.019	---	---	NESV	---	---	Yes	No ESV Available
Phenanthrene	85-01-8	32	21	66%	0.0019	0.121	1	0.2391	0.0012	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - 1/2MDL	---	32	22	69%	0.00594	0.93726	7.755	1.99786	0.01103	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - MDL	---	32	22	69%	0.00888	0.96611	7.768	2.00558	0.01103	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - Zero	---	32	22	69%	0.003	0.908	7.742	2.011	0.011	NESV	---	---	Yes	No ESV Available
Benzo(A)Pyrene	50-32-8	32	14	44%	0.0014	0.1718	0.87	0.1945	0.0007	NESV	---	---	Yes	No ESV Available
Benzo(A)Anthracene	56-55-3	32	17	53%	0.00095	0.3119	2.1	0.45553	0.00079	NESV	---	---	Yes	No ESV Available
Benzo(G,H,I)Perylene	191-24-2	32	18	56%	0.00098	0.18175	1.2	0.2589	0.00071	NESV	---	---	Yes	No ESV Available
Benzo(K)Fluoranthene	207-08-9	32	17	53%	0.0015	0.312	1.9	0.4186	0.0007	NESV	---	---	Yes	No ESV Available
Chrysene	218-01-9	32	22	69%	0.0013	0.7077	4.9	1.2073	0.0009	NESV	---	---	Yes	No ESV Available
Dibenz(A,H)Anthracene	53-70-3	32	9	28%	0.0013	0.1098	0.41	0.088	0.0005	NESV	---	---	Yes	No ESV Available
Indeno(1,2,3-C,D)Pyrene	193-39-5	32	17	53%	0.00098	0.2136	1.5	0.30338	0.00045	NESV	---	---	Yes	No ESV Available
Pyrene	129-00-0	32	21	66%	0.0014	0.7137	6.8	1.3647	0.0011	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - 1/2MDL	---	32	22	69%	0.00709	2.86264	23.18	6.45656	0.00676	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - MDL	---	32	22	69%	0.0096	2.8772	23.18	6.3983	0.0068	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - Zero	---	32	22	69%	0.00458	2.84811	23.18	6.55334	0.00676	NESV	---	---	Yes	No ESV Available
Total PAHs - 1/2MDL	---	32	22	69%	0.01133	3.28688	26.829	7.27345	0.01103	NESV	---	---	Yes	No ESV Available
Total PAHs - MDL	---	32	22	69%	0.01628	3.32628	26.836	7.22361	0.01103	NESV	---	---	Yes	No ESV Available
Total PAHs - Zero	---	32	22	69%	0.00638	3.24747	26.822	7.3757	0.01103	NESV	---	---	Yes	No ESV Available
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)														
3- And 4- Methylphenol (Total)	106445	15	4	27%	0.024	0.192	0.49	0.126	---	0.67	0	<1	No	[Maximum] < ESV
Benzaldehyde	100-52-7	27	2	7%	0.0098	0.0474	0.085	---	0.0018	NESV	---	---	Yes	No ESV Available
Bis(2-Ethylhexyl) Phthalate	117-81-7	27	3	11%	0.018	0.103	0.26	---	0.012	20.455	0	<1	No	[Maximum] < ESV
Carbazole	86-74-8	27	6	22%	0.0028	0.1198	0.36	0.1062	0.0005	NESV	---	---	Yes	No ESV Available
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)														
Acetone	67-64-1	6	6	100%	0.018	0.045	0.089	0.068	---	6.923	0	<1	No	[Maximum] < ESV
Carbon Disulfide	75-15-0	6	6	100%	0.00045	0.00417	0.014	0.00833	---	0.216	0	<1	No	[Maximum] < ESV
Cyclohexane	110-82-7	6	6	100%	0.0013	0.0025	0.0039	0.0034	---	NESV	---	---	Yes	No ESV Available
Methyl Acetate	79-20-9	6	1	17%	0.11	0.11	0.11	---	---	NESV	---	---	Yes	No ESV Available
Methylcyclohexane	108-87-2	6	6	100%	0.0023	0.0049	0.0085	0.0067	---	NESV	---	---	Yes	No ESV Available

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List

Table E-24
Refined Ecological Screening for Surface Water
Flathead River Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Surface Water Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (µg/L)															
Aluminum	7429-90-5	U	76	70	92%	17.5	333.4	1540	486.2	108.8	51	21	30.2	Yes	[Maximum] > ESV
Barium	7440-39-3	U	76	76	100%	62.8	110.1	216	116.8	92.6	4	76	54	Yes	[Maximum] > ESV
Barium	7440-39-3	F	49	49	100%	62.5	95.3	191	103.6	86.4	4	49	47.8	Yes	[Maximum] > ESV
Copper	7440-50-8	U	76	21	28%	1.4	4.2	12.3	3.2	1.1	7.46	0	1.6	No	[Maximum] < ESV
Copper	7440-50-8	F	49	2	4%	3	15	26	---	1	0.12	1	219.7	No	< 5% Detected
Iron	7439-89-6	U	76	51	67%	62.4	551.7	1640	477.5	126.5	1000	8	1.6	Yes	[Maximum] > ESV
Iron	7439-89-6	F	49	11	22%	45.8	98.6	164	62.6	22.9	158	1	1	Yes	[Maximum] > ESV
Manganese	7439-96-5	U	76	54	71%	2.6	29.3	212	28.4	5.9	120	1	1.8	Yes	[Maximum] > ESV
Nickel	7440-02-0	F	49	2	4%	1.3	16.8	32.2	---	0.7	32.612	0	<1	No	< 5% Detected
Vanadium	7440-62-2	U	76	4	5%	1.2	1.4	1.9	1.2	0.6	NESV	---	---	Yes	No ESV Available
Other Inorganic Parameters (µg/L unless otherwise noted)															
Cyanide	57-12-5	U	76	28	37%	3.2	107.9	378	85	1	5.2	27	72.7	Yes	[Maximum] > ESV
Cyanide	57-12-5	F	15	9	60%	11.7	108.7	328	182.8	---	5.2	9	63.1	Yes	[Maximum] > ESV
Cyanide (Free)	FREE CN	U	48	26	54%	1.5	19.3	139	26.8	0.9	5.2	14	26.7	Yes	[Maximum] > ESV
Cyanide (Free)	FREE CN	F	10	10	100%	1.6	10.3	42.2	23.2	---	5.2	7	8.1	Yes	[Maximum] > ESV
Fluoride	16984-48-8	U	76	65	86%	28.6	450.8	2570	742.1	15	1285	0	2	No	[Maximum] < ESV
Fluoride	16984-48-8	F	9	9	100%	109	179	558	389	---	1454	0	<1	No	[Maximum] < ESV
Polycyclic Aromatic Hydrocarbons (PAHs) (µg/L)															
Benzo(A)Anthracene	56-55-3	U	11	3	27%	0.0048	0.2353	0.63	---	0.0361	2.227	0	<1	No	[Maximum] < ESV
Benzo(A)Pyrene	50-32-8	U	11	2	18%	0.041	0.145	0.25	---	0.026	0.957	0	<1	No	[Maximum] < ESV
Benzo(B)Fluoranthene	205-99-2	U	11	3	27%	0.0056	0.2685	0.7	---	0.0468	0.677	1	1	Yes	[Maximum] > ESV
Benzo(G,H,I)Perylene	191-24-2	U	11	1	9%	0.044	0.044	0.044	---	0.033	0.439	0	<1	No	[Maximum] < ESV
Benzo(K)Fluoranthene	207-08-9	U	11	2	18%	0.095	0.277	0.46	---	0.043	0.641	0	<1	No	[Maximum] < ESV
Chrysene	218-01-9	U	11	4	36%	0.011	0.351	1.2	0.366	0.039	2.042	0	<1	No	[Maximum] < ESV
Dibenz(A,H)Anthracene	53-70-3	U	11	1	9%	0.015	0.015	0.015	---	0.035	0.282	0	<1	No	[Maximum] < ESV
Fluoranthene	206-44-0	U	11	4	36%	0.0077	0.5872	2.1	---	0.0292	7.109	0	<1	No	[Maximum] < ESV
Indeno(1,2,3-C,D)Pyrene	193-39-5	U	11	1	9%	0.04	0.04	0.04	---	0.04	0.275	0	<1	No	[Maximum] < ESV
Phenanthrene	85-01-8	U	11	2	18%	0.024	0.612	1.2	---	0.052	19.13	0	<1	No	[Maximum] < ESV
Pyrene	129-00-0	U	11	4	36%	0.0069	0.453	1.6	---	0.0261	0.025	2	64	Yes	[Maximum] > ESV
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (µg/L)															
Bis(2-Ethylhexyl) Phthalate	117-81-7	U	11	4	36%	1.2	9.1	22	7.7	3.1	16	1	1.4	Yes	[Maximum] > ESV
Caprolactam	105-60-2	U	11	4	36%	0.6	0.9	1.1	0.9	1.1	NESV	---	---	No	95% UCL < Background

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
[Maximum]: Maximum concentration
NESV: No Ecological Screening Value
MDL: Method Detection Limit
SW: Surface Water
TAL: Target Analyte List
TCL: Target Compound List
U: Unfiltered
µg/L: microgram per liter
F: Filtered

Table E-25
Refined Ecological Screening for Bulk Sediment (0-0.5 feet)
Cedar Creek Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Sediment Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (mg/kg)														
Barium	7440-39-3	9	9	100%	20.2	122.8	249	165	99.3	NESV	---	---	Yes	No ESV Available
Beryllium	7440-41-7	9	9	100%	0.21	0.36	0.68	0.45	0.53	NESV	---	---	No	95% UCL < Background
Manganese	7439-96-5	9	9	100%	67.3	252.3	571	348.9	322.2	460	1	1.2	Yes	[Maximum] > ESV
Vanadium	7440-62-2	9	9	100%	4.6	7.1	8.8	8	9.6	NESV	---	---	No	95% UCL < Background
Other Inorganic Parameters (mg/kg unless otherwise noted)														
Cyanide	57-12-5	9	4	44%	0.1	0.2	0.2	0.2	0.1	0.1	3	2.4	Yes	[Maximum] > ESV
Essential Nutrients (mg/kg)														
Calcium	7440-70-2	9	9	100%	1120	15558	37000	22760	9774	NESV	---	---	No	Process-Related Essential Nutrient
Magnesium	7439-95-4	9	9	100%	5410	9070	13700	10857	12517	NESV	---	---	No	Essential Nutrient
Potassium	7440-09-7	9	9	100%	177	658	1230	829	732	NESV	---	---	No	Essential Nutrient
Sodium	7440-23-5	9	5	56%	40.2	103.3	154	107.5	29.6	NESV	---	---	No	Essential Nutrient
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)														
Acenaphthene	83-32-9	9	2	22%	0.0058	0.0084	0.011	---	0.0028	NESV	---	---	Yes	No ESV Available
Acenaphthylene	208-96-8	9	3	33%	0.011	0.022	0.033	---	0.002	NESV	---	---	Yes	No ESV Available
Anthracene	120-12-7	9	3	33%	0.026	0.042	0.051	---	0.003	NESV	---	---	Yes	No ESV Available
Fluoranthene	206-44-0	9	9	100%	0.0023	0.0832	0.19	0.1288	0.0026	NESV	---	---	Yes	No ESV Available
Fluorene	86-73-7	9	2	22%	0.013	0.021	0.028	---	0.002	NESV	---	---	Yes	No ESV Available
Phenanthrene	85-01-8	9	8	89%	0.0028	0.0989	0.21	0.1404	0.003	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - 1/2MDL	---	9	9	100%	0.0107	0.2472	0.512	0.3712	0.0349	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - MDL	---	9	9	100%	0.0163	0.2952	0.591	0.4338	0.0349	NESV	---	---	Yes	No ESV Available
Total LMW PAHs - Zero	---	9	9	100%	0.0051	0.1992	0.454	0.3155	0.0349	NESV	---	---	Yes	No ESV Available
Benzo(A)Pyrene	50-32-8	9	6	67%	0.0032	0.0547	0.094	0.0615	0.0021	NESV	---	---	Yes	No ESV Available
Benzo(A)Anthracene	56-55-3	9	5	56%	0.0034	0.0655	0.12	0.0729	0.002	NESV	---	---	Yes	No ESV Available
Benzo(G,H,I)Perylene	191-24-2	9	4	44%	0.03	0.06	0.08	0.05	---	NESV	---	---	Yes	No ESV Available
Chrysene	218-01-9	9	8	89%	0.0052	0.0644	0.13	0.0871	0.0021	NESV	---	---	Yes	No ESV Available
Indeno(1,2,3-C,D)Pyrene	193-39-5	9	4	44%	0.022	0.049	0.087	0.049	0.002	NESV	---	---	Yes	No ESV Available
Pyrene	129-00-0	9	7	78%	0.0058	0.0867	0.16	0.1102	0.0023	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - 1/2MDL	---	9	8	89%	0.0278	0.3879	0.845	0.5862	0.0205	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - MDL	---	9	8	89%	0.0345	0.4477	0.898	0.6493	0.0205	NESV	---	---	Yes	No ESV Available
Total HMW PAHs - Zero	---	9	8	89%	0.0131	0.3282	0.792	0.539	0.0205	NESV	---	---	Yes	No ESV Available
Total PAHs - 1/2MDL	---	9	9	100%	0.01685	0.54528	1.1885	0.82608	0.03493	NESV	---	---	Yes	No ESV Available
Total PAHs - MDL	---	9	9	100%	0.0286	0.6361	1.345	0.938	0.0349	NESV	---	---	Yes	No ESV Available
Total PAHs - Zero	---	9	9	100%	0.0051	0.4545	1.085	0.731	0.0349	NESV	---	---	Yes	No ESV Available
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)														
Benzaldehyde	100-52-7	9	3	33%	0.15	0.16	0.17	---	0.01	NESV	---	---	Yes	No ESV Available
Carbazole	86-74-8	9	2	22%	0.0049	0.0073	0.0098	---	0.0023	NESV	---	---	Yes	No ESV Available

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
NESV: No Ecological Screening Value
[Maximum]: Maximum concentration
MDL: Method Detection Limit
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List

Table E-26
Refined Ecological Screening for Surface Water
Cedar Creek Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	Fraction	Number of Samples	Number of Detections	Detection Frequency	Minimum Detected Concentration	Mean Detected Concentration	Maximum Concentration	UCL Value	Mean Surface Water Background Concentration	Refined Ecological Screening Value (ESV)	Result Concentrations > ESV	Maximum Hazard Quotient (HQ_{Max})	COPEC Decision	COPEC Decision Rationale
TAL Metals (µg/L)															
Barium	7440-39-3	U	28	28	100%	85.9	104.7	130	108.2	53.3	4	28	32.5	Yes	[Maximum] > ESV
Barium	7440-39-3	F	16	16	100%	85.9	99.7	117	104.6	53.5	4	16	29.3	Yes	[Maximum] > ESV
Chromium, Total	7440-47-3	U	28	2	7%	8.9	23.3	37.7	---	0.7	125.994	0	<1	No	[Maximum] < ESV
Copper	7440-50-8	U	28	9	32%	1.9	4.3	8.5	3	2.1	17.761	0	<1	No	[Maximum] < ESV
Iron	7439-89-6	U	28	3	11%	100	178	304	---	34	1000	0	<1	No	[Maximum] < ESV
Zinc	7440-66-6	F	16	1	6%	25.4	25.4	25.4	---	3.5	175	0	<1	No	[Maximum] < ESV
Other Inorganic Parameters (µg/L unless otherwise noted)															
Cyanide	57-12-5	U	32	7	22%	2	5	15	5	1	5.2	2	2.9	Yes	[Maximum] > ESV
Cyanide (Free)	FREE CN	U	20	2	10%	1.9	4.8	7.7	---	0.8	5.2	1	1.5	Yes	[Maximum] > ESV
Fluoride	16984-48-8	U	28	22	79%	55.8	113.9	137	107.5	43.8	3228	0	<1	No	[Maximum] < ESV
Fluoride	16984-48-8	F	4	4	100%	121	128	131	129	---	3539	0	<1	No	[Maximum] < ESV

Notes:
---: Not applicable.
COPEC: Constituent of Potential Ecological Concern
[Maximum]: Maximum concentration
NESV: No Ecological Screening Value
MDL: Method Detection Limit
SW: Surface Water
TAL: Target Analyte List
U: Unfiltered
µg/L: microgram per liter
F: Filtered

Appendix F Equilibrium Partitioning Sediment Benchmark Calculations for Certain Non-ionic Organic Constituents

Table F-1
Summary of Equilibrium Partitioning Sediment Benchmarks
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	ESB (mg/kg @ 1% OC)	Source
1,1,1-Trichloroethane	71556	0.213	EPA R3 @ 1%OC
1,1,2,2-Tetrachloroethane	79345	1.36	EPA R3 @ 1%OC
1,1,2-Trichloroethane	79005	1.24	EPA R3 @ 1%OC
1,1-Dichloroethene	75354	0.031	EPA R3 @ 1%OC
1,2,3-Trichlorobenzene	87616	0.858	EPA R3 @ 1%OC
1,2,4-Trichlorobenzene	120821	2.1	EPA R3 @ 1%OC
1,3-Dichlorobenzene	541731	4.43	EPA R3 @ 1%OC
1,4-Dichlorobenzene	106467	0.599	EPA R3 @ 1%OC
2,3,4,6-Tetrachlorophenol	58902	0.284	EPA R3 @ 1%OC
2,4,6-Trichlorophenol	88062	0.213	EPA R3 @ 1%OC
2,4-Dichlorophenol	120832	0.117	EPA R3 @ 1%OC
2,4-Dinitrotoluene	121142	0.0416	EPA R3 @ 1%OC
2-Chlorophenol	95578	0.0312	EPA R3 @ 1%OC
3,3'-Dichlorobenzidine	91941	0.127	EPA R3 @ 1%OC
4-Bromophenyl Phenyl Ether	101553	1.23	EPA R3 @ 1%OC
Atrazine	1912249	0.00662	EPA R3 @ 1%OC
Acetone	67641	14.1	Derived using SW Screening-Level ESVs. mg/kg dw @ 1% OC
Benzyl Butyl Phthalate	85687	10.9	EPA R3 @ 1%OC
Biphenyl (Diphenyl)	92524	1.22	EPA R3 @ 1%OC
Bis(2-ethylhexyl) phthalate	117817	5306.05	Derived using SW Screening-Level ESVs. mg/kg dw @ 1% OC
Bromoform	75252	0.654	EPA R3 @ 1%OC
Carbon Disulfide	75150	0.441	Derived using SW Refined ESV. mg/kg dw @ 1% OC
Chlorobenzene	108907	0.00842	EPA R3 @ 1%OC
Delta BHC (Delta Hexachlorocyclohexane)	319868	6.4	EPA R3 @ 1%OC
Dibenzofuran	132649	17	EPA 2008 @ 1%OC
Diethyl Phthalate	84662	0.603	EPA R3 @ 1%OC
Di-N-Butyl Phthalate	84742	6.47	EPA R3 @ 1%OC
Ethylbenzene	100414	1.1	EPA R3 @ 1%OC
Hexachloroethane	67721	1.027	EPA R3 @ 1%OC
Isopropylbenzene (Cumene)	98828	0.086	EPA R3 @ 1%OC
Methoxychlor	72435	0.187	EPA R3 @ 1%OC
Methyl Ethyl Ketone	78933	14.3	Derived using SW Screening-Level ESVs. mg/kg dw @ 1% OC
N-Nitrosodiphenylamine	86306	2.68	EPA R3 @ 1%OC
Phenol	108952	0.42	EPA R3 @ 1%OC
Styrene	100425	0.559	EPA R3 @ 1%OC
Trans-1,2-Dichloroethene	156605	1.05	EPA R3 @ 1%OC

Notes:
dw: Dry Weight
EPA: Environmental Protection Agency
ESB: Equilibrium Sediment Benchmark
ESV: Ecological Screening Value
OC: Organic Carbon
SW: Surface Water

Table F-2
Summary of Equilibrium Partitioning Sediment Benchmarks Based on NOEC Aqueous Toxicity Data
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	CAS Number	log K_{ow}	log K_{oc}	Molecular Weight (g/mol)	Chemical Class Correction	Final Chronic Value (FCV) (µg/L)	FCV Toxicological Basis	FCV Source	ESB_{NOEC} (µg/kg oc)	ESB_{NOEC} (µg/kg dw) 1% TOC
Semi-Volatile Organic Compounds										
Acetone	67641	-0.24	-0.24	58.08	0	1500	Conventional	ORNL Tier II SCV	150,872	1,509
Carbon Disulfide	75150	1.94	1.91	76.13	0	244	Conventional	Suter and Tsao (1996)	44,110.1	441
Methyl Ethyl Ketone	78933	0.316	0.31	72.11	0	14000	Conventional	ORNL Tier II SCV	1,428,644	14,286
Bis(2-Ethylhexyl)Phthalate	117817	8.39	8.25	390.57	0	3	Conventional	ORNL Tier II SCV	530,604,898	5,306,049

Notes:
FCV: Final chronic value
ESB_{NOEC}: Equilibrium-partitioning sediment benchmark based on NOEC aqueous toxicity data
TOC: Total organic carbon
Assumes 50% moisture/50% solids based on minimum average %solids by exposure area.

Appendix G Equilibrium Partitioning Sediment Benchmark Toxicity Units Calculations for Polycyclic Aromatic Hydrocarbons

Table G-1
Summary of Equilibrium Partitioning Sediment Benchmark Toxicity Units for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth Interval (ft)	Sample Date	Sample Type	Percent TOC	$\sum ESBTU_{13}$	$\sum ESBTU_{34}$ (Estimated)	$\sum ESBTU_{34}$	Total $PAHs_{13}$ (mg/kg)	Total $PAHs_{34}$ (mg/kg)
Cedar Creek Area										
CFSDP-014-SD	CFSDP-014	0.00-0.50	8/29/2016	N	16.0	0.001	0.003	---	0.119	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	10/10/2018	N	0.6	0.004	0.012	---	0.021	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	8/29/2016	N	26.6	0.002	0.005	---	0.333	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	10/9/2018	N	0.2	0.004	0.010	---	0.0051	---
CFSDP-016-SD	CFSDP-016	0.00-0.50	8/29/2016	N	27.7	0.005	0.013	---	0.984	---
CFSDP-016-SD	CFSDP-016	0.00-0.50	10/9/2018	N	2.0	0.045	0.124	---	0.6408	---
CFSDP-025-SD	CFSDP-025	0.00-0.50	10/10/2018	N	0.2	0.025	0.070	---	0.0346	---
CFSDP-044-SD	CFSDP-044	0.00-0.50	10/10/2018	N	10.8	0.013	0.037	---	1.045	---
CFSDP-045-SD	CFSDP-045	0.00-0.50	10/9/2018	N	0.2	0.483	1.329	---	0.792	---
CFSDP-DUP4-SD	CFSDP-016	0.00-0.50	10/9/2018	FD	0.9	0.014	0.039	---	0.092	---
CFSDP-DUP5-SD	CFSDP-025	0.00-0.50	10/10/2018	FD	0.2	0.007	0.019	---	0.0109	---
Cedar Creek Reservoir Overflow Ditch Area										
CFSB-282-SO-0-0.5	CFSB-282	0.00-0.50	6/16/2018	N	2.9	0.253	0.695	---	5.713	---
CFSB-283-SO-0-0.5	CFSB-283	0.00-0.50	6/16/2018	N	5.3	0.253	0.697	---	10.638	---
CFSB-284-SO-0-0.5	CFSB-284	0.00-0.50	6/16/2018	N	0.006	77.106	212.040	---	7.403	---
CFSDP-009-SO	CFSDP-009	0.00-0.50	9/6/2016	N	4.3	0.030	0.081	---	1.024	---
CFSDP-010-SO	CFSDP-010	0.00-0.50	9/6/2016	N	9.2	0.115	0.317	---	8.586	---
CFSDP-011-SO	CFSDP-011	0.00-0.50	9/6/2016	N	5.2	0.195	0.536	---	7.878	---
CFSDP-012-SO	CFSDP-012	0.00-0.50	9/6/2016	N	6.2	0.140	0.385	---	6.845	---
CFSDP-013-SO	CFSDP-013	0.00-0.50	9/6/2016	N	18.3	0.006	0.017	---	0.911	---
CFSDP-DUP1-SO	CFSDP-012	0.00-0.50	9/6/2016	FD	6.1	0.128	0.353	---	6.225	---
South Percolation Pond Area										
CFSB-101-SO-0-0.5	CFSB-101	0.00-0.50	7/21/2016	N	7.8	0.006	0.016	---	0.363	---
CFSB-102-SO-0-0.5	CFSB-102	0.00-0.50	7/13/2016	N	7.8	0.018	0.049	---	1.144	---
CFSB-104-SO-0-0.5	CFSB-104	0.00-0.50	7/13/2016	N	7.8	0.031	0.085	---	1.96	---
CFSB-109-SO-0-0.5	CFSB-109	0.00-0.50	7/13/2016	N	7.8	0.059	0.161	---	3.7	---
CFSB-110-SO-0-0.5	CFSB-110	0.00-0.50	7/14/2016	N	7.8	0.026	0.073	---	1.69	---
CFSB-113-SO-0-0.5	CFSB-113	0.00-0.50	8/31/2016	N	7.8	0.022	0.061	---	1.4	---
CFSB-115-SO-0-0.5	CFSB-115	0.00-0.50	8/31/2016	N	7.8	0.011	0.030	---	0.702	---
CFSB-116-SO-0-0.5	CFSB-116	0.00-0.50	7/22/2016	N	7.8	0.019	0.052	---	1.197	---
CFSB-118-SO-0-0.5	CFSB-118	0.00-0.50	7/21/2016	N	7.8	---	---	---	---	---
CFSB-149-SD-0-0.5	CFSB-149	0.00-0.50	11/7/2017	N	1.9	0.061	0.167	---	0.931	---
CFSB-150-SD-0-0.5	CFSB-150	0.00-0.50	11/7/2017	N	5.2	0.053	0.145	---	2.28	---
CFSB-151-SO-0-0.5	CFSB-151	0.00-0.50	11/7/2017	N	1.5	0.047	0.128	---	0.566	---
CFSB-152-SO-0-0.5	CFSB-152	0.00-0.50	11/7/2017	N	6.6	0.027	0.075	---	1.37	---
CFSB-153-SO-0-0.5	CFSB-153	0.00-0.50	11/6/2017	N	9.8	0.177	0.488	---	15.15	---
CFSDP-018-SD	CFSDP-018	0.00-0.50	9/7/2016	N	25.3	0.010	0.028	---	2.12	---

Table G-1
Summary of Equilibrium Partitioning Sediment Benchmark Toxicity Units for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth Interval (ft)	Sample Date	Sample Type	Percent TOC	$\sum ESBTU_{13}$	$\sum ESBTU_{34}$ (Estimated)	$\sum ESBTU_{34}$	Total $PAHs_{13}$ (mg/kg)	Total $PAHs_{34}$ (mg/kg)
CFSDP-018-SD	CFSDP-018	0.00-0.50	10/17/2018	N	5.7	0.153	0.421	---	7.106	---
CFSDP-018-SD	CFSDP-018	0.00-0.50	11/7/2017	N	10.5	0.072	0.198	---	6.55	---
CFSDP-019-SD	CFSDP-019	0.00-0.50	9/7/2016	N	28.4	0.007	0.018	---	1.526	---
CFSDP-019-SD	CFSDP-019	0.00-0.50	10/16/2018	N	5.6	0.039	0.107	---	1.752	---
CFSDP-019-SD	CFSDP-019	0.00-0.50	11/7/2017	N	9.2	0.043	0.118	---	3.27	---
CFSDP-020-SD	CFSDP-020	0.00-0.50	9/7/2016	N	7.7	0.025	0.070	---	1.57	---
CFSDP-020-SD	CFSDP-020	0.00-0.50	10/11/2018	N	1.8	0.123	0.338	---	1.771	---
CFSDP-020-SD	CFSDP-020	0.00-0.50	11/7/2017	N	4.2	0.096	0.263	---	3.32	---
CFSDP-058-SD	CFSDP-058	0.00-0.50	10/11/2018	N	2.4	0.071	0.196	---	1.43	---
CFSDP-059-SD	CFSDP-059	0.00-0.50	10/11/2018	N	3.5	0.068	0.187	---	1.8947	---
CFSDP-060-SD	CFSDP-060	0.00-0.50	10/16/2018	N	4.3	0.077	0.211	---	2.736	---
Northern Surface Water Feature Area										
CFSDP-021-SD	CFSDP-021	0.00-0.50	6/19/2018	N	0.6	0.017	0.046	---	0.0778	---
CFSDP-021-SO	CFSDP-021	0.00-0.50	9/6/2016	N	2.3	0.007	0.019	---	0.132	---
CFSDP-022-SD	CFSDP-022	0.00-0.50	6/20/2018	N	2.4	0.014	0.038	---	0.261	---
CFSDP-022-SO	CFSDP-022	0.00-0.50	9/6/2016	N	12.9	0.008	0.021	---	0.786	---
CFSDP-046-SD	CFSDP-046	0.00-0.50	6/19/2018	N	16.2	0.006	0.015	---	0.725	---
CFSDP-047-SD	CFSDP-047	0.00-0.50	6/19/2018	N	16.1	0.005	0.014	---	0.672	---
CFSDP-048-SD	CFSDP-048	0.00-0.50	6/20/2018	N	5.1	0.008	0.021	---	0.309	---
CFSDP-049-SD	CFSDP-049	0.00-0.50	6/20/2018	N	5.7	0.014	0.039	---	0.6342	---
CFSDP-050-SD	CFSDP-050	0.00-0.50	6/21/2018	N	3.1	0.013	0.036	---	0.324	---
CFSDP-051-SD	CFSDP-051	0.00-0.50	6/21/2018	N	0.6	---	---	---	---	---
CFSDP-052-SD	CFSDP-052	0.00-0.50	6/18/2018	N	1.4	0.019	0.052	---	0.216	---
CFSDP-053-SD	CFSDP-053	0.00-0.50	6/18/2018	N	2.9	0.037	0.102	---	0.8768	---
CFSDP-DUP3-SD	CFSDP-050	0.00-0.50	6/21/2018	FD	2.0	0.011	0.030	---	0.173	---
North Percolation Pond Area										
CFMW-027-SO-0-0.5	CFMW-027	0.00-0.50	6/30/2016	N	14.7	20.819	57.253	---	2734.7	---
CFSB-014-SO-0-0.5	CFSB-014	0.00-0.50	6/2/2016	N	14.7	0.165	0.454	---	20.665	---
CFSB-016-SO-0-0.5	CFSB-016	0.00-0.50	6/2/2016	N	14.7	1.147	3.155	---	135.71	---
CFSB-019-SO-0-0.5	CFSB-019	0.00-0.50	6/4/2016	N	14.7	0.013	0.034	---	1.021	---
CFSB-025-SO-0-0.5	CFSB-025	0.00-0.50	6/13/2016	N	14.7	12.186	33.512	---	1555.3	---
CFSB-026-SO-0-0.5	CFSB-026	0.00-0.50	6/13/2016	N	14.7	10.756	29.580	---	1307.6	---
CFSB-027-SO-0-0.5	CFSB-027	0.00-0.50	6/13/2016	N	14.7	1.111	3.056	---	127.03	---
CFSB-028-SO-0-0.5	CFSB-028	0.00-0.50	7/18/2016	N	14.7	0.440	1.209	---	51.487	---
CFSB-030-SO-0-0.5	CFSB-030	0.00-0.50	6/13/2016	N	14.7	0.576	1.585	---	67.85	---
CFSB-199-SO-0-0.5	CFSB-199	0.00-0.50	6/28/2018	N	12.4	9.243	25.418	12.47	905	1282
CFSB-201-SO-0-0.5	CFSB-201	0.00-0.50	6/22/2018	N	2.4	1.307	3.594	2.11	25.72	44.47
CFSB-202-SO-0-0.5	CFSB-202	0.00-0.50	6/22/2018	N	2.9	4.034	11.093	6.29	99.98	164.3

Table G-1
Summary of Equilibrium Partitioning Sediment Benchmark Toxicity Units for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth Interval (ft)	Sample Date	Sample Type	Percent TOC	$\sum ESBTU_{13}$	$\sum ESBTU_{34}$ (Estimated)	$\sum ESBTU_{34}$	Total $PAHs_{13}$ (mg/kg)	Total $PAHs_{34}$ (mg/kg)
CFSB-203-SO-0-0.5	CFSB-203	0.00-0.50	6/28/2018	N	18.2	72.289	198.794	110.33	22722	33642
CFSB-204-SO-0-0.5	CFSB-204	0.00-0.50	6/22/2018	N	5.7	6.160	16.940	---	286	---
CFSB-214-SO-0-0.5	CFSB-214	0.00-0.50	6/22/2018	N	12.9	0.421	1.159	0.59	42.37	62.72
CFSB-272-SO-0-0.5	CFSB-272	0.00-0.50	6/28/2018	N	14.7	60.942	167.590	92.71	14033	20958
CFSB-273-SO-0-0.5	CFSB-273	0.00-0.50	5/4/2018	N	8.4	26.445	72.724	---	1767.35	---
CFSB-279-SO-0-0.5	CFSB-279	0.00-0.50	6/22/2018	N	14.7	0.491	1.351	0.72	61.26	93.30
CFSB-280-SO-0-0.5	CFSB-280	0.00-0.50	6/22/2018	N	14.7	0.353	0.971	0.57	43.25	74.75
CFSB-281-SO-0-0.5	CFSB-281	0.00-0.50	5/4/2018	N	11.1	10.879	29.918	---	934.2	---
CFSDP-023-SD	CFSDP-023	0.00-0.50	9/7/2016	N	49.4	0.372	1.023	---	153.766	---
CFSDP-024-SD	CFSDP-024	0.00-0.50	9/7/2016	N	47.0	2.326	6.397	---	897.99	---
CFSDP-DUP2-SD	CFSDP-023	0.00-0.50	9/7/2016	FD	55.5	0.385	1.059	---	180.09	---
Flathead River Riparian Area										
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	0.5	0.063	0.174	0.08	0.2553	0.3479
CFSDP-029-SD	CFSDP-029	0.00-0.50	11/1/2017	N	0.2	1.451	3.991	---	2.511	---
CFSDP-030-SD	CFSDP-030	0.00-0.50	10/18/2018	N	1.0	0.036	0.099	---	0.277	---
CFSDP-030-SD	CFSDP-030	0.00-0.50	11/3/2017	N	1.4	0.060	0.164	---	0.705	---
CFSDP-031-SD	CFSDP-031	0.00-0.50	10/18/2018	N	3.7	0.041	0.112	---	1.1896	---
CFSDP-031-SD	CFSDP-031	0.00-0.50	11/3/2017	N	1.5	0.013	0.036	---	0.154	---
CFSDP-032-SD	CFSDP-032	0.00-0.50	10/17/2018	N	0.7	0.029	0.078	---	0.154	---
CFSDP-032-SD	CFSDP-032	0.00-0.50	11/3/2017	N	0.4	0.035	0.096	---	0.113	---
CFSDP-033-SD	CFSDP-033	0.00-0.50	10/17/2018	N	1.0	0.015	0.042	---	0.1255	---
CFSDP-033-SD	CFSDP-033	0.00-0.50	11/3/2017	N	0.3	0.172	0.473	---	0.439	---
Flathead River Area										
CFSDP-001-SD	CFSDP-001	0.00-0.50	10/5/2018	N	0.1	0.024	0.065	---	0.0148	---
CFSDP-001-SO	CFSDP-001	0.00-0.50	9/8/2016	N	0.9	---	---	---	---	---
CFSDP-002-SD	CFSDP-002	0.00-0.50	10/5/2018	N	0.8	0.010	0.028	---	0.0613	---
CFSDP-002-SO	CFSDP-002	0.00-0.50	9/8/2016	N	0.8	---	---	---	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	9/9/2016	N	6.2	0.036	0.099	---	1.78	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/4/2018	N	0.8	1.384	3.806	---	9.525	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/31/2017	N	1.1	0.131	0.359	---	1.094	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	9/9/2016	N	3.7	---	---	---	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/4/2018	N	0.005	2.917	8.022	---	0.1053	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/31/2017	N	2.6	0.020	0.054	---	0.393	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	9/9/2016	N	2.7	---	---	---	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	0.6	0.208	0.572	0.27	0.9497	1.28
CFSDP-005-SD	CFSDP-005	0.00-0.50	11/1/2017	N	0.2	0.341	0.937	---	0.556	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	9/9/2016	N	0.4	---	---	---	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	10/4/2018	N	0.1	0.050	0.137	---	0.0234	---

Table G-1
Summary of Equilibrium Partitioning Sediment Benchmark Toxicity Units for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth Interval (ft)	Sample Date	Sample Type	Percent TOC	$\sum ESBTU_{13}$	$\sum ESBTU_{34}$ (Estimated)	$\sum ESBTU_{34}$	Total $PAHs_{13}$ (mg/kg)	Total $PAHs_{34}$ (mg/kg)
CFSDP-007-SD	CFSDP-007	0.00-0.50	10/3/2018	N	0.005	0.260	0.716	---	0.00915	---
CFSDP-007-SO	CFSDP-007	0.00-0.50	9/8/2016	N	1.5	---	---	---	---	---
CFSDP-008-SD	CFSDP-008	0.00-0.50	10/3/2018	N	0.004	---	---	---	---	---
CFSDP-008-SO	CFSDP-008	0.00-0.50	9/8/2016	N	0.9	---	---	---	---	---
CFSDP-017-SD	CFSDP-017	0.00-0.50	10/3/2018	N	0.037	0.061	0.168	---	0.0165	---
CFSDP-017-SO	CFSDP-017	0.00-0.50	9/8/2016	N	0.8	---	---	---	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	1.0	2.526	6.947	3.24	19.16	25.33
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/31/2017	N	0.5	0.417	1.147	---	1.601	---
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	1.8	0.189	0.518	0.25	2.81	3.83
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/31/2017	N	4.5	0.802	2.207	---	27.812	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	0.5	1.483	4.079	1.84	5.40	6.88
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/31/2017	N	1.8	0.068	0.186	---	0.948	---
CFSDP-034-SD	CFSDP-034	0.00-0.50	10/5/2018	N	0.6	0.016	0.043	---	0.0758	---
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	1.2	0.112	0.307	0.15	1.06	1.42
CFSDP-036-SD	CFSDP-036	0.00-0.50	10/4/2018	N	0.015	9.804	26.960	---	1.3526	---
CFSDP-037-SD	CFSDP-037	0.00-0.50	10/3/2018	N	0.005	---	---	---	---	---
CFSDP-038-SD	CFSDP-038	0.00-0.50	10/3/2018	N	0.005	0.186	0.512	---	0.0066	---
CFSDP-DUP3-SD	CFSDP-005	0.00-0.50	11/1/2017	FD	0.2	---	---	---	---	---

Notes:

---: Not applicable

FD: Duplicate Sample

mg/kg: milligram per kilogram

N: Normal (Primary) Sample

PAH: Polycyclic Aromatic Hydrocarbons

∑ESBTU: Summation of congener-specific ESBTU values

$\sum ESBTU_{34}$ (Estimated): $\sum ESBTU_{34}$ value estimated by multiplying the $\sum ESBTU_{13}$ result by a conversion factor of 2.75

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
Cedar Creek Area												
CFSDP-014-SD	CFSDP-014	0.00-0.50	8/29/2016	N	Acenaphthene	N	---	33400	491	0.1600	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	8/29/2016	N	Acenaphthylene	N	---	24000	452	0.1600	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	8/29/2016	N	Anthracene	N	---	1300	594	0.1600	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	8/29/2016	N	Benzo(A)Anthracene	N	---	4153	841	0.1600	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	8/29/2016	N	Benzo(A)Pyrene	N	---	3840	965	0.1600	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	8/29/2016	N	Benzo(B)Fluoranthene	N	---	2169	979	0.1600	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	8/29/2016	N	Benzo(K)Fluoranthene	N	---	1220	981	0.1600	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	8/29/2016	N	Chrysene	Y	0.038	826	844	0.1600	0.24	0.0003
CFSDP-014-SD	CFSDP-014	0.00-0.50	8/29/2016	N	Fluoranthene	Y	0.042	23870	707	0.1600	0.26	0.0004
CFSDP-014-SD	CFSDP-014	0.00-0.50	8/29/2016	N	Fluorene	N	---	26000	538	0.1600	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	8/29/2016	N	Naphthalene	N	---	61700	385	0.1600	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	8/29/2016	N	Phenanthrene	Y	0.039	34300	596	0.1600	0.24	0.0004
CFSDP-014-SD	CFSDP-014	0.00-0.50	8/29/2016	N	Pyrene	N	---	9090	697	0.1600	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	10/10/2018	N	Acenaphthene	N	---	33400	491	0.0065	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	10/10/2018	N	Acenaphthylene	N	---	24000	452	0.0065	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	10/10/2018	N	Anthracene	N	---	1300	594	0.0065	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	10/10/2018	N	Benzo(A)Anthracene	N	---	4153	841	0.0065	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	10/10/2018	N	Benzo(A)Pyrene	N	---	3840	965	0.0065	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	10/10/2018	N	Benzo(B)Fluoranthene	N	---	2169	979	0.0065	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	10/10/2018	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0065	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	10/10/2018	N	Chrysene	Y	0.0061	826	844	0.0065	0.94	0.0011
CFSDP-014-SD	CFSDP-014	0.00-0.50	10/10/2018	N	Fluoranthene	Y	0.0079	23870	707	0.0065	1.22	0.0017
CFSDP-014-SD	CFSDP-014	0.00-0.50	10/10/2018	N	Fluorene	N	---	26000	538	0.0065	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	10/10/2018	N	Naphthalene	N	---	61700	385	0.0065	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	10/10/2018	N	Phenanthrene	N	---	34300	596	0.0065	---	---
CFSDP-014-SD	CFSDP-014	0.00-0.50	10/10/2018	N	Pyrene	Y	0.007	9090	697	0.0065	1.08	0.0015
CFSDP-015-SD	CFSDP-015	0.00-0.50	8/29/2016	N	Acenaphthene	N	---	33400	491	0.2660	---	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	8/29/2016	N	Acenaphthylene	N	---	24000	452	0.2660	---	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	8/29/2016	N	Anthracene	N	---	1300	594	0.2660	---	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	8/29/2016	N	Benzo(A)Anthracene	N	---	4153	841	0.2660	---	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	8/29/2016	N	Benzo(A)Pyrene	Y	0.043	3840	965	0.2660	0.16	0.0002
CFSDP-015-SD	CFSDP-015	0.00-0.50	8/29/2016	N	Benzo(B)Fluoranthene	N	---	2169	979	0.2660	---	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	8/29/2016	N	Benzo(K)Fluoranthene	N	---	1220	981	0.2660	---	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	8/29/2016	N	Chrysene	Y	0.069	826	844	0.2660	0.26	0.0003
CFSDP-015-SD	CFSDP-015	0.00-0.50	8/29/2016	N	Fluoranthene	Y	0.08	23870	707	0.2660	0.30	0.0004
CFSDP-015-SD	CFSDP-015	0.00-0.50	8/29/2016	N	Fluorene	N	---	26000	538	0.2660	---	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	8/29/2016	N	Naphthalene	N	---	61700	385	0.2660	---	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	8/29/2016	N	Phenanthrene	Y	0.072	34300	596	0.2660	0.27	0.0005
CFSDP-015-SD	CFSDP-015	0.00-0.50	8/29/2016	N	Pyrene	Y	0.069	9090	697	0.2660	0.26	0.0004
CFSDP-015-SD	CFSDP-015	0.00-0.50	10/9/2018	N	Acenaphthene	N	---	33400	491	0.0021	---	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	10/9/2018	N	Acenaphthylene	N	---	24000	452	0.0021	---	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	10/9/2018	N	Anthracene	N	---	1300	594	0.0021	---	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	10/9/2018	N	Benzo(A)Anthracene	N	---	4153	841	0.0021	---	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	10/9/2018	N	Benzo(A)Pyrene	N	---	3840	965	0.0021	---	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	10/9/2018	N	Benzo(B)Fluoranthene	N	---	2169	979	0.0021	---	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	10/9/2018	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0021	---	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	10/9/2018	N	Chrysene	N	---	826	844	0.0021	---	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	10/9/2018	N	Fluoranthene	Y	0.0023	23870	707	0.0021	1.09	0.0015

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-015-SD	CFSDP-015	0.00-0.50	10/9/2018	N	Fluorene	N	---	26000	538	0.0021	---	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	10/9/2018	N	Naphthalene	N	---	61700	385	0.0021	---	---
CFSDP-015-SD	CFSDP-015	0.00-0.50	10/9/2018	N	Phenanthrene	Y	0.0028	34300	596	0.0021	1.33	0.0022
CFSDP-015-SD	CFSDP-015	0.00-0.50	10/9/2018	N	Pyrene	N	---	9090	697	0.0021	---	---
CFSDP-016-SD	CFSDP-016	0.00-0.50	8/29/2016	N	Acenaphthene	N	---	33400	491	0.2770	---	---
CFSDP-016-SD	CFSDP-016	0.00-0.50	8/29/2016	N	Acenaphthylene	N	---	24000	452	0.2770	---	---
CFSDP-016-SD	CFSDP-016	0.00-0.50	8/29/2016	N	Anthracene	N	---	1300	594	0.2770	---	---
CFSDP-016-SD	CFSDP-016	0.00-0.50	8/29/2016	N	Benzo(A)Anthracene	Y	0.12	4153	841	0.2770	0.43	0.0005
CFSDP-016-SD	CFSDP-016	0.00-0.50	8/29/2016	N	Benzo(A)Pyrene	Y	0.094	3840	965	0.2770	0.34	0.0004
CFSDP-016-SD	CFSDP-016	0.00-0.50	8/29/2016	N	Benzo(B)Fluoranthene	Y	0.12	2169	979	0.2770	0.43	0.0004
CFSDP-016-SD	CFSDP-016	0.00-0.50	8/29/2016	N	Benzo(K)Fluoranthene	N	---	1220	981	0.2770	---	---
CFSDP-016-SD	CFSDP-016	0.00-0.50	8/29/2016	N	Chrysene	Y	0.13	826	844	0.2770	0.47	0.0006
CFSDP-016-SD	CFSDP-016	0.00-0.50	8/29/2016	N	Fluoranthene	Y	0.19	23870	707	0.2770	0.69	0.0010
CFSDP-016-SD	CFSDP-016	0.00-0.50	8/29/2016	N	Fluorene	N	---	26000	538	0.2770	---	---
CFSDP-016-SD	CFSDP-016	0.00-0.50	8/29/2016	N	Naphthalene	N	---	61700	385	0.2770	---	---
CFSDP-016-SD	CFSDP-016	0.00-0.50	8/29/2016	N	Phenanthrene	Y	0.17	34300	596	0.2770	0.61	0.0010
CFSDP-016-SD	CFSDP-016	0.00-0.50	8/29/2016	N	Pyrene	Y	0.16	9090	697	0.2770	0.58	0.0008
CFSDP-016-SD	CFSDP-016	0.00-0.50	10/9/2018	N	Acenaphthene	Y	0.0058	33400	491	0.0195	0.30	0.0006
CFSDP-016-SD	CFSDP-016	0.00-0.50	10/9/2018	N	Acenaphthylene	Y	0.011	24000	452	0.0195	0.56	0.0012
CFSDP-016-SD	CFSDP-016	0.00-0.50	10/9/2018	N	Anthracene	Y	0.026	1300	594	0.0195	1.33	0.0022
CFSDP-016-SD	CFSDP-016	0.00-0.50	10/9/2018	N	Benzo(A)Anthracene	Y	0.052	4153	841	0.0195	2.67	0.0032
CFSDP-016-SD	CFSDP-016	0.00-0.50	10/9/2018	N	Benzo(A)Pyrene	Y	0.043	3840	965	0.0195	2.21	0.0023
CFSDP-016-SD	CFSDP-016	0.00-0.50	10/9/2018	N	Benzo(B)Fluoranthene	Y	0.061	2169	979	0.0195	3.13	0.0032
CFSDP-016-SD	CFSDP-016	0.00-0.50	10/9/2018	N	Benzo(K)Fluoranthene	Y	0.029	1220	981	0.0195	1.49	0.0015
CFSDP-016-SD	CFSDP-016	0.00-0.50	10/9/2018	N	Chrysene	Y	0.085	826	844	0.0195	4.36	0.0052
CFSDP-016-SD	CFSDP-016	0.00-0.50	10/9/2018	N	Fluoranthene	Y	0.12	23870	707	0.0195	6.15	0.0087
CFSDP-016-SD	CFSDP-016	0.00-0.50	10/9/2018	N	Fluorene	Y	0.013	26000	538	0.0195	0.67	0.0012
CFSDP-016-SD	CFSDP-016	0.00-0.50	10/9/2018	N	Naphthalene	N	---	61700	385	0.0195	---	---
CFSDP-016-SD	CFSDP-016	0.00-0.50	10/9/2018	N	Phenanthrene	Y	0.1	34300	596	0.0195	5.13	0.0086
CFSDP-016-SD	CFSDP-016	0.00-0.50	10/9/2018	N	Pyrene	Y	0.095	9090	697	0.0195	4.87	0.0070
CFSDP-025-SD	CFSDP-025	0.00-0.50	10/10/2018	N	Acenaphthene	N	---	33400	491	0.0018	---	---
CFSDP-025-SD	CFSDP-025	0.00-0.50	10/10/2018	N	Acenaphthylene	N	---	24000	452	0.0018	---	---
CFSDP-025-SD	CFSDP-025	0.00-0.50	10/10/2018	N	Anthracene	N	---	1300	594	0.0018	---	---
CFSDP-025-SD	CFSDP-025	0.00-0.50	10/10/2018	N	Benzo(A)Anthracene	Y	0.0034	4153	841	0.0018	1.86	0.0022
CFSDP-025-SD	CFSDP-025	0.00-0.50	10/10/2018	N	Benzo(A)Pyrene	Y	0.0032	3840	965	0.0018	1.75	0.0018
CFSDP-025-SD	CFSDP-025	0.00-0.50	10/10/2018	N	Benzo(B)Fluoranthene	Y	0.0035	2169	979	0.0018	1.91	0.0020
CFSDP-025-SD	CFSDP-025	0.00-0.50	10/10/2018	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0018	---	---
CFSDP-025-SD	CFSDP-025	0.00-0.50	10/10/2018	N	Chrysene	Y	0.0052	826	844	0.0018	2.84	0.0034
CFSDP-025-SD	CFSDP-025	0.00-0.50	10/10/2018	N	Fluoranthene	Y	0.0063	23870	707	0.0018	3.44	0.0049
CFSDP-025-SD	CFSDP-025	0.00-0.50	10/10/2018	N	Fluorene	N	---	26000	538	0.0018	---	---
CFSDP-025-SD	CFSDP-025	0.00-0.50	10/10/2018	N	Naphthalene	N	---	61700	385	0.0018	---	---
CFSDP-025-SD	CFSDP-025	0.00-0.50	10/10/2018	N	Phenanthrene	Y	0.0072	34300	596	0.0018	3.93	0.0066
CFSDP-025-SD	CFSDP-025	0.00-0.50	10/10/2018	N	Pyrene	Y	0.0058	9090	697	0.0018	3.17	0.0045
CFSDP-044-SD	CFSDP-044	0.00-0.50	10/10/2018	N	Acenaphthene	N	---	33400	491	0.1080	---	---
CFSDP-044-SD	CFSDP-044	0.00-0.50	10/10/2018	N	Acenaphthylene	Y	0.033	24000	452	0.1080	0.31	0.0007
CFSDP-044-SD	CFSDP-044	0.00-0.50	10/10/2018	N	Anthracene	Y	0.051	1300	594	0.1080	0.47	0.0008
CFSDP-044-SD	CFSDP-044	0.00-0.50	10/10/2018	N	Benzo(A)Anthracene	Y	0.091	4153	841	0.1080	0.84	0.0010
CFSDP-044-SD	CFSDP-044	0.00-0.50	10/10/2018	N	Benzo(A)Pyrene	Y	0.094	3840	965	0.1080	0.87	0.0009
CFSDP-044-SD	CFSDP-044	0.00-0.50	10/10/2018	N	Benzo(B)Fluoranthene	Y	0.096	2169	979	0.1080	0.89	0.0009

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-044-SD	CFSDP-044	0.00-0.50	10/10/2018	N	Benzo(K)Fluoranthene	Y	0.04	1220	981	0.1080	0.37	0.0004
CFSDP-044-SD	CFSDP-044	0.00-0.50	10/10/2018	N	Chrysene	Y	0.11	826	844	0.1080	1.02	0.0012
CFSDP-044-SD	CFSDP-044	0.00-0.50	10/10/2018	N	Fluoranthene	Y	0.18	23870	707	0.1080	1.67	0.0024
CFSDP-044-SD	CFSDP-044	0.00-0.50	10/10/2018	N	Fluorene	N	---	26000	538	0.1080	---	---
CFSDP-044-SD	CFSDP-044	0.00-0.50	10/10/2018	N	Naphthalene	N	---	61700	385	0.1080	---	---
CFSDP-044-SD	CFSDP-044	0.00-0.50	10/10/2018	N	Phenanthrene	Y	0.19	34300	596	0.1080	1.76	0.0030
CFSDP-044-SD	CFSDP-044	0.00-0.50	10/10/2018	N	Pyrene	Y	0.16	9090	697	0.1080	1.48	0.0021
CFSDP-045-SD	CFSDP-045	0.00-0.50	10/9/2018	N	Acenaphthene	Y	0.011	33400	491	0.0024	4.60	0.0094
CFSDP-045-SD	CFSDP-045	0.00-0.50	10/9/2018	N	Acenaphthylene	Y	0.022	24000	452	0.0024	9.21	0.0204
CFSDP-045-SD	CFSDP-045	0.00-0.50	10/9/2018	N	Anthracene	Y	0.049	1300	594	0.0024	20.50	0.0345
CFSDP-045-SD	CFSDP-045	0.00-0.50	10/9/2018	N	Benzo(A)Anthracene	Y	0.061	4153	841	0.0024	25.52	0.0303
CFSDP-045-SD	CFSDP-045	0.00-0.50	10/9/2018	N	Benzo(A)Pyrene	Y	0.051	3840	965	0.0024	21.34	0.0221
CFSDP-045-SD	CFSDP-045	0.00-0.50	10/9/2018	N	Benzo(B)Fluoranthene	Y	0.044	2169	979	0.0024	18.41	0.0188
CFSDP-045-SD	CFSDP-045	0.00-0.50	10/9/2018	N	Benzo(K)Fluoranthene	Y	0.014	1220	981	0.0024	5.86	0.0060
CFSDP-045-SD	CFSDP-045	0.00-0.50	10/9/2018	N	Chrysene	Y	0.072	826	844	0.0024	30.13	0.0357
CFSDP-045-SD	CFSDP-045	0.00-0.50	10/9/2018	N	Fluoranthene	Y	0.12	23870	707	0.0024	50.21	0.0710
CFSDP-045-SD	CFSDP-045	0.00-0.50	10/9/2018	N	Fluorene	Y	0.028	26000	538	0.0024	11.72	0.0218
CFSDP-045-SD	CFSDP-045	0.00-0.50	10/9/2018	N	Naphthalene	N	---	61700	385	0.0024	---	---
CFSDP-045-SD	CFSDP-045	0.00-0.50	10/9/2018	N	Phenanthrene	Y	0.21	34300	596	0.0024	87.87	0.1474
CFSDP-045-SD	CFSDP-045	0.00-0.50	10/9/2018	N	Pyrene	Y	0.11	9090	697	0.0024	46.03	0.0660
CFSDP-DUP4-SD	CFSDP-016	0.00-0.50	10/9/2018	FD	Acenaphthene	N	---	33400	491	0.0091	---	---
CFSDP-DUP4-SD	CFSDP-016	0.00-0.50	10/9/2018	FD	Acenaphthylene	N	---	24000	452	0.0091	---	---
CFSDP-DUP4-SD	CFSDP-016	0.00-0.50	10/9/2018	FD	Anthracene	N	---	1300	594	0.0091	---	---
CFSDP-DUP4-SD	CFSDP-016	0.00-0.50	10/9/2018	FD	Benzo(A)Anthracene	Y	0.011	4153	841	0.0091	1.21	0.0014
CFSDP-DUP4-SD	CFSDP-016	0.00-0.50	10/9/2018	FD	Benzo(A)Pyrene	N	---	3840	965	0.0091	---	---
CFSDP-DUP4-SD	CFSDP-016	0.00-0.50	10/9/2018	FD	Benzo(B)Fluoranthene	N	---	2169	979	0.0091	---	---
CFSDP-DUP4-SD	CFSDP-016	0.00-0.50	10/9/2018	FD	Benzo(K)Fluoranthene	N	---	1220	981	0.0091	---	---
CFSDP-DUP4-SD	CFSDP-016	0.00-0.50	10/9/2018	FD	Chrysene	Y	0.017	826	844	0.0091	1.86	0.0022
CFSDP-DUP4-SD	CFSDP-016	0.00-0.50	10/9/2018	FD	Fluoranthene	Y	0.026	23870	707	0.0091	2.85	0.0040
CFSDP-DUP4-SD	CFSDP-016	0.00-0.50	10/9/2018	FD	Fluorene	N	---	26000	538	0.0091	---	---
CFSDP-DUP4-SD	CFSDP-016	0.00-0.50	10/9/2018	FD	Naphthalene	N	---	61700	385	0.0091	---	---
CFSDP-DUP4-SD	CFSDP-016	0.00-0.50	10/9/2018	FD	Phenanthrene	Y	0.017	34300	596	0.0091	1.86	0.0031
CFSDP-DUP4-SD	CFSDP-016	0.00-0.50	10/9/2018	FD	Pyrene	Y	0.021	9090	697	0.0091	2.30	0.0033
CFSDP-DUP5-SD	CFSDP-025	0.00-0.50	10/10/2018	FD	Acenaphthene	N	---	33400	491	0.0023	---	---
CFSDP-DUP5-SD	CFSDP-025	0.00-0.50	10/10/2018	FD	Acenaphthylene	N	---	24000	452	0.0023	---	---
CFSDP-DUP5-SD	CFSDP-025	0.00-0.50	10/10/2018	FD	Anthracene	N	---	1300	594	0.0023	---	---
CFSDP-DUP5-SD	CFSDP-025	0.00-0.50	10/10/2018	FD	Benzo(A)Anthracene	N	---	4153	841	0.0023	---	---
CFSDP-DUP5-SD	CFSDP-025	0.00-0.50	10/10/2018	FD	Benzo(A)Pyrene	N	---	3840	965	0.0023	---	---
CFSDP-DUP5-SD	CFSDP-025	0.00-0.50	10/10/2018	FD	Benzo(B)Fluoranthene	N	---	2169	979	0.0023	---	---
CFSDP-DUP5-SD	CFSDP-025	0.00-0.50	10/10/2018	FD	Benzo(K)Fluoranthene	N	---	1220	981	0.0023	---	---
CFSDP-DUP5-SD	CFSDP-025	0.00-0.50	10/10/2018	FD	Chrysene	Y	0.0021	826	844	0.0023	0.93	0.0011
CFSDP-DUP5-SD	CFSDP-025	0.00-0.50	10/10/2018	FD	Fluoranthene	Y	0.0023	23870	707	0.0023	1.02	0.0014
CFSDP-DUP5-SD	CFSDP-025	0.00-0.50	10/10/2018	FD	Fluorene	N	---	26000	538	0.0023	---	---
CFSDP-DUP5-SD	CFSDP-025	0.00-0.50	10/10/2018	FD	Naphthalene	N	---	61700	385	0.0023	---	---
CFSDP-DUP5-SD	CFSDP-025	0.00-0.50	10/10/2018	FD	Phenanthrene	Y	0.0034	34300	596	0.0023	1.51	0.0025
CFSDP-DUP5-SD	CFSDP-025	0.00-0.50	10/10/2018	FD	Pyrene	Y	0.0031	9090	697	0.0023	1.38	0.0020
Cedar Creek Reservoir Overflow Ditch Area												
CFSB-282-SO-0-0	CFSB-282	0.00-0.50	6/16/2018	N	Acenaphthene	Y	0.034	33400	491	0.0286	1.19	0.0024
CFSB-282-SO-0-0	CFSB-282	0.00-0.50	6/16/2018	N	Acenaphthylene	N	---	24000	452	0.0286	---	---

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSB-282-SO-0-0	CFSB-282	0.00-0.50	6/16/2018	N	Anthracene	Y	0.066	1300	594	0.0286	2.31	0.0039
CFSB-282-SO-0-0	CFSB-282	0.00-0.50	6/16/2018	N	Benzo(A)Anthracene	Y	0.52	4153	841	0.0286	18.18	0.0216
CFSB-282-SO-0-0	CFSB-282	0.00-0.50	6/16/2018	N	Benzo(A)Pyrene	Y	0.71	3840	965	0.0286	24.83	0.0257
CFSB-282-SO-0-0	CFSB-282	0.00-0.50	6/16/2018	N	Benzo(B)Fluoranthene	Y	0.9	2169	979	0.0286	31.47	0.0321
CFSB-282-SO-0-0	CFSB-282	0.00-0.50	6/16/2018	N	Benzo(K)Fluoranthene	Y	0.36	1220	981	0.0286	12.59	0.0128
CFSB-282-SO-0-0	CFSB-282	0.00-0.50	6/16/2018	N	Chrysene	Y	0.8	826	844	0.0286	27.97	0.0331
CFSB-282-SO-0-0	CFSB-282	0.00-0.50	6/16/2018	N	Fluoranthene	Y	0.96	23870	707	0.0286	33.57	0.0475
CFSB-282-SO-0-0	CFSB-282	0.00-0.50	6/16/2018	N	Fluorene	Y	0.022	26000	538	0.0286	0.77	0.0014
CFSB-282-SO-0-0	CFSB-282	0.00-0.50	6/16/2018	N	Naphthalene	Y	0.021	61700	385	0.0286	0.73	0.0019
CFSB-282-SO-0-0	CFSB-282	0.00-0.50	6/16/2018	N	Phenanthrene	Y	0.45	34300	596	0.0286	15.73	0.0264
CFSB-282-SO-0-0	CFSB-282	0.00-0.50	6/16/2018	N	Pyrene	Y	0.87	9090	697	0.0286	30.42	0.0436
CFSB-283-SO-0-0	CFSB-283	0.00-0.50	6/16/2018	N	Acenaphthene	Y	0.072	33400	491	0.0528	1.36	0.0028
CFSB-283-SO-0-0	CFSB-283	0.00-0.50	6/16/2018	N	Acenaphthylene	N	---	24000	452	0.0528	---	---
CFSB-283-SO-0-0	CFSB-283	0.00-0.50	6/16/2018	N	Anthracene	Y	0.14	1300	594	0.0528	2.65	0.0045
CFSB-283-SO-0-0	CFSB-283	0.00-0.50	6/16/2018	N	Benzo(A)Anthracene	Y	1	4153	841	0.0528	18.94	0.0225
CFSB-283-SO-0-0	CFSB-283	0.00-0.50	6/16/2018	N	Benzo(A)Pyrene	Y	1.4	3840	965	0.0528	26.52	0.0275
CFSB-283-SO-0-0	CFSB-283	0.00-0.50	6/16/2018	N	Benzo(B)Fluoranthene	Y	1.7	2169	979	0.0528	32.20	0.0329
CFSB-283-SO-0-0	CFSB-283	0.00-0.50	6/16/2018	N	Benzo(K)Fluoranthene	Y	0.75	1220	981	0.0528	14.20	0.0145
CFSB-283-SO-0-0	CFSB-283	0.00-0.50	6/16/2018	N	Chrysene	Y	1.4	826	844	0.0528	26.52	0.0314
CFSB-283-SO-0-0	CFSB-283	0.00-0.50	6/16/2018	N	Fluoranthene	Y	1.8	23870	707	0.0528	34.09	0.0482
CFSB-283-SO-0-0	CFSB-283	0.00-0.50	6/16/2018	N	Fluorene	Y	0.042	26000	538	0.0528	0.80	0.0015
CFSB-283-SO-0-0	CFSB-283	0.00-0.50	6/16/2018	N	Naphthalene	Y	0.024	61700	385	0.0528	0.45	0.0012
CFSB-283-SO-0-0	CFSB-283	0.00-0.50	6/16/2018	N	Phenanthrene	Y	0.81	34300	596	0.0528	15.34	0.0257
CFSB-283-SO-0-0	CFSB-283	0.00-0.50	6/16/2018	N	Pyrene	Y	1.5	9090	697	0.0528	28.41	0.0408
CFSB-284-SO-0-0	CFSB-284	0.00-0.50	6/16/2018	N	Acenaphthene	Y	0.061	33400	491	6.35E-05	960.63	1.9565
CFSB-284-SO-0-0	CFSB-284	0.00-0.50	6/16/2018	N	Acenaphthylene	N	---	24000	452	6.35E-05	---	---
CFSB-284-SO-0-0	CFSB-284	0.00-0.50	6/16/2018	N	Anthracene	Y	0.12	1300	594	6.35E-05	1889.76	2.1886
CFSB-284-SO-0-0	CFSB-284	0.00-0.50	6/16/2018	N	Benzo(A)Anthracene	Y	0.6	4153	841	6.35E-05	9448.82	4.9382
CFSB-284-SO-0-0	CFSB-284	0.00-0.50	6/16/2018	N	Benzo(A)Pyrene	Y	0.77	3840	965	6.35E-05	12125.98	3.9793
CFSB-284-SO-0-0	CFSB-284	0.00-0.50	6/16/2018	N	Benzo(B)Fluoranthene	Y	1.3	2169	979	6.35E-05	20472.44	2.2155
CFSB-284-SO-0-0	CFSB-284	0.00-0.50	6/16/2018	N	Benzo(K)Fluoranthene	Y	0.43	1220	981	6.35E-05	6771.65	1.2436
CFSB-284-SO-0-0	CFSB-284	0.00-0.50	6/16/2018	N	Chrysene	Y	1.1	826	844	6.35E-05	17322.83	0.9787
CFSB-284-SO-0-0	CFSB-284	0.00-0.50	6/16/2018	N	Fluoranthene	Y	1.2	23870	707	6.35E-05	18897.64	26.7293
CFSB-284-SO-0-0	CFSB-284	0.00-0.50	6/16/2018	N	Fluorene	Y	0.037	26000	538	6.35E-05	582.68	1.0830
CFSB-284-SO-0-0	CFSB-284	0.00-0.50	6/16/2018	N	Naphthalene	Y	0.045	61700	385	6.35E-05	708.66	1.8407
CFSB-284-SO-0-0	CFSB-284	0.00-0.50	6/16/2018	N	Phenanthrene	Y	0.64	34300	596	6.35E-05	10078.74	16.9106
CFSB-284-SO-0-0	CFSB-284	0.00-0.50	6/16/2018	N	Pyrene	Y	1.1	9090	697	6.35E-05	17322.83	13.0416
CFSDP-009-SO	CFSDP-009	0.00-0.50	9/6/2016	N	Acenaphthene	N	---	33400	491	0.0425	---	---
CFSDP-009-SO	CFSDP-009	0.00-0.50	9/6/2016	N	Acenaphthylene	N	---	24000	452	0.0425	---	---
CFSDP-009-SO	CFSDP-009	0.00-0.50	9/6/2016	N	Anthracene	N	---	1300	594	0.0425	---	---
CFSDP-009-SO	CFSDP-009	0.00-0.50	9/6/2016	N	Benzo(A)Anthracene	Y	0.1	4153	841	0.0425	2.35	0.0028
CFSDP-009-SO	CFSDP-009	0.00-0.50	9/6/2016	N	Benzo(A)Pyrene	Y	0.12	3840	965	0.0425	2.82	0.0029
CFSDP-009-SO	CFSDP-009	0.00-0.50	9/6/2016	N	Benzo(B)Fluoranthene	Y	0.21	2169	979	0.0425	4.94	0.0050
CFSDP-009-SO	CFSDP-009	0.00-0.50	9/6/2016	N	Benzo(K)Fluoranthene	Y	0.069	1220	981	0.0425	1.62	0.0017
CFSDP-009-SO	CFSDP-009	0.00-0.50	9/6/2016	N	Chrysene	Y	0.14	826	844	0.0425	3.29	0.0039
CFSDP-009-SO	CFSDP-009	0.00-0.50	9/6/2016	N	Fluoranthene	Y	0.13	23870	707	0.0425	3.06	0.0043
CFSDP-009-SO	CFSDP-009	0.00-0.50	9/6/2016	N	Fluorene	N	---	26000	538	0.0425	---	---
CFSDP-009-SO	CFSDP-009	0.00-0.50	9/6/2016	N	Naphthalene	N	---	61700	385	0.0425	---	---
CFSDP-009-SO	CFSDP-009	0.00-0.50	9/6/2016	N	Phenanthrene	Y	0.065	34300	596	0.0425	1.53	0.0026

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-009-SO	CFSDP-009	0.00-0.50	9/6/2016	N	Pyrene	Y	0.19	9090	697	0.0425	4.47	0.0064
CFSDP-010-SO	CFSDP-010	0.00-0.50	9/6/2016	N	Acenaphthene	Y	0.043	33400	491	0.0922	0.47	0.0009
CFSDP-010-SO	CFSDP-010	0.00-0.50	9/6/2016	N	Acenaphthylene	N	---	24000	452	0.0922	---	---
CFSDP-010-SO	CFSDP-010	0.00-0.50	9/6/2016	N	Anthracene	Y	0.082	1300	594	0.0922	0.89	0.0015
CFSDP-010-SO	CFSDP-010	0.00-0.50	9/6/2016	N	Benzo(A)Anthracene	Y	0.82	4153	841	0.0922	8.89	0.0106
CFSDP-010-SO	CFSDP-010	0.00-0.50	9/6/2016	N	Benzo(A)Pyrene	Y	1.1	3840	965	0.0922	11.93	0.0124
CFSDP-010-SO	CFSDP-010	0.00-0.50	9/6/2016	N	Benzo(B)Fluoranthene	Y	1.8	2169	979	0.0922	19.52	0.0199
CFSDP-010-SO	CFSDP-010	0.00-0.50	9/6/2016	N	Benzo(K)Fluoranthene	Y	0.47	1220	981	0.0922	5.10	0.0052
CFSDP-010-SO	CFSDP-010	0.00-0.50	9/6/2016	N	Chrysene	Y	1.1	826	844	0.0922	11.93	0.0141
CFSDP-010-SO	CFSDP-010	0.00-0.50	9/6/2016	N	Fluoranthene	Y	1.1	23870	707	0.0922	11.93	0.0169
CFSDP-010-SO	CFSDP-010	0.00-0.50	9/6/2016	N	Fluorene	Y	0.028	26000	538	0.0922	0.30	0.0006
CFSDP-010-SO	CFSDP-010	0.00-0.50	9/6/2016	N	Naphthalene	Y	0.013	61700	385	0.0922	0.14	0.0004
CFSDP-010-SO	CFSDP-010	0.00-0.50	9/6/2016	N	Phenanthrene	Y	0.53	34300	596	0.0922	5.75	0.0096
CFSDP-010-SO	CFSDP-010	0.00-0.50	9/6/2016	N	Pyrene	Y	1.5	9090	697	0.0922	16.27	0.0233
CFSDP-011-SO	CFSDP-011	0.00-0.50	9/6/2016	N	Acenaphthene	Y	0.075	33400	491	0.0515	1.46	0.0030
CFSDP-011-SO	CFSDP-011	0.00-0.50	9/6/2016	N	Acenaphthylene	N	---	24000	452	0.0515	---	---
CFSDP-011-SO	CFSDP-011	0.00-0.50	9/6/2016	N	Anthracene	Y	0.14	1300	594	0.0515	2.72	0.0046
CFSDP-011-SO	CFSDP-011	0.00-0.50	9/6/2016	N	Benzo(A)Anthracene	Y	0.74	4153	841	0.0515	14.37	0.0171
CFSDP-011-SO	CFSDP-011	0.00-0.50	9/6/2016	N	Benzo(A)Pyrene	Y	0.94	3840	965	0.0515	18.25	0.0189
CFSDP-011-SO	CFSDP-011	0.00-0.50	9/6/2016	N	Benzo(B)Fluoranthene	Y	1.3	2169	979	0.0515	25.24	0.0258
CFSDP-011-SO	CFSDP-011	0.00-0.50	9/6/2016	N	Benzo(K)Fluoranthene	Y	0.49	1220	981	0.0515	9.51	0.0097
CFSDP-011-SO	CFSDP-011	0.00-0.50	9/6/2016	N	Chrysene	Y	0.93	826	844	0.0515	18.06	0.0214
CFSDP-011-SO	CFSDP-011	0.00-0.50	9/6/2016	N	Fluoranthene	Y	1.1	23870	707	0.0515	21.36	0.0302
CFSDP-011-SO	CFSDP-011	0.00-0.50	9/6/2016	N	Fluorene	Y	0.053	26000	538	0.0515	1.03	0.0019
CFSDP-011-SO	CFSDP-011	0.00-0.50	9/6/2016	N	Naphthalene	Y	0.02	61700	385	0.0515	0.39	0.0010
CFSDP-011-SO	CFSDP-011	0.00-0.50	9/6/2016	N	Phenanthrene	Y	0.69	34300	596	0.0515	13.40	0.0225
CFSDP-011-SO	CFSDP-011	0.00-0.50	9/6/2016	N	Pyrene	Y	1.4	9090	697	0.0515	27.18	0.0390
CFSDP-012-SO	CFSDP-012	0.00-0.50	9/6/2016	N	Acenaphthene	Y	0.046	33400	491	0.0615	0.75	0.0015
CFSDP-012-SO	CFSDP-012	0.00-0.50	9/6/2016	N	Acenaphthylene	N	---	24000	452	0.0615	---	---
CFSDP-012-SO	CFSDP-012	0.00-0.50	9/6/2016	N	Anthracene	Y	0.096	1300	594	0.0615	1.56	0.0026
CFSDP-012-SO	CFSDP-012	0.00-0.50	9/6/2016	N	Benzo(A)Anthracene	Y	0.64	4153	841	0.0615	10.41	0.0124
CFSDP-012-SO	CFSDP-012	0.00-0.50	9/6/2016	N	Benzo(A)Pyrene	Y	0.83	3840	965	0.0615	13.50	0.0140
CFSDP-012-SO	CFSDP-012	0.00-0.50	9/6/2016	N	Benzo(B)Fluoranthene	Y	1.2	2169	979	0.0615	19.51	0.0199
CFSDP-012-SO	CFSDP-012	0.00-0.50	9/6/2016	N	Benzo(K)Fluoranthene	Y	0.45	1220	981	0.0615	7.32	0.0075
CFSDP-012-SO	CFSDP-012	0.00-0.50	9/6/2016	N	Chrysene	Y	0.89	826	844	0.0615	14.47	0.0171
CFSDP-012-SO	CFSDP-012	0.00-0.50	9/6/2016	N	Fluoranthene	Y	1	23870	707	0.0615	16.26	0.0230
CFSDP-012-SO	CFSDP-012	0.00-0.50	9/6/2016	N	Fluorene	Y	0.03	26000	538	0.0615	0.49	0.0009
CFSDP-012-SO	CFSDP-012	0.00-0.50	9/6/2016	N	Naphthalene	Y	0.013	61700	385	0.0615	0.21	0.0005
CFSDP-012-SO	CFSDP-012	0.00-0.50	9/6/2016	N	Phenanthrene	Y	0.55	34300	596	0.0615	8.94	0.0150
CFSDP-012-SO	CFSDP-012	0.00-0.50	9/6/2016	N	Pyrene	Y	1.1	9090	697	0.0615	17.89	0.0257
CFSDP-013-SO	CFSDP-013	0.00-0.50	9/6/2016	N	Acenaphthene	N	---	33400	491	0.1830	---	---
CFSDP-013-SO	CFSDP-013	0.00-0.50	9/6/2016	N	Acenaphthylene	N	---	24000	452	0.1830	---	---
CFSDP-013-SO	CFSDP-013	0.00-0.50	9/6/2016	N	Anthracene	N	---	1300	594	0.1830	---	---
CFSDP-013-SO	CFSDP-013	0.00-0.50	9/6/2016	N	Benzo(A)Anthracene	Y	0.093	4153	841	0.1830	0.51	0.0006
CFSDP-013-SO	CFSDP-013	0.00-0.50	9/6/2016	N	Benzo(A)Pyrene	Y	0.11	3840	965	0.1830	0.60	0.0006
CFSDP-013-SO	CFSDP-013	0.00-0.50	9/6/2016	N	Benzo(B)Fluoranthene	Y	0.19	2169	979	0.1830	1.04	0.0011
CFSDP-013-SO	CFSDP-013	0.00-0.50	9/6/2016	N	Benzo(K)Fluoranthene	Y	0.051	1220	981	0.1830	0.28	0.0003
CFSDP-013-SO	CFSDP-013	0.00-0.50	9/6/2016	N	Chrysene	Y	0.13	826	844	0.1830	0.71	0.0008
CFSDP-013-SO	CFSDP-013	0.00-0.50	9/6/2016	N	Fluoranthene	Y	0.14	23870	707	0.1830	0.77	0.0011

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-013-SO	CFSDP-013	0.00-0.50	9/6/2016	N	Fluorene	N	---	26000	538	0.1830	---	---
CFSDP-013-SO	CFSDP-013	0.00-0.50	9/6/2016	N	Naphthalene	N	---	61700	385	0.1830	---	---
CFSDP-013-SO	CFSDP-013	0.00-0.50	9/6/2016	N	Phenanthrene	Y	0.067	34300	596	0.1830	0.37	0.0006
CFSDP-013-SO	CFSDP-013	0.00-0.50	9/6/2016	N	Pyrene	Y	0.13	9090	697	0.1830	0.71	0.0010
CFSDP-DUP1-SO	CFSDP-012	0.00-0.50	9/6/2016	FD	Acenaphthene	Y	0.037	33400	491	0.0610	0.61	0.0012
CFSDP-DUP1-SO	CFSDP-012	0.00-0.50	9/6/2016	FD	Acenaphthylene	N	---	24000	452	0.0610	---	---
CFSDP-DUP1-SO	CFSDP-012	0.00-0.50	9/6/2016	FD	Anthracene	Y	0.083	1300	594	0.0610	1.36	0.0023
CFSDP-DUP1-SO	CFSDP-012	0.00-0.50	9/6/2016	FD	Benzo(A)Anthracene	Y	0.55	4153	841	0.0610	9.02	0.0107
CFSDP-DUP1-SO	CFSDP-012	0.00-0.50	9/6/2016	FD	Benzo(A)Pyrene	Y	0.74	3840	965	0.0610	12.13	0.0126
CFSDP-DUP1-SO	CFSDP-012	0.00-0.50	9/6/2016	FD	Benzo(B)Fluoranthene	Y	1.1	2169	979	0.0610	18.03	0.0184
CFSDP-DUP1-SO	CFSDP-012	0.00-0.50	9/6/2016	FD	Benzo(K)Fluoranthene	Y	0.45	1220	981	0.0610	7.38	0.0075
CFSDP-DUP1-SO	CFSDP-012	0.00-0.50	9/6/2016	FD	Chrysene	Y	0.82	826	844	0.0610	13.44	0.0159
CFSDP-DUP1-SO	CFSDP-012	0.00-0.50	9/6/2016	FD	Fluoranthene	Y	0.92	23870	707	0.0610	15.08	0.0213
CFSDP-DUP1-SO	CFSDP-012	0.00-0.50	9/6/2016	FD	Fluorene	Y	0.024	26000	538	0.0610	0.39	0.0007
CFSDP-DUP1-SO	CFSDP-012	0.00-0.50	9/6/2016	FD	Naphthalene	Y	0.011	61700	385	0.0610	0.18	0.0005
CFSDP-DUP1-SO	CFSDP-012	0.00-0.50	9/6/2016	FD	Phenanthrene	Y	0.49	34300	596	0.0610	8.03	0.0135
CFSDP-DUP1-SO	CFSDP-012	0.00-0.50	9/6/2016	FD	Pyrene	Y	1	9090	697	0.0610	16.39	0.0235
South Percolation Pond Area												
CFSB-101-SO-0-0	CFSB-101	0.00-0.50	7/21/2016	N	Acenaphthene	N	---	33400	491	0.0785	---	---
CFSB-101-SO-0-0	CFSB-101	0.00-0.50	7/21/2016	N	Acenaphthylene	N	---	24000	452	0.0785	---	---
CFSB-101-SO-0-0	CFSB-101	0.00-0.50	7/21/2016	N	Anthracene	N	---	1300	594	0.0785	---	---
CFSB-101-SO-0-0	CFSB-101	0.00-0.50	7/21/2016	N	Benzo(A)Anthracene	Y	0.042	4153	841	0.0785	0.54	0.0006
CFSB-101-SO-0-0	CFSB-101	0.00-0.50	7/21/2016	N	Benzo(A)Pyrene	N	---	3840	965	0.0785	---	---
CFSB-101-SO-0-0	CFSB-101	0.00-0.50	7/21/2016	N	Benzo(B)Fluoranthene	Y	0.084	2169	979	0.0785	1.07	0.0011
CFSB-101-SO-0-0	CFSB-101	0.00-0.50	7/21/2016	N	Benzo(K)Fluoranthene	Y	0.022	1220	981	0.0785	0.28	0.0003
CFSB-101-SO-0-0	CFSB-101	0.00-0.50	7/21/2016	N	Chrysene	Y	0.067	826	844	0.0785	0.85	0.0010
CFSB-101-SO-0-0	CFSB-101	0.00-0.50	7/21/2016	N	Fluoranthene	Y	0.053	23870	707	0.0785	0.68	0.0010
CFSB-101-SO-0-0	CFSB-101	0.00-0.50	7/21/2016	N	Fluorene	N	---	26000	538	0.0785	---	---
CFSB-101-SO-0-0	CFSB-101	0.00-0.50	7/21/2016	N	Naphthalene	N	---	61700	385	0.0785	---	---
CFSB-101-SO-0-0	CFSB-101	0.00-0.50	7/21/2016	N	Phenanthrene	Y	0.037	34300	596	0.0785	0.47	0.0008
CFSB-101-SO-0-0	CFSB-101	0.00-0.50	7/21/2016	N	Pyrene	Y	0.058	9090	697	0.0785	0.74	0.0011
CFSB-102-SO-0-0	CFSB-102	0.00-0.50	7/13/2016	N	Acenaphthene	N	---	33400	491	0.0785	---	---
CFSB-102-SO-0-0	CFSB-102	0.00-0.50	7/13/2016	N	Acenaphthylene	N	---	24000	452	0.0785	---	---
CFSB-102-SO-0-0	CFSB-102	0.00-0.50	7/13/2016	N	Anthracene	N	---	1300	594	0.0785	---	---
CFSB-102-SO-0-0	CFSB-102	0.00-0.50	7/13/2016	N	Benzo(A)Anthracene	Y	0.11	4153	841	0.0785	1.40	0.0017
CFSB-102-SO-0-0	CFSB-102	0.00-0.50	7/13/2016	N	Benzo(A)Pyrene	Y	0.13	3840	965	0.0785	1.66	0.0017
CFSB-102-SO-0-0	CFSB-102	0.00-0.50	7/13/2016	N	Benzo(B)Fluoranthene	Y	0.22	2169	979	0.0785	2.80	0.0029
CFSB-102-SO-0-0	CFSB-102	0.00-0.50	7/13/2016	N	Benzo(K)Fluoranthene	Y	0.079	1220	981	0.0785	1.01	0.0010
CFSB-102-SO-0-0	CFSB-102	0.00-0.50	7/13/2016	N	Chrysene	Y	0.19	826	844	0.0785	2.42	0.0029
CFSB-102-SO-0-0	CFSB-102	0.00-0.50	7/13/2016	N	Fluoranthene	Y	0.16	23870	707	0.0785	2.04	0.0029
CFSB-102-SO-0-0	CFSB-102	0.00-0.50	7/13/2016	N	Fluorene	N	---	26000	538	0.0785	---	---
CFSB-102-SO-0-0	CFSB-102	0.00-0.50	7/13/2016	N	Naphthalene	N	---	61700	385	0.0785	---	---
CFSB-102-SO-0-0	CFSB-102	0.00-0.50	7/13/2016	N	Phenanthrene	Y	0.075	34300	596	0.0785	0.96	0.0016
CFSB-102-SO-0-0	CFSB-102	0.00-0.50	7/13/2016	N	Pyrene	Y	0.18	9090	697	0.0785	2.29	0.0033
CFSB-104-SO-0-0	CFSB-104	0.00-0.50	7/13/2016	N	Acenaphthene	N	---	33400	491	0.0785	---	---
CFSB-104-SO-0-0	CFSB-104	0.00-0.50	7/13/2016	N	Acenaphthylene	N	---	24000	452	0.0785	---	---
CFSB-104-SO-0-0	CFSB-104	0.00-0.50	7/13/2016	N	Anthracene	N	---	1300	594	0.0785	---	---
CFSB-104-SO-0-0	CFSB-104	0.00-0.50	7/13/2016	N	Benzo(A)Anthracene	Y	0.18	4153	841	0.0785	2.29	0.0027
CFSB-104-SO-0-0	CFSB-104	0.00-0.50	7/13/2016	N	Benzo(A)Pyrene	Y	0.25	3840	965	0.0785	3.19	0.0033

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSB-104-SO-0-0	CFSB-104	0.00-0.50	7/13/2016	N	Benzo(B)Fluoranthene	Y	0.35	2169	979	0.0785	4.46	0.0046
CFSB-104-SO-0-0	CFSB-104	0.00-0.50	7/13/2016	N	Benzo(K)Fluoranthene	Y	0.15	1220	981	0.0785	1.91	0.0019
CFSB-104-SO-0-0	CFSB-104	0.00-0.50	7/13/2016	N	Chrysene	Y	0.3	826	844	0.0785	3.82	0.0045
CFSB-104-SO-0-0	CFSB-104	0.00-0.50	7/13/2016	N	Fluoranthene	Y	0.27	23870	707	0.0785	3.44	0.0049
CFSB-104-SO-0-0	CFSB-104	0.00-0.50	7/13/2016	N	Fluorene	N	---	26000	538	0.0785	---	---
CFSB-104-SO-0-0	CFSB-104	0.00-0.50	7/13/2016	N	Naphthalene	N	---	61700	385	0.0785	---	---
CFSB-104-SO-0-0	CFSB-104	0.00-0.50	7/13/2016	N	Phenanthrene	Y	0.14	34300	596	0.0785	1.78	0.0030
CFSB-104-SO-0-0	CFSB-104	0.00-0.50	7/13/2016	N	Pyrene	Y	0.32	9090	697	0.0785	4.08	0.0059
CFSB-109-SO-0-0	CFSB-109	0.00-0.50	7/13/2016	N	Acenaphthene	Y	0.02	33400	491	0.0785	0.25	0.0005
CFSB-109-SO-0-0	CFSB-109	0.00-0.50	7/13/2016	N	Acenaphthylene	N	---	24000	452	0.0785	---	---
CFSB-109-SO-0-0	CFSB-109	0.00-0.50	7/13/2016	N	Anthracene	N	---	1300	594	0.0785	---	---
CFSB-109-SO-0-0	CFSB-109	0.00-0.50	7/13/2016	N	Benzo(A)Anthracene	Y	0.36	4153	841	0.0785	4.59	0.0055
CFSB-109-SO-0-0	CFSB-109	0.00-0.50	7/13/2016	N	Benzo(A)Pyrene	Y	0.48	3840	965	0.0785	6.12	0.0063
CFSB-109-SO-0-0	CFSB-109	0.00-0.50	7/13/2016	N	Benzo(B)Fluoranthene	Y	0.62	2169	979	0.0785	7.90	0.0081
CFSB-109-SO-0-0	CFSB-109	0.00-0.50	7/13/2016	N	Benzo(K)Fluoranthene	Y	0.25	1220	981	0.0785	3.19	0.0032
CFSB-109-SO-0-0	CFSB-109	0.00-0.50	7/13/2016	N	Chrysene	Y	0.55	826	844	0.0785	7.01	0.0083
CFSB-109-SO-0-0	CFSB-109	0.00-0.50	7/13/2016	N	Fluoranthene	Y	0.56	23870	707	0.0785	7.14	0.0101
CFSB-109-SO-0-0	CFSB-109	0.00-0.50	7/13/2016	N	Fluorene	Y	0.02	26000	538	0.0785	0.25	0.0005
CFSB-109-SO-0-0	CFSB-109	0.00-0.50	7/13/2016	N	Naphthalene	N	---	61700	385	0.0785	---	---
CFSB-109-SO-0-0	CFSB-109	0.00-0.50	7/13/2016	N	Phenanthrene	Y	0.27	34300	596	0.0785	3.44	0.0058
CFSB-109-SO-0-0	CFSB-109	0.00-0.50	7/13/2016	N	Pyrene	Y	0.57	9090	697	0.0785	7.27	0.0104
CFSB-110-SO-0-0	CFSB-110	0.00-0.50	7/14/2016	N	Acenaphthene	N	---	33400	491	0.0785	---	---
CFSB-110-SO-0-0	CFSB-110	0.00-0.50	7/14/2016	N	Acenaphthylene	N	---	24000	452	0.0785	---	---
CFSB-110-SO-0-0	CFSB-110	0.00-0.50	7/14/2016	N	Anthracene	N	---	1300	594	0.0785	---	---
CFSB-110-SO-0-0	CFSB-110	0.00-0.50	7/14/2016	N	Benzo(A)Anthracene	Y	0.18	4153	841	0.0785	2.29	0.0027
CFSB-110-SO-0-0	CFSB-110	0.00-0.50	7/14/2016	N	Benzo(A)Pyrene	Y	0.23	3840	965	0.0785	2.93	0.0030
CFSB-110-SO-0-0	CFSB-110	0.00-0.50	7/14/2016	N	Benzo(B)Fluoranthene	Y	0.29	2169	979	0.0785	3.70	0.0038
CFSB-110-SO-0-0	CFSB-110	0.00-0.50	7/14/2016	N	Benzo(K)Fluoranthene	Y	0.12	1220	981	0.0785	1.53	0.0016
CFSB-110-SO-0-0	CFSB-110	0.00-0.50	7/14/2016	N	Chrysene	Y	0.28	826	844	0.0785	3.57	0.0042
CFSB-110-SO-0-0	CFSB-110	0.00-0.50	7/14/2016	N	Fluoranthene	Y	0.24	23870	707	0.0785	3.06	0.0043
CFSB-110-SO-0-0	CFSB-110	0.00-0.50	7/14/2016	N	Fluorene	N	---	26000	538	0.0785	---	---
CFSB-110-SO-0-0	CFSB-110	0.00-0.50	7/14/2016	N	Naphthalene	N	---	61700	385	0.0785	---	---
CFSB-110-SO-0-0	CFSB-110	0.00-0.50	7/14/2016	N	Phenanthrene	Y	0.12	34300	596	0.0785	1.53	0.0026
CFSB-110-SO-0-0	CFSB-110	0.00-0.50	7/14/2016	N	Pyrene	Y	0.23	9090	697	0.0785	2.93	0.0042
CFSB-113-SO-0-0	CFSB-113	0.00-0.50	8/31/2016	N	Acenaphthene	Y	0.01	33400	491	0.0785	0.13	0.0003
CFSB-113-SO-0-0	CFSB-113	0.00-0.50	8/31/2016	N	Acenaphthylene	N	---	24000	452	0.0785	---	---
CFSB-113-SO-0-0	CFSB-113	0.00-0.50	8/31/2016	N	Anthracene	N	---	1300	594	0.0785	---	---
CFSB-113-SO-0-0	CFSB-113	0.00-0.50	8/31/2016	N	Benzo(A)Anthracene	Y	0.12	4153	841	0.0785	1.53	0.0018
CFSB-113-SO-0-0	CFSB-113	0.00-0.50	8/31/2016	N	Benzo(A)Pyrene	Y	0.17	3840	965	0.0785	2.17	0.0022
CFSB-113-SO-0-0	CFSB-113	0.00-0.50	8/31/2016	N	Benzo(B)Fluoranthene	Y	0.29	2169	979	0.0785	3.70	0.0038
CFSB-113-SO-0-0	CFSB-113	0.00-0.50	8/31/2016	N	Benzo(K)Fluoranthene	Y	0.1	1220	981	0.0785	1.27	0.0013
CFSB-113-SO-0-0	CFSB-113	0.00-0.50	8/31/2016	N	Chrysene	Y	0.19	826	844	0.0785	2.42	0.0029
CFSB-113-SO-0-0	CFSB-113	0.00-0.50	8/31/2016	N	Fluoranthene	Y	0.2	23870	707	0.0785	2.55	0.0036
CFSB-113-SO-0-0	CFSB-113	0.00-0.50	8/31/2016	N	Fluorene	N	---	26000	538	0.0785	---	---
CFSB-113-SO-0-0	CFSB-113	0.00-0.50	8/31/2016	N	Naphthalene	N	---	61700	385	0.0785	---	---
CFSB-113-SO-0-0	CFSB-113	0.00-0.50	8/31/2016	N	Phenanthrene	Y	0.1	34300	596	0.0785	1.27	0.0021
CFSB-113-SO-0-0	CFSB-113	0.00-0.50	8/31/2016	N	Pyrene	Y	0.22	9090	697	0.0785	2.80	0.0040
CFSB-115-SO-0-0	CFSB-115	0.00-0.50	8/31/2016	N	Acenaphthene	N	---	33400	491	0.0785	---	---
CFSB-115-SO-0-0	CFSB-115	0.00-0.50	8/31/2016	N	Acenaphthylene	N	---	24000	452	0.0785	---	---

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSB-115-SO-0-0	CFSB-115	0.00-0.50	8/31/2016	N	Anthracene	N	---	1300	594	0.0785	---	---
CFSB-115-SO-0-0	CFSB-115	0.00-0.50	8/31/2016	N	Benzo(A)Anthracene	Y	0.059	4153	841	0.0785	0.75	0.0009
CFSB-115-SO-0-0	CFSB-115	0.00-0.50	8/31/2016	N	Benzo(A)Pyrene	Y	0.084	3840	965	0.0785	1.07	0.0011
CFSB-115-SO-0-0	CFSB-115	0.00-0.50	8/31/2016	N	Benzo(B)Fluoranthene	Y	0.17	2169	979	0.0785	2.17	0.0022
CFSB-115-SO-0-0	CFSB-115	0.00-0.50	8/31/2016	N	Benzo(K)Fluoranthene	Y	0.06	1220	981	0.0785	0.76	0.0008
CFSB-115-SO-0-0	CFSB-115	0.00-0.50	8/31/2016	N	Chrysene	Y	0.1	826	844	0.0785	1.27	0.0015
CFSB-115-SO-0-0	CFSB-115	0.00-0.50	8/31/2016	N	Fluoranthene	Y	0.089	23870	707	0.0785	1.13	0.0016
CFSB-115-SO-0-0	CFSB-115	0.00-0.50	8/31/2016	N	Fluorene	N	---	26000	538	0.0785	---	---
CFSB-115-SO-0-0	CFSB-115	0.00-0.50	8/31/2016	N	Naphthalene	N	---	61700	385	0.0785	---	---
CFSB-115-SO-0-0	CFSB-115	0.00-0.50	8/31/2016	N	Phenanthrene	Y	0.044	34300	596	0.0785	0.56	0.0009
CFSB-115-SO-0-0	CFSB-115	0.00-0.50	8/31/2016	N	Pyrene	Y	0.096	9090	697	0.0785	1.22	0.0018
CFSB-116-SO-0-0	CFSB-116	0.00-0.50	7/22/2016	N	Acenaphthene	N	---	33400	491	0.0785	---	---
CFSB-116-SO-0-0	CFSB-116	0.00-0.50	7/22/2016	N	Acenaphthylene	N	---	24000	452	0.0785	---	---
CFSB-116-SO-0-0	CFSB-116	0.00-0.50	7/22/2016	N	Anthracene	N	---	1300	594	0.0785	---	---
CFSB-116-SO-0-0	CFSB-116	0.00-0.50	7/22/2016	N	Benzo(A)Anthracene	Y	0.11	4153	841	0.0785	1.40	0.0017
CFSB-116-SO-0-0	CFSB-116	0.00-0.50	7/22/2016	N	Benzo(A)Pyrene	Y	0.15	3840	965	0.0785	1.91	0.0020
CFSB-116-SO-0-0	CFSB-116	0.00-0.50	7/22/2016	N	Benzo(B)Fluoranthene	Y	0.25	2169	979	0.0785	3.19	0.0033
CFSB-116-SO-0-0	CFSB-116	0.00-0.50	7/22/2016	N	Benzo(K)Fluoranthene	Y	0.083	1220	981	0.0785	1.06	0.0011
CFSB-116-SO-0-0	CFSB-116	0.00-0.50	7/22/2016	N	Chrysene	Y	0.17	826	844	0.0785	2.17	0.0026
CFSB-116-SO-0-0	CFSB-116	0.00-0.50	7/22/2016	N	Fluoranthene	Y	0.16	23870	707	0.0785	2.04	0.0029
CFSB-116-SO-0-0	CFSB-116	0.00-0.50	7/22/2016	N	Fluorene	N	---	26000	538	0.0785	---	---
CFSB-116-SO-0-0	CFSB-116	0.00-0.50	7/22/2016	N	Naphthalene	Y	0.015	61700	385	0.0785	0.19	0.0005
CFSB-116-SO-0-0	CFSB-116	0.00-0.50	7/22/2016	N	Phenanthrene	Y	0.089	34300	596	0.0785	1.13	0.0019
CFSB-116-SO-0-0	CFSB-116	0.00-0.50	7/22/2016	N	Pyrene	Y	0.17	9090	697	0.0785	2.17	0.0031
CFSB-118-SO-0-0	CFSB-118	0.00-0.50	7/21/2016	N	Acenaphthene	N	---	33400	491	0.0785	---	---
CFSB-118-SO-0-0	CFSB-118	0.00-0.50	7/21/2016	N	Acenaphthylene	N	---	24000	452	0.0785	---	---
CFSB-118-SO-0-0	CFSB-118	0.00-0.50	7/21/2016	N	Anthracene	N	---	1300	594	0.0785	---	---
CFSB-118-SO-0-0	CFSB-118	0.00-0.50	7/21/2016	N	Benzo(A)Anthracene	N	---	4153	841	0.0785	---	---
CFSB-118-SO-0-0	CFSB-118	0.00-0.50	7/21/2016	N	Benzo(A)Pyrene	N	---	3840	965	0.0785	---	---
CFSB-118-SO-0-0	CFSB-118	0.00-0.50	7/21/2016	N	Benzo(B)Fluoranthene	N	---	2169	979	0.0785	---	---
CFSB-118-SO-0-0	CFSB-118	0.00-0.50	7/21/2016	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0785	---	---
CFSB-118-SO-0-0	CFSB-118	0.00-0.50	7/21/2016	N	Chrysene	N	---	826	844	0.0785	---	---
CFSB-118-SO-0-0	CFSB-118	0.00-0.50	7/21/2016	N	Fluoranthene	N	---	23870	707	0.0785	---	---
CFSB-118-SO-0-0	CFSB-118	0.00-0.50	7/21/2016	N	Fluorene	N	---	26000	538	0.0785	---	---
CFSB-118-SO-0-0	CFSB-118	0.00-0.50	7/21/2016	N	Naphthalene	N	---	61700	385	0.0785	---	---
CFSB-118-SO-0-0	CFSB-118	0.00-0.50	7/21/2016	N	Phenanthrene	N	---	34300	596	0.0785	---	---
CFSB-118-SO-0-0	CFSB-118	0.00-0.50	7/21/2016	N	Pyrene	N	---	9090	697	0.0785	---	---
CFSB-149-SD-0-0	CFSB-149	0.00-0.50	11/7/2017	N	Acenaphthene	N	---	33400	491	0.0187	---	---
CFSB-149-SD-0-0	CFSB-149	0.00-0.50	11/7/2017	N	Acenaphthylene	N	---	24000	452	0.0187	---	---
CFSB-149-SD-0-0	CFSB-149	0.00-0.50	11/7/2017	N	Anthracene	N	---	1300	594	0.0187	---	---
CFSB-149-SD-0-0	CFSB-149	0.00-0.50	11/7/2017	N	Benzo(A)Anthracene	Y	0.083	4153	841	0.0187	4.44	0.0053
CFSB-149-SD-0-0	CFSB-149	0.00-0.50	11/7/2017	N	Benzo(A)Pyrene	Y	0.11	3840	965	0.0187	5.88	0.0061
CFSB-149-SD-0-0	CFSB-149	0.00-0.50	11/7/2017	N	Benzo(B)Fluoranthene	Y	0.2	2169	979	0.0187	10.70	0.0109
CFSB-149-SD-0-0	CFSB-149	0.00-0.50	11/7/2017	N	Benzo(K)Fluoranthene	Y	0.076	1220	981	0.0187	4.06	0.0041
CFSB-149-SD-0-0	CFSB-149	0.00-0.50	11/7/2017	N	Chrysene	Y	0.14	826	844	0.0187	7.49	0.0089
CFSB-149-SD-0-0	CFSB-149	0.00-0.50	11/7/2017	N	Fluoranthene	Y	0.12	23870	707	0.0187	6.42	0.0091
CFSB-149-SD-0-0	CFSB-149	0.00-0.50	11/7/2017	N	Fluorene	N	---	26000	538	0.0187	---	---
CFSB-149-SD-0-0	CFSB-149	0.00-0.50	11/7/2017	N	Naphthalene	N	---	61700	385	0.0187	---	---
CFSB-149-SD-0-0	CFSB-149	0.00-0.50	11/7/2017	N	Phenanthrene	Y	0.062	34300	596	0.0187	3.32	0.0056

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSB-149-SD-0-0	CFSB-149	0.00-0.50	11/7/2017	N	Pyrene	Y	0.14	9090	697	0.0187	7.49	0.0107
CFSB-150-SD-0-0	CFSB-150	0.00-0.50	11/7/2017	N	Acenaphthene	N	---	33400	491	0.0519	---	---
CFSB-150-SD-0-0	CFSB-150	0.00-0.50	11/7/2017	N	Acenaphthylene	N	---	24000	452	0.0519	---	---
CFSB-150-SD-0-0	CFSB-150	0.00-0.50	11/7/2017	N	Anthracene	N	---	1300	594	0.0519	---	---
CFSB-150-SD-0-0	CFSB-150	0.00-0.50	11/7/2017	N	Benzo(A)Anthracene	Y	0.2	4153	841	0.0519	3.85	0.0046
CFSB-150-SD-0-0	CFSB-150	0.00-0.50	11/7/2017	N	Benzo(A)Pyrene	Y	0.31	3840	965	0.0519	5.97	0.0062
CFSB-150-SD-0-0	CFSB-150	0.00-0.50	11/7/2017	N	Benzo(B)Fluoranthene	Y	0.55	2169	979	0.0519	10.60	0.0108
CFSB-150-SD-0-0	CFSB-150	0.00-0.50	11/7/2017	N	Benzo(K)Fluoranthene	Y	0.19	1220	981	0.0519	3.66	0.0037
CFSB-150-SD-0-0	CFSB-150	0.00-0.50	11/7/2017	N	Chrysene	Y	0.34	826	844	0.0519	6.55	0.0078
CFSB-150-SD-0-0	CFSB-150	0.00-0.50	11/7/2017	N	Fluoranthene	Y	0.28	23870	707	0.0519	5.39	0.0076
CFSB-150-SD-0-0	CFSB-150	0.00-0.50	11/7/2017	N	Fluorene	N	---	26000	538	0.0519	---	---
CFSB-150-SD-0-0	CFSB-150	0.00-0.50	11/7/2017	N	Naphthalene	N	---	61700	385	0.0519	---	---
CFSB-150-SD-0-0	CFSB-150	0.00-0.50	11/7/2017	N	Phenanthrene	Y	0.15	34300	596	0.0519	2.89	0.0048
CFSB-150-SD-0-0	CFSB-150	0.00-0.50	11/7/2017	N	Pyrene	Y	0.26	9090	697	0.0519	5.01	0.0072
CFSB-151-SO-0-0	CFSB-151	0.00-0.50	11/7/2017	N	Acenaphthene	N	---	33400	491	0.0151	---	---
CFSB-151-SO-0-0	CFSB-151	0.00-0.50	11/7/2017	N	Acenaphthylene	N	---	24000	452	0.0151	---	---
CFSB-151-SO-0-0	CFSB-151	0.00-0.50	11/7/2017	N	Anthracene	N	---	1300	594	0.0151	---	---
CFSB-151-SO-0-0	CFSB-151	0.00-0.50	11/7/2017	N	Benzo(A)Anthracene	Y	0.053	4153	841	0.0151	3.51	0.0042
CFSB-151-SO-0-0	CFSB-151	0.00-0.50	11/7/2017	N	Benzo(A)Pyrene	Y	0.059	3840	965	0.0151	3.91	0.0040
CFSB-151-SO-0-0	CFSB-151	0.00-0.50	11/7/2017	N	Benzo(B)Fluoranthene	Y	0.11	2169	979	0.0151	7.28	0.0074
CFSB-151-SO-0-0	CFSB-151	0.00-0.50	11/7/2017	N	Benzo(K)Fluoranthene	Y	0.046	1220	981	0.0151	3.05	0.0031
CFSB-151-SO-0-0	CFSB-151	0.00-0.50	11/7/2017	N	Chrysene	Y	0.067	826	844	0.0151	4.44	0.0053
CFSB-151-SO-0-0	CFSB-151	0.00-0.50	11/7/2017	N	Fluoranthene	Y	0.094	23870	707	0.0151	6.23	0.0088
CFSB-151-SO-0-0	CFSB-151	0.00-0.50	11/7/2017	N	Fluorene	N	---	26000	538	0.0151	---	---
CFSB-151-SO-0-0	CFSB-151	0.00-0.50	11/7/2017	N	Naphthalene	N	---	61700	385	0.0151	---	---
CFSB-151-SO-0-0	CFSB-151	0.00-0.50	11/7/2017	N	Phenanthrene	Y	0.047	34300	596	0.0151	3.11	0.0052
CFSB-151-SO-0-0	CFSB-151	0.00-0.50	11/7/2017	N	Pyrene	Y	0.09	9090	697	0.0151	5.96	0.0086
CFSB-152-SO-0-0	CFSB-152	0.00-0.50	11/7/2017	N	Acenaphthene	N	---	33400	491	0.0657	---	---
CFSB-152-SO-0-0	CFSB-152	0.00-0.50	11/7/2017	N	Acenaphthylene	N	---	24000	452	0.0657	---	---
CFSB-152-SO-0-0	CFSB-152	0.00-0.50	11/7/2017	N	Anthracene	N	---	1300	594	0.0657	---	---
CFSB-152-SO-0-0	CFSB-152	0.00-0.50	11/7/2017	N	Benzo(A)Anthracene	Y	0.2	4153	841	0.0657	3.04	0.0036
CFSB-152-SO-0-0	CFSB-152	0.00-0.50	11/7/2017	N	Benzo(A)Pyrene	N	---	3840	965	0.0657	---	---
CFSB-152-SO-0-0	CFSB-152	0.00-0.50	11/7/2017	N	Benzo(B)Fluoranthene	N	---	2169	979	0.0657	---	---
CFSB-152-SO-0-0	CFSB-152	0.00-0.50	11/7/2017	N	Benzo(K)Fluoranthene	Y	0.14	1220	981	0.0657	2.13	0.0022
CFSB-152-SO-0-0	CFSB-152	0.00-0.50	11/7/2017	N	Chrysene	Y	0.34	826	844	0.0657	5.18	0.0061
CFSB-152-SO-0-0	CFSB-152	0.00-0.50	11/7/2017	N	Fluoranthene	Y	0.31	23870	707	0.0657	4.72	0.0067
CFSB-152-SO-0-0	CFSB-152	0.00-0.50	11/7/2017	N	Fluorene	N	---	26000	538	0.0657	---	---
CFSB-152-SO-0-0	CFSB-152	0.00-0.50	11/7/2017	N	Naphthalene	N	---	61700	385	0.0657	---	---
CFSB-152-SO-0-0	CFSB-152	0.00-0.50	11/7/2017	N	Phenanthrene	Y	0.13	34300	596	0.0657	1.98	0.0033
CFSB-152-SO-0-0	CFSB-152	0.00-0.50	11/7/2017	N	Pyrene	Y	0.25	9090	697	0.0657	3.81	0.0055
CFSB-153-SO-0-0	CFSB-153	0.00-0.50	11/6/2017	N	Acenaphthene	N	---	33400	491	0.0978	---	---
CFSB-153-SO-0-0	CFSB-153	0.00-0.50	11/6/2017	N	Acenaphthylene	N	---	24000	452	0.0978	---	---
CFSB-153-SO-0-0	CFSB-153	0.00-0.50	11/6/2017	N	Anthracene	N	---	1300	594	0.0978	---	---
CFSB-153-SO-0-0	CFSB-153	0.00-0.50	11/6/2017	N	Benzo(A)Anthracene	N	---	4153	841	0.0978	---	---
CFSB-153-SO-0-0	CFSB-153	0.00-0.50	11/6/2017	N	Benzo(A)Pyrene	Y	2.8	3840	965	0.0978	28.63	0.0297
CFSB-153-SO-0-0	CFSB-153	0.00-0.50	11/6/2017	N	Benzo(B)Fluoranthene	Y	6.6	2169	979	0.0978	67.48	0.0689
CFSB-153-SO-0-0	CFSB-153	0.00-0.50	11/6/2017	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0978	---	---
CFSB-153-SO-0-0	CFSB-153	0.00-0.50	11/6/2017	N	Chrysene	Y	2.6	826	844	0.0978	26.58	0.0315
CFSB-153-SO-0-0	CFSB-153	0.00-0.50	11/6/2017	N	Fluoranthene	Y	1.3	23870	707	0.0978	13.29	0.0188

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSB-153-SO-0-0	CFSB-153	0.00-0.50	11/6/2017	N	Fluorene	N	---	26000	538	0.0978	---	---
CFSB-153-SO-0-0	CFSB-153	0.00-0.50	11/6/2017	N	Naphthalene	N	---	61700	385	0.0978	---	---
CFSB-153-SO-0-0	CFSB-153	0.00-0.50	11/6/2017	N	Phenanthrene	Y	0.55	34300	596	0.0978	5.62	0.0094
CFSB-153-SO-0-0	CFSB-153	0.00-0.50	11/6/2017	N	Pyrene	Y	1.3	9090	697	0.0978	13.29	0.0191
CFSDP-018-SD	CFSDP-018	0.00-0.50	9/7/2016	N	Acenaphthene	N	---	33400	491	0.2530	---	---
CFSDP-018-SD	CFSDP-018	0.00-0.50	9/7/2016	N	Acenaphthylene	N	---	24000	452	0.2530	---	---
CFSDP-018-SD	CFSDP-018	0.00-0.50	9/7/2016	N	Anthracene	N	---	1300	594	0.2530	---	---
CFSDP-018-SD	CFSDP-018	0.00-0.50	9/7/2016	N	Benzo(A)Anthracene	Y	0.21	4153	841	0.2530	0.83	0.0010
CFSDP-018-SD	CFSDP-018	0.00-0.50	9/7/2016	N	Benzo(A)Pyrene	Y	0.26	3840	965	0.2530	1.03	0.0011
CFSDP-018-SD	CFSDP-018	0.00-0.50	9/7/2016	N	Benzo(B)Fluoranthene	Y	0.37	2169	979	0.2530	1.46	0.0015
CFSDP-018-SD	CFSDP-018	0.00-0.50	9/7/2016	N	Benzo(K)Fluoranthene	Y	0.17	1220	981	0.2530	0.67	0.0007
CFSDP-018-SD	CFSDP-018	0.00-0.50	9/7/2016	N	Chrysene	Y	0.33	826	844	0.2530	1.30	0.0015
CFSDP-018-SD	CFSDP-018	0.00-0.50	9/7/2016	N	Fluoranthene	Y	0.3	23870	707	0.2530	1.19	0.0017
CFSDP-018-SD	CFSDP-018	0.00-0.50	9/7/2016	N	Fluorene	N	---	26000	538	0.2530	---	---
CFSDP-018-SD	CFSDP-018	0.00-0.50	9/7/2016	N	Naphthalene	N	---	61700	385	0.2530	---	---
CFSDP-018-SD	CFSDP-018	0.00-0.50	9/7/2016	N	Phenanthrene	Y	0.13	34300	596	0.2530	0.51	0.0009
CFSDP-018-SD	CFSDP-018	0.00-0.50	9/7/2016	N	Pyrene	Y	0.35	9090	697	0.2530	1.38	0.0020
CFSDP-018-SD	CFSDP-018	0.00-0.50	11/7/2017	N	Acenaphthene	N	---	33400	491	0.1050	---	---
CFSDP-018-SD	CFSDP-018	0.00-0.50	11/7/2017	N	Acenaphthylene	N	---	24000	452	0.1050	---	---
CFSDP-018-SD	CFSDP-018	0.00-0.50	11/7/2017	N	Anthracene	N	---	1300	594	0.1050	---	---
CFSDP-018-SD	CFSDP-018	0.00-0.50	11/7/2017	N	Benzo(A)Anthracene	Y	0.51	4153	841	0.1050	4.86	0.0058
CFSDP-018-SD	CFSDP-018	0.00-0.50	11/7/2017	N	Benzo(A)Pyrene	Y	0.86	3840	965	0.1050	8.19	0.0085
CFSDP-018-SD	CFSDP-018	0.00-0.50	11/7/2017	N	Benzo(B)Fluoranthene	Y	1.9	2169	979	0.1050	18.10	0.0185
CFSDP-018-SD	CFSDP-018	0.00-0.50	11/7/2017	N	Benzo(K)Fluoranthene	Y	0.64	1220	981	0.1050	6.10	0.0062
CFSDP-018-SD	CFSDP-018	0.00-0.50	11/7/2017	N	Chrysene	Y	1.4	826	844	0.1050	13.33	0.0158
CFSDP-018-SD	CFSDP-018	0.00-0.50	11/7/2017	N	Fluoranthene	Y	1	23870	707	0.1050	9.52	0.0135
CFSDP-018-SD	CFSDP-018	0.00-0.50	11/7/2017	N	Fluorene	N	---	26000	538	0.1050	---	---
CFSDP-018-SD	CFSDP-018	0.00-0.50	11/7/2017	N	Naphthalene	N	---	61700	385	0.1050	---	---
CFSDP-018-SD	CFSDP-018	0.00-0.50	11/7/2017	N	Phenanthrene	Y	0.24	34300	596	0.1050	2.29	0.0038
CFSDP-018-SD	CFSDP-018	0.00-0.50	11/7/2017	N	Pyrene	N	---	9090	697	0.1050	---	---
CFSDP-018-SD	CFSDP-018	0.00-0.50	10/17/2018	N	Acenaphthene	N	---	33400	491	0.0565	---	---
CFSDP-018-SD	CFSDP-018	0.00-0.50	10/17/2018	N	Acenaphthylene	N	---	24000	452	0.0565	---	---
CFSDP-018-SD	CFSDP-018	0.00-0.50	10/17/2018	N	Anthracene	Y	0.096	1300	594	0.0565	1.70	0.0029
CFSDP-018-SD	CFSDP-018	0.00-0.50	10/17/2018	N	Benzo(A)Anthracene	Y	0.57	4153	841	0.0565	10.09	0.0120
CFSDP-018-SD	CFSDP-018	0.00-0.50	10/17/2018	N	Benzo(A)Pyrene	Y	0.78	3840	965	0.0565	13.81	0.0143
CFSDP-018-SD	CFSDP-018	0.00-0.50	10/17/2018	N	Benzo(B)Fluoranthene	Y	1.4	2169	979	0.0565	24.78	0.0253
CFSDP-018-SD	CFSDP-018	0.00-0.50	10/17/2018	N	Benzo(K)Fluoranthene	Y	0.61	1220	981	0.0565	10.80	0.0110
CFSDP-018-SD	CFSDP-018	0.00-0.50	10/17/2018	N	Chrysene	Y	1.4	826	844	0.0565	24.78	0.0294
CFSDP-018-SD	CFSDP-018	0.00-0.50	10/17/2018	N	Fluoranthene	Y	1.1	23870	707	0.0565	19.47	0.0275
CFSDP-018-SD	CFSDP-018	0.00-0.50	10/17/2018	N	Fluorene	N	---	26000	538	0.0565	---	---
CFSDP-018-SD	CFSDP-018	0.00-0.50	10/17/2018	N	Naphthalene	N	---	61700	385	0.0565	---	---
CFSDP-018-SD	CFSDP-018	0.00-0.50	10/17/2018	N	Phenanthrene	Y	0.37	34300	596	0.0565	6.55	0.0110
CFSDP-018-SD	CFSDP-018	0.00-0.50	10/17/2018	N	Pyrene	Y	0.78	9090	697	0.0565	13.81	0.0198
CFSDP-019-SD	CFSDP-019	0.00-0.50	9/7/2016	N	Acenaphthene	N	---	33400	491	0.2840	---	---
CFSDP-019-SD	CFSDP-019	0.00-0.50	9/7/2016	N	Acenaphthylene	N	---	24000	452	0.2840	---	---
CFSDP-019-SD	CFSDP-019	0.00-0.50	9/7/2016	N	Anthracene	N	---	1300	594	0.2840	---	---
CFSDP-019-SD	CFSDP-019	0.00-0.50	9/7/2016	N	Benzo(A)Anthracene	Y	0.16	4153	841	0.2840	0.56	0.0007
CFSDP-019-SD	CFSDP-019	0.00-0.50	9/7/2016	N	Benzo(A)Pyrene	Y	0.19	3840	965	0.2840	0.67	0.0007
CFSDP-019-SD	CFSDP-019	0.00-0.50	9/7/2016	N	Benzo(B)Fluoranthene	Y	0.27	2169	979	0.2840	0.95	0.0010

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-019-SD	CFSDP-019	0.00-0.50	9/7/2016	N	Benzo(K)Fluoranthene	Y	0.086	1220	981	0.2840	0.30	0.0003
CFSDP-019-SD	CFSDP-019	0.00-0.50	9/7/2016	N	Chrysene	Y	0.23	826	844	0.2840	0.81	0.0010
CFSDP-019-SD	CFSDP-019	0.00-0.50	9/7/2016	N	Fluoranthene	Y	0.23	23870	707	0.2840	0.81	0.0011
CFSDP-019-SD	CFSDP-019	0.00-0.50	9/7/2016	N	Fluorene	N	---	26000	538	0.2840	---	---
CFSDP-019-SD	CFSDP-019	0.00-0.50	9/7/2016	N	Naphthalene	N	---	61700	385	0.2840	---	---
CFSDP-019-SD	CFSDP-019	0.00-0.50	9/7/2016	N	Phenanthrene	Y	0.11	34300	596	0.2840	0.39	0.0006
CFSDP-019-SD	CFSDP-019	0.00-0.50	9/7/2016	N	Pyrene	Y	0.25	9090	697	0.2840	0.88	0.0013
CFSDP-019-SD	CFSDP-019	0.00-0.50	11/7/2017	N	Acenaphthene	N	---	33400	491	0.0915	---	---
CFSDP-019-SD	CFSDP-019	0.00-0.50	11/7/2017	N	Acenaphthylene	N	---	24000	452	0.0915	---	---
CFSDP-019-SD	CFSDP-019	0.00-0.50	11/7/2017	N	Anthracene	N	---	1300	594	0.0915	---	---
CFSDP-019-SD	CFSDP-019	0.00-0.50	11/7/2017	N	Benzo(A)Anthracene	Y	0.31	4153	841	0.0915	3.39	0.0040
CFSDP-019-SD	CFSDP-019	0.00-0.50	11/7/2017	N	Benzo(A)Pyrene	Y	0.48	3840	965	0.0915	5.25	0.0054
CFSDP-019-SD	CFSDP-019	0.00-0.50	11/7/2017	N	Benzo(B)Fluoranthene	Y	0.76	2169	979	0.0915	8.31	0.0085
CFSDP-019-SD	CFSDP-019	0.00-0.50	11/7/2017	N	Benzo(K)Fluoranthene	Y	0.22	1220	981	0.0915	2.40	0.0025
CFSDP-019-SD	CFSDP-019	0.00-0.50	11/7/2017	N	Chrysene	Y	0.52	826	844	0.0915	5.68	0.0067
CFSDP-019-SD	CFSDP-019	0.00-0.50	11/7/2017	N	Fluoranthene	Y	0.41	23870	707	0.0915	4.48	0.0063
CFSDP-019-SD	CFSDP-019	0.00-0.50	11/7/2017	N	Fluorene	N	---	26000	538	0.0915	---	---
CFSDP-019-SD	CFSDP-019	0.00-0.50	11/7/2017	N	Naphthalene	N	---	61700	385	0.0915	---	---
CFSDP-019-SD	CFSDP-019	0.00-0.50	11/7/2017	N	Phenanthrene	Y	0.22	34300	596	0.0915	2.40	0.0040
CFSDP-019-SD	CFSDP-019	0.00-0.50	11/7/2017	N	Pyrene	Y	0.35	9090	697	0.0915	3.83	0.0055
CFSDP-019-SD	CFSDP-019	0.00-0.50	10/16/2018	N	Acenaphthene	N	---	33400	491	0.0561	---	---
CFSDP-019-SD	CFSDP-019	0.00-0.50	10/16/2018	N	Acenaphthylene	N	---	24000	452	0.0561	---	---
CFSDP-019-SD	CFSDP-019	0.00-0.50	10/16/2018	N	Anthracene	Y	0.03	1300	594	0.0561	0.53	0.0009
CFSDP-019-SD	CFSDP-019	0.00-0.50	10/16/2018	N	Benzo(A)Anthracene	Y	0.16	4153	841	0.0561	2.85	0.0034
CFSDP-019-SD	CFSDP-019	0.00-0.50	10/16/2018	N	Benzo(A)Pyrene	Y	0.21	3840	965	0.0561	3.74	0.0039
CFSDP-019-SD	CFSDP-019	0.00-0.50	10/16/2018	N	Benzo(B)Fluoranthene	Y	0.33	2169	979	0.0561	5.88	0.0060
CFSDP-019-SD	CFSDP-019	0.00-0.50	10/16/2018	N	Benzo(K)Fluoranthene	Y	0.092	1220	981	0.0561	1.64	0.0017
CFSDP-019-SD	CFSDP-019	0.00-0.50	10/16/2018	N	Chrysene	Y	0.25	826	844	0.0561	4.46	0.0053
CFSDP-019-SD	CFSDP-019	0.00-0.50	10/16/2018	N	Fluoranthene	Y	0.3	23870	707	0.0561	5.35	0.0076
CFSDP-019-SD	CFSDP-019	0.00-0.50	10/16/2018	N	Fluorene	N	---	26000	538	0.0561	---	---
CFSDP-019-SD	CFSDP-019	0.00-0.50	10/16/2018	N	Naphthalene	N	---	61700	385	0.0561	---	---
CFSDP-019-SD	CFSDP-019	0.00-0.50	10/16/2018	N	Phenanthrene	Y	0.14	34300	596	0.0561	2.50	0.0042
CFSDP-019-SD	CFSDP-019	0.00-0.50	10/16/2018	N	Pyrene	Y	0.24	9090	697	0.0561	4.28	0.0061
CFSDP-020-SD	CFSDP-020	0.00-0.50	9/7/2016	N	Acenaphthene	N	---	33400	491	0.0765	---	---
CFSDP-020-SD	CFSDP-020	0.00-0.50	9/7/2016	N	Acenaphthylene	N	---	24000	452	0.0765	---	---
CFSDP-020-SD	CFSDP-020	0.00-0.50	9/7/2016	N	Anthracene	N	---	1300	594	0.0765	---	---
CFSDP-020-SD	CFSDP-020	0.00-0.50	9/7/2016	N	Benzo(A)Anthracene	Y	0.15	4153	841	0.0765	1.96	0.0023
CFSDP-020-SD	CFSDP-020	0.00-0.50	9/7/2016	N	Benzo(A)Pyrene	Y	0.19	3840	965	0.0765	2.48	0.0026
CFSDP-020-SD	CFSDP-020	0.00-0.50	9/7/2016	N	Benzo(B)Fluoranthene	Y	0.28	2169	979	0.0765	3.66	0.0037
CFSDP-020-SD	CFSDP-020	0.00-0.50	9/7/2016	N	Benzo(K)Fluoranthene	Y	0.11	1220	981	0.0765	1.44	0.0015
CFSDP-020-SD	CFSDP-020	0.00-0.50	9/7/2016	N	Chrysene	Y	0.23	826	844	0.0765	3.01	0.0036
CFSDP-020-SD	CFSDP-020	0.00-0.50	9/7/2016	N	Fluoranthene	Y	0.21	23870	707	0.0765	2.75	0.0039
CFSDP-020-SD	CFSDP-020	0.00-0.50	9/7/2016	N	Fluorene	N	---	26000	538	0.0765	---	---
CFSDP-020-SD	CFSDP-020	0.00-0.50	9/7/2016	N	Naphthalene	N	---	61700	385	0.0765	---	---
CFSDP-020-SD	CFSDP-020	0.00-0.50	9/7/2016	N	Phenanthrene	Y	0.11	34300	596	0.0765	1.44	0.0024
CFSDP-020-SD	CFSDP-020	0.00-0.50	9/7/2016	N	Pyrene	Y	0.29	9090	697	0.0765	3.79	0.0054
CFSDP-020-SD	CFSDP-020	0.00-0.50	11/7/2017	N	Acenaphthene	N	---	33400	491	0.0421	---	---
CFSDP-020-SD	CFSDP-020	0.00-0.50	11/7/2017	N	Acenaphthylene	N	---	24000	452	0.0421	---	---
CFSDP-020-SD	CFSDP-020	0.00-0.50	11/7/2017	N	Anthracene	N	---	1300	594	0.0421	---	---

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-020-SD	CFSDP-020	0.00-0.50	11/7/2017	N	Benzo(A)Anthracene	Y	0.31	4153	841	0.0421	7.36	0.0088
CFSDP-020-SD	CFSDP-020	0.00-0.50	11/7/2017	N	Benzo(A)Pyrene	Y	0.48	3840	965	0.0421	11.40	0.0118
CFSDP-020-SD	CFSDP-020	0.00-0.50	11/7/2017	N	Benzo(B)Fluoranthene	Y	0.71	2169	979	0.0421	16.86	0.0172
CFSDP-020-SD	CFSDP-020	0.00-0.50	11/7/2017	N	Benzo(K)Fluoranthene	Y	0.26	1220	981	0.0421	6.18	0.0063
CFSDP-020-SD	CFSDP-020	0.00-0.50	11/7/2017	N	Chrysene	Y	0.47	826	844	0.0421	11.16	0.0132
CFSDP-020-SD	CFSDP-020	0.00-0.50	11/7/2017	N	Fluoranthene	Y	0.44	23870	707	0.0421	10.45	0.0148
CFSDP-020-SD	CFSDP-020	0.00-0.50	11/7/2017	N	Fluorene	N	---	26000	538	0.0421	---	---
CFSDP-020-SD	CFSDP-020	0.00-0.50	11/7/2017	N	Naphthalene	N	---	61700	385	0.0421	---	---
CFSDP-020-SD	CFSDP-020	0.00-0.50	11/7/2017	N	Phenanthrene	Y	0.23	34300	596	0.0421	5.46	0.0092
CFSDP-020-SD	CFSDP-020	0.00-0.50	11/7/2017	N	Pyrene	Y	0.42	9090	697	0.0421	9.98	0.0143
CFSDP-020-SD	CFSDP-020	0.00-0.50	10/11/2018	N	Acenaphthene	N	---	33400	491	0.0179	---	---
CFSDP-020-SD	CFSDP-020	0.00-0.50	10/11/2018	N	Acenaphthylene	N	---	24000	452	0.0179	---	---
CFSDP-020-SD	CFSDP-020	0.00-0.50	10/11/2018	N	Anthracene	Y	0.021	1300	594	0.0179	1.17	0.0020
CFSDP-020-SD	CFSDP-020	0.00-0.50	10/11/2018	N	Benzo(A)Anthracene	Y	0.15	4153	841	0.0179	8.38	0.0100
CFSDP-020-SD	CFSDP-020	0.00-0.50	10/11/2018	N	Benzo(A)Pyrene	Y	0.23	3840	965	0.0179	12.85	0.0133
CFSDP-020-SD	CFSDP-020	0.00-0.50	10/11/2018	N	Benzo(B)Fluoranthene	Y	0.3	2169	979	0.0179	16.76	0.0171
CFSDP-020-SD	CFSDP-020	0.00-0.50	10/11/2018	N	Benzo(K)Fluoranthene	Y	0.14	1220	981	0.0179	7.82	0.0080
CFSDP-020-SD	CFSDP-020	0.00-0.50	10/11/2018	N	Chrysene	Y	0.25	826	844	0.0179	13.97	0.0165
CFSDP-020-SD	CFSDP-020	0.00-0.50	10/11/2018	N	Fluoranthene	Y	0.3	23870	707	0.0179	16.76	0.0237
CFSDP-020-SD	CFSDP-020	0.00-0.50	10/11/2018	N	Fluorene	N	---	26000	538	0.0179	---	---
CFSDP-020-SD	CFSDP-020	0.00-0.50	10/11/2018	N	Naphthalene	N	---	61700	385	0.0179	---	---
CFSDP-020-SD	CFSDP-020	0.00-0.50	10/11/2018	N	Phenanthrene	Y	0.13	34300	596	0.0179	7.26	0.0122
CFSDP-020-SD	CFSDP-020	0.00-0.50	10/11/2018	N	Pyrene	Y	0.25	9090	697	0.0179	13.97	0.0200
CFSDP-058-SD	CFSDP-058	0.00-0.50	10/11/2018	N	Acenaphthene	N	---	33400	491	0.0243	---	---
CFSDP-058-SD	CFSDP-058	0.00-0.50	10/11/2018	N	Acenaphthylene	N	---	24000	452	0.0243	---	---
CFSDP-058-SD	CFSDP-058	0.00-0.50	10/11/2018	N	Anthracene	N	---	1300	594	0.0243	---	---
CFSDP-058-SD	CFSDP-058	0.00-0.50	10/11/2018	N	Benzo(A)Anthracene	Y	0.11	4153	841	0.0243	4.53	0.0054
CFSDP-058-SD	CFSDP-058	0.00-0.50	10/11/2018	N	Benzo(A)Pyrene	Y	0.17	3840	965	0.0243	7.00	0.0072
CFSDP-058-SD	CFSDP-058	0.00-0.50	10/11/2018	N	Benzo(B)Fluoranthene	Y	0.31	2169	979	0.0243	12.76	0.0130
CFSDP-058-SD	CFSDP-058	0.00-0.50	10/11/2018	N	Benzo(K)Fluoranthene	Y	0.12	1220	981	0.0243	4.94	0.0050
CFSDP-058-SD	CFSDP-058	0.00-0.50	10/11/2018	N	Chrysene	Y	0.25	826	844	0.0243	10.29	0.0122
CFSDP-058-SD	CFSDP-058	0.00-0.50	10/11/2018	N	Fluoranthene	Y	0.21	23870	707	0.0243	8.64	0.0122
CFSDP-058-SD	CFSDP-058	0.00-0.50	10/11/2018	N	Fluorene	N	---	26000	538	0.0243	---	---
CFSDP-058-SD	CFSDP-058	0.00-0.50	10/11/2018	N	Naphthalene	N	---	61700	385	0.0243	---	---
CFSDP-058-SD	CFSDP-058	0.00-0.50	10/11/2018	N	Phenanthrene	Y	0.09	34300	596	0.0243	3.70	0.0062
CFSDP-058-SD	CFSDP-058	0.00-0.50	10/11/2018	N	Pyrene	Y	0.17	9090	697	0.0243	7.00	0.0100
CFSDP-059-SD	CFSDP-059	0.00-0.50	10/11/2018	N	Acenaphthene	Y	0.012	33400	491	0.0346	0.35	0.0007
CFSDP-059-SD	CFSDP-059	0.00-0.50	10/11/2018	N	Acenaphthylene	N	---	24000	452	0.0346	---	---
CFSDP-059-SD	CFSDP-059	0.00-0.50	10/11/2018	N	Anthracene	Y	0.024	1300	594	0.0346	0.69	0.0012
CFSDP-059-SD	CFSDP-059	0.00-0.50	10/11/2018	N	Benzo(A)Anthracene	Y	0.16	4153	841	0.0346	4.62	0.0055
CFSDP-059-SD	CFSDP-059	0.00-0.50	10/11/2018	N	Benzo(A)Pyrene	Y	0.24	3840	965	0.0346	6.94	0.0072
CFSDP-059-SD	CFSDP-059	0.00-0.50	10/11/2018	N	Benzo(B)Fluoranthene	Y	0.37	2169	979	0.0346	10.69	0.0109
CFSDP-059-SD	CFSDP-059	0.00-0.50	10/11/2018	N	Benzo(K)Fluoranthene	Y	0.11	1220	981	0.0346	3.18	0.0032
CFSDP-059-SD	CFSDP-059	0.00-0.50	10/11/2018	N	Chrysene	Y	0.29	826	844	0.0346	8.38	0.0099
CFSDP-059-SD	CFSDP-059	0.00-0.50	10/11/2018	N	Fluoranthene	Y	0.3	23870	707	0.0346	8.67	0.0123
CFSDP-059-SD	CFSDP-059	0.00-0.50	10/11/2018	N	Fluorene	Y	0.0087	26000	538	0.0346	0.25	0.0005
CFSDP-059-SD	CFSDP-059	0.00-0.50	10/11/2018	N	Naphthalene	N	---	61700	385	0.0346	---	---
CFSDP-059-SD	CFSDP-059	0.00-0.50	10/11/2018	N	Phenanthrene	Y	0.13	34300	596	0.0346	3.76	0.0063
CFSDP-059-SD	CFSDP-059	0.00-0.50	10/11/2018	N	Pyrene	Y	0.25	9090	697	0.0346	7.23	0.0104

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-060-SD	CFSDP-060	0.00-0.50	10/16/2018	N	Acenaphthene	N	---	33400	491	0.0430	---	---
CFSDP-060-SD	CFSDP-060	0.00-0.50	10/16/2018	N	Acenaphthylene	N	---	24000	452	0.0430	---	---
CFSDP-060-SD	CFSDP-060	0.00-0.50	10/16/2018	N	Anthracene	Y	0.036	1300	594	0.0430	0.84	0.0014
CFSDP-060-SD	CFSDP-060	0.00-0.50	10/16/2018	N	Benzo(A)Anthracene	Y	0.21	4153	841	0.0430	4.88	0.0058
CFSDP-060-SD	CFSDP-060	0.00-0.50	10/16/2018	N	Benzo(A)Pyrene	Y	0.37	3840	965	0.0430	8.60	0.0089
CFSDP-060-SD	CFSDP-060	0.00-0.50	10/16/2018	N	Benzo(B)Fluoranthene	Y	0.65	2169	979	0.0430	15.12	0.0154
CFSDP-060-SD	CFSDP-060	0.00-0.50	10/16/2018	N	Benzo(K)Fluoranthene	Y	0.24	1220	981	0.0430	5.58	0.0057
CFSDP-060-SD	CFSDP-060	0.00-0.50	10/16/2018	N	Chrysene	Y	0.41	826	844	0.0430	9.53	0.0113
CFSDP-060-SD	CFSDP-060	0.00-0.50	10/16/2018	N	Fluoranthene	Y	0.35	23870	707	0.0430	8.14	0.0115
CFSDP-060-SD	CFSDP-060	0.00-0.50	10/16/2018	N	Fluorene	N	---	26000	538	0.0430	---	---
CFSDP-060-SD	CFSDP-060	0.00-0.50	10/16/2018	N	Naphthalene	N	---	61700	385	0.0430	---	---
CFSDP-060-SD	CFSDP-060	0.00-0.50	10/16/2018	N	Phenanthrene	Y	0.17	34300	596	0.0430	3.95	0.0066
CFSDP-060-SD	CFSDP-060	0.00-0.50	10/16/2018	N	Pyrene	Y	0.3	9090	697	0.0430	6.98	0.0100
Northern Surface Water Feature Area												
CFSDP-021-SD	CFSDP-021	0.00-0.50	6/19/2018	N	Acenaphthene	N	---	33400	491	0.0058	---	---
CFSDP-021-SD	CFSDP-021	0.00-0.50	6/19/2018	N	Acenaphthylene	N	---	24000	452	0.0058	---	---
CFSDP-021-SD	CFSDP-021	0.00-0.50	6/19/2018	N	Anthracene	N	---	1300	594	0.0058	---	---
CFSDP-021-SD	CFSDP-021	0.00-0.50	6/19/2018	N	Benzo(A)Anthracene	Y	0.0061	4153	841	0.0058	1.05	0.0012
CFSDP-021-SD	CFSDP-021	0.00-0.50	6/19/2018	N	Benzo(A)Pyrene	Y	0.007	3840	965	0.0058	1.20	0.0012
CFSDP-021-SD	CFSDP-021	0.00-0.50	6/19/2018	N	Benzo(B)Fluoranthene	Y	0.015	2169	979	0.0058	2.58	0.0026
CFSDP-021-SD	CFSDP-021	0.00-0.50	6/19/2018	N	Benzo(K)Fluoranthene	Y	0.0039	1220	981	0.0058	0.67	0.0007
CFSDP-021-SD	CFSDP-021	0.00-0.50	6/19/2018	N	Chrysene	Y	0.016	826	844	0.0058	2.75	0.0033
CFSDP-021-SD	CFSDP-021	0.00-0.50	6/19/2018	N	Fluoranthene	Y	0.013	23870	707	0.0058	2.24	0.0032
CFSDP-021-SD	CFSDP-021	0.00-0.50	6/19/2018	N	Fluorene	N	---	26000	538	0.0058	---	---
CFSDP-021-SD	CFSDP-021	0.00-0.50	6/19/2018	N	Naphthalene	N	---	61700	385	0.0058	---	---
CFSDP-021-SD	CFSDP-021	0.00-0.50	6/19/2018	N	Phenanthrene	Y	0.0058	34300	596	0.0058	1.00	0.0017
CFSDP-021-SD	CFSDP-021	0.00-0.50	6/19/2018	N	Pyrene	Y	0.011	9090	697	0.0058	1.89	0.0027
CFSDP-021-SO	CFSDP-021	0.00-0.50	9/6/2016	N	Acenaphthene	N	---	33400	491	0.0232	---	---
CFSDP-021-SO	CFSDP-021	0.00-0.50	9/6/2016	N	Acenaphthylene	N	---	24000	452	0.0232	---	---
CFSDP-021-SO	CFSDP-021	0.00-0.50	9/6/2016	N	Anthracene	N	---	1300	594	0.0232	---	---
CFSDP-021-SO	CFSDP-021	0.00-0.50	9/6/2016	N	Benzo(A)Anthracene	N	---	4153	841	0.0232	---	---
CFSDP-021-SO	CFSDP-021	0.00-0.50	9/6/2016	N	Benzo(A)Pyrene	Y	0.021	3840	965	0.0232	0.91	0.0009
CFSDP-021-SO	CFSDP-021	0.00-0.50	9/6/2016	N	Benzo(B)Fluoranthene	Y	0.036	2169	979	0.0232	1.55	0.0016
CFSDP-021-SO	CFSDP-021	0.00-0.50	9/6/2016	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0232	---	---
CFSDP-021-SO	CFSDP-021	0.00-0.50	9/6/2016	N	Chrysene	Y	0.019	826	844	0.0232	0.82	0.0010
CFSDP-021-SO	CFSDP-021	0.00-0.50	9/6/2016	N	Fluoranthene	Y	0.018	23870	707	0.0232	0.78	0.0011
CFSDP-021-SO	CFSDP-021	0.00-0.50	9/6/2016	N	Fluorene	N	---	26000	538	0.0232	---	---
CFSDP-021-SO	CFSDP-021	0.00-0.50	9/6/2016	N	Naphthalene	N	---	61700	385	0.0232	---	---
CFSDP-021-SO	CFSDP-021	0.00-0.50	9/6/2016	N	Phenanthrene	Y	0.011	34300	596	0.0232	0.47	0.0008
CFSDP-021-SO	CFSDP-021	0.00-0.50	9/6/2016	N	Pyrene	Y	0.027	9090	697	0.0232	1.16	0.0017
CFSDP-022-SD	CFSDP-022	0.00-0.50	6/20/2018	N	Acenaphthene	N	---	33400	491	0.0238	---	---
CFSDP-022-SD	CFSDP-022	0.00-0.50	6/20/2018	N	Acenaphthylene	N	---	24000	452	0.0238	---	---
CFSDP-022-SD	CFSDP-022	0.00-0.50	6/20/2018	N	Anthracene	N	---	1300	594	0.0238	---	---
CFSDP-022-SD	CFSDP-022	0.00-0.50	6/20/2018	N	Benzo(A)Anthracene	Y	0.021	4153	841	0.0238	0.88	0.0010
CFSDP-022-SD	CFSDP-022	0.00-0.50	6/20/2018	N	Benzo(A)Pyrene	Y	0.023	3840	965	0.0238	0.97	0.0010
CFSDP-022-SD	CFSDP-022	0.00-0.50	6/20/2018	N	Benzo(B)Fluoranthene	Y	0.038	2169	979	0.0238	1.60	0.0016
CFSDP-022-SD	CFSDP-022	0.00-0.50	6/20/2018	N	Benzo(K)Fluoranthene	Y	0.019	1220	981	0.0238	0.80	0.0008
CFSDP-022-SD	CFSDP-022	0.00-0.50	6/20/2018	N	Chrysene	Y	0.054	826	844	0.0238	2.27	0.0027
CFSDP-022-SD	CFSDP-022	0.00-0.50	6/20/2018	N	Fluoranthene	Y	0.047	23870	707	0.0238	1.97	0.0028

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-022-SD	CFSDP-022	0.00-0.50	6/20/2018	N	Fluorene	N	---	26000	538	0.0238	---	---
CFSDP-022-SD	CFSDP-022	0.00-0.50	6/20/2018	N	Naphthalene	N	---	61700	385	0.0238	---	---
CFSDP-022-SD	CFSDP-022	0.00-0.50	6/20/2018	N	Phenanthrene	Y	0.018	34300	596	0.0238	0.76	0.0013
CFSDP-022-SD	CFSDP-022	0.00-0.50	6/20/2018	N	Pyrene	Y	0.041	9090	697	0.0238	1.72	0.0025
CFSDP-022-SO	CFSDP-022	0.00-0.50	9/6/2016	N	Acenaphthene	N	---	33400	491	0.1290	---	---
CFSDP-022-SO	CFSDP-022	0.00-0.50	9/6/2016	N	Acenaphthylene	N	---	24000	452	0.1290	---	---
CFSDP-022-SO	CFSDP-022	0.00-0.50	9/6/2016	N	Anthracene	N	---	1300	594	0.1290	---	---
CFSDP-022-SO	CFSDP-022	0.00-0.50	9/6/2016	N	Benzo(A)Anthracene	Y	0.074	4153	841	0.1290	0.57	0.0007
CFSDP-022-SO	CFSDP-022	0.00-0.50	9/6/2016	N	Benzo(A)Pyrene	Y	0.091	3840	965	0.1290	0.71	0.0007
CFSDP-022-SO	CFSDP-022	0.00-0.50	9/6/2016	N	Benzo(B)Fluoranthene	Y	0.15	2169	979	0.1290	1.16	0.0012
CFSDP-022-SO	CFSDP-022	0.00-0.50	9/6/2016	N	Benzo(K)Fluoranthene	Y	0.053	1220	981	0.1290	0.41	0.0004
CFSDP-022-SO	CFSDP-022	0.00-0.50	9/6/2016	N	Chrysene	Y	0.13	826	844	0.1290	1.01	0.0012
CFSDP-022-SO	CFSDP-022	0.00-0.50	9/6/2016	N	Fluoranthene	Y	0.12	23870	707	0.1290	0.93	0.0013
CFSDP-022-SO	CFSDP-022	0.00-0.50	9/6/2016	N	Fluorene	N	---	26000	538	0.1290	---	---
CFSDP-022-SO	CFSDP-022	0.00-0.50	9/6/2016	N	Naphthalene	N	---	61700	385	0.1290	---	---
CFSDP-022-SO	CFSDP-022	0.00-0.50	9/6/2016	N	Phenanthrene	Y	0.058	34300	596	0.1290	0.45	0.0008
CFSDP-022-SO	CFSDP-022	0.00-0.50	9/6/2016	N	Pyrene	Y	0.11	9090	697	0.1290	0.85	0.0012
CFSDP-046-SD	CFSDP-046	0.00-0.50	6/19/2018	N	Acenaphthene	N	---	33400	491	0.1620	---	---
CFSDP-046-SD	CFSDP-046	0.00-0.50	6/19/2018	N	Acenaphthylene	N	---	24000	452	0.1620	---	---
CFSDP-046-SD	CFSDP-046	0.00-0.50	6/19/2018	N	Anthracene	N	---	1300	594	0.1620	---	---
CFSDP-046-SD	CFSDP-046	0.00-0.50	6/19/2018	N	Benzo(A)Anthracene	Y	0.069	4153	841	0.1620	0.43	0.0005
CFSDP-046-SD	CFSDP-046	0.00-0.50	6/19/2018	N	Benzo(A)Pyrene	Y	0.086	3840	965	0.1620	0.53	0.0006
CFSDP-046-SD	CFSDP-046	0.00-0.50	6/19/2018	N	Benzo(B)Fluoranthene	Y	0.13	2169	979	0.1620	0.80	0.0008
CFSDP-046-SD	CFSDP-046	0.00-0.50	6/19/2018	N	Benzo(K)Fluoranthene	Y	0.045	1220	981	0.1620	0.28	0.0003
CFSDP-046-SD	CFSDP-046	0.00-0.50	6/19/2018	N	Chrysene	Y	0.1	826	844	0.1620	0.62	0.0007
CFSDP-046-SD	CFSDP-046	0.00-0.50	6/19/2018	N	Fluoranthene	Y	0.11	23870	707	0.1620	0.68	0.0010
CFSDP-046-SD	CFSDP-046	0.00-0.50	6/19/2018	N	Fluorene	N	---	26000	538	0.1620	---	---
CFSDP-046-SD	CFSDP-046	0.00-0.50	6/19/2018	N	Naphthalene	N	---	61700	385	0.1620	---	---
CFSDP-046-SD	CFSDP-046	0.00-0.50	6/19/2018	N	Phenanthrene	Y	0.085	34300	596	0.1620	0.52	0.0009
CFSDP-046-SD	CFSDP-046	0.00-0.50	6/19/2018	N	Pyrene	Y	0.1	9090	697	0.1620	0.62	0.0009
CFSDP-047-SD	CFSDP-047	0.00-0.50	6/19/2018	N	Acenaphthene	N	---	33400	491	0.1610	---	---
CFSDP-047-SD	CFSDP-047	0.00-0.50	6/19/2018	N	Acenaphthylene	N	---	24000	452	0.1610	---	---
CFSDP-047-SD	CFSDP-047	0.00-0.50	6/19/2018	N	Anthracene	Y	0.012	1300	594	0.1610	0.07	0.0001
CFSDP-047-SD	CFSDP-047	0.00-0.50	6/19/2018	N	Benzo(A)Anthracene	Y	0.057	4153	841	0.1610	0.35	0.0004
CFSDP-047-SD	CFSDP-047	0.00-0.50	6/19/2018	N	Benzo(A)Pyrene	Y	0.083	3840	965	0.1610	0.52	0.0005
CFSDP-047-SD	CFSDP-047	0.00-0.50	6/19/2018	N	Benzo(B)Fluoranthene	Y	0.11	2169	979	0.1610	0.68	0.0007
CFSDP-047-SD	CFSDP-047	0.00-0.50	6/19/2018	N	Benzo(K)Fluoranthene	Y	0.047	1220	981	0.1610	0.29	0.0003
CFSDP-047-SD	CFSDP-047	0.00-0.50	6/19/2018	N	Chrysene	Y	0.092	826	844	0.1610	0.57	0.0007
CFSDP-047-SD	CFSDP-047	0.00-0.50	6/19/2018	N	Fluoranthene	Y	0.11	23870	707	0.1610	0.68	0.0010
CFSDP-047-SD	CFSDP-047	0.00-0.50	6/19/2018	N	Fluorene	N	---	26000	538	0.1610	---	---
CFSDP-047-SD	CFSDP-047	0.00-0.50	6/19/2018	N	Naphthalene	N	---	61700	385	0.1610	---	---
CFSDP-047-SD	CFSDP-047	0.00-0.50	6/19/2018	N	Phenanthrene	Y	0.069	34300	596	0.1610	0.43	0.0007
CFSDP-047-SD	CFSDP-047	0.00-0.50	6/19/2018	N	Pyrene	Y	0.092	9090	697	0.1610	0.57	0.0008
CFSDP-048-SD	CFSDP-048	0.00-0.50	6/20/2018	N	Acenaphthene	N	---	33400	491	0.0512	---	---
CFSDP-048-SD	CFSDP-048	0.00-0.50	6/20/2018	N	Acenaphthylene	N	---	24000	452	0.0512	---	---
CFSDP-048-SD	CFSDP-048	0.00-0.50	6/20/2018	N	Anthracene	N	---	1300	594	0.0512	---	---
CFSDP-048-SD	CFSDP-048	0.00-0.50	6/20/2018	N	Benzo(A)Anthracene	Y	0.025	4153	841	0.0512	0.49	0.0006
CFSDP-048-SD	CFSDP-048	0.00-0.50	6/20/2018	N	Benzo(A)Pyrene	Y	0.033	3840	965	0.0512	0.64	0.0007
CFSDP-048-SD	CFSDP-048	0.00-0.50	6/20/2018	N	Benzo(B)Fluoranthene	Y	0.041	2169	979	0.0512	0.80	0.0008

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-048-SD	CFSDP-048	0.00-0.50	6/20/2018	N	Benzo(K)Fluoranthene	Y	0.024	1220	981	0.0512	0.47	0.0005
CFSDP-048-SD	CFSDP-048	0.00-0.50	6/20/2018	N	Chrysene	Y	0.044	826	844	0.0512	0.86	0.0010
CFSDP-048-SD	CFSDP-048	0.00-0.50	6/20/2018	N	Fluoranthene	Y	0.051	23870	707	0.0512	1.00	0.0014
CFSDP-048-SD	CFSDP-048	0.00-0.50	6/20/2018	N	Fluorene	N	---	26000	538	0.0512	---	---
CFSDP-048-SD	CFSDP-048	0.00-0.50	6/20/2018	N	Naphthalene	N	---	61700	385	0.0512	---	---
CFSDP-048-SD	CFSDP-048	0.00-0.50	6/20/2018	N	Phenanthrene	Y	0.045	34300	596	0.0512	0.88	0.0015
CFSDP-048-SD	CFSDP-048	0.00-0.50	6/20/2018	N	Pyrene	Y	0.046	9090	697	0.0512	0.90	0.0013
CFSDP-049-SD	CFSDP-049	0.00-0.50	6/20/2018	N	Acenaphthene	N	---	33400	491	0.0570	---	---
CFSDP-049-SD	CFSDP-049	0.00-0.50	6/20/2018	N	Acenaphthylene	N	---	24000	452	0.0570	---	---
CFSDP-049-SD	CFSDP-049	0.00-0.50	6/20/2018	N	Anthracene	Y	0.013	1300	594	0.0570	0.23	0.0004
CFSDP-049-SD	CFSDP-049	0.00-0.50	6/20/2018	N	Benzo(A)Anthracene	Y	0.052	4153	841	0.0570	0.91	0.0011
CFSDP-049-SD	CFSDP-049	0.00-0.50	6/20/2018	N	Benzo(A)Pyrene	Y	0.079	3840	965	0.0570	1.39	0.0014
CFSDP-049-SD	CFSDP-049	0.00-0.50	6/20/2018	N	Benzo(B)Fluoranthene	Y	0.11	2169	979	0.0570	1.93	0.0020
CFSDP-049-SD	CFSDP-049	0.00-0.50	6/20/2018	N	Benzo(K)Fluoranthene	Y	0.043	1220	981	0.0570	0.75	0.0008
CFSDP-049-SD	CFSDP-049	0.00-0.50	6/20/2018	N	Chrysene	Y	0.084	826	844	0.0570	1.47	0.0017
CFSDP-049-SD	CFSDP-049	0.00-0.50	6/20/2018	N	Fluoranthene	Y	0.1	23870	707	0.0570	1.75	0.0025
CFSDP-049-SD	CFSDP-049	0.00-0.50	6/20/2018	N	Fluorene	Y	0.0062	26000	538	0.0570	0.11	0.0002
CFSDP-049-SD	CFSDP-049	0.00-0.50	6/20/2018	N	Naphthalene	N	---	61700	385	0.0570	---	---
CFSDP-049-SD	CFSDP-049	0.00-0.50	6/20/2018	N	Phenanthrene	Y	0.06	34300	596	0.0570	1.05	0.0018
CFSDP-049-SD	CFSDP-049	0.00-0.50	6/20/2018	N	Pyrene	Y	0.087	9090	697	0.0570	1.53	0.0022
CFSDP-050-SD	CFSDP-050	0.00-0.50	6/21/2018	N	Acenaphthene	N	---	33400	491	0.0311	---	---
CFSDP-050-SD	CFSDP-050	0.00-0.50	6/21/2018	N	Acenaphthylene	N	---	24000	452	0.0311	---	---
CFSDP-050-SD	CFSDP-050	0.00-0.50	6/21/2018	N	Anthracene	N	---	1300	594	0.0311	---	---
CFSDP-050-SD	CFSDP-050	0.00-0.50	6/21/2018	N	Benzo(A)Anthracene	Y	0.028	4153	841	0.0311	0.90	0.0011
CFSDP-050-SD	CFSDP-050	0.00-0.50	6/21/2018	N	Benzo(A)Pyrene	Y	0.036	3840	965	0.0311	1.16	0.0012
CFSDP-050-SD	CFSDP-050	0.00-0.50	6/21/2018	N	Benzo(B)Fluoranthene	Y	0.052	2169	979	0.0311	1.67	0.0017
CFSDP-050-SD	CFSDP-050	0.00-0.50	6/21/2018	N	Benzo(K)Fluoranthene	Y	0.028	1220	981	0.0311	0.90	0.0009
CFSDP-050-SD	CFSDP-050	0.00-0.50	6/21/2018	N	Chrysene	Y	0.048	826	844	0.0311	1.54	0.0018
CFSDP-050-SD	CFSDP-050	0.00-0.50	6/21/2018	N	Fluoranthene	Y	0.055	23870	707	0.0311	1.77	0.0025
CFSDP-050-SD	CFSDP-050	0.00-0.50	6/21/2018	N	Fluorene	N	---	26000	538	0.0311	---	---
CFSDP-050-SD	CFSDP-050	0.00-0.50	6/21/2018	N	Naphthalene	N	---	61700	385	0.0311	---	---
CFSDP-050-SD	CFSDP-050	0.00-0.50	6/21/2018	N	Phenanthrene	Y	0.028	34300	596	0.0311	0.90	0.0015
CFSDP-050-SD	CFSDP-050	0.00-0.50	6/21/2018	N	Pyrene	Y	0.049	9090	697	0.0311	1.58	0.0023
CFSDP-051-SD	CFSDP-051	0.00-0.50	6/21/2018	N	Acenaphthene	N	---	33400	491	0.0058	---	---
CFSDP-051-SD	CFSDP-051	0.00-0.50	6/21/2018	N	Acenaphthylene	N	---	24000	452	0.0058	---	---
CFSDP-051-SD	CFSDP-051	0.00-0.50	6/21/2018	N	Anthracene	N	---	1300	594	0.0058	---	---
CFSDP-051-SD	CFSDP-051	0.00-0.50	6/21/2018	N	Benzo(A)Anthracene	N	---	4153	841	0.0058	---	---
CFSDP-051-SD	CFSDP-051	0.00-0.50	6/21/2018	N	Benzo(A)Pyrene	N	---	3840	965	0.0058	---	---
CFSDP-051-SD	CFSDP-051	0.00-0.50	6/21/2018	N	Benzo(B)Fluoranthene	N	---	2169	979	0.0058	---	---
CFSDP-051-SD	CFSDP-051	0.00-0.50	6/21/2018	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0058	---	---
CFSDP-051-SD	CFSDP-051	0.00-0.50	6/21/2018	N	Chrysene	N	---	826	844	0.0058	---	---
CFSDP-051-SD	CFSDP-051	0.00-0.50	6/21/2018	N	Fluoranthene	N	---	23870	707	0.0058	---	---
CFSDP-051-SD	CFSDP-051	0.00-0.50	6/21/2018	N	Fluorene	N	---	26000	538	0.0058	---	---
CFSDP-051-SD	CFSDP-051	0.00-0.50	6/21/2018	N	Naphthalene	N	---	61700	385	0.0058	---	---
CFSDP-051-SD	CFSDP-051	0.00-0.50	6/21/2018	N	Phenanthrene	N	---	34300	596	0.0058	---	---
CFSDP-051-SD	CFSDP-051	0.00-0.50	6/21/2018	N	Pyrene	N	---	9090	697	0.0058	---	---
CFSDP-052-SD	CFSDP-052	0.00-0.50	6/18/2018	N	Acenaphthene	N	---	33400	491	0.0144	---	---
CFSDP-052-SD	CFSDP-052	0.00-0.50	6/18/2018	N	Acenaphthylene	N	---	24000	452	0.0144	---	---
CFSDP-052-SD	CFSDP-052	0.00-0.50	6/18/2018	N	Anthracene	N	---	1300	594	0.0144	---	---

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-052-SD	CFSDP-052	0.00-0.50	6/18/2018	N	Benzo(A)Anthracene	Y	0.019	4153	841	0.0144	1.32	0.0016
CFSDP-052-SD	CFSDP-052	0.00-0.50	6/18/2018	N	Benzo(A)Pyrene	Y	0.024	3840	965	0.0144	1.67	0.0017
CFSDP-052-SD	CFSDP-052	0.00-0.50	6/18/2018	N	Benzo(B)Fluoranthene	Y	0.031	2169	979	0.0144	2.15	0.0022
CFSDP-052-SD	CFSDP-052	0.00-0.50	6/18/2018	N	Benzo(K)Fluoranthene	Y	0.017	1220	981	0.0144	1.18	0.0012
CFSDP-052-SD	CFSDP-052	0.00-0.50	6/18/2018	N	Chrysene	Y	0.03	826	844	0.0144	2.08	0.0025
CFSDP-052-SD	CFSDP-052	0.00-0.50	6/18/2018	N	Fluoranthene	Y	0.039	23870	707	0.0144	2.71	0.0038
CFSDP-052-SD	CFSDP-052	0.00-0.50	6/18/2018	N	Fluorene	N	---	26000	538	0.0144	---	---
CFSDP-052-SD	CFSDP-052	0.00-0.50	6/18/2018	N	Naphthalene	N	---	61700	385	0.0144	---	---
CFSDP-052-SD	CFSDP-052	0.00-0.50	6/18/2018	N	Phenanthrene	Y	0.026	34300	596	0.0144	1.81	0.0030
CFSDP-052-SD	CFSDP-052	0.00-0.50	6/18/2018	N	Pyrene	Y	0.03	9090	697	0.0144	2.08	0.0030
CFSDP-053-SD	CFSDP-053	0.00-0.50	6/18/2018	N	Acenaphthene	N	---	33400	491	0.0292	---	---
CFSDP-053-SD	CFSDP-053	0.00-0.50	6/18/2018	N	Acenaphthylene	N	---	24000	452	0.0292	---	---
CFSDP-053-SD	CFSDP-053	0.00-0.50	6/18/2018	N	Anthracene	Y	0.0098	1300	594	0.0292	0.34	0.0006
CFSDP-053-SD	CFSDP-053	0.00-0.50	6/18/2018	N	Benzo(A)Anthracene	Y	0.062	4153	841	0.0292	2.12	0.0025
CFSDP-053-SD	CFSDP-053	0.00-0.50	6/18/2018	N	Benzo(A)Pyrene	Y	0.071	3840	965	0.0292	2.43	0.0025
CFSDP-053-SD	CFSDP-053	0.00-0.50	6/18/2018	N	Benzo(B)Fluoranthene	Y	0.16	2169	979	0.0292	5.48	0.0056
CFSDP-053-SD	CFSDP-053	0.00-0.50	6/18/2018	N	Benzo(K)Fluoranthene	Y	0.057	1220	981	0.0292	1.95	0.0020
CFSDP-053-SD	CFSDP-053	0.00-0.50	6/18/2018	N	Chrysene	Y	0.2	826	844	0.0292	6.85	0.0081
CFSDP-053-SD	CFSDP-053	0.00-0.50	6/18/2018	N	Fluoranthene	Y	0.15	23870	707	0.0292	5.14	0.0073
CFSDP-053-SD	CFSDP-053	0.00-0.50	6/18/2018	N	Fluorene	N	---	26000	538	0.0292	---	---
CFSDP-053-SD	CFSDP-053	0.00-0.50	6/18/2018	N	Naphthalene	N	---	61700	385	0.0292	---	---
CFSDP-053-SD	CFSDP-053	0.00-0.50	6/18/2018	N	Phenanthrene	Y	0.047	34300	596	0.0292	1.61	0.0027
CFSDP-053-SD	CFSDP-053	0.00-0.50	6/18/2018	N	Pyrene	Y	0.12	9090	697	0.0292	4.11	0.0059
CFSDP-DUP3-SD	CFSDP-050	0.00-0.50	6/21/2018	FD	Acenaphthene	N	---	33400	491	0.0198	---	---
CFSDP-DUP3-SD	CFSDP-050	0.00-0.50	6/21/2018	FD	Acenaphthylene	N	---	24000	452	0.0198	---	---
CFSDP-DUP3-SD	CFSDP-050	0.00-0.50	6/21/2018	FD	Anthracene	N	---	1300	594	0.0198	---	---
CFSDP-DUP3-SD	CFSDP-050	0.00-0.50	6/21/2018	FD	Benzo(A)Anthracene	Y	0.015	4153	841	0.0198	0.76	0.0009
CFSDP-DUP3-SD	CFSDP-050	0.00-0.50	6/21/2018	FD	Benzo(A)Pyrene	Y	0.018	3840	965	0.0198	0.91	0.0009
CFSDP-DUP3-SD	CFSDP-050	0.00-0.50	6/21/2018	FD	Benzo(B)Fluoranthene	Y	0.029	2169	979	0.0198	1.46	0.0015
CFSDP-DUP3-SD	CFSDP-050	0.00-0.50	6/21/2018	FD	Benzo(K)Fluoranthene	Y	0.011	1220	981	0.0198	0.56	0.0006
CFSDP-DUP3-SD	CFSDP-050	0.00-0.50	6/21/2018	FD	Chrysene	Y	0.03	826	844	0.0198	1.52	0.0018
CFSDP-DUP3-SD	CFSDP-050	0.00-0.50	6/21/2018	FD	Fluoranthene	Y	0.029	23870	707	0.0198	1.46	0.0021
CFSDP-DUP3-SD	CFSDP-050	0.00-0.50	6/21/2018	FD	Fluorene	N	---	26000	538	0.0198	---	---
CFSDP-DUP3-SD	CFSDP-050	0.00-0.50	6/21/2018	FD	Naphthalene	N	---	61700	385	0.0198	---	---
CFSDP-DUP3-SD	CFSDP-050	0.00-0.50	6/21/2018	FD	Phenanthrene	Y	0.016	34300	596	0.0198	0.81	0.0014
CFSDP-DUP3-SD	CFSDP-050	0.00-0.50	6/21/2018	FD	Pyrene	Y	0.025	9090	697	0.0198	1.26	0.0018
North Percolation Pond Area												
CFMW-027-SO-0-	CFMW-027	0.00-0.50	6/30/2016	N	Acenaphthene	Y	40	33400	491	0.1471	271.97	0.5539
CFMW-027-SO-0-	CFMW-027	0.00-0.50	6/30/2016	N	Acenaphthylene	Y	1.2	24000	452	0.1471	8.16	0.0181
CFMW-027-SO-0-	CFMW-027	0.00-0.50	6/30/2016	N	Anthracene	Y	41	1300	594	0.1471	278.77	0.4693
CFMW-027-SO-0-	CFMW-027	0.00-0.50	6/30/2016	N	Benzo(A)Anthracene	Y	280	4153	841	0.1471	1903.77	2.2637
CFMW-027-SO-0-	CFMW-027	0.00-0.50	6/30/2016	N	Benzo(A)Pyrene	Y	320	3840	965	0.1471	2175.73	2.2546
CFMW-027-SO-0-	CFMW-027	0.00-0.50	6/30/2016	N	Benzo(B)Fluoranthene	Y	460	2169	979	0.1471	3127.62	2.2155
CFMW-027-SO-0-	CFMW-027	0.00-0.50	6/30/2016	N	Benzo(K)Fluoranthene	Y	150	1220	981	0.1471	1019.87	1.0396
CFMW-027-SO-0-	CFMW-027	0.00-0.50	6/30/2016	N	Chrysene	Y	350	826	844	0.1471	2379.71	0.9787
CFMW-027-SO-0-	CFMW-027	0.00-0.50	6/30/2016	N	Fluoranthene	Y	430	23870	707	0.1471	2923.64	4.1353
CFMW-027-SO-0-	CFMW-027	0.00-0.50	6/30/2016	N	Fluorene	Y	16	26000	538	0.1471	108.79	0.2022
CFMW-027-SO-0-	CFMW-027	0.00-0.50	6/30/2016	N	Naphthalene	Y	6.5	61700	385	0.1471	44.19	0.1148
CFMW-027-SO-0-	CFMW-027	0.00-0.50	6/30/2016	N	Phenanthrene	Y	200	34300	596	0.1471	1359.83	2.2816

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFMW-027-SO-0-(	CFMW-027	0.00-0.50	6/30/2016	N	Pyrene	Y	440	9090	697	0.1471	2991.63	4.2922
CFSB-014-SO-0-0	CFSB-014	0.00-0.50	6/2/2016	N	Acenaphthene	Y	0.031	33400	491	0.1471	0.21	0.0004
CFSB-014-SO-0-0	CFSB-014	0.00-0.50	6/2/2016	N	Acenaphthylene	N	---	24000	452	0.1471	---	---
CFSB-014-SO-0-0	CFSB-014	0.00-0.50	6/2/2016	N	Anthracene	Y	0.13	1300	594	0.1471	0.88	0.0015
CFSB-014-SO-0-0	CFSB-014	0.00-0.50	6/2/2016	N	Benzo(A)Anthracene	Y	1.7	4153	841	0.1471	11.56	0.0137
CFSB-014-SO-0-0	CFSB-014	0.00-0.50	6/2/2016	N	Benzo(A)Pyrene	Y	2	3840	965	0.1471	13.60	0.0141
CFSB-014-SO-0-0	CFSB-014	0.00-0.50	6/2/2016	N	Benzo(B)Fluoranthene	Y	6.8	2169	979	0.1471	46.23	0.0472
CFSB-014-SO-0-0	CFSB-014	0.00-0.50	6/2/2016	N	Benzo(K)Fluoranthene	Y	2.4	1220	981	0.1471	16.32	0.0166
CFSB-014-SO-0-0	CFSB-014	0.00-0.50	6/2/2016	N	Chrysene	Y	2.3	826	844	0.1471	15.64	0.0185
CFSB-014-SO-0-0	CFSB-014	0.00-0.50	6/2/2016	N	Fluoranthene	Y	2.3	23870	707	0.1471	15.64	0.0221
CFSB-014-SO-0-0	CFSB-014	0.00-0.50	6/2/2016	N	Fluorene	Y	0.012	26000	538	0.1471	0.08	0.0002
CFSB-014-SO-0-0	CFSB-014	0.00-0.50	6/2/2016	N	Naphthalene	Y	0.042	61700	385	0.1471	0.29	0.0007
CFSB-014-SO-0-0	CFSB-014	0.00-0.50	6/2/2016	N	Phenanthrene	Y	0.65	34300	596	0.1471	4.42	0.0074
CFSB-014-SO-0-0	CFSB-014	0.00-0.50	6/2/2016	N	Pyrene	Y	2.3	9090	697	0.1471	15.64	0.0224
CFSB-016-SO-0-0	CFSB-016	0.00-0.50	6/2/2016	N	Acenaphthene	Y	0.72	33400	491	0.1471	4.90	0.0100
CFSB-016-SO-0-0	CFSB-016	0.00-0.50	6/2/2016	N	Acenaphthylene	N	---	24000	452	0.1471	---	---
CFSB-016-SO-0-0	CFSB-016	0.00-0.50	6/2/2016	N	Anthracene	Y	1.9	1300	594	0.1471	12.92	0.0217
CFSB-016-SO-0-0	CFSB-016	0.00-0.50	6/2/2016	N	Benzo(A)Anthracene	Y	11	4153	841	0.1471	74.79	0.0889
CFSB-016-SO-0-0	CFSB-016	0.00-0.50	6/2/2016	N	Benzo(A)Pyrene	Y	14	3840	965	0.1471	95.19	0.0986
CFSB-016-SO-0-0	CFSB-016	0.00-0.50	6/2/2016	N	Benzo(B)Fluoranthene	Y	30	2169	979	0.1471	203.97	0.2084
CFSB-016-SO-0-0	CFSB-016	0.00-0.50	6/2/2016	N	Benzo(K)Fluoranthene	Y	12	1220	981	0.1471	81.59	0.0832
CFSB-016-SO-0-0	CFSB-016	0.00-0.50	6/2/2016	N	Chrysene	Y	16	826	844	0.1471	108.79	0.1289
CFSB-016-SO-0-0	CFSB-016	0.00-0.50	6/2/2016	N	Fluoranthene	Y	19	23870	707	0.1471	129.18	0.1827
CFSB-016-SO-0-0	CFSB-016	0.00-0.50	6/2/2016	N	Fluorene	Y	0.37	26000	538	0.1471	2.52	0.0047
CFSB-016-SO-0-0	CFSB-016	0.00-0.50	6/2/2016	N	Naphthalene	Y	0.72	61700	385	0.1471	4.90	0.0127
CFSB-016-SO-0-0	CFSB-016	0.00-0.50	6/2/2016	N	Phenanthrene	Y	9	34300	596	0.1471	61.19	0.1027
CFSB-016-SO-0-0	CFSB-016	0.00-0.50	6/2/2016	N	Pyrene	Y	21	9090	697	0.1471	142.78	0.2049
CFSB-019-SO-0-0	CFSB-019	0.00-0.50	6/4/2016	N	Acenaphthene	Y	0.069	33400	491	0.1471	0.47	0.0010
CFSB-019-SO-0-0	CFSB-019	0.00-0.50	6/4/2016	N	Acenaphthylene	Y	0.033	24000	452	0.1471	0.22	0.0005
CFSB-019-SO-0-0	CFSB-019	0.00-0.50	6/4/2016	N	Anthracene	Y	0.049	1300	594	0.1471	0.33	0.0006
CFSB-019-SO-0-0	CFSB-019	0.00-0.50	6/4/2016	N	Benzo(A)Anthracene	N	---	4153	841	0.1471	---	---
CFSB-019-SO-0-0	CFSB-019	0.00-0.50	6/4/2016	N	Benzo(A)Pyrene	N	---	3840	965	0.1471	---	---
CFSB-019-SO-0-0	CFSB-019	0.00-0.50	6/4/2016	N	Benzo(B)Fluoranthene	N	---	2169	979	0.1471	---	---
CFSB-019-SO-0-0	CFSB-019	0.00-0.50	6/4/2016	N	Benzo(K)Fluoranthene	N	---	1220	981	0.1471	---	---
CFSB-019-SO-0-0	CFSB-019	0.00-0.50	6/4/2016	N	Chrysene	N	---	826	844	0.1471	---	---
CFSB-019-SO-0-0	CFSB-019	0.00-0.50	6/4/2016	N	Fluoranthene	Y	0.029	23870	707	0.1471	0.20	0.0003
CFSB-019-SO-0-0	CFSB-019	0.00-0.50	6/4/2016	N	Fluorene	Y	0.19	26000	538	0.1471	1.29	0.0024
CFSB-019-SO-0-0	CFSB-019	0.00-0.50	6/4/2016	N	Naphthalene	Y	0.083	61700	385	0.1471	0.56	0.0015
CFSB-019-SO-0-0	CFSB-019	0.00-0.50	6/4/2016	N	Phenanthrene	Y	0.51	34300	596	0.1471	3.47	0.0058
CFSB-019-SO-0-0	CFSB-019	0.00-0.50	6/4/2016	N	Pyrene	Y	0.058	9090	697	0.1471	0.39	0.0006
CFSB-025-SO-0-0	CFSB-025	0.00-0.50	6/13/2016	N	Acenaphthene	Y	5.3	33400	491	0.1471	36.04	0.0734
CFSB-025-SO-0-0	CFSB-025	0.00-0.50	6/13/2016	N	Acenaphthylene	N	---	24000	452	0.1471	---	---
CFSB-025-SO-0-0	CFSB-025	0.00-0.50	6/13/2016	N	Anthracene	Y	38	1300	594	0.1471	258.37	0.4350
CFSB-025-SO-0-0	CFSB-025	0.00-0.50	6/13/2016	N	Benzo(A)Anthracene	Y	190	4153	841	0.1471	1291.84	1.5361
CFSB-025-SO-0-0	CFSB-025	0.00-0.50	6/13/2016	N	Benzo(A)Pyrene	Y	140	3840	965	0.1471	951.88	0.9864
CFSB-025-SO-0-0	CFSB-025	0.00-0.50	6/13/2016	N	Benzo(B)Fluoranthene	Y	210	2169	979	0.1471	1427.82	1.4585
CFSB-025-SO-0-0	CFSB-025	0.00-0.50	6/13/2016	N	Benzo(K)Fluoranthene	Y	78	1220	981	0.1471	530.33	0.5406
CFSB-025-SO-0-0	CFSB-025	0.00-0.50	6/13/2016	N	Chrysene	Y	270	826	844	0.1471	1835.77	0.9787
CFSB-025-SO-0-0	CFSB-025	0.00-0.50	6/13/2016	N	Fluoranthene	Y	320	23870	707	0.1471	2175.73	3.0774

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSB-025-SO-0-0	CFSB-025	0.00-0.50	6/13/2016	N	Fluorene	Y	4.2	26000	538	0.1471	28.56	0.0531
CFSB-025-SO-0-0	CFSB-025	0.00-0.50	6/13/2016	N	Naphthalene	Y	3.8	61700	385	0.1471	25.84	0.0671
CFSB-025-SO-0-0	CFSB-025	0.00-0.50	6/13/2016	N	Phenanthrene	Y	56	34300	596	0.1471	380.75	0.6388
CFSB-025-SO-0-0	CFSB-025	0.00-0.50	6/13/2016	N	Pyrene	Y	240	9090	697	0.1471	1631.80	2.3412
CFSB-026-SO-0-0	CFSB-026	0.00-0.50	6/13/2016	N	Acenaphthene	Y	8.4	33400	491	0.1471	57.11	0.1163
CFSB-026-SO-0-0	CFSB-026	0.00-0.50	6/13/2016	N	Acenaphthylene	N	---	24000	452	0.1471	---	---
CFSB-026-SO-0-0	CFSB-026	0.00-0.50	6/13/2016	N	Anthracene	Y	21	1300	594	0.1471	142.78	0.2404
CFSB-026-SO-0-0	CFSB-026	0.00-0.50	6/13/2016	N	Benzo(A)Anthracene	Y	89	4153	841	0.1471	605.13	0.7195
CFSB-026-SO-0-0	CFSB-026	0.00-0.50	6/13/2016	N	Benzo(A)Pyrene	Y	76	3840	965	0.1471	516.74	0.5355
CFSB-026-SO-0-0	CFSB-026	0.00-0.50	6/13/2016	N	Benzo(B)Fluoranthene	Y	190	2169	979	0.1471	1291.84	1.3196
CFSB-026-SO-0-0	CFSB-026	0.00-0.50	6/13/2016	N	Benzo(K)Fluoranthene	Y	57	1220	981	0.1471	387.55	0.3951
CFSB-026-SO-0-0	CFSB-026	0.00-0.50	6/13/2016	N	Chrysene	Y	220	826	844	0.1471	1495.82	0.9787
CFSB-026-SO-0-0	CFSB-026	0.00-0.50	6/13/2016	N	Fluoranthene	Y	250	23870	707	0.1471	1699.79	2.4042
CFSB-026-SO-0-0	CFSB-026	0.00-0.50	6/13/2016	N	Fluorene	Y	8.1	26000	538	0.1471	55.07	0.1024
CFSB-026-SO-0-0	CFSB-026	0.00-0.50	6/13/2016	N	Naphthalene	Y	2.1	61700	385	0.1471	14.28	0.0371
CFSB-026-SO-0-0	CFSB-026	0.00-0.50	6/13/2016	N	Phenanthrene	Y	86	34300	596	0.1471	584.73	0.9811
CFSB-026-SO-0-0	CFSB-026	0.00-0.50	6/13/2016	N	Pyrene	Y	300	9090	697	0.1471	2039.75	2.9265
CFSB-027-SO-0-0	CFSB-027	0.00-0.50	6/13/2016	N	Acenaphthene	Y	0.91	33400	491	0.1471	6.19	0.0126
CFSB-027-SO-0-0	CFSB-027	0.00-0.50	6/13/2016	N	Acenaphthylene	N	---	24000	452	0.1471	---	---
CFSB-027-SO-0-0	CFSB-027	0.00-0.50	6/13/2016	N	Anthracene	Y	2	1300	594	0.1471	13.60	0.0229
CFSB-027-SO-0-0	CFSB-027	0.00-0.50	6/13/2016	N	Benzo(A)Anthracene	Y	13	4153	841	0.1471	88.39	0.1051
CFSB-027-SO-0-0	CFSB-027	0.00-0.50	6/13/2016	N	Benzo(A)Pyrene	Y	15	3840	965	0.1471	101.99	0.1057
CFSB-027-SO-0-0	CFSB-027	0.00-0.50	6/13/2016	N	Benzo(B)Fluoranthene	Y	18	2169	979	0.1471	122.38	0.1250
CFSB-027-SO-0-0	CFSB-027	0.00-0.50	6/13/2016	N	Benzo(K)Fluoranthene	Y	6.1	1220	981	0.1471	41.47	0.0423
CFSB-027-SO-0-0	CFSB-027	0.00-0.50	6/13/2016	N	Chrysene	Y	15	826	844	0.1471	101.99	0.1208
CFSB-027-SO-0-0	CFSB-027	0.00-0.50	6/13/2016	N	Fluoranthene	Y	22	23870	707	0.1471	149.58	0.2116
CFSB-027-SO-0-0	CFSB-027	0.00-0.50	6/13/2016	N	Fluorene	Y	0.82	26000	538	0.1471	5.58	0.0104
CFSB-027-SO-0-0	CFSB-027	0.00-0.50	6/13/2016	N	Naphthalene	Y	0.2	61700	385	0.1471	1.36	0.0035
CFSB-027-SO-0-0	CFSB-027	0.00-0.50	6/13/2016	N	Phenanthrene	Y	12	34300	596	0.1471	81.59	0.1369
CFSB-027-SO-0-0	CFSB-027	0.00-0.50	6/13/2016	N	Pyrene	Y	22	9090	697	0.1471	149.58	0.2146
CFSB-028-SO-0-0	CFSB-028	0.00-0.50	7/18/2016	N	Acenaphthene	Y	0.31	33400	491	0.1471	2.11	0.0043
CFSB-028-SO-0-0	CFSB-028	0.00-0.50	7/18/2016	N	Acenaphthylene	N	---	24000	452	0.1471	---	---
CFSB-028-SO-0-0	CFSB-028	0.00-0.50	7/18/2016	N	Anthracene	Y	0.89	1300	594	0.1471	6.05	0.0102
CFSB-028-SO-0-0	CFSB-028	0.00-0.50	7/18/2016	N	Benzo(A)Anthracene	Y	4.9	4153	841	0.1471	33.32	0.0396
CFSB-028-SO-0-0	CFSB-028	0.00-0.50	7/18/2016	N	Benzo(A)Pyrene	Y	5.3	3840	965	0.1471	36.04	0.0373
CFSB-028-SO-0-0	CFSB-028	0.00-0.50	7/18/2016	N	Benzo(B)Fluoranthene	Y	8.8	2169	979	0.1471	59.83	0.0611
CFSB-028-SO-0-0	CFSB-028	0.00-0.50	7/18/2016	N	Benzo(K)Fluoranthene	Y	3.3	1220	981	0.1471	22.44	0.0229
CFSB-028-SO-0-0	CFSB-028	0.00-0.50	7/18/2016	N	Chrysene	Y	8.8	826	844	0.1471	59.83	0.0709
CFSB-028-SO-0-0	CFSB-028	0.00-0.50	7/18/2016	N	Fluoranthene	Y	7.5	23870	707	0.1471	50.99	0.0721
CFSB-028-SO-0-0	CFSB-028	0.00-0.50	7/18/2016	N	Fluorene	Y	0.21	26000	538	0.1471	1.43	0.0027
CFSB-028-SO-0-0	CFSB-028	0.00-0.50	7/18/2016	N	Naphthalene	Y	0.077	61700	385	0.1471	0.52	0.0014
CFSB-028-SO-0-0	CFSB-028	0.00-0.50	7/18/2016	N	Phenanthrene	Y	3.7	34300	596	0.1471	25.16	0.0422
CFSB-028-SO-0-0	CFSB-028	0.00-0.50	7/18/2016	N	Pyrene	Y	7.7	9090	697	0.1471	52.35	0.0751
CFSB-030-SO-0-0	CFSB-030	0.00-0.50	6/13/2016	N	Acenaphthene	Y	0.36	33400	491	0.1471	2.45	0.0050
CFSB-030-SO-0-0	CFSB-030	0.00-0.50	6/13/2016	N	Acenaphthylene	N	---	24000	452	0.1471	---	---
CFSB-030-SO-0-0	CFSB-030	0.00-0.50	6/13/2016	N	Anthracene	Y	0.85	1300	594	0.1471	5.78	0.0097
CFSB-030-SO-0-0	CFSB-030	0.00-0.50	6/13/2016	N	Benzo(A)Anthracene	Y	6	4153	841	0.1471	40.79	0.0485
CFSB-030-SO-0-0	CFSB-030	0.00-0.50	6/13/2016	N	Benzo(A)Pyrene	Y	6.9	3840	965	0.1471	46.91	0.0486
CFSB-030-SO-0-0	CFSB-030	0.00-0.50	6/13/2016	N	Benzo(B)Fluoranthene	Y	13	2169	979	0.1471	88.39	0.0903

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSB-030-SO-0-0	CFSB-030	0.00-0.50	6/13/2016	N	Benzo(K)Fluoranthene	Y	4.3	1220	981	0.1471	29.24	0.0298
CFSB-030-SO-0-0	CFSB-030	0.00-0.50	6/13/2016	N	Chrysene	Y	11	826	844	0.1471	74.79	0.0886
CFSB-030-SO-0-0	CFSB-030	0.00-0.50	6/13/2016	N	Fluoranthene	Y	11	23870	707	0.1471	74.79	0.1058
CFSB-030-SO-0-0	CFSB-030	0.00-0.50	6/13/2016	N	Fluorene	Y	0.3	26000	538	0.1471	2.04	0.0038
CFSB-030-SO-0-0	CFSB-030	0.00-0.50	6/13/2016	N	Naphthalene	Y	0.14	61700	385	0.1471	0.95	0.0025
CFSB-030-SO-0-0	CFSB-030	0.00-0.50	6/13/2016	N	Phenanthrene	Y	4.4	34300	596	0.1471	29.92	0.0502
CFSB-030-SO-0-0	CFSB-030	0.00-0.50	6/13/2016	N	Pyrene	Y	9.6	9090	697	0.1471	65.27	0.0936
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	Acenaphthene	Y	2.9	33400	491	0.1240	23.39	0.0476
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	Acenaphthylene	N	---	24000	452	0.1240	---	---
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	Anthracene	Y	13	1300	594	0.1240	104.84	0.1765
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	Benzo(A)Anthracene	Y	79	4153	841	0.1240	637.10	0.7575
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	Benzo(A)Pyrene	Y	68	3840	965	0.1240	548.39	0.5683
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	Benzo(B)Fluoranthene	Y	110	2169	979	0.1240	887.10	0.9061
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	Benzo(G,H,I)Perylene	Y	63	648	1095	0.1240	508.06	0.4640
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	Benzo(K)Fluoranthene	Y	79	1220	981	0.1240	637.10	0.6494
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	Benzo[E]Pyrene	Y	76	4300	967	0.1240	612.90	0.6338
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	C1-Chrysenes	Y	34	---	929	0.1240	274.19	0.2951
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	C1-Fluoranthenes/Pyrenes	Y	63	---	770	0.1240	508.06	0.6598
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	C1-Fluorenes	N	---	---	611	0.1240	---	---
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	C1-Naphthalenes	N	---	---	444	0.1240	---	---
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	C1-Phenanthrenes/Anthracen	Y	16	---	670	0.1240	129.03	0.1926
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	C2-Chrysenes	Y	8.9	---	1008	0.1240	71.77	0.0712
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	C2-Fluorenes	N	---	---	686	0.1240	---	---
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	C2-Naphthalenes	N	---	---	510	0.1240	---	---
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	C2-Phenanthrenes/Anthracen	Y	10	---	746	0.1240	80.65	0.1081
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	C3-Chrysenes	Y	4.9	---	1112	0.1240	39.52	0.0355
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	C3-Fluorenes	N	---	---	769	0.1240	---	---
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	C3-Naphthalenes	N	---	---	581	0.1240	---	---
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	C3-Phenanthrenes/Anthracen	Y	5.2	---	829	0.1240	41.94	0.0506
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	C4 Chrysenes	N	---	---	1214	0.1240	---	---
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	C4-Naphthalenes	N	---	---	657	0.1240	---	---
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	C4-Phenanthrenes/Anthracen	N	---	---	913	0.1240	---	---
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	Chrysene	Y	110	826	844	0.1240	887.10	0.9787
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	Dibenz(A,H)Anthracene	Y	20	2389	1123	0.1240	161.29	0.1436
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	Fluoranthene	Y	220	23870	707	0.1240	1774.19	2.5095
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	Fluorene	Y	2.1	26000	538	0.1240	16.94	0.0315
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	Indeno(1,2,3-C,D)Pyrene	Y	57	---	1115	0.1240	459.68	0.4123
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	Naphthalene	N	---	61700	385	0.1240	---	---
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	Perylene	Y	19	431	967	0.1240	153.23	0.1585
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	Phenanthrene	Y	31	34300	596	0.1240	250.00	0.4195
CFSB-199-SO-0-0	CFSB-199	0.00-0.50	6/28/2018	N	Pyrene	Y	190	9090	697	0.1240	1532.26	2.1984
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	Acenaphthene	Y	0.06	33400	491	0.0235	2.55	0.0052
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	Acenaphthylene	N	---	24000	452	0.0235	---	---
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	Anthracene	Y	0.31	1300	594	0.0235	13.19	0.0222
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	Benzo(A)Anthracene	Y	2.2	4153	841	0.0235	93.62	0.1113
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	Benzo(A)Pyrene	Y	3.3	3840	965	0.0235	140.43	0.1455
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	Benzo(B)Fluoranthene	Y	5	2169	979	0.0235	212.77	0.2173
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	Benzo(G,H,I)Perylene	Y	4.8	648	1095	0.0235	204.26	0.1865
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	Benzo(K)Fluoranthene	Y	4.1	1220	981	0.0235	174.47	0.1778

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	Benzo[E]Pyrene	Y	3.9	4300	967	0.0235	165.96	0.1716
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	C1-Chrysenes	Y	1	---	929	0.0235	42.55	0.0458
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	C1-Fluoranthenes/Pyrenes	Y	1.6	---	770	0.0235	68.09	0.0884
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	C1-Fluorenes	N	---	---	611	0.0235	---	---
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	C1-Naphthalenes	N	---	---	444	0.0235	---	---
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	C1-Phenanthrenes/Anthracen	Y	0.37	---	670	0.0235	15.74	0.0235
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	C2-Chrysenes	Y	0.43	---	1008	0.0235	18.30	0.0182
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	C2-Fluorenes	N	---	---	686	0.0235	---	---
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	C2-Naphthalenes	N	---	---	510	0.0235	---	---
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	C2-Phenanthrenes/Anthracen	Y	0.23	---	746	0.0235	9.79	0.0131
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	C3-Chrysenes	N	---	---	1112	0.0235	---	---
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	C3-Fluorenes	N	---	---	769	0.0235	---	---
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	C3-Naphthalenes	N	---	---	581	0.0235	---	---
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	C3-Phenanthrenes/Anthracen	Y	0.15	---	829	0.0235	6.38	0.0077
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	C4 Chrysenes	N	---	---	1214	0.0235	---	---
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	C4-Naphthalenes	N	---	---	657	0.0235	---	---
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	C4-Phenanthrenes/Anthracen	N	---	---	913	0.0235	---	---
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	Chrysene	Y	3.2	826	844	0.0235	136.17	0.1613
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	Dibenz(A,H)Anthracene	Y	1.2	2389	1123	0.0235	51.06	0.0455
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	Fluoranthene	Y	3.1	23870	707	0.0235	131.91	0.1866
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	Fluorene	N	---	26000	538	0.0235	---	---
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	Indeno(1,2,3-C,D)Pyrene	Y	4.2	---	1115	0.0235	178.72	0.1603
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	Naphthalene	N	---	61700	385	0.0235	---	---
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	Perylene	Y	0.87	431	967	0.0235	37.02	0.0383
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	Phenanthrene	Y	0.75	34300	596	0.0235	31.91	0.0535
CFSB-201-SO-0-0	CFSB-201	0.00-0.50	6/22/2018	N	Pyrene	Y	3.7	9090	697	0.0235	157.45	0.2259
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	Acenaphthene	Y	0.18	33400	491	0.0294	6.12	0.0125
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	Acenaphthylene	N	---	24000	452	0.0294	---	---
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	Anthracene	Y	2.1	1300	594	0.0294	71.43	0.1203
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	Benzo(A)Anthracene	Y	9.1	4153	841	0.0294	309.52	0.3680
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	Benzo(A)Pyrene	Y	9.9	3840	965	0.0294	336.73	0.3489
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	Benzo(B)Fluoranthene	Y	24	2169	979	0.0294	816.33	0.8338
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	Benzo(G,H,I)Perylene	Y	12	648	1095	0.0294	408.16	0.3728
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	Benzo(K)Fluoranthene	Y	17	1220	981	0.0294	578.23	0.5894
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	Benzo[E]Pyrene	Y	15	4300	967	0.0294	510.20	0.5276
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	C1-Chrysenes	Y	5.1	---	929	0.0294	173.47	0.1867
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	C1-Fluoranthenes/Pyrenes	Y	6.8	---	770	0.0294	231.29	0.3004
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	C1-Fluorenes	N	---	---	611	0.0294	---	---
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	C1-Naphthalenes	N	---	---	444	0.0294	---	---
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	C1-Phenanthrenes/Anthracen	Y	2.2	---	670	0.0294	74.83	0.1117
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	C2-Chrysenes	Y	2.1	---	1008	0.0294	71.43	0.0709
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	C2-Fluorenes	N	---	---	686	0.0294	---	---
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	C2-Naphthalenes	N	---	---	510	0.0294	---	---
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	C2-Phenanthrenes/Anthracen	Y	1.6	---	746	0.0294	54.42	0.0730
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	C3-Chrysenes	N	---	---	1112	0.0294	---	---
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	C3-Fluorenes	N	---	---	769	0.0294	---	---
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	C3-Naphthalenes	N	---	---	581	0.0294	---	---
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	C3-Phenanthrenes/Anthracen	Y	0.82	---	829	0.0294	27.89	0.0336
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	C4 Chrysenes	N	---	---	1214	0.0294	---	---

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	C4-Naphthalenes	N	---	---	657	0.0294	---	---
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	C4-Phenanthrenes/Anthracen	N	---	---	913	0.0294	---	---
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	Chrysene	Y	11	826	844	0.0294	374.15	0.4433
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	Dibenz(A,H)Anthracene	Y	4.2	2389	1123	0.0294	142.86	0.1272
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	Fluoranthene	Y	11	23870	707	0.0294	374.15	0.5292
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	Fluorene	N	---	26000	538	0.0294	---	---
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	Indeno(1,2,3-C,D)Pyrene	Y	12	---	1115	0.0294	408.16	0.3661
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	Naphthalene	N	---	61700	385	0.0294	---	---
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	Perylene	Y	2.5	431	967	0.0294	85.03	0.0879
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	Phenanthrene	Y	2.7	34300	596	0.0294	91.84	0.1541
CFSB-202-SO-0-0	CFSB-202	0.00-0.50	6/22/2018	N	Pyrene	Y	13	9090	697	0.0294	442.18	0.6344
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	Acenaphthene	Y	190	33400	491	0.1820	1043.96	2.1262
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	Acenaphthylene	N	---	24000	452	0.1820	---	---
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	Anthracene	Y	250	1300	594	0.1820	1373.63	2.1886
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	Benzo(A)Anthracene	Y	2700	4153	841	0.1820	14835.16	4.9382
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	Benzo(A)Pyrene	Y	3100	3840	965	0.1820	17032.97	3.9793
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	Benzo(B)Fluoranthene	Y	3000	2169	979	0.1820	16483.52	2.2155
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	Benzo(G,H,I)Perylene	Y	2200	648	1095	0.1820	12087.91	0.5918
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	Benzo(K)Fluoranthene	Y	2400	1220	981	0.1820	13186.81	1.2436
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	Benzo[E]Pyrene	Y	2100	4300	967	0.1820	11538.46	4.4467
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	C1-Chrysenes	Y	880	---	929	0.1820	4835.16	5.2047
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	C1-Fluoranthenes/Pyrenes	Y	1400	---	770	0.1820	7692.31	9.9900
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	C1-Fluorenes	N	---	---	611	0.1820	---	---
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	C1-Naphthalenes	N	---	---	444	0.1820	---	---
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	C1-Phenanthrenes/Anthracen	Y	360	---	670	0.1820	1978.02	2.9523
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	C2-Chrysenes	Y	230	---	1008	0.1820	1263.74	1.2537
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	C2-Fluorenes	N	---	---	686	0.1820	---	---
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	C2-Naphthalenes	N	---	---	510	0.1820	---	---
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	C2-Phenanthrenes/Anthracen	Y	160	---	746	0.1820	879.12	1.1784
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	C3-Chrysenes	N	---	---	1112	0.1820	---	---
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	C3-Fluorenes	N	---	---	769	0.1820	---	---
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	C3-Naphthalenes	N	---	---	581	0.1820	---	---
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	C3-Phenanthrenes/Anthracen	N	---	---	829	0.1820	---	---
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	C4 Chrysenes	N	---	---	1214	0.1820	---	---
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	C4-Naphthalenes	N	---	---	657	0.1820	---	---
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	C4-Phenanthrenes/Anthracen	N	---	---	913	0.1820	---	---
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	Chrysene	Y	2800	826	844	0.1820	15384.62	0.9787
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	Dibenz(A,H)Anthracene	Y	740	2389	1123	0.1820	4065.93	2.1273
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	Fluoranthene	Y	3700	23870	707	0.1820	20329.67	28.7548
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	Fluorene	Y	82	26000	538	0.1820	450.55	0.8375
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	Indeno(1,2,3-C,D)Pyrene	Y	2000	---	1115	0.1820	10989.01	9.8556
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	Naphthalene	N	---	61700	385	0.1820	---	---
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	Perylene	Y	850	431	967	0.1820	4670.33	0.4457
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	Phenanthrene	Y	1300	34300	596	0.1820	7142.86	11.9847
CFSB-203-SO-0-0	CFSB-203	0.00-0.50	6/28/2018	N	Pyrene	Y	3200	9090	697	0.1820	17582.42	13.0416
CFSB-204-SO-0-0	CFSB-204	0.00-0.50	6/22/2018	N	Acenaphthene	Y	1.5	33400	491	0.0571	26.27	0.0535
CFSB-204-SO-0-0	CFSB-204	0.00-0.50	6/22/2018	N	Acenaphthylene	Y	0.23	24000	452	0.0571	4.03	0.0089
CFSB-204-SO-0-0	CFSB-204	0.00-0.50	6/22/2018	N	Anthracene	Y	5	1300	594	0.0571	87.57	0.1474
CFSB-204-SO-0-0	CFSB-204	0.00-0.50	6/22/2018	N	Benzo(A)Anthracene	Y	24	4153	841	0.0571	420.32	0.4998

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSB-204-SO-0-0	CFSB-204	0.00-0.50	6/22/2018	N	Benzo(A)Pyrene	Y	36	3840	965	0.0571	630.47	0.6533
CFSB-204-SO-0-0	CFSB-204	0.00-0.50	6/22/2018	N	Benzo(B)Fluoranthene	Y	64	2169	979	0.0571	1120.84	1.1449
CFSB-204-SO-0-0	CFSB-204	0.00-0.50	6/22/2018	N	Benzo(K)Fluoranthene	Y	24	1220	981	0.0571	420.32	0.4285
CFSB-204-SO-0-0	CFSB-204	0.00-0.50	6/22/2018	N	Chrysene	Y	33	826	844	0.0571	577.93	0.6848
CFSB-204-SO-0-0	CFSB-204	0.00-0.50	6/22/2018	N	Fluoranthene	Y	42	23870	707	0.0571	735.55	1.0404
CFSB-204-SO-0-0	CFSB-204	0.00-0.50	6/22/2018	N	Fluorene	Y	0.71	26000	538	0.0571	12.43	0.0231
CFSB-204-SO-0-0	CFSB-204	0.00-0.50	6/22/2018	N	Naphthalene	Y	0.56	61700	385	0.0571	9.81	0.0255
CFSB-204-SO-0-0	CFSB-204	0.00-0.50	6/22/2018	N	Phenanthrene	Y	16	34300	596	0.0571	280.21	0.4702
CFSB-204-SO-0-0	CFSB-204	0.00-0.50	6/22/2018	N	Pyrene	Y	39	9090	697	0.0571	683.01	0.9799
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	Acenaphthene	Y	0.39	33400	491	0.1290	3.02	0.0062
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	Acenaphthylene	N	---	24000	452	0.1290	---	---
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	Anthracene	Y	0.9	1300	594	0.1290	6.98	0.0117
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	Benzo(A)Anthracene	Y	4.1	4153	841	0.1290	31.78	0.0378
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	Benzo(A)Pyrene	Y	4.7	3840	965	0.1290	36.43	0.0378
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	Benzo(B)Fluoranthene	Y	5	2169	979	0.1290	38.76	0.0396
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	Benzo(G,H,I)Perylene	Y	3.7	648	1095	0.1290	28.68	0.0262
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	Benzo(K)Fluoranthene	Y	4.1	1220	981	0.1290	31.78	0.0324
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	Benzo[E]Pyrene	Y	3.5	4300	967	0.1290	27.13	0.0281
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	C1-Chrysenes	Y	1.6	---	929	0.1290	12.40	0.0134
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	C1-Fluoranthenes/Pyrenes	Y	3	---	770	0.1290	23.26	0.0302
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	C1-Fluorenes	N	---	---	611	0.1290	---	---
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	C1-Naphthalenes	N	---	---	444	0.1290	---	---
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	C1-Phenanthrenes/Anthracen	Y	1	---	670	0.1290	7.75	0.0116
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	C2-Chrysenes	Y	0.58	---	1008	0.1290	4.50	0.0045
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	C2-Fluorenes	N	---	---	686	0.1290	---	---
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	C2-Naphthalenes	N	---	---	510	0.1290	---	---
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	C2-Phenanthrenes/Anthracen	Y	0.45	---	746	0.1290	3.49	0.0047
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	C3-Chrysenes	Y	0.27	---	1112	0.1290	2.09	0.0019
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	C3-Fluorenes	N	---	---	769	0.1290	---	---
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	C3-Naphthalenes	N	---	---	581	0.1290	---	---
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	C3-Phenanthrenes/Anthracen	Y	0.25	---	829	0.1290	1.94	0.0023
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	C4 Chrysenes	N	---	---	1214	0.1290	---	---
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	C4-Naphthalenes	N	---	---	657	0.1290	---	---
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	C4-Phenanthrenes/Anthracen	N	---	---	913	0.1290	---	---
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	Chrysene	Y	5	826	844	0.1290	38.76	0.0459
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	Dibenz(A,H)Anthracene	Y	1.3	2389	1123	0.1290	10.08	0.0090
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	Fluoranthene	Y	6.9	23870	707	0.1290	53.49	0.0757
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	Fluorene	Y	0.27	26000	538	0.1290	2.09	0.0039
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	Indeno(1,2,3-C,D)Pyrene	Y	3.5	---	1115	0.1290	27.13	0.0243
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	Naphthalene	Y	0.11	61700	385	0.1290	0.85	0.0022
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	Perylene	Y	1.2	431	967	0.1290	9.30	0.0096
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	Phenanthrene	Y	3.7	34300	596	0.1290	28.68	0.0481
CFSB-214-SO-0-0	CFSB-214	0.00-0.50	6/22/2018	N	Pyrene	Y	7.2	9090	697	0.1290	55.81	0.0801
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	Acenaphthene	Y	130	33400	491	0.1471	883.89	1.8002
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	Acenaphthylene	Y	0.89	24000	452	0.1471	6.05	0.0134
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	Anthracene	Y	180	1300	594	0.1471	1223.85	2.0604
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	Benzo(A)Anthracene	Y	1700	4153	841	0.1471	11558.58	4.9382
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	Benzo(A)Pyrene	Y	1900	3840	965	0.1471	12918.41	3.9793
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	Benzo(B)Fluoranthene	Y	2100	2169	979	0.1471	14278.24	2.2155

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	Benzo(G,H,I)Perylene	Y	1400	648	1095	0.1471	9518.83	0.5918
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	Benzo(K)Fluoranthene	Y	1300	1220	981	0.1471	8838.91	1.2436
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	Benzo[E]Pyrene	Y	1300	4300	967	0.1471	8838.91	4.4467
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	C1-Chrysenes	Y	490	---	929	0.1471	3331.59	3.5862
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	C1-Fluoranthenes/Pyrenes	Y	770	---	770	0.1471	5235.36	6.7992
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	C1-Fluorenes	Y	13	---	611	0.1471	88.39	0.1447
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	C1-Naphthalenes	Y	8.3	---	444	0.1471	56.43	0.1271
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	C1-Phenanthrenes/Anthracen	Y	220	---	670	0.1471	1495.82	2.2326
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	C2-Chrysenes	Y	150	---	1008	0.1471	1019.87	1.0118
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	C2-Fluorenes	Y	9.5	---	686	0.1471	64.59	0.0942
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	C2-Naphthalenes	Y	13	---	510	0.1471	88.39	0.1733
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	C2-Phenanthrenes/Anthracen	Y	98	---	746	0.1471	666.32	0.8932
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	C3-Chrysenes	Y	46	---	1112	0.1471	312.76	0.2813
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	C3-Fluorenes	Y	20	---	769	0.1471	135.98	0.1768
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	C3-Naphthalenes	Y	8.6	---	581	0.1471	58.47	0.1006
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	C3-Phenanthrenes/Anthracen	Y	47	---	829	0.1471	319.56	0.3855
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	C4 Chrysenes	Y	16	---	1214	0.1471	108.79	0.0896
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	C4-Naphthalenes	Y	3.8	---	657	0.1471	25.84	0.0393
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	C4-Phenanthrenes/Anthracen	Y	12	---	913	0.1471	81.59	0.0894
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	Chrysene	Y	1700	826	844	0.1471	11558.58	0.9787
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	Dibenz(A,H)Anthracene	Y	490	2389	1123	0.1471	3331.59	2.1273
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	Fluoranthene	Y	2200	23870	707	0.1471	14958.16	21.1572
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	Fluorene	Y	50	26000	538	0.1471	339.96	0.6319
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	Indeno(1,2,3-C,D)Pyrene	Y	1300	---	1115	0.1471	8838.91	7.9273
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	Naphthalene	Y	12	61700	385	0.1471	81.59	0.2119
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	Perylene	Y	510	431	967	0.1471	3467.57	0.4457
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	Phenanthrene	Y	760	34300	596	0.1471	5167.36	8.6701
CFSB-272-SO-0-0	CFSB-272	0.00-0.50	6/28/2018	N	Pyrene	Y	2000	9090	697	0.1471	13598.33	13.0416
CFSB-273-SO-0-0	CFSB-273	0.00-0.50	5/4/2018	N	Acenaphthene	Y	19	33400	491	0.0835	227.54	0.4634
CFSB-273-SO-0-0	CFSB-273	0.00-0.50	5/4/2018	N	Acenaphthylene	Y	0.85	24000	452	0.0835	10.18	0.0225
CFSB-273-SO-0-0	CFSB-273	0.00-0.50	5/4/2018	N	Anthracene	Y	54	1300	594	0.0835	646.71	1.0887
CFSB-273-SO-0-0	CFSB-273	0.00-0.50	5/4/2018	N	Benzo(A)Anthracene	Y	130	4153	841	0.0835	1556.89	1.8512
CFSB-273-SO-0-0	CFSB-273	0.00-0.50	5/4/2018	N	Benzo(A)Pyrene	Y	100	3840	965	0.0835	1197.60	1.2410
CFSB-273-SO-0-0	CFSB-273	0.00-0.50	5/4/2018	N	Benzo(B)Fluoranthene	Y	190	2169	979	0.0835	2275.45	2.2155
CFSB-273-SO-0-0	CFSB-273	0.00-0.50	5/4/2018	N	Benzo(K)Fluoranthene	Y	62	1220	981	0.0835	742.51	0.7569
CFSB-273-SO-0-0	CFSB-273	0.00-0.50	5/4/2018	N	Chrysene	Y	190	826	844	0.0835	2275.45	0.9787
CFSB-273-SO-0-0	CFSB-273	0.00-0.50	5/4/2018	N	Fluoranthene	Y	480	23870	707	0.0835	5748.50	8.1308
CFSB-273-SO-0-0	CFSB-273	0.00-0.50	5/4/2018	N	Fluorene	Y	10	26000	538	0.0835	119.76	0.2226
CFSB-273-SO-0-0	CFSB-273	0.00-0.50	5/4/2018	N	Naphthalene	Y	1.5	61700	385	0.0835	17.96	0.0467
CFSB-273-SO-0-0	CFSB-273	0.00-0.50	5/4/2018	N	Phenanthrene	Y	110	34300	596	0.0835	1317.37	2.2103
CFSB-273-SO-0-0	CFSB-273	0.00-0.50	5/4/2018	N	Pyrene	Y	420	9090	697	0.0835	5029.94	7.2166
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	Acenaphthene	Y	0.12	33400	491	0.1471	0.82	0.0017
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	Acenaphthylene	N	---	24000	452	0.1471	---	---
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	Anthracene	Y	0.94	1300	594	0.1471	6.39	0.0108
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	Benzo(A)Anthracene	Y	5.7	4153	841	0.1471	38.76	0.0461
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	Benzo(A)Pyrene	Y	5.8	3840	965	0.1471	39.44	0.0409
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	Benzo(B)Fluoranthene	Y	16	2169	979	0.1471	108.79	0.1111
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	Benzo(G,H,I)Perylene	Y	4.5	648	1095	0.1471	30.60	0.0279
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	Benzo(K)Fluoranthene	Y	9.6	1220	981	0.1471	65.27	0.0665

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	Benzo[E]Pyrene	Y	8.2	4300	967	0.1471	55.75	0.0577
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	C1-Chrysenes	Y	2.8	---	929	0.1471	19.04	0.0205
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	C1-Fluoranthenes/Pyrenes	Y	4.9	---	770	0.1471	33.32	0.0433
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	C1-Fluorenes	N	---	---	611	0.1471	---	---
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	C1-Naphthalenes	N	---	---	444	0.1471	---	---
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	C1-Phenanthrenes/Anthracen	Y	0.77	---	670	0.1471	5.24	0.0078
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	C2-Chrysenes	Y	1.3	---	1008	0.1471	8.84	0.0088
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	C2-Fluorenes	N	---	---	686	0.1471	---	---
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	C2-Naphthalenes	N	---	---	510	0.1471	---	---
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	C2-Phenanthrenes/Anthracen	Y	0.52	---	746	0.1471	3.54	0.0047
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	C3-Chrysenes	Y	0.34	---	1112	0.1471	2.31	0.0021
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	C3-Fluorenes	N	---	---	769	0.1471	---	---
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	C3-Naphthalenes	N	---	---	581	0.1471	---	---
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	C3-Phenanthrenes/Anthracen	Y	0.31	---	829	0.1471	2.11	0.0025
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	C4 Chrysenes	N	---	---	1214	0.1471	---	---
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	C4-Naphthalenes	N	---	---	657	0.1471	---	---
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	C4-Phenanthrenes/Anthracen	N	---	---	913	0.1471	---	---
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	Chrysene	Y	7.8	826	844	0.1471	53.03	0.0628
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	Dibenz(A,H)Anthracene	Y	1.9	2389	1123	0.1471	12.92	0.0115
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	Fluoranthene	Y	6.7	23870	707	0.1471	45.55	0.0644
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	Fluorene	Y	0.099	26000	538	0.1471	0.67	0.0013
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	Indeno(1,2,3-C,D)Pyrene	Y	5	---	1115	0.1471	34.00	0.0305
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	Naphthalene	N	---	61700	385	0.1471	---	---
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	Perylene	Y	1.5	431	967	0.1471	10.20	0.0105
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	Phenanthrene	Y	1.6	34300	596	0.1471	10.88	0.0183
CFSB-279-SO-0-0	CFSB-279	0.00-0.50	6/22/2018	N	Pyrene	Y	6.9	9090	697	0.1471	46.91	0.0673
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	Acenaphthene	Y	0.15	33400	491	0.1471	1.02	0.0021
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	Acenaphthylene	N	---	24000	452	0.1471	---	---
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	Anthracene	Y	0.7	1300	594	0.1471	4.76	0.0080
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	Benzo(A)Anthracene	Y	3.8	4153	841	0.1471	25.84	0.0307
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	Benzo(A)Pyrene	Y	5.2	3840	965	0.1471	35.36	0.0366
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	Benzo(B)Fluoranthene	Y	8.6	2169	979	0.1471	58.47	0.0597
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	Benzo(G,H,I)Perylene	Y	8.4	648	1095	0.1471	57.11	0.0522
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	Benzo(K)Fluoranthene	Y	6.8	1220	981	0.1471	46.23	0.0471
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	Benzo[E]Pyrene	Y	6.3	4300	967	0.1471	42.83	0.0443
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	C1-Chrysenes	Y	1.6	---	929	0.1471	10.88	0.0117
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	C1-Fluoranthenes/Pyrenes	Y	2.8	---	770	0.1471	19.04	0.0247
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	C1-Fluorenes	N	---	---	611	0.1471	---	---
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	C1-Naphthalenes	N	---	---	444	0.1471	---	---
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	C1-Phenanthrenes/Anthracen	Y	0.72	---	670	0.1471	4.90	0.0073
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	C2-Chrysenes	Y	0.71	---	1008	0.1471	4.83	0.0048
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	C2-Fluorenes	N	---	---	686	0.1471	---	---
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	C2-Naphthalenes	N	---	---	510	0.1471	---	---
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	C2-Phenanthrenes/Anthracen	Y	0.47	---	746	0.1471	3.20	0.0043
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	C3-Chrysenes	N	---	---	1112	0.1471	---	---
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	C3-Fluorenes	N	---	---	769	0.1471	---	---
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	C3-Naphthalenes	N	---	---	581	0.1471	---	---
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	C3-Phenanthrenes/Anthracen	N	---	---	829	0.1471	---	---
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	C4 Chrysenes	N	---	---	1214	0.1471	---	---

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	C4-Naphthalenes	N	---	---	657	0.1471	---	---
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	C4-Phenanthrenes/Anthracen	N	---	---	913	0.1471	---	---
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	Chrysene	Y	5.2	826	844	0.1471	35.36	0.0419
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	Dibenz(A,H)Anthracene	Y	1.9	2389	1123	0.1471	12.92	0.0115
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	Fluoranthene	Y	5.2	23870	707	0.1471	35.36	0.0500
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	Fluorene	N	---	26000	538	0.1471	---	---
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	Indeno(1,2,3-C,D)Pyrene	Y	7.1	---	1115	0.1471	48.27	0.0433
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	Naphthalene	N	---	61700	385	0.1471	---	---
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	Perylene	Y	1.5	431	967	0.1471	10.20	0.0105
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	Phenanthrene	Y	1.6	34300	596	0.1471	10.88	0.0183
CFSB-280-SO-0-0	CFSB-280	0.00-0.50	6/22/2018	N	Pyrene	Y	6	9090	697	0.1471	40.79	0.0585
CFSB-281-SO-0-0	CFSB-281	0.00-0.50	5/4/2018	N	Acenaphthene	Y	3	33400	491	0.1110	27.03	0.0550
CFSB-281-SO-0-0	CFSB-281	0.00-0.50	5/4/2018	N	Acenaphthylene	N	---	24000	452	0.1110	---	---
CFSB-281-SO-0-0	CFSB-281	0.00-0.50	5/4/2018	N	Anthracene	Y	17	1300	594	0.1110	153.15	0.2578
CFSB-281-SO-0-0	CFSB-281	0.00-0.50	5/4/2018	N	Benzo(A)Anthracene	Y	80	4153	841	0.1110	720.72	0.8570
CFSB-281-SO-0-0	CFSB-281	0.00-0.50	5/4/2018	N	Benzo(A)Pyrene	Y	55	3840	965	0.1110	495.50	0.5135
CFSB-281-SO-0-0	CFSB-281	0.00-0.50	5/4/2018	N	Benzo(B)Fluoranthene	Y	100	2169	979	0.1110	900.90	0.9202
CFSB-281-SO-0-0	CFSB-281	0.00-0.50	5/4/2018	N	Benzo(K)Fluoranthene	Y	29	1220	981	0.1110	261.26	0.2663
CFSB-281-SO-0-0	CFSB-281	0.00-0.50	5/4/2018	N	Chrysene	Y	110	826	844	0.1110	990.99	0.9787
CFSB-281-SO-0-0	CFSB-281	0.00-0.50	5/4/2018	N	Fluoranthene	Y	270	23870	707	0.1110	2432.43	3.4405
CFSB-281-SO-0-0	CFSB-281	0.00-0.50	5/4/2018	N	Fluorene	Y	2.5	26000	538	0.1110	22.52	0.0419
CFSB-281-SO-0-0	CFSB-281	0.00-0.50	5/4/2018	N	Naphthalene	Y	0.7	61700	385	0.1110	6.31	0.0164
CFSB-281-SO-0-0	CFSB-281	0.00-0.50	5/4/2018	N	Phenanthrene	Y	37	34300	596	0.1110	333.33	0.5593
CFSB-281-SO-0-0	CFSB-281	0.00-0.50	5/4/2018	N	Pyrene	Y	230	9090	697	0.1110	2072.07	2.9728
CFSDP-023-SD	CFSDP-023	0.00-0.50	9/7/2016	N	Acenaphthene	Y	0.28	33400	491	0.4940	0.57	0.0012
CFSDP-023-SD	CFSDP-023	0.00-0.50	9/7/2016	N	Acenaphthylene	Y	0.086	24000	452	0.4940	0.17	0.0004
CFSDP-023-SD	CFSDP-023	0.00-0.50	9/7/2016	N	Anthracene	Y	1.7	1300	594	0.4940	3.44	0.0058
CFSDP-023-SD	CFSDP-023	0.00-0.50	9/7/2016	N	Benzo(A)Anthracene	Y	14	4153	841	0.4940	28.34	0.0337
CFSDP-023-SD	CFSDP-023	0.00-0.50	9/7/2016	N	Benzo(A)Pyrene	Y	19	3840	965	0.4940	38.46	0.0399
CFSDP-023-SD	CFSDP-023	0.00-0.50	9/7/2016	N	Benzo(B)Fluoranthene	Y	40	2169	979	0.4940	80.97	0.0827
CFSDP-023-SD	CFSDP-023	0.00-0.50	9/7/2016	N	Benzo(K)Fluoranthene	Y	17	1220	981	0.4940	34.41	0.0351
CFSDP-023-SD	CFSDP-023	0.00-0.50	9/7/2016	N	Chrysene	Y	18	826	844	0.4940	36.44	0.0432
CFSDP-023-SD	CFSDP-023	0.00-0.50	9/7/2016	N	Fluoranthene	Y	21	23870	707	0.4940	42.51	0.0601
CFSDP-023-SD	CFSDP-023	0.00-0.50	9/7/2016	N	Fluorene	Y	0.11	26000	538	0.4940	0.22	0.0004
CFSDP-023-SD	CFSDP-023	0.00-0.50	9/7/2016	N	Naphthalene	Y	0.39	61700	385	0.4940	0.79	0.0021
CFSDP-023-SD	CFSDP-023	0.00-0.50	9/7/2016	N	Phenanthrene	Y	6.2	34300	596	0.4940	12.55	0.0211
CFSDP-023-SD	CFSDP-023	0.00-0.50	9/7/2016	N	Pyrene	Y	16	9090	697	0.4940	32.39	0.0465
CFSDP-024-SD	CFSDP-024	0.00-0.50	9/7/2016	N	Acenaphthene	Y	4.1	33400	491	0.4700	8.72	0.0178
CFSDP-024-SD	CFSDP-024	0.00-0.50	9/7/2016	N	Acenaphthylene	N	---	24000	452	0.4700	---	---
CFSDP-024-SD	CFSDP-024	0.00-0.50	9/7/2016	N	Anthracene	Y	9.9	1300	594	0.4700	21.06	0.0355
CFSDP-024-SD	CFSDP-024	0.00-0.50	9/7/2016	N	Benzo(A)Anthracene	Y	76	4153	841	0.4700	161.70	0.1923
CFSDP-024-SD	CFSDP-024	0.00-0.50	9/7/2016	N	Benzo(A)Pyrene	Y	100	3840	965	0.4700	212.77	0.2205
CFSDP-024-SD	CFSDP-024	0.00-0.50	9/7/2016	N	Benzo(B)Fluoranthene	Y	210	2169	979	0.4700	446.81	0.4564
CFSDP-024-SD	CFSDP-024	0.00-0.50	9/7/2016	N	Benzo(K)Fluoranthene	Y	64	1220	981	0.4700	136.17	0.1388
CFSDP-024-SD	CFSDP-024	0.00-0.50	9/7/2016	N	Chrysene	Y	150	826	844	0.4700	319.15	0.3781
CFSDP-024-SD	CFSDP-024	0.00-0.50	9/7/2016	N	Fluoranthene	Y	120	23870	707	0.4700	255.32	0.3611
CFSDP-024-SD	CFSDP-024	0.00-0.50	9/7/2016	N	Fluorene	Y	2.1	26000	538	0.4700	4.47	0.0083
CFSDP-024-SD	CFSDP-024	0.00-0.50	9/7/2016	N	Naphthalene	Y	0.89	61700	385	0.4700	1.89	0.0049
CFSDP-024-SD	CFSDP-024	0.00-0.50	9/7/2016	N	Phenanthrene	Y	41	34300	596	0.4700	87.23	0.1464

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-024-SD	CFSDP-024	0.00-0.50	9/7/2016	N	Pyrene	Y	120	9090	697	0.4700	255.32	0.3663
CFSDP-DUP2-SD	CFSDP-023	0.00-0.50	9/7/2016	FD	Acenaphthene	Y	0.32	33400	491	0.5550	0.58	0.0012
CFSDP-DUP2-SD	CFSDP-023	0.00-0.50	9/7/2016	FD	Acenaphthylene	N	---	24000	452	0.5550	---	---
CFSDP-DUP2-SD	CFSDP-023	0.00-0.50	9/7/2016	FD	Anthracene	Y	1.3	1300	594	0.5550	2.34	0.0039
CFSDP-DUP2-SD	CFSDP-023	0.00-0.50	9/7/2016	FD	Benzo(A)Anthracene	Y	15	4153	841	0.5550	27.03	0.0321
CFSDP-DUP2-SD	CFSDP-023	0.00-0.50	9/7/2016	FD	Benzo(A)Pyrene	Y	21	3840	965	0.5550	37.84	0.0392
CFSDP-DUP2-SD	CFSDP-023	0.00-0.50	9/7/2016	FD	Benzo(B)Fluoranthene	Y	55	2169	979	0.5550	99.10	0.1012
CFSDP-DUP2-SD	CFSDP-023	0.00-0.50	9/7/2016	FD	Benzo(K)Fluoranthene	Y	18	1220	981	0.5550	32.43	0.0331
CFSDP-DUP2-SD	CFSDP-023	0.00-0.50	9/7/2016	FD	Chrysene	Y	19	826	844	0.5550	34.23	0.0406
CFSDP-DUP2-SD	CFSDP-023	0.00-0.50	9/7/2016	FD	Fluoranthene	Y	17	23870	707	0.5550	30.63	0.0433
CFSDP-DUP2-SD	CFSDP-023	0.00-0.50	9/7/2016	FD	Fluorene	Y	0.12	26000	538	0.5550	0.22	0.0004
CFSDP-DUP2-SD	CFSDP-023	0.00-0.50	9/7/2016	FD	Naphthalene	Y	0.45	61700	385	0.5550	0.81	0.0021
CFSDP-DUP2-SD	CFSDP-023	0.00-0.50	9/7/2016	FD	Phenanthrene	Y	6.9	34300	596	0.5550	12.43	0.0209
CFSDP-DUP2-SD	CFSDP-023	0.00-0.50	9/7/2016	FD	Pyrene	Y	26	9090	697	0.5550	46.85	0.0672
Flathead River Riparian Area												
CFSDP-029-SD	CFSDP-029	0.00-0.50	11/1/2017	N	Acenaphthene	N	---	33400	491	0.0023	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	11/1/2017	N	Acenaphthylene	N	---	24000	452	0.0023	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	11/1/2017	N	Anthracene	N	---	1300	594	0.0023	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	11/1/2017	N	Benzo(A)Anthracene	N	---	4153	841	0.0023	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	11/1/2017	N	Benzo(A)Pyrene	Y	0.071	3840	965	0.0023	31.00	0.0321
CFSDP-029-SD	CFSDP-029	0.00-0.50	11/1/2017	N	Benzo(B)Fluoranthene	Y	0.34	2169	979	0.0023	148.47	0.1517
CFSDP-029-SD	CFSDP-029	0.00-0.50	11/1/2017	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0023	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	11/1/2017	N	Chrysene	Y	0.5	826	844	0.0023	218.34	0.2587
CFSDP-029-SD	CFSDP-029	0.00-0.50	11/1/2017	N	Fluoranthene	Y	0.94	23870	707	0.0023	410.48	0.5806
CFSDP-029-SD	CFSDP-029	0.00-0.50	11/1/2017	N	Fluorene	N	---	26000	538	0.0023	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	11/1/2017	N	Naphthalene	N	---	61700	385	0.0023	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	11/1/2017	N	Phenanthrene	Y	0.14	34300	596	0.0023	61.14	0.1026
CFSDP-029-SD	CFSDP-029	0.00-0.50	11/1/2017	N	Pyrene	Y	0.52	9090	697	0.0023	227.07	0.3258
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	Acenaphthene	Y	4.00E-04	33400	491	0.0051	0.08	0.0002
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	Acenaphthylene	N	---	24000	452	0.0051	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	Anthracene	Y	0.0017	1300	594	0.0051	0.34	0.0006
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	Benzo(A)Anthracene	Y	0.018	4153	841	0.0051	3.55	0.0042
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	Benzo(A)Pyrene	Y	0.0089	3840	965	0.0051	1.76	0.0018
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	Benzo(B)Fluoranthene	Y	0.035	2169	979	0.0051	6.90	0.0071
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	Benzo(G,H,I)Perylene	Y	0.011	648	1095	0.0051	2.17	0.0020
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	Benzo(K)Fluoranthene	Y	0.024	1220	981	0.0051	4.73	0.0048
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	Benzo[E]Pyrene	Y	0.02	4300	967	0.0051	3.94	0.0041
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	C1-Chrysenes	Y	0.0092	---	929	0.0051	1.81	0.0020
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	C1-Fluoranthenes/Pyrenes	Y	0.017	---	770	0.0051	3.35	0.0044
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	C1-Fluorenes	N	---	---	611	0.0051	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	C1-Naphthalenes	N	---	---	444	0.0051	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	C1-Phenanthrenes/Anthracen	Y	0.0053	---	670	0.0051	1.05	0.0016
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	C2-Chrysenes	Y	0.0024	---	1008	0.0051	0.47	0.0005
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	C2-Fluorenes	N	---	---	686	0.0051	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	C2-Naphthalenes	N	---	---	510	0.0051	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	C2-Phenanthrenes/Anthracen	Y	0.004	---	746	0.0051	0.79	0.0011
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	C3-Chrysenes	N	---	---	1112	0.0051	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	C3-Fluorenes	N	---	---	769	0.0051	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	C3-Naphthalenes	Y	0.0033	---	581	0.0051	0.65	0.0011

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	C3-Phenanthrenes/Anthracen	Y	0.0021	---	829	0.0051	0.41	0.0005
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	C4 Chrysenes	N	---	---	1214	0.0051	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	C4-Naphthalenes	N	---	---	657	0.0051	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	C4-Phenanthrenes/Anthracen	N	---	---	913	0.0051	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	Chrysene	Y	0.057	826	844	0.0051	11.24	0.0133
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	Dibenz(A,H)Anthracene	Y	0.0033	2389	1123	0.0051	0.65	0.0006
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	Fluoranthene	Y	0.053	23870	707	0.0051	10.45	0.0148
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	Fluorene	N	---	26000	538	0.0051	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	Indeno(1,2,3-C,D)Pyrene	Y	0.011	---	1115	0.0051	2.17	0.0019
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	Naphthalene	N	---	61700	385	0.0051	---	---
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	Perylene	Y	0.004	431	967	0.0051	0.79	0.0008
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	Phenanthrene	Y	0.0083	34300	596	0.0051	1.64	0.0027
CFSDP-029-SD	CFSDP-029	0.00-0.50	10/18/2018	N	Pyrene	Y	0.049	9090	697	0.0051	9.66	0.0139
CFSDP-030-SD	CFSDP-030	0.00-0.50	11/3/2017	N	Acenaphthene	N	---	33400	491	0.0143	---	---
CFSDP-030-SD	CFSDP-030	0.00-0.50	11/3/2017	N	Acenaphthylene	N	---	24000	452	0.0143	---	---
CFSDP-030-SD	CFSDP-030	0.00-0.50	11/3/2017	N	Anthracene	N	---	1300	594	0.0143	---	---
CFSDP-030-SD	CFSDP-030	0.00-0.50	11/3/2017	N	Benzo(A)Anthracene	Y	0.066	4153	841	0.0143	4.62	0.0055
CFSDP-030-SD	CFSDP-030	0.00-0.50	11/3/2017	N	Benzo(A)Pyrene	Y	0.091	3840	965	0.0143	6.36	0.0066
CFSDP-030-SD	CFSDP-030	0.00-0.50	11/3/2017	N	Benzo(B)Fluoranthene	Y	0.16	2169	979	0.0143	11.19	0.0114
CFSDP-030-SD	CFSDP-030	0.00-0.50	11/3/2017	N	Benzo(K)Fluoranthene	Y	0.054	1220	981	0.0143	3.78	0.0038
CFSDP-030-SD	CFSDP-030	0.00-0.50	11/3/2017	N	Chrysene	Y	0.11	826	844	0.0143	7.69	0.0091
CFSDP-030-SD	CFSDP-030	0.00-0.50	11/3/2017	N	Fluoranthene	Y	0.082	23870	707	0.0143	5.73	0.0081
CFSDP-030-SD	CFSDP-030	0.00-0.50	11/3/2017	N	Fluorene	N	---	26000	538	0.0143	---	---
CFSDP-030-SD	CFSDP-030	0.00-0.50	11/3/2017	N	Naphthalene	N	---	61700	385	0.0143	---	---
CFSDP-030-SD	CFSDP-030	0.00-0.50	11/3/2017	N	Phenanthrene	Y	0.044	34300	596	0.0143	3.08	0.0052
CFSDP-030-SD	CFSDP-030	0.00-0.50	11/3/2017	N	Pyrene	Y	0.098	9090	697	0.0143	6.85	0.0098
CFSDP-030-SD	CFSDP-030	0.00-0.50	10/18/2018	N	Acenaphthene	N	---	33400	491	0.0096	---	---
CFSDP-030-SD	CFSDP-030	0.00-0.50	10/18/2018	N	Acenaphthylene	N	---	24000	452	0.0096	---	---
CFSDP-030-SD	CFSDP-030	0.00-0.50	10/18/2018	N	Anthracene	N	---	1300	594	0.0096	---	---
CFSDP-030-SD	CFSDP-030	0.00-0.50	10/18/2018	N	Benzo(A)Anthracene	Y	0.021	4153	841	0.0096	2.19	0.0026
CFSDP-030-SD	CFSDP-030	0.00-0.50	10/18/2018	N	Benzo(A)Pyrene	Y	0.024	3840	965	0.0096	2.50	0.0026
CFSDP-030-SD	CFSDP-030	0.00-0.50	10/18/2018	N	Benzo(B)Fluoranthene	Y	0.046	2169	979	0.0096	4.79	0.0049
CFSDP-030-SD	CFSDP-030	0.00-0.50	10/18/2018	N	Benzo(K)Fluoranthene	Y	0.016	1220	981	0.0096	1.66	0.0017
CFSDP-030-SD	CFSDP-030	0.00-0.50	10/18/2018	N	Chrysene	Y	0.052	826	844	0.0096	5.41	0.0064
CFSDP-030-SD	CFSDP-030	0.00-0.50	10/18/2018	N	Fluoranthene	Y	0.057	23870	707	0.0096	5.93	0.0084
CFSDP-030-SD	CFSDP-030	0.00-0.50	10/18/2018	N	Fluorene	N	---	26000	538	0.0096	---	---
CFSDP-030-SD	CFSDP-030	0.00-0.50	10/18/2018	N	Naphthalene	N	---	61700	385	0.0096	---	---
CFSDP-030-SD	CFSDP-030	0.00-0.50	10/18/2018	N	Phenanthrene	Y	0.018	34300	596	0.0096	1.87	0.0031
CFSDP-030-SD	CFSDP-030	0.00-0.50	10/18/2018	N	Pyrene	Y	0.043	9090	697	0.0096	4.47	0.0064
CFSDP-031-SD	CFSDP-031	0.00-0.50	11/3/2017	N	Acenaphthene	N	---	33400	491	0.0148	---	---
CFSDP-031-SD	CFSDP-031	0.00-0.50	11/3/2017	N	Acenaphthylene	N	---	24000	452	0.0148	---	---
CFSDP-031-SD	CFSDP-031	0.00-0.50	11/3/2017	N	Anthracene	N	---	1300	594	0.0148	---	---
CFSDP-031-SD	CFSDP-031	0.00-0.50	11/3/2017	N	Benzo(A)Anthracene	N	---	4153	841	0.0148	---	---
CFSDP-031-SD	CFSDP-031	0.00-0.50	11/3/2017	N	Benzo(A)Pyrene	N	---	3840	965	0.0148	---	---
CFSDP-031-SD	CFSDP-031	0.00-0.50	11/3/2017	N	Benzo(B)Fluoranthene	Y	0.053	2169	979	0.0148	3.58	0.0037
CFSDP-031-SD	CFSDP-031	0.00-0.50	11/3/2017	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0148	---	---
CFSDP-031-SD	CFSDP-031	0.00-0.50	11/3/2017	N	Chrysene	Y	0.028	826	844	0.0148	1.89	0.0022
CFSDP-031-SD	CFSDP-031	0.00-0.50	11/3/2017	N	Fluoranthene	Y	0.028	23870	707	0.0148	1.89	0.0027
CFSDP-031-SD	CFSDP-031	0.00-0.50	11/3/2017	N	Fluorene	N	---	26000	538	0.0148	---	---

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-031-SD	CFSDP-031	0.00-0.50	11/3/2017	N	Naphthalene	N	---	61700	385	0.0148	---	---
CFSDP-031-SD	CFSDP-031	0.00-0.50	11/3/2017	N	Phenanthrene	Y	0.014	34300	596	0.0148	0.95	0.0016
CFSDP-031-SD	CFSDP-031	0.00-0.50	11/3/2017	N	Pyrene	Y	0.031	9090	697	0.0148	2.09	0.0030
CFSDP-031-SD	CFSDP-031	0.00-0.50	10/18/2018	N	Acenaphthene	N	---	33400	491	0.0371	---	---
CFSDP-031-SD	CFSDP-031	0.00-0.50	10/18/2018	N	Acenaphthylene	N	---	24000	452	0.0371	---	---
CFSDP-031-SD	CFSDP-031	0.00-0.50	10/18/2018	N	Anthracene	Y	0.0096	1300	594	0.0371	0.26	0.0004
CFSDP-031-SD	CFSDP-031	0.00-0.50	10/18/2018	N	Benzo(A)Anthracene	Y	0.074	4153	841	0.0371	1.99	0.0024
CFSDP-031-SD	CFSDP-031	0.00-0.50	10/18/2018	N	Benzo(A)Pyrene	Y	0.036	3840	965	0.0371	0.97	0.0010
CFSDP-031-SD	CFSDP-031	0.00-0.50	10/18/2018	N	Benzo(B)Fluoranthene	Y	0.16	2169	979	0.0371	4.31	0.0044
CFSDP-031-SD	CFSDP-031	0.00-0.50	10/18/2018	N	Benzo(K)Fluoranthene	Y	0.073	1220	981	0.0371	1.97	0.0020
CFSDP-031-SD	CFSDP-031	0.00-0.50	10/18/2018	N	Chrysene	Y	0.28	826	844	0.0371	7.55	0.0089
CFSDP-031-SD	CFSDP-031	0.00-0.50	10/18/2018	N	Fluoranthene	Y	0.3	23870	707	0.0371	8.09	0.0114
CFSDP-031-SD	CFSDP-031	0.00-0.50	10/18/2018	N	Fluorene	N	---	26000	538	0.0371	---	---
CFSDP-031-SD	CFSDP-031	0.00-0.50	10/18/2018	N	Naphthalene	N	---	61700	385	0.0371	---	---
CFSDP-031-SD	CFSDP-031	0.00-0.50	10/18/2018	N	Phenanthrene	Y	0.047	34300	596	0.0371	1.27	0.0021
CFSDP-031-SD	CFSDP-031	0.00-0.50	10/18/2018	N	Pyrene	Y	0.21	9090	697	0.0371	5.66	0.0081
CFSDP-032-SD	CFSDP-032	0.00-0.50	11/3/2017	N	Acenaphthene	N	---	33400	491	0.0040	---	---
CFSDP-032-SD	CFSDP-032	0.00-0.50	11/3/2017	N	Acenaphthylene	N	---	24000	452	0.0040	---	---
CFSDP-032-SD	CFSDP-032	0.00-0.50	11/3/2017	N	Anthracene	N	---	1300	594	0.0040	---	---
CFSDP-032-SD	CFSDP-032	0.00-0.50	11/3/2017	N	Benzo(A)Anthracene	N	---	4153	841	0.0040	---	---
CFSDP-032-SD	CFSDP-032	0.00-0.50	11/3/2017	N	Benzo(A)Pyrene	N	---	3840	965	0.0040	---	---
CFSDP-032-SD	CFSDP-032	0.00-0.50	11/3/2017	N	Benzo(B)Fluoranthene	Y	0.042	2169	979	0.0040	10.53	0.0108
CFSDP-032-SD	CFSDP-032	0.00-0.50	11/3/2017	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0040	---	---
CFSDP-032-SD	CFSDP-032	0.00-0.50	11/3/2017	N	Chrysene	Y	0.019	826	844	0.0040	4.76	0.0056
CFSDP-032-SD	CFSDP-032	0.00-0.50	11/3/2017	N	Fluoranthene	Y	0.025	23870	707	0.0040	6.27	0.0089
CFSDP-032-SD	CFSDP-032	0.00-0.50	11/3/2017	N	Fluorene	N	---	26000	538	0.0040	---	---
CFSDP-032-SD	CFSDP-032	0.00-0.50	11/3/2017	N	Naphthalene	N	---	61700	385	0.0040	---	---
CFSDP-032-SD	CFSDP-032	0.00-0.50	11/3/2017	N	Phenanthrene	N	---	34300	596	0.0040	---	---
CFSDP-032-SD	CFSDP-032	0.00-0.50	11/3/2017	N	Pyrene	Y	0.027	9090	697	0.0040	6.77	0.0097
CFSDP-032-SD	CFSDP-032	0.00-0.50	10/17/2018	N	Acenaphthene	N	---	33400	491	0.0068	---	---
CFSDP-032-SD	CFSDP-032	0.00-0.50	10/17/2018	N	Acenaphthylene	N	---	24000	452	0.0068	---	---
CFSDP-032-SD	CFSDP-032	0.00-0.50	10/17/2018	N	Anthracene	N	---	1300	594	0.0068	---	---
CFSDP-032-SD	CFSDP-032	0.00-0.50	10/17/2018	N	Benzo(A)Anthracene	Y	0.013	4153	841	0.0068	1.90	0.0023
CFSDP-032-SD	CFSDP-032	0.00-0.50	10/17/2018	N	Benzo(A)Pyrene	Y	0.013	3840	965	0.0068	1.90	0.0020
CFSDP-032-SD	CFSDP-032	0.00-0.50	10/17/2018	N	Benzo(B)Fluoranthene	Y	0.03	2169	979	0.0068	4.39	0.0045
CFSDP-032-SD	CFSDP-032	0.00-0.50	10/17/2018	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0068	---	---
CFSDP-032-SD	CFSDP-032	0.00-0.50	10/17/2018	N	Chrysene	Y	0.03	826	844	0.0068	4.39	0.0052
CFSDP-032-SD	CFSDP-032	0.00-0.50	10/17/2018	N	Fluoranthene	Y	0.031	23870	707	0.0068	4.54	0.0064
CFSDP-032-SD	CFSDP-032	0.00-0.50	10/17/2018	N	Fluorene	N	---	26000	538	0.0068	---	---
CFSDP-032-SD	CFSDP-032	0.00-0.50	10/17/2018	N	Naphthalene	N	---	61700	385	0.0068	---	---
CFSDP-032-SD	CFSDP-032	0.00-0.50	10/17/2018	N	Phenanthrene	Y	0.011	34300	596	0.0068	1.61	0.0027
CFSDP-032-SD	CFSDP-032	0.00-0.50	10/17/2018	N	Pyrene	Y	0.026	9090	697	0.0068	3.81	0.0055
CFSDP-033-SD	CFSDP-033	0.00-0.50	11/3/2017	N	Acenaphthene	N	---	33400	491	0.0029	---	---
CFSDP-033-SD	CFSDP-033	0.00-0.50	11/3/2017	N	Acenaphthylene	N	---	24000	452	0.0029	---	---
CFSDP-033-SD	CFSDP-033	0.00-0.50	11/3/2017	N	Anthracene	N	---	1300	594	0.0029	---	---
CFSDP-033-SD	CFSDP-033	0.00-0.50	11/3/2017	N	Benzo(A)Anthracene	N	---	4153	841	0.0029	---	---
CFSDP-033-SD	CFSDP-033	0.00-0.50	11/3/2017	N	Benzo(A)Pyrene	Y	0.08	3840	965	0.0029	28.07	0.0291
CFSDP-033-SD	CFSDP-033	0.00-0.50	11/3/2017	N	Benzo(B)Fluoranthene	Y	0.2	2169	979	0.0029	70.18	0.0717
CFSDP-033-SD	CFSDP-033	0.00-0.50	11/3/2017	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0029	---	---

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-033-SD	CFSDP-033	0.00-0.50	11/3/2017	N	Chrysene	Y	0.1	826	844	0.0029	35.09	0.0416
CFSDP-033-SD	CFSDP-033	0.00-0.50	11/3/2017	N	Fluoranthene	Y	0.024	23870	707	0.0029	8.42	0.0119
CFSDP-033-SD	CFSDP-033	0.00-0.50	11/3/2017	N	Fluorene	N	---	26000	538	0.0029	---	---
CFSDP-033-SD	CFSDP-033	0.00-0.50	11/3/2017	N	Naphthalene	N	---	61700	385	0.0029	---	---
CFSDP-033-SD	CFSDP-033	0.00-0.50	11/3/2017	N	Phenanthrene	N	---	34300	596	0.0029	---	---
CFSDP-033-SD	CFSDP-033	0.00-0.50	11/3/2017	N	Pyrene	Y	0.035	9090	697	0.0029	12.28	0.0176
CFSDP-033-SD	CFSDP-033	0.00-0.50	10/17/2018	N	Acenaphthene	N	---	33400	491	0.0102	---	---
CFSDP-033-SD	CFSDP-033	0.00-0.50	10/17/2018	N	Acenaphthylene	N	---	24000	452	0.0102	---	---
CFSDP-033-SD	CFSDP-033	0.00-0.50	10/17/2018	N	Anthracene	N	---	1300	594	0.0102	---	---
CFSDP-033-SD	CFSDP-033	0.00-0.50	10/17/2018	N	Benzo(A)Anthracene	Y	0.011	4153	841	0.0102	1.08	0.0013
CFSDP-033-SD	CFSDP-033	0.00-0.50	10/17/2018	N	Benzo(A)Pyrene	Y	0.013	3840	965	0.0102	1.27	0.0013
CFSDP-033-SD	CFSDP-033	0.00-0.50	10/17/2018	N	Benzo(B)Fluoranthene	Y	0.021	2169	979	0.0102	2.06	0.0021
CFSDP-033-SD	CFSDP-033	0.00-0.50	10/17/2018	N	Benzo(K)Fluoranthene	Y	0.0075	1220	981	0.0102	0.74	0.0007
CFSDP-033-SD	CFSDP-033	0.00-0.50	10/17/2018	N	Chrysene	Y	0.021	826	844	0.0102	2.06	0.0024
CFSDP-033-SD	CFSDP-033	0.00-0.50	10/17/2018	N	Fluoranthene	Y	0.023	23870	707	0.0102	2.25	0.0032
CFSDP-033-SD	CFSDP-033	0.00-0.50	10/17/2018	N	Fluorene	N	---	26000	538	0.0102	---	---
CFSDP-033-SD	CFSDP-033	0.00-0.50	10/17/2018	N	Naphthalene	N	---	61700	385	0.0102	---	---
CFSDP-033-SD	CFSDP-033	0.00-0.50	10/17/2018	N	Phenanthrene	Y	0.01	34300	596	0.0102	0.98	0.0016
CFSDP-033-SD	CFSDP-033	0.00-0.50	10/17/2018	N	Pyrene	Y	0.019	9090	697	0.0102	1.86	0.0027
Flathead River Area												
CFSDP-001-SD	CFSDP-001	0.00-0.50	10/5/2018	N	Acenaphthene	N	---	33400	491	0.0009	---	---
CFSDP-001-SD	CFSDP-001	0.00-0.50	10/5/2018	N	Acenaphthylene	N	---	24000	452	0.0009	---	---
CFSDP-001-SD	CFSDP-001	0.00-0.50	10/5/2018	N	Anthracene	N	---	1300	594	0.0009	---	---
CFSDP-001-SD	CFSDP-001	0.00-0.50	10/5/2018	N	Benzo(A)Anthracene	N	---	4153	841	0.0009	---	---
CFSDP-001-SD	CFSDP-001	0.00-0.50	10/5/2018	N	Benzo(A)Pyrene	N	---	3840	965	0.0009	---	---
CFSDP-001-SD	CFSDP-001	0.00-0.50	10/5/2018	N	Benzo(B)Fluoranthene	N	---	2169	979	0.0009	---	---
CFSDP-001-SD	CFSDP-001	0.00-0.50	10/5/2018	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0009	---	---
CFSDP-001-SD	CFSDP-001	0.00-0.50	10/5/2018	N	Chrysene	Y	0.0041	826	844	0.0009	4.62	0.0055
CFSDP-001-SD	CFSDP-001	0.00-0.50	10/5/2018	N	Fluoranthene	Y	0.004	23870	707	0.0009	4.50	0.0064
CFSDP-001-SD	CFSDP-001	0.00-0.50	10/5/2018	N	Fluorene	N	---	26000	538	0.0009	---	---
CFSDP-001-SD	CFSDP-001	0.00-0.50	10/5/2018	N	Naphthalene	N	---	61700	385	0.0009	---	---
CFSDP-001-SD	CFSDP-001	0.00-0.50	10/5/2018	N	Phenanthrene	Y	0.0039	34300	596	0.0009	4.39	0.0074
CFSDP-001-SD	CFSDP-001	0.00-0.50	10/5/2018	N	Pyrene	Y	0.0028	9090	697	0.0009	3.15	0.0045
CFSDP-001-SO	CFSDP-001	0.00-0.50	9/8/2016	N	Acenaphthene	N	---	33400	491	0.0090	---	---
CFSDP-001-SO	CFSDP-001	0.00-0.50	9/8/2016	N	Acenaphthylene	N	---	24000	452	0.0090	---	---
CFSDP-001-SO	CFSDP-001	0.00-0.50	9/8/2016	N	Anthracene	N	---	1300	594	0.0090	---	---
CFSDP-001-SO	CFSDP-001	0.00-0.50	9/8/2016	N	Benzo(A)Anthracene	N	---	4153	841	0.0090	---	---
CFSDP-001-SO	CFSDP-001	0.00-0.50	9/8/2016	N	Benzo(A)Pyrene	N	---	3840	965	0.0090	---	---
CFSDP-001-SO	CFSDP-001	0.00-0.50	9/8/2016	N	Benzo(B)Fluoranthene	N	---	2169	979	0.0090	---	---
CFSDP-001-SO	CFSDP-001	0.00-0.50	9/8/2016	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0090	---	---
CFSDP-001-SO	CFSDP-001	0.00-0.50	9/8/2016	N	Chrysene	N	---	826	844	0.0090	---	---
CFSDP-001-SO	CFSDP-001	0.00-0.50	9/8/2016	N	Fluoranthene	N	---	23870	707	0.0090	---	---
CFSDP-001-SO	CFSDP-001	0.00-0.50	9/8/2016	N	Fluorene	N	---	26000	538	0.0090	---	---
CFSDP-001-SO	CFSDP-001	0.00-0.50	9/8/2016	N	Naphthalene	N	---	61700	385	0.0090	---	---
CFSDP-001-SO	CFSDP-001	0.00-0.50	9/8/2016	N	Phenanthrene	N	---	34300	596	0.0090	---	---
CFSDP-001-SO	CFSDP-001	0.00-0.50	9/8/2016	N	Pyrene	N	---	9090	697	0.0090	---	---
CFSDP-002-SD	CFSDP-002	0.00-0.50	10/5/2018	N	Acenaphthene	N	---	33400	491	0.0081	---	---
CFSDP-002-SD	CFSDP-002	0.00-0.50	10/5/2018	N	Acenaphthylene	N	---	24000	452	0.0081	---	---
CFSDP-002-SD	CFSDP-002	0.00-0.50	10/5/2018	N	Anthracene	N	---	1300	594	0.0081	---	---

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-002-SD	CFSDP-002	0.00-0.50	10/5/2018	N	Benzo(A)Anthracene	Y	0.0038	4153	841	0.0081	0.47	0.0006
CFSDP-002-SD	CFSDP-002	0.00-0.50	10/5/2018	N	Benzo(A)Pyrene	Y	0.0023	3840	965	0.0081	0.29	0.0003
CFSDP-002-SD	CFSDP-002	0.00-0.50	10/5/2018	N	Benzo(B)Fluoranthene	Y	0.0071	2169	979	0.0081	0.88	0.0009
CFSDP-002-SD	CFSDP-002	0.00-0.50	10/5/2018	N	Benzo(K)Fluoranthene	Y	0.0039	1220	981	0.0081	0.48	0.0005
CFSDP-002-SD	CFSDP-002	0.00-0.50	10/5/2018	N	Chrysene	Y	0.0099	826	844	0.0081	1.23	0.0015
CFSDP-002-SD	CFSDP-002	0.00-0.50	10/5/2018	N	Fluoranthene	Y	0.015	23870	707	0.0081	1.86	0.0026
CFSDP-002-SD	CFSDP-002	0.00-0.50	10/5/2018	N	Fluorene	N	---	26000	538	0.0081	---	---
CFSDP-002-SD	CFSDP-002	0.00-0.50	10/5/2018	N	Naphthalene	N	---	61700	385	0.0081	---	---
CFSDP-002-SD	CFSDP-002	0.00-0.50	10/5/2018	N	Phenanthrene	Y	0.01	34300	596	0.0081	1.24	0.0021
CFSDP-002-SD	CFSDP-002	0.00-0.50	10/5/2018	N	Pyrene	Y	0.0093	9090	697	0.0081	1.16	0.0017
CFSDP-002-SO	CFSDP-002	0.00-0.50	9/8/2016	N	Acenaphthene	N	---	33400	491	0.0080	---	---
CFSDP-002-SO	CFSDP-002	0.00-0.50	9/8/2016	N	Acenaphthylene	N	---	24000	452	0.0080	---	---
CFSDP-002-SO	CFSDP-002	0.00-0.50	9/8/2016	N	Anthracene	N	---	1300	594	0.0080	---	---
CFSDP-002-SO	CFSDP-002	0.00-0.50	9/8/2016	N	Benzo(A)Anthracene	N	---	4153	841	0.0080	---	---
CFSDP-002-SO	CFSDP-002	0.00-0.50	9/8/2016	N	Benzo(A)Pyrene	N	---	3840	965	0.0080	---	---
CFSDP-002-SO	CFSDP-002	0.00-0.50	9/8/2016	N	Benzo(B)Fluoranthene	N	---	2169	979	0.0080	---	---
CFSDP-002-SO	CFSDP-002	0.00-0.50	9/8/2016	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0080	---	---
CFSDP-002-SO	CFSDP-002	0.00-0.50	9/8/2016	N	Chrysene	N	---	826	844	0.0080	---	---
CFSDP-002-SO	CFSDP-002	0.00-0.50	9/8/2016	N	Fluoranthene	N	---	23870	707	0.0080	---	---
CFSDP-002-SO	CFSDP-002	0.00-0.50	9/8/2016	N	Fluorene	N	---	26000	538	0.0080	---	---
CFSDP-002-SO	CFSDP-002	0.00-0.50	9/8/2016	N	Naphthalene	N	---	61700	385	0.0080	---	---
CFSDP-002-SO	CFSDP-002	0.00-0.50	9/8/2016	N	Phenanthrene	N	---	34300	596	0.0080	---	---
CFSDP-002-SO	CFSDP-002	0.00-0.50	9/8/2016	N	Pyrene	N	---	9090	697	0.0080	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	9/9/2016	N	Acenaphthene	N	---	33400	491	0.0618	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	9/9/2016	N	Acenaphthylene	N	---	24000	452	0.0618	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	9/9/2016	N	Anthracene	N	---	1300	594	0.0618	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	9/9/2016	N	Benzo(A)Anthracene	N	---	4153	841	0.0618	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	9/9/2016	N	Benzo(A)Pyrene	Y	0.1	3840	965	0.0618	1.62	0.0017
CFSDP-003-SD	CFSDP-003	0.00-0.50	9/9/2016	N	Benzo(B)Fluoranthene	Y	0.3	2169	979	0.0618	4.85	0.0050
CFSDP-003-SD	CFSDP-003	0.00-0.50	9/9/2016	N	Benzo(K)Fluoranthene	Y	0.11	1220	981	0.0618	1.78	0.0018
CFSDP-003-SD	CFSDP-003	0.00-0.50	9/9/2016	N	Chrysene	Y	0.48	826	844	0.0618	7.77	0.0092
CFSDP-003-SD	CFSDP-003	0.00-0.50	9/9/2016	N	Fluoranthene	Y	0.48	23870	707	0.0618	7.77	0.0110
CFSDP-003-SD	CFSDP-003	0.00-0.50	9/9/2016	N	Fluorene	N	---	26000	538	0.0618	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	9/9/2016	N	Naphthalene	N	---	61700	385	0.0618	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	9/9/2016	N	Phenanthrene	N	---	34300	596	0.0618	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	9/9/2016	N	Pyrene	Y	0.31	9090	697	0.0618	5.02	0.0072
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/31/2017	N	Acenaphthene	N	---	33400	491	0.0108	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/31/2017	N	Acenaphthylene	N	---	24000	452	0.0108	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/31/2017	N	Anthracene	N	---	1300	594	0.0108	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/31/2017	N	Benzo(A)Anthracene	Y	0.079	4153	841	0.0108	7.31	0.0087
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/31/2017	N	Benzo(A)Pyrene	N	---	3840	965	0.0108	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/31/2017	N	Benzo(B)Fluoranthene	Y	0.17	2169	979	0.0108	15.74	0.0161
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/31/2017	N	Benzo(K)Fluoranthene	Y	0.051	1220	981	0.0108	4.72	0.0048
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/31/2017	N	Chrysene	Y	0.21	826	844	0.0108	19.44	0.0230
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/31/2017	N	Fluoranthene	Y	0.27	23870	707	0.0108	25.00	0.0354
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/31/2017	N	Fluorene	N	---	26000	538	0.0108	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/31/2017	N	Naphthalene	N	---	61700	385	0.0108	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/31/2017	N	Phenanthrene	Y	0.044	34300	596	0.0108	4.07	0.0068
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/31/2017	N	Pyrene	Y	0.27	9090	697	0.0108	25.00	0.0359

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/4/2018	N	Acenaphthene	N	---	33400	491	0.0084	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/4/2018	N	Acenaphthylene	N	---	24000	452	0.0084	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/4/2018	N	Anthracene	Y	0.075	1300	594	0.0084	8.92	0.0150
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/4/2018	N	Benzo(A)Anthracene	Y	0.73	4153	841	0.0084	86.80	0.1032
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/4/2018	N	Benzo(A)Pyrene	Y	0.42	3840	965	0.0084	49.94	0.0518
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/4/2018	N	Benzo(B)Fluoranthene	Y	1.8	2169	979	0.0084	214.03	0.2186
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/4/2018	N	Benzo(K)Fluoranthene	Y	0.75	1220	981	0.0084	89.18	0.0909
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/4/2018	N	Chrysene	Y	2.7	826	844	0.0084	321.05	0.3804
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/4/2018	N	Fluoranthene	Y	1.5	23870	707	0.0084	178.36	0.2523
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/4/2018	N	Fluorene	N	---	26000	538	0.0084	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/4/2018	N	Naphthalene	N	---	61700	385	0.0084	---	---
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/4/2018	N	Phenanthrene	Y	0.25	34300	596	0.0084	29.73	0.0499
CFSDP-003-SD	CFSDP-003	0.00-0.50	10/4/2018	N	Pyrene	Y	1.3	9090	697	0.0084	154.58	0.2218
CFSDP-004-SD	CFSDP-004	0.00-0.50	9/9/2016	N	Acenaphthene	N	---	33400	491	0.0374	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	9/9/2016	N	Acenaphthylene	N	---	24000	452	0.0374	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	9/9/2016	N	Anthracene	N	---	1300	594	0.0374	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	9/9/2016	N	Benzo(A)Anthracene	N	---	4153	841	0.0374	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	9/9/2016	N	Benzo(A)Pyrene	N	---	3840	965	0.0374	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	9/9/2016	N	Benzo(B)Fluoranthene	N	---	2169	979	0.0374	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	9/9/2016	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0374	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	9/9/2016	N	Chrysene	N	---	826	844	0.0374	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	9/9/2016	N	Fluoranthene	N	---	23870	707	0.0374	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	9/9/2016	N	Fluorene	N	---	26000	538	0.0374	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	9/9/2016	N	Naphthalene	N	---	61700	385	0.0374	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	9/9/2016	N	Phenanthrene	N	---	34300	596	0.0374	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	9/9/2016	N	Pyrene	N	---	9090	697	0.0374	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/31/2017	N	Acenaphthene	N	---	33400	491	0.0256	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/31/2017	N	Acenaphthylene	N	---	24000	452	0.0256	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/31/2017	N	Anthracene	N	---	1300	594	0.0256	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/31/2017	N	Benzo(A)Anthracene	N	---	4153	841	0.0256	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/31/2017	N	Benzo(A)Pyrene	N	---	3840	965	0.0256	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/31/2017	N	Benzo(B)Fluoranthene	Y	0.082	2169	979	0.0256	3.20	0.0033
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/31/2017	N	Benzo(K)Fluoranthene	Y	0.027	1220	981	0.0256	1.05	0.0011
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/31/2017	N	Chrysene	Y	0.071	826	844	0.0256	2.77	0.0033
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/31/2017	N	Fluoranthene	Y	0.099	23870	707	0.0256	3.87	0.0055
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/31/2017	N	Fluorene	N	---	26000	538	0.0256	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/31/2017	N	Naphthalene	N	---	61700	385	0.0256	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/31/2017	N	Phenanthrene	Y	0.024	34300	596	0.0256	0.94	0.0016
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/31/2017	N	Pyrene	Y	0.09	9090	697	0.0256	3.52	0.0050
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/4/2018	N	Acenaphthene	N	---	33400	491	4.57E-05	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/4/2018	N	Acenaphthylene	N	---	24000	452	4.57E-05	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/4/2018	N	Anthracene	N	---	1300	594	4.57E-05	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/4/2018	N	Benzo(A)Anthracene	Y	0.0076	4153	841	4.57E-05	166.30	0.1977
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/4/2018	N	Benzo(A)Pyrene	N	---	3840	965	4.57E-05	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/4/2018	N	Benzo(B)Fluoranthene	Y	0.017	2169	979	4.57E-05	371.99	0.3800
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/4/2018	N	Benzo(K)Fluoranthene	Y	0.0079	1220	981	4.57E-05	172.87	0.1762
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/4/2018	N	Chrysene	Y	0.025	826	844	4.57E-05	547.05	0.6482
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/4/2018	N	Fluoranthene	Y	0.025	23870	707	4.57E-05	547.05	0.7738
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/4/2018	N	Fluorene	N	---	26000	538	4.57E-05	---	---

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/4/2018	N	Naphthalene	N	---	61700	385	4.57E-05	---	---
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/4/2018	N	Phenanthrene	Y	0.0048	34300	596	4.57E-05	105.03	0.1762
CFSDP-004-SD	CFSDP-004	0.00-0.50	10/4/2018	N	Pyrene	Y	0.018	9090	697	4.57E-05	393.87	0.5651
CFSDP-005-SD	CFSDP-005	0.00-0.50	9/9/2016	N	Acenaphthene	N	---	33400	491	0.0267	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	9/9/2016	N	Acenaphthylene	N	---	24000	452	0.0267	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	9/9/2016	N	Anthracene	N	---	1300	594	0.0267	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	9/9/2016	N	Benzo(A)Anthracene	N	---	4153	841	0.0267	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	9/9/2016	N	Benzo(A)Pyrene	N	---	3840	965	0.0267	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	9/9/2016	N	Benzo(B)Fluoranthene	N	---	2169	979	0.0267	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	9/9/2016	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0267	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	9/9/2016	N	Chrysene	N	---	826	844	0.0267	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	9/9/2016	N	Fluoranthene	N	---	23870	707	0.0267	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	9/9/2016	N	Fluorene	N	---	26000	538	0.0267	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	9/9/2016	N	Naphthalene	N	---	61700	385	0.0267	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	9/9/2016	N	Phenanthrene	N	---	34300	596	0.0267	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	9/9/2016	N	Pyrene	N	---	9090	697	0.0267	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	11/1/2017	N	Acenaphthene	N	---	33400	491	0.0021	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	11/1/2017	N	Acenaphthylene	N	---	24000	452	0.0021	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	11/1/2017	N	Anthracene	N	---	1300	594	0.0021	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	11/1/2017	N	Benzo(A)Anthracene	N	---	4153	841	0.0021	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	11/1/2017	N	Benzo(A)Pyrene	Y	0.038	3840	965	0.0021	17.84	0.0185
CFSDP-005-SD	CFSDP-005	0.00-0.50	11/1/2017	N	Benzo(B)Fluoranthene	Y	0.11	2169	979	0.0021	51.64	0.0528
CFSDP-005-SD	CFSDP-005	0.00-0.50	11/1/2017	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0021	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	11/1/2017	N	Chrysene	Y	0.13	826	844	0.0021	61.03	0.0723
CFSDP-005-SD	CFSDP-005	0.00-0.50	11/1/2017	N	Fluoranthene	Y	0.14	23870	707	0.0021	65.73	0.0930
CFSDP-005-SD	CFSDP-005	0.00-0.50	11/1/2017	N	Fluorene	N	---	26000	538	0.0021	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	11/1/2017	N	Naphthalene	Y	0.016	61700	385	0.0021	7.51	0.0195
CFSDP-005-SD	CFSDP-005	0.00-0.50	11/1/2017	N	Phenanthrene	Y	0.022	34300	596	0.0021	10.33	0.0173
CFSDP-005-SD	CFSDP-005	0.00-0.50	11/1/2017	N	Pyrene	Y	0.1	9090	697	0.0021	46.95	0.0674
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	Acenaphthene	Y	0.0011	33400	491	0.0057	0.19	0.0004
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	Acenaphthylene	N	---	24000	452	0.0057	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	Anthracene	Y	0.0056	1300	594	0.0057	0.98	0.0017
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	Benzo(A)Anthracene	Y	0.069	4153	841	0.0057	12.11	0.0144
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	Benzo(A)Pyrene	Y	0.028	3840	965	0.0057	4.91	0.0051
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	Benzo(B)Fluoranthene	Y	0.13	2169	979	0.0057	22.81	0.0233
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	Benzo(G,H,I)Perylene	Y	0.036	648	1095	0.0057	6.32	0.0058
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	Benzo(K)Fluoranthene	Y	0.11	1220	981	0.0057	19.30	0.0197
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	Benzo[E]Pyrene	Y	0.077	4300	967	0.0057	13.51	0.0140
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	C1-Chrysenes	Y	0.038	---	929	0.0057	6.67	0.0072
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	C1-Fluoranthenes/Pyrenes	Y	0.067	---	770	0.0057	11.75	0.0153
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	C1-Fluorenes	N	---	---	611	0.0057	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	C1-Naphthalenes	N	---	---	444	0.0057	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	C1-Phenanthrenes/Anthracen	Y	0.017	---	670	0.0057	2.98	0.0045
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	C2-Chrysenes	Y	0.0082	---	1008	0.0057	1.44	0.0014
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	C2-Fluorenes	N	---	---	686	0.0057	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	C2-Naphthalenes	N	---	---	510	0.0057	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	C2-Phenanthrenes/Anthracen	Y	0.012	---	746	0.0057	2.11	0.0028
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	C3-Chrysenes	N	---	---	1112	0.0057	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	C3-Fluorenes	N	---	---	769	0.0057	---	---

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	C3-Naphthalenes	Y	0.0051	---	581	0.0057	0.89	0.0015
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	C3-Phenanthrenes/Anthracen	Y	0.0053	---	829	0.0057	0.93	0.0011
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	C4 Chrysenes	N	---	---	1214	0.0057	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	C4-Naphthalenes	N	---	---	657	0.0057	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	C4-Phenanthrenes/Anthracen	N	---	---	913	0.0057	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	Chrysene	Y	0.22	826	844	0.0057	38.60	0.0457
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	Dibenz(A,H)Anthracene	Y	0.015	2389	1123	0.0057	2.63	0.0023
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	Fluoranthene	Y	0.18	23870	707	0.0057	31.58	0.0447
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	Fluorene	N	---	26000	538	0.0057	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	Indeno(1,2,3-C,D)Pyrene	Y	0.04	---	1115	0.0057	7.02	0.0063
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	Naphthalene	N	---	61700	385	0.0057	---	---
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	Perylene	Y	0.012	431	967	0.0057	2.11	0.0022
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	Phenanthrene	Y	0.026	34300	596	0.0057	4.56	0.0077
CFSDP-005-SD	CFSDP-005	0.00-0.50	10/18/2018	N	Pyrene	Y	0.18	9090	697	0.0057	31.58	0.0453
CFSDP-006-SD	CFSDP-006	0.00-0.50	9/9/2016	N	Acenaphthene	N	---	33400	491	0.0041	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	9/9/2016	N	Acenaphthylene	N	---	24000	452	0.0041	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	9/9/2016	N	Anthracene	N	---	1300	594	0.0041	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	9/9/2016	N	Benzo(A)Anthracene	N	---	4153	841	0.0041	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	9/9/2016	N	Benzo(A)Pyrene	N	---	3840	965	0.0041	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	9/9/2016	N	Benzo(B)Fluoranthene	N	---	2169	979	0.0041	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	9/9/2016	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0041	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	9/9/2016	N	Chrysene	N	---	826	844	0.0041	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	9/9/2016	N	Fluoranthene	N	---	23870	707	0.0041	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	9/9/2016	N	Fluorene	N	---	26000	538	0.0041	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	9/9/2016	N	Naphthalene	N	---	61700	385	0.0041	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	9/9/2016	N	Phenanthrene	N	---	34300	596	0.0041	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	9/9/2016	N	Pyrene	N	---	9090	697	0.0041	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	10/4/2018	N	Acenaphthene	N	---	33400	491	0.0006	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	10/4/2018	N	Acenaphthylene	N	---	24000	452	0.0006	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	10/4/2018	N	Anthracene	N	---	1300	594	0.0006	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	10/4/2018	N	Benzo(A)Anthracene	Y	0.0016	4153	841	0.0006	2.67	0.0032
CFSDP-006-SD	CFSDP-006	0.00-0.50	10/4/2018	N	Benzo(A)Pyrene	Y	0.0014	3840	965	0.0006	2.34	0.0024
CFSDP-006-SD	CFSDP-006	0.00-0.50	10/4/2018	N	Benzo(B)Fluoranthene	Y	0.0038	2169	979	0.0006	6.34	0.0065
CFSDP-006-SD	CFSDP-006	0.00-0.50	10/4/2018	N	Benzo(K)Fluoranthene	Y	0.0015	1220	981	0.0006	2.50	0.0026
CFSDP-006-SD	CFSDP-006	0.00-0.50	10/4/2018	N	Chrysene	Y	0.0041	826	844	0.0006	6.84	0.0081
CFSDP-006-SD	CFSDP-006	0.00-0.50	10/4/2018	N	Fluoranthene	Y	0.0049	23870	707	0.0006	8.18	0.0116
CFSDP-006-SD	CFSDP-006	0.00-0.50	10/4/2018	N	Fluorene	N	---	26000	538	0.0006	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	10/4/2018	N	Naphthalene	N	---	61700	385	0.0006	---	---
CFSDP-006-SD	CFSDP-006	0.00-0.50	10/4/2018	N	Phenanthrene	Y	0.0022	34300	596	0.0006	3.67	0.0062
CFSDP-006-SD	CFSDP-006	0.00-0.50	10/4/2018	N	Pyrene	Y	0.0039	9090	697	0.0006	6.51	0.0093
CFSDP-007-SD	CFSDP-007	0.00-0.50	10/3/2018	N	Acenaphthene	N	---	33400	491	4.76E-05	---	---
CFSDP-007-SD	CFSDP-007	0.00-0.50	10/3/2018	N	Acenaphthylene	N	---	24000	452	4.76E-05	---	---
CFSDP-007-SD	CFSDP-007	0.00-0.50	10/3/2018	N	Anthracene	N	---	1300	594	4.76E-05	---	---
CFSDP-007-SD	CFSDP-007	0.00-0.50	10/3/2018	N	Benzo(A)Anthracene	Y	0.00095	4153	841	4.76E-05	19.98	0.0238
CFSDP-007-SD	CFSDP-007	0.00-0.50	10/3/2018	N	Benzo(A)Pyrene	N	---	3840	965	4.76E-05	---	---
CFSDP-007-SD	CFSDP-007	0.00-0.50	10/3/2018	N	Benzo(B)Fluoranthene	Y	0.0014	2169	979	4.76E-05	29.44	0.0301
CFSDP-007-SD	CFSDP-007	0.00-0.50	10/3/2018	N	Benzo(K)Fluoranthene	N	---	1220	981	4.76E-05	---	---
CFSDP-007-SD	CFSDP-007	0.00-0.50	10/3/2018	N	Chrysene	Y	0.0014	826	844	4.76E-05	29.44	0.0349
CFSDP-007-SD	CFSDP-007	0.00-0.50	10/3/2018	N	Fluoranthene	Y	0.0021	23870	707	4.76E-05	44.16	0.0625

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-007-SD	CFSDP-007	0.00-0.50	10/3/2018	N	Fluorene	N	---	26000	538	4.76E-05	---	---
CFSDP-007-SD	CFSDP-007	0.00-0.50	10/3/2018	N	Naphthalene	N	---	61700	385	4.76E-05	---	---
CFSDP-007-SD	CFSDP-007	0.00-0.50	10/3/2018	N	Phenanthrene	Y	0.0019	34300	596	4.76E-05	39.96	0.0670
CFSDP-007-SD	CFSDP-007	0.00-0.50	10/3/2018	N	Pyrene	Y	0.0014	9090	697	4.76E-05	29.44	0.0422
CFSDP-007-SO	CFSDP-007	0.00-0.50	9/8/2016	N	Acenaphthene	N	---	33400	491	0.0150	---	---
CFSDP-007-SO	CFSDP-007	0.00-0.50	9/8/2016	N	Acenaphthylene	N	---	24000	452	0.0150	---	---
CFSDP-007-SO	CFSDP-007	0.00-0.50	9/8/2016	N	Anthracene	N	---	1300	594	0.0150	---	---
CFSDP-007-SO	CFSDP-007	0.00-0.50	9/8/2016	N	Benzo(A)Anthracene	N	---	4153	841	0.0150	---	---
CFSDP-007-SO	CFSDP-007	0.00-0.50	9/8/2016	N	Benzo(A)Pyrene	N	---	3840	965	0.0150	---	---
CFSDP-007-SO	CFSDP-007	0.00-0.50	9/8/2016	N	Benzo(B)Fluoranthene	N	---	2169	979	0.0150	---	---
CFSDP-007-SO	CFSDP-007	0.00-0.50	9/8/2016	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0150	---	---
CFSDP-007-SO	CFSDP-007	0.00-0.50	9/8/2016	N	Chrysene	N	---	826	844	0.0150	---	---
CFSDP-007-SO	CFSDP-007	0.00-0.50	9/8/2016	N	Fluoranthene	N	---	23870	707	0.0150	---	---
CFSDP-007-SO	CFSDP-007	0.00-0.50	9/8/2016	N	Fluorene	N	---	26000	538	0.0150	---	---
CFSDP-007-SO	CFSDP-007	0.00-0.50	9/8/2016	N	Naphthalene	N	---	61700	385	0.0150	---	---
CFSDP-007-SO	CFSDP-007	0.00-0.50	9/8/2016	N	Phenanthrene	N	---	34300	596	0.0150	---	---
CFSDP-007-SO	CFSDP-007	0.00-0.50	9/8/2016	N	Pyrene	N	---	9090	697	0.0150	---	---
CFSDP-008-SD	CFSDP-008	0.00-0.50	10/3/2018	N	Acenaphthene	N	---	33400	491	3.86E-05	---	---
CFSDP-008-SD	CFSDP-008	0.00-0.50	10/3/2018	N	Acenaphthylene	N	---	24000	452	3.86E-05	---	---
CFSDP-008-SD	CFSDP-008	0.00-0.50	10/3/2018	N	Anthracene	N	---	1300	594	3.86E-05	---	---
CFSDP-008-SD	CFSDP-008	0.00-0.50	10/3/2018	N	Benzo(A)Anthracene	N	---	4153	841	3.86E-05	---	---
CFSDP-008-SD	CFSDP-008	0.00-0.50	10/3/2018	N	Benzo(A)Pyrene	N	---	3840	965	3.86E-05	---	---
CFSDP-008-SD	CFSDP-008	0.00-0.50	10/3/2018	N	Benzo(B)Fluoranthene	N	---	2169	979	3.86E-05	---	---
CFSDP-008-SD	CFSDP-008	0.00-0.50	10/3/2018	N	Benzo(K)Fluoranthene	N	---	1220	981	3.86E-05	---	---
CFSDP-008-SD	CFSDP-008	0.00-0.50	10/3/2018	N	Chrysene	N	---	826	844	3.86E-05	---	---
CFSDP-008-SD	CFSDP-008	0.00-0.50	10/3/2018	N	Fluoranthene	N	---	23870	707	3.86E-05	---	---
CFSDP-008-SD	CFSDP-008	0.00-0.50	10/3/2018	N	Fluorene	N	---	26000	538	3.86E-05	---	---
CFSDP-008-SD	CFSDP-008	0.00-0.50	10/3/2018	N	Naphthalene	N	---	61700	385	3.86E-05	---	---
CFSDP-008-SD	CFSDP-008	0.00-0.50	10/3/2018	N	Phenanthrene	N	---	34300	596	3.86E-05	---	---
CFSDP-008-SD	CFSDP-008	0.00-0.50	10/3/2018	N	Pyrene	N	---	9090	697	3.86E-05	---	---
CFSDP-008-SO	CFSDP-008	0.00-0.50	9/8/2016	N	Acenaphthene	N	---	33400	491	0.0088	---	---
CFSDP-008-SO	CFSDP-008	0.00-0.50	9/8/2016	N	Acenaphthylene	N	---	24000	452	0.0088	---	---
CFSDP-008-SO	CFSDP-008	0.00-0.50	9/8/2016	N	Anthracene	N	---	1300	594	0.0088	---	---
CFSDP-008-SO	CFSDP-008	0.00-0.50	9/8/2016	N	Benzo(A)Anthracene	N	---	4153	841	0.0088	---	---
CFSDP-008-SO	CFSDP-008	0.00-0.50	9/8/2016	N	Benzo(A)Pyrene	N	---	3840	965	0.0088	---	---
CFSDP-008-SO	CFSDP-008	0.00-0.50	9/8/2016	N	Benzo(B)Fluoranthene	N	---	2169	979	0.0088	---	---
CFSDP-008-SO	CFSDP-008	0.00-0.50	9/8/2016	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0088	---	---
CFSDP-008-SO	CFSDP-008	0.00-0.50	9/8/2016	N	Chrysene	N	---	826	844	0.0088	---	---
CFSDP-008-SO	CFSDP-008	0.00-0.50	9/8/2016	N	Fluoranthene	N	---	23870	707	0.0088	---	---
CFSDP-008-SO	CFSDP-008	0.00-0.50	9/8/2016	N	Fluorene	N	---	26000	538	0.0088	---	---
CFSDP-008-SO	CFSDP-008	0.00-0.50	9/8/2016	N	Naphthalene	N	---	61700	385	0.0088	---	---
CFSDP-008-SO	CFSDP-008	0.00-0.50	9/8/2016	N	Phenanthrene	N	---	34300	596	0.0088	---	---
CFSDP-008-SO	CFSDP-008	0.00-0.50	9/8/2016	N	Pyrene	N	---	9090	697	0.0088	---	---
CFSDP-017-SD	CFSDP-017	0.00-0.50	10/3/2018	N	Acenaphthene	N	---	33400	491	0.0004	---	---
CFSDP-017-SD	CFSDP-017	0.00-0.50	10/3/2018	N	Acenaphthylene	N	---	24000	452	0.0004	---	---
CFSDP-017-SD	CFSDP-017	0.00-0.50	10/3/2018	N	Anthracene	N	---	1300	594	0.0004	---	---
CFSDP-017-SD	CFSDP-017	0.00-0.50	10/3/2018	N	Benzo(A)Anthracene	N	---	4153	841	0.0004	---	---
CFSDP-017-SD	CFSDP-017	0.00-0.50	10/3/2018	N	Benzo(A)Pyrene	N	---	3840	965	0.0004	---	---
CFSDP-017-SD	CFSDP-017	0.00-0.50	10/3/2018	N	Benzo(B)Fluoranthene	Y	0.0024	2169	979	0.0004	6.47	0.0066

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-017-SD	CFSDP-017	0.00-0.50	10/3/2018	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0004	---	---
CFSDP-017-SD	CFSDP-017	0.00-0.50	10/3/2018	N	Chrysene	Y	0.003	826	844	0.0004	8.09	0.0096
CFSDP-017-SD	CFSDP-017	0.00-0.50	10/3/2018	N	Fluoranthene	Y	0.0047	23870	707	0.0004	12.67	0.0179
CFSDP-017-SD	CFSDP-017	0.00-0.50	10/3/2018	N	Fluorene	N	---	26000	538	0.0004	---	---
CFSDP-017-SD	CFSDP-017	0.00-0.50	10/3/2018	N	Naphthalene	N	---	61700	385	0.0004	---	---
CFSDP-017-SD	CFSDP-017	0.00-0.50	10/3/2018	N	Phenanthrene	Y	0.0032	34300	596	0.0004	8.63	0.0145
CFSDP-017-SD	CFSDP-017	0.00-0.50	10/3/2018	N	Pyrene	Y	0.0032	9090	697	0.0004	8.63	0.0124
CFSDP-017-SO	CFSDP-017	0.00-0.50	9/8/2016	N	Acenaphthene	N	---	33400	491	0.0076	---	---
CFSDP-017-SO	CFSDP-017	0.00-0.50	9/8/2016	N	Acenaphthylene	N	---	24000	452	0.0076	---	---
CFSDP-017-SO	CFSDP-017	0.00-0.50	9/8/2016	N	Anthracene	N	---	1300	594	0.0076	---	---
CFSDP-017-SO	CFSDP-017	0.00-0.50	9/8/2016	N	Benzo(A)Anthracene	N	---	4153	841	0.0076	---	---
CFSDP-017-SO	CFSDP-017	0.00-0.50	9/8/2016	N	Benzo(A)Pyrene	N	---	3840	965	0.0076	---	---
CFSDP-017-SO	CFSDP-017	0.00-0.50	9/8/2016	N	Benzo(B)Fluoranthene	N	---	2169	979	0.0076	---	---
CFSDP-017-SO	CFSDP-017	0.00-0.50	9/8/2016	N	Benzo(K)Fluoranthene	N	---	1220	981	0.0076	---	---
CFSDP-017-SO	CFSDP-017	0.00-0.50	9/8/2016	N	Chrysene	N	---	826	844	0.0076	---	---
CFSDP-017-SO	CFSDP-017	0.00-0.50	9/8/2016	N	Fluoranthene	N	---	23870	707	0.0076	---	---
CFSDP-017-SO	CFSDP-017	0.00-0.50	9/8/2016	N	Fluorene	N	---	26000	538	0.0076	---	---
CFSDP-017-SO	CFSDP-017	0.00-0.50	9/8/2016	N	Naphthalene	N	---	61700	385	0.0076	---	---
CFSDP-017-SO	CFSDP-017	0.00-0.50	9/8/2016	N	Phenanthrene	N	---	34300	596	0.0076	---	---
CFSDP-017-SO	CFSDP-017	0.00-0.50	9/8/2016	N	Pyrene	N	---	9090	697	0.0076	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/31/2017	N	Acenaphthene	N	---	33400	491	0.0049	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/31/2017	N	Acenaphthylene	N	---	24000	452	0.0049	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/31/2017	N	Anthracene	N	---	1300	594	0.0049	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/31/2017	N	Benzo(A)Anthracene	Y	0.13	4153	841	0.0049	26.48	0.0315
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/31/2017	N	Benzo(A)Pyrene	N	---	3840	965	0.0049	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/31/2017	N	Benzo(B)Fluoranthene	Y	0.27	2169	979	0.0049	54.99	0.0562
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/31/2017	N	Benzo(K)Fluoranthene	Y	0.088	1220	981	0.0049	17.92	0.0183
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/31/2017	N	Chrysene	Y	0.3	826	844	0.0049	61.10	0.0724
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/31/2017	N	Fluoranthene	Y	0.37	23870	707	0.0049	75.36	0.1066
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/31/2017	N	Fluorene	N	---	26000	538	0.0049	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/31/2017	N	Naphthalene	N	---	61700	385	0.0049	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/31/2017	N	Phenanthrene	Y	0.053	34300	596	0.0049	10.79	0.0181
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/31/2017	N	Pyrene	Y	0.39	9090	697	0.0049	79.43	0.1140
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	Acenaphthene	Y	0.023	33400	491	0.0095	2.42	0.0049
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	Acenaphthylene	N	---	24000	452	0.0095	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	Anthracene	Y	0.11	1300	594	0.0095	11.58	0.0195
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	Benzo(A)Anthracene	Y	1.4	4153	841	0.0095	147.37	0.1752
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	Benzo(A)Pyrene	Y	0.59	3840	965	0.0095	62.11	0.0644
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	Benzo(B)Fluoranthene	Y	2.7	2169	979	0.0095	284.21	0.2903
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	Benzo(G,H,I)Perylene	Y	0.67	648	1095	0.0095	70.53	0.0644
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	Benzo(K)Fluoranthene	Y	1.9	1220	981	0.0095	200.00	0.2039
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	Benzo[E]Pyrene	Y	1.5	4300	967	0.0095	157.89	0.1633
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	C1-Chrysenes	Y	0.76	---	929	0.0095	80.00	0.0861
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	C1-Fluoranthenes/Pyrenes	Y	1.4	---	770	0.0095	147.37	0.1914
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	C1-Fluorenes	N	---	---	611	0.0095	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	C1-Naphthalenes	N	---	---	444	0.0095	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	C1-Phenanthrenes/Anthracen	Y	0.33	---	670	0.0095	34.74	0.0518
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	C2-Chrysenes	Y	0.17	---	1008	0.0095	17.89	0.0178
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	C2-Fluorenes	N	---	---	686	0.0095	---	---

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	C2-Naphthalenes	N	---	---	510	0.0095	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	C2-Phenanthrenes/Anthracen	Y	0.22	---	746	0.0095	23.16	0.0310
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	C3-Chrysenes	N	---	---	1112	0.0095	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	C3-Fluorenes	N	---	---	769	0.0095	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	C3-Naphthalenes	N	---	---	581	0.0095	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	C3-Phenanthrenes/Anthracen	N	---	---	829	0.0095	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	C4 Chrysenes	N	---	---	1214	0.0095	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	C4-Naphthalenes	N	---	---	657	0.0095	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	C4-Phenanthrenes/Anthracen	N	---	---	913	0.0095	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	Chrysene	Y	4.3	826	844	0.0095	452.63	0.5363
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	Dibenz(A,H)Anthracene	Y	0.23	2389	1123	0.0095	24.21	0.0216
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	Fluoranthene	Y	4.2	23870	707	0.0095	442.11	0.6253
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	Fluorene	N	---	26000	538	0.0095	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	Indeno(1,2,3-C,D)Pyrene	Y	0.72	---	1115	0.0095	75.79	0.0680
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	Naphthalene	N	---	61700	385	0.0095	---	---
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	Perylene	Y	0.17	431	967	0.0095	17.89	0.0185
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	Phenanthrene	Y	0.44	34300	596	0.0095	46.32	0.0777
CFSDP-026-SD	CFSDP-026	0.00-0.50	10/5/2018	N	Pyrene	Y	3.5	9090	697	0.0095	368.42	0.5286
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/31/2017	N	Acenaphthene	Y	0.033	33400	491	0.0446	0.74	0.0015
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/31/2017	N	Acenaphthylene	N	---	24000	452	0.0446	---	---
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/31/2017	N	Anthracene	Y	0.16	1300	594	0.0446	3.59	0.0060
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/31/2017	N	Benzo(A)Anthracene	Y	2.1	4153	841	0.0446	47.09	0.0560
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/31/2017	N	Benzo(A)Pyrene	Y	0.87	3840	965	0.0446	19.51	0.0202
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/31/2017	N	Benzo(B)Fluoranthene	Y	4.1	2169	979	0.0446	91.93	0.0939
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/31/2017	N	Benzo(K)Fluoranthene	Y	1.3	1220	981	0.0446	29.15	0.0297
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/31/2017	N	Chrysene	Y	4.9	826	844	0.0446	109.87	0.1302
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/31/2017	N	Fluoranthene	Y	6.5	23870	707	0.0446	145.74	0.2061
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/31/2017	N	Fluorene	Y	0.03	26000	538	0.0446	0.67	0.0013
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/31/2017	N	Naphthalene	Y	0.019	61700	385	0.0446	0.43	0.0011
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/31/2017	N	Phenanthrene	Y	1	34300	596	0.0446	22.42	0.0376
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/31/2017	N	Pyrene	Y	6.8	9090	697	0.0446	152.47	0.2187
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	Acenaphthene	Y	0.0031	33400	491	0.0184	0.17	0.0003
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	Acenaphthylene	N	---	24000	452	0.0184	---	---
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	Anthracene	Y	0.013	1300	594	0.0184	0.71	0.0012
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	Benzo(A)Anthracene	Y	0.23	4153	841	0.0184	12.50	0.0149
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	Benzo(A)Pyrene	Y	0.11	3840	965	0.0184	5.98	0.0062
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	Benzo(B)Fluoranthene	Y	0.43	2169	979	0.0184	23.37	0.0239
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	Benzo(G,H,I)Perylene	Y	0.13	648	1095	0.0184	7.07	0.0065
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	Benzo(K)Fluoranthene	Y	0.34	1220	981	0.0184	18.48	0.0188
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	Benzo[E]Pyrene	Y	0.25	4300	967	0.0184	13.59	0.0141
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	C1-Chrysenes	Y	0.12	---	929	0.0184	6.52	0.0070
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	C1-Fluoranthenes/Pyrenes	Y	0.2	---	770	0.0184	10.87	0.0141
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	C1-Fluorenes	N	---	---	611	0.0184	---	---
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	C1-Naphthalenes	N	---	---	444	0.0184	---	---
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	C1-Phenanthrenes/Anthracen	Y	0.044	---	670	0.0184	2.39	0.0036
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	C2-Chrysenes	Y	0.024	---	1008	0.0184	1.30	0.0013
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	C2-Fluorenes	N	---	---	686	0.0184	---	---
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	C2-Naphthalenes	N	---	---	510	0.0184	---	---
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	C2-Phenanthrenes/Anthracen	Y	0.029	---	746	0.0184	1.58	0.0021

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	C3-Chrysenes	N	---	---	1112	0.0184	---	---
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	C3-Fluorenes	N	---	---	769	0.0184	---	---
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	C3-Naphthalenes	N	---	---	581	0.0184	---	---
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	C3-Phenanthrenes/Anthracen	N	---	---	829	0.0184	---	---
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	C4 Chrysenes	N	---	---	1214	0.0184	---	---
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	C4-Naphthalenes	N	---	---	657	0.0184	---	---
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	C4-Phenanthrenes/Anthracen	N	---	---	913	0.0184	---	---
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	Chrysene	Y	0.62	826	844	0.0184	33.70	0.0399
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	Dibenz(A,H)Anthracene	Y	0.045	2389	1123	0.0184	2.45	0.0022
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	Fluoranthene	Y	0.55	23870	707	0.0184	29.89	0.0423
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	Fluorene	N	---	26000	538	0.0184	---	---
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	Indeno(1,2,3-C,D)Pyrene	Y	0.14	---	1115	0.0184	7.61	0.0068
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	Naphthalene	N	---	61700	385	0.0184	---	---
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	Perylene	Y	0.035	431	967	0.0184	1.90	0.0020
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	Phenanthrene	Y	0.065	34300	596	0.0184	3.53	0.0059
CFSDP-027-SD	CFSDP-027	0.00-0.50	10/5/2018	N	Pyrene	Y	0.45	9090	697	0.0184	24.46	0.0351
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/31/2017	N	Acenaphthene	N	---	33400	491	0.0175	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/31/2017	N	Acenaphthylene	N	---	24000	452	0.0175	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/31/2017	N	Anthracene	N	---	1300	594	0.0175	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/31/2017	N	Benzo(A)Anthracene	Y	0.084	4153	841	0.0175	4.80	0.0057
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/31/2017	N	Benzo(A)Pyrene	Y	0.055	3840	965	0.0175	3.14	0.0033
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/31/2017	N	Benzo(B)Fluoranthene	Y	0.17	2169	979	0.0175	9.71	0.0099
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/31/2017	N	Benzo(K)Fluoranthene	Y	0.059	1220	981	0.0175	3.37	0.0034
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/31/2017	N	Chrysene	Y	0.18	826	844	0.0175	10.29	0.0122
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/31/2017	N	Fluoranthene	Y	0.17	23870	707	0.0175	9.71	0.0137
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/31/2017	N	Fluorene	N	---	26000	538	0.0175	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/31/2017	N	Naphthalene	N	---	61700	385	0.0175	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/31/2017	N	Phenanthrene	Y	0.05	34300	596	0.0175	2.86	0.0048
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/31/2017	N	Pyrene	Y	0.18	9090	697	0.0175	10.29	0.0148
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	Acenaphthene	N	---	33400	491	0.0048	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	Acenaphthylene	N	---	24000	452	0.0048	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	Anthracene	Y	0.048	1300	594	0.0048	9.94	0.0167
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	Benzo(A)Anthracene	Y	0.32	4153	841	0.0048	66.25	0.0788
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	Benzo(A)Pyrene	Y	0.1	3840	965	0.0048	20.70	0.0215
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	Benzo(B)Fluoranthene	Y	0.47	2169	979	0.0048	97.31	0.0994
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	Benzo(G,H,I)Perylene	Y	0.12	648	1095	0.0048	24.84	0.0227
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	Benzo(K)Fluoranthene	Y	0.36	1220	981	0.0048	74.53	0.0760
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	Benzo[E]Pyrene	Y	0.26	4300	967	0.0048	53.83	0.0557
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	C1-Chrysenes	Y	0.15	---	929	0.0048	31.06	0.0334
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	C1-Fluoranthenes/Pyrenes	Y	0.49	---	770	0.0048	101.45	0.1318
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	C1-Fluorenes	N	---	---	611	0.0048	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	C1-Naphthalenes	N	---	---	444	0.0048	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	C1-Phenanthrenes/Anthracen	Y	0.18	---	670	0.0048	37.27	0.0556
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	C2-Chrysenes	N	---	---	1008	0.0048	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	C2-Fluorenes	N	---	---	686	0.0048	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	C2-Naphthalenes	N	---	---	510	0.0048	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	C2-Phenanthrenes/Anthracen	Y	0.072	---	746	0.0048	14.91	0.0200
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	C3-Chrysenes	N	---	---	1112	0.0048	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	C3-Fluorenes	N	---	---	769	0.0048	---	---

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	C3-Naphthalenes	N	---	---	581	0.0048	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	C3-Phenanthrenes/Anthracen	N	---	---	829	0.0048	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	C4 Chrysenes	N	---	---	1214	0.0048	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	C4-Naphthalenes	N	---	---	657	0.0048	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	C4-Phenanthrenes/Anthracen	N	---	---	913	0.0048	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	Chrysene	Y	0.83	826	844	0.0048	171.84	0.2036
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	Dibenz(A,H)Anthracene	Y	0.043	2389	1123	0.0048	8.90	0.0079
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	Fluoranthene	Y	1.8	23870	707	0.0048	372.67	0.5271
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	Fluorene	N	---	26000	538	0.0048	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	Indeno(1,2,3-C,D)Pyrene	Y	0.13	---	1115	0.0048	26.92	0.0241
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	Naphthalene	N	---	61700	385	0.0048	---	---
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	Perylene	Y	0.033	431	967	0.0048	6.83	0.0071
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	Phenanthrene	Y	0.47	34300	596	0.0048	97.31	0.1633
CFSDP-028-SD	CFSDP-028	0.00-0.50	10/4/2018	N	Pyrene	Y	1	9090	697	0.0048	207.04	0.2970
CFSDP-034-SD	CFSDP-034	0.00-0.50	10/5/2018	N	Acenaphthene	N	---	33400	491	0.0061	---	---
CFSDP-034-SD	CFSDP-034	0.00-0.50	10/5/2018	N	Acenaphthylene	N	---	24000	452	0.0061	---	---
CFSDP-034-SD	CFSDP-034	0.00-0.50	10/5/2018	N	Anthracene	Y	0.0012	1300	594	0.0061	0.20	0.0003
CFSDP-034-SD	CFSDP-034	0.00-0.50	10/5/2018	N	Benzo(A)Anthracene	Y	0.0053	4153	841	0.0061	0.88	0.0010
CFSDP-034-SD	CFSDP-034	0.00-0.50	10/5/2018	N	Benzo(A)Pyrene	Y	0.0042	3840	965	0.0061	0.69	0.0007
CFSDP-034-SD	CFSDP-034	0.00-0.50	10/5/2018	N	Benzo(B)Fluoranthene	Y	0.014	2169	979	0.0061	2.31	0.0024
CFSDP-034-SD	CFSDP-034	0.00-0.50	10/5/2018	N	Benzo(K)Fluoranthene	Y	0.0041	1220	981	0.0061	0.68	0.0007
CFSDP-034-SD	CFSDP-034	0.00-0.50	10/5/2018	N	Chrysene	Y	0.019	826	844	0.0061	3.14	0.0037
CFSDP-034-SD	CFSDP-034	0.00-0.50	10/5/2018	N	Fluoranthene	Y	0.014	23870	707	0.0061	2.31	0.0033
CFSDP-034-SD	CFSDP-034	0.00-0.50	10/5/2018	N	Fluorene	N	---	26000	538	0.0061	---	---
CFSDP-034-SD	CFSDP-034	0.00-0.50	10/5/2018	N	Naphthalene	N	---	61700	385	0.0061	---	---
CFSDP-034-SD	CFSDP-034	0.00-0.50	10/5/2018	N	Phenanthrene	Y	0.0056	34300	596	0.0061	0.93	0.0016
CFSDP-034-SD	CFSDP-034	0.00-0.50	10/5/2018	N	Pyrene	Y	0.0084	9090	697	0.0061	1.39	0.0020
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	Acenaphthene	Y	0.0014	33400	491	0.0116	0.12	0.0002
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	Acenaphthylene	N	---	24000	452	0.0116	---	---
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	Anthracene	Y	0.0055	1300	594	0.0116	0.47	0.0008
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	Benzo(A)Anthracene	Y	0.07	4153	841	0.0116	6.03	0.0072
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	Benzo(A)Pyrene	Y	0.043	3840	965	0.0116	3.71	0.0038
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	Benzo(B)Fluoranthene	Y	0.18	2169	979	0.0116	15.52	0.0159
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	Benzo(G,H,I)Perylene	Y	0.056	648	1095	0.0116	4.83	0.0044
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	Benzo(K)Fluoranthene	Y	0.12	1220	981	0.0116	10.34	0.0105
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	Benzo[E]Pyrene	Y	0.1	4300	967	0.0116	8.62	0.0089
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	C1-Chrysenes	Y	0.035	---	929	0.0116	3.02	0.0032
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	C1-Fluoranthenes/Pyrenes	Y	0.057	---	770	0.0116	4.91	0.0064
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	C1-Fluorenes	N	---	---	611	0.0116	---	---
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	C1-Naphthalenes	N	---	---	444	0.0116	---	---
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	C1-Phenanthrenes/Anthracen	Y	0.016	---	670	0.0116	1.38	0.0021
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	C2-Chrysenes	Y	0.0085	---	1008	0.0116	0.73	0.0007
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	C2-Fluorenes	N	---	---	686	0.0116	---	---
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	C2-Naphthalenes	N	---	---	510	0.0116	---	---
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	C2-Phenanthrenes/Anthracen	Y	0.0088	---	746	0.0116	0.76	0.0010
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	C3-Chrysenes	N	---	---	1112	0.0116	---	---
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	C3-Fluorenes	N	---	---	769	0.0116	---	---
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	C3-Naphthalenes	N	---	---	581	0.0116	---	---
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	C3-Phenanthrenes/Anthracen	N	---	---	829	0.0116	---	---

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	C4 Chrysenes	N	---	---	1214	0.0116	---	---
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	C4-Naphthalenes	N	---	---	657	0.0116	---	---
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	C4-Phenanthrenes/Anthracen	N	---	---	913	0.0116	---	---
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	Chrysene	Y	0.26	826	844	0.0116	22.41	0.0266
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	Dibenz(A,H)Anthracene	Y	0.018	2389	1123	0.0116	1.55	0.0014
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	Fluoranthene	Y	0.19	23870	707	0.0116	16.38	0.0232
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	Fluorene	N	---	26000	538	0.0116	---	---
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	Indeno(1,2,3-C,D)Pyrene	Y	0.057	---	1115	0.0116	4.91	0.0044
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	Naphthalene	N	---	61700	385	0.0116	---	---
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	Perylene	Y	0.012	431	967	0.0116	1.03	0.0011
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	Phenanthrene	Y	0.026	34300	596	0.0116	2.24	0.0038
CFSDP-035-SD	CFSDP-035	0.00-0.50	10/5/2018	N	Pyrene	Y	0.16	9090	697	0.0116	13.79	0.0198
CFSDP-036-SD	CFSDP-036	0.00-0.50	10/4/2018	N	Acenaphthene	N	---	33400	491	0.0002	---	---
CFSDP-036-SD	CFSDP-036	0.00-0.50	10/4/2018	N	Acenaphthylene	N	---	24000	452	0.0002	---	---
CFSDP-036-SD	CFSDP-036	0.00-0.50	10/4/2018	N	Anthracene	Y	0.0086	1300	594	0.0002	56.21	0.0946
CFSDP-036-SD	CFSDP-036	0.00-0.50	10/4/2018	N	Benzo(A)Anthracene	Y	0.07	4153	841	0.0002	457.52	0.5440
CFSDP-036-SD	CFSDP-036	0.00-0.50	10/4/2018	N	Benzo(A)Pyrene	Y	0.044	3840	965	0.0002	287.58	0.2980
CFSDP-036-SD	CFSDP-036	0.00-0.50	10/4/2018	N	Benzo(B)Fluoranthene	Y	0.24	2169	979	0.0002	1568.63	1.6023
CFSDP-036-SD	CFSDP-036	0.00-0.50	10/4/2018	N	Benzo(K)Fluoranthene	Y	0.072	1220	981	0.0002	470.59	0.4797
CFSDP-036-SD	CFSDP-036	0.00-0.50	10/4/2018	N	Chrysene	Y	0.3	826	844	0.0002	1960.78	0.9787
CFSDP-036-SD	CFSDP-036	0.00-0.50	10/4/2018	N	Fluoranthene	Y	0.37	23870	707	0.0002	2418.30	3.4205
CFSDP-036-SD	CFSDP-036	0.00-0.50	10/4/2018	N	Fluorene	N	---	26000	538	0.0002	---	---
CFSDP-036-SD	CFSDP-036	0.00-0.50	10/4/2018	N	Naphthalene	N	---	61700	385	0.0002	---	---
CFSDP-036-SD	CFSDP-036	0.00-0.50	10/4/2018	N	Phenanthrene	Y	0.038	34300	596	0.0002	248.37	0.4167
CFSDP-036-SD	CFSDP-036	0.00-0.50	10/4/2018	N	Pyrene	Y	0.21	9090	697	0.0002	1372.55	1.9692
CFSDP-037-SD	CFSDP-037	0.00-0.50	10/3/2018	N	Acenaphthene	N	---	33400	491	4.57E-05	---	---
CFSDP-037-SD	CFSDP-037	0.00-0.50	10/3/2018	N	Acenaphthylene	N	---	24000	452	4.57E-05	---	---
CFSDP-037-SD	CFSDP-037	0.00-0.50	10/3/2018	N	Anthracene	N	---	1300	594	4.57E-05	---	---
CFSDP-037-SD	CFSDP-037	0.00-0.50	10/3/2018	N	Benzo(A)Anthracene	N	---	4153	841	4.57E-05	---	---
CFSDP-037-SD	CFSDP-037	0.00-0.50	10/3/2018	N	Benzo(A)Pyrene	N	---	3840	965	4.57E-05	---	---
CFSDP-037-SD	CFSDP-037	0.00-0.50	10/3/2018	N	Benzo(B)Fluoranthene	N	---	2169	979	4.57E-05	---	---
CFSDP-037-SD	CFSDP-037	0.00-0.50	10/3/2018	N	Benzo(K)Fluoranthene	N	---	1220	981	4.57E-05	---	---
CFSDP-037-SD	CFSDP-037	0.00-0.50	10/3/2018	N	Chrysene	N	---	826	844	4.57E-05	---	---
CFSDP-037-SD	CFSDP-037	0.00-0.50	10/3/2018	N	Fluoranthene	N	---	23870	707	4.57E-05	---	---
CFSDP-037-SD	CFSDP-037	0.00-0.50	10/3/2018	N	Fluorene	N	---	26000	538	4.57E-05	---	---
CFSDP-037-SD	CFSDP-037	0.00-0.50	10/3/2018	N	Naphthalene	N	---	61700	385	4.57E-05	---	---
CFSDP-037-SD	CFSDP-037	0.00-0.50	10/3/2018	N	Phenanthrene	N	---	34300	596	4.57E-05	---	---
CFSDP-037-SD	CFSDP-037	0.00-0.50	10/3/2018	N	Pyrene	N	---	9090	697	4.57E-05	---	---
CFSDP-038-SD	CFSDP-038	0.00-0.50	10/3/2018	N	Acenaphthene	N	---	33400	491	4.74E-05	---	---
CFSDP-038-SD	CFSDP-038	0.00-0.50	10/3/2018	N	Acenaphthylene	N	---	24000	452	4.74E-05	---	---
CFSDP-038-SD	CFSDP-038	0.00-0.50	10/3/2018	N	Anthracene	N	---	1300	594	4.74E-05	---	---
CFSDP-038-SD	CFSDP-038	0.00-0.50	10/3/2018	N	Benzo(A)Anthracene	Y	0.0011	4153	841	4.74E-05	23.21	0.0276
CFSDP-038-SD	CFSDP-038	0.00-0.50	10/3/2018	N	Benzo(A)Pyrene	N	---	3840	965	4.74E-05	---	---
CFSDP-038-SD	CFSDP-038	0.00-0.50	10/3/2018	N	Benzo(B)Fluoranthene	Y	0.0012	2169	979	4.74E-05	25.32	0.0259
CFSDP-038-SD	CFSDP-038	0.00-0.50	10/3/2018	N	Benzo(K)Fluoranthene	N	---	1220	981	4.74E-05	---	---
CFSDP-038-SD	CFSDP-038	0.00-0.50	10/3/2018	N	Chrysene	Y	0.0013	826	844	4.74E-05	27.43	0.0325
CFSDP-038-SD	CFSDP-038	0.00-0.50	10/3/2018	N	Fluoranthene	Y	0.0011	23870	707	4.74E-05	23.21	0.0328
CFSDP-038-SD	CFSDP-038	0.00-0.50	10/3/2018	N	Fluorene	N	---	26000	538	4.74E-05	---	---
CFSDP-038-SD	CFSDP-038	0.00-0.50	10/3/2018	N	Naphthalene	N	---	61700	385	4.74E-05	---	---

Table G-2
Equilibrium Partitioning Sediment Benchmark Toxicity Unit Calculations for PAH Mixtures
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	Location ID	Depth interval (ft)	Sample Date	Sample Type	Constituent	Detected (Y/N)	Result Value (mg/kg)	$C_{OC,PAHi,Maxi}$ (mg/kg_{OC})	$C_{OC,PAHi,FCVi}$ (mg/kg_{OC})	f_{OC}	C_{OC} (mg/kg_{OC})	$ESBTU_{FCVi}$
CFSDP-038-SD	CFSDP-038	0.00-0.50	10/3/2018	N	Phenanthrene	Y	0.0019	34300	596	4.74E-05	40.08	0.0673
CFSDP-038-SD	CFSDP-038	0.00-0.50	10/3/2018	N	Pyrene	N	---	9090	697	4.74E-05	---	---
CFSDP-DUP3-SD	CFSDP-005	0.00-0.50	11/1/2017	FD	Acenaphthene	N	---	33400	491	0.0016	---	---
CFSDP-DUP3-SD	CFSDP-005	0.00-0.50	11/1/2017	FD	Acenaphthylene	N	---	24000	452	0.0016	---	---
CFSDP-DUP3-SD	CFSDP-005	0.00-0.50	11/1/2017	FD	Anthracene	N	---	1300	594	0.0016	---	---
CFSDP-DUP3-SD	CFSDP-005	0.00-0.50	11/1/2017	FD	Benzo(A)Anthracene	N	---	4153	841	0.0016	---	---
CFSDP-DUP3-SD	CFSDP-005	0.00-0.50	11/1/2017	FD	Benzo(A)Pyrene	N	---	3840	965	0.0016	---	---
CFSDP-DUP3-SD	CFSDP-005	0.00-0.50	11/1/2017	FD	Benzo(B)Fluoranthene	N	---	2169	979	0.0016	---	---
CFSDP-DUP3-SD	CFSDP-005	0.00-0.50	11/1/2017	FD	Benzo(K)Fluoranthene	N	---	1220	981	0.0016	---	---
CFSDP-DUP3-SD	CFSDP-005	0.00-0.50	11/1/2017	FD	Chrysene	N	---	826	844	0.0016	---	---
CFSDP-DUP3-SD	CFSDP-005	0.00-0.50	11/1/2017	FD	Fluoranthene	N	---	23870	707	0.0016	---	---
CFSDP-DUP3-SD	CFSDP-005	0.00-0.50	11/1/2017	FD	Fluorene	N	---	26000	538	0.0016	---	---
CFSDP-DUP3-SD	CFSDP-005	0.00-0.50	11/1/2017	FD	Naphthalene	N	---	61700	385	0.0016	---	---
CFSDP-DUP3-SD	CFSDP-005	0.00-0.50	11/1/2017	FD	Phenanthrene	N	---	34300	596	0.0016	---	---
CFSDP-DUP3-SD	CFSDP-005	0.00-0.50	11/1/2017	FD	Pyrene	N	---	9090	697	0.0016	---	---

Notes:
---: Not available
$C_{OC,PAHi,FCVi}$: Effect concentration of a PAH in sediment on an organic carbon basis calculated from the product of its FCV and KOC
$C_{OC,PAHi,Maxi}$: Maximum solubility limited PAH concentration in sediment on an organic carbon basis
FCV: Final Chronic Value
FD: Duplicate Sample
f_{OC}: Fraction Organic Carbon
N: Normal (Primary) Sample
$ESBTU_{FCVi}$: Equilibrium Partitioning Sediment Benchmark Toxic Unit, based on the FCV
C_{OC}: Organic Carbon normalized PAH concentration
mg/kg: milligram per kilogram
PAH: Polycyclic Aromatic Hydrocarbons

Appendix H Food Chain Models for Calculating Doses to Representative Ecological Receptors

Appendix H0 Food Chain Model Parameters

Table H0-1
Summary of Bioaccumulative COPECs for Evaluation in Wildlife Exposure Modeling
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Detected Chemicals	CAS Number	log K_{ow} USEPA EPISUITE	COPECs by Matrix			Bioaccumulative COPEC Lists				Wildlife Ingestion COPEC
			Soil	Sediment	Surface Water	log K_{ow} > 3.5?	USEPA 2017 PBT Constituents	USEPA 2000 Important Bioaccumulative Constituents	EPA Eco-SSL Wildlife Value	
Metals										
Aluminum		NA	●	●	●	NA			Narrative Statement	Yes
Antimony		NA	●	●	●	NA			Yes	Yes
Arsenic		NA	●	●	●	NA		Yes	Yes	Yes
Barium		NA	●	●	●	NA			Yes	Yes
Beryllium		NA	●	●	●	NA			Yes	Yes
Cadmium		NA	●	●	●	NA		Yes	Yes	Yes
Chromium		NA	●	●	●	NA		Yes	Yes	Yes
Cobalt		NA	●	●	●	NA			Yes	Yes
Copper		NA	●	●	●	NA		Yes	Yes	Yes
Lead		NA	●	●	●	NA	Yes	Yes	Yes	Yes
Manganese		NA	●	●	●	NA			Yes	Yes
Mercury		NA	●	●	●	NA	Yes	Yes	Yes	Yes
Nickel		NA	●	●	●	NA		Yes	Yes	Yes
Selenium		NA	●	●	●	NA		Yes	Yes	Yes
Silver		NA		●		NA		Yes	Yes	Yes
Thallium		NA	●	●	●	NA				Yes
Vanadium		NA	●	●	●	NA			Yes	Yes
Zinc		NA	●	●	●	NA		Yes	Yes	Yes
Other Inorganics										
Cyanide		NA	●	●	●	NA				Yes
Fluoride		NA	●	●	●	NA				Yes
PCBs										
Aroclor 1248	12672-29-6	6.34	●				Yes	Yes		Yes
Aroclor 1254	11097-69-1	6.98	●				Yes	Yes		Yes
PAHs										
Total HMW- PAHs		NA	●	●	●	NA	Yes	Yes	Yes	Yes
Total LMW- PAHs		NA	●	●	●	NA	Yes	Yes	Yes	Yes
Dioxin and Dioxin-Like Compounds										
Dioxin and Dioxin-Like Compounds		NA	●			NA	Yes	Yes		Yes
Non-PAH SVOCs										
2,4-Dimethylphenol	105679	2.6074	●			No				
2-Methylphenol	7440-66-6	2.06		●		No				
3- And 4- Methylphenol (Total)	XXXX		●	●	●	No				
4-Nitroaniline	100-01-6	1.47	●			No				
Acetophenone	98-86-2	1.67		●		No				
Benzaldehyde	100-52-7	1.71		●	●	No				
Biphenyl (Diphenyl)	92-52-4	3.76	●			Yes				Yes
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	1.56	●			No				
Bis(2-ethylhexyl)phthalate	117817	8.3918	●	●	●	Yes				Yes
Butylbenzylphthalate	85687	4.8445	●	●	●	Yes				Yes

Table H0-1
Summary of Bioaccumulative COPECs for Evaluation in Wildlife Exposure Modeling
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Detected Chemicals	CAS Number	log K_{ow} USEPA EPISUITE	COPECs by Matrix			Bioaccumulative COPEC Lists				Wildlife Ingestion COPEC
			Soil	Sediment	Surface Water	log K_{ow} > 3.5?	USEPA 2017 PBT Constituents	USEPA 2000 Important Bioaccumulative Constituents	EPA Eco-SSL Wildlife Value	
Caprolactam	105-60-2	0.66	●		●	No				
Carbazole	86-74-8	3.23	●	●	●	No				
Dibenzofuran	132649	3.7147	●	●		Yes				Yes
Diethyl phthalate	84-66-2	2.65	●	●		No				
Di-n-butyl phthalate	84742	4.61	●	●		Yes				Yes
Di-n-octyl phthalate	84742	8.54	●	●	●	Yes				Yes
Hexachlorobenzene	118741	5.86	●			Yes	Yes	Yes		Yes
Isophorone	78-59-1	2.62	●	●		No				
Pentachlorophenol	87865	4.7353	●			Yes		Yes	Yes	Yes
Phenol	108952	1.5128	●	●	●	No				
Volatile Organic Compounds (VOCs)										
1,2-Dichloroethane	107-06-2	1.83	●			No				
1,4-Dichlorobenzene	106-46-7	3.28	●			No				
2-Hexanone	591-78-6	1.24	●			No				
Acetone	67-64-1	-0.24	●	●	●	No				
Benzene	71-43-2	1.99	●	●		No				
Bromomethane	74-83-9	1.18	●			No				
Carbon Disulfide	75-15-0	1.94	●	●		No				
Cyclohexane	110-82-7	3.18	●	●		No				
Ethylbenzene	100-41-4	3.03	●	●		No				
Isopropylbenzene	98-82-8	3.45	●			No				
m,p-Xylene	79601-23-1	3.09	●	●		No				
Methyl Ethyl Ketone (2-Butanone)	78-93-3	0.26	●	●		No				
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	1.16	●			No				
Methylacetate	79-20-9	0.37	●	●		No				
Methylcyclohexane	108-87-2	3.59	●	●		Yes				Yes
Methylene Chloride	75-09-2	1.34	●	●	●	No				
o-Xylene	95-47-6	3.09	●	●		No				
Styrene	100-42-5	2.89	●		●	No				
Tetrachloroethylene (PCE)	127-18-4	2.97	●	●		No				
Toluene	108-88-3	2.54	●	●	●	No				
Trichlorofluoromethane	75-69-4	2.13	●			No				

Notes:
= Chemical not bioaccumulative

Table H0-2
Summary of Exposure Parameters for Wildlife Receptors of Concern
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Representative Species			Foraging Range [a]	Foraging Range Reference	Area Use Factor (AUF)		Body Weight (kg wet weight)			Dietary Composition					Ingestion Rates							
															Dietary		Drinking Water		Incidental Substrate			
Common Name	Scientific Name	Food-web classification			Preliminary	Refined	Mean	±SD	Body Weight Reference	Plant Material	Invertebrates	Fish	Small Mammals	Dietary Composition Reference	kg dry weight/day	Reference	L/day	Reference	Avg. % of Dry Intake	± SD % of Dry Intake	kg dry weight/day	Reference
Avian Receptors																						
American Dipper	*Cinclus mexicanus*	semi-aquatic passerine invertivore	0.32 km	Bakus (1959)	1.0	Area specific	0.0546	0.0048	Dunning (2008)		100%			Ealey (1977)	0.0091	Nagy (2001)[b]	0.0084	Caulder and Braun (1983)	2%	---	0.0002	Assumption[m]
American Woodcock	*Scolopax minor*	small soil probing invertivore	11.1 ac	Gregg (1984); USCHPPM (2004)	1.0	Area specific	0.176	---	Dunning (2008)	10%	90%			Sample and Suter (1994)	0.021	Nagy (2001)[b]	0.018	Caulder and Braun (1983)	7.5%	6.9%	0.0016	USEPA (2005)
Belted Kingfisher	*Ceryle alcyon*	small aquatic piscivore	1.03 km	USCHPPM (2004)	1.0	Area specific	0.148	0.0208	Dunning (2008)		10%	90%		Sample and Suter (1994)	0.023	Nagy (2001)[d]	0.016	Caulder and Braun (1983)	0%	---	0	Sample and Suter (1994)[h]
Mourning Dove	*Zenaida macroura*	small herbivore	1.6 km	Tomlinson et al. (1960)	1.0	Area specific	0.115	0.0018	Dunning (2008)	100%				USEPA (2005)	0.013	Nagy (2001)[c]	0.014	Caulder and Braun (1983)	6.8%	5.3%	0.00089	USEPA (2005)[l]
Red-tailed Hawk	*Buteo jamaicensis*	large carnivore	551 ac	Sample and Suter (1994)	1.0	Area specific	1.028	---	Dunning (2008)				100%	Sample and Suter (1994)	0.084	Nagy (2001)[d]	0.060	Caulder and Braun (1983)	2.6%	2.3%	0.0022	USEPA (2005)
Yellow-billed Cuckoo	*Coccyzus americanus*	terrestrial insectivore (Special Status)	42 ac	USFWS (2017a)	1.0	Area specific	0.064	0.0091	Dunning (2008)		100%			USEPA (1993)	0.010	Nagy (2001)[b]	0.0094	Caulder and Braun (1983)	0%	---	0	Assumption[n]
Mammalian Receptors																						
Canada Lynx	*Lynx canadensis*	medium carnivore (Special Status)	10,625 ac	USFWS (2017b)	1.0	Area specific	6.0	---	USFWS (2017b)				100%	USFWS (2017b)	0.187	Nagy (2001)[e]	0.497	Caulder and Braun (1983)	2.8%	0.08%	0.005	Beyer et al. (1994)[l]
Grizzly Bear	*Ursus arctos horribilis*	large carnivore (Special Status)	32,000 ac	USFWS (2007)	1.0	Area specific	90.7	---	USFWS (2007)	65%	15%	10%	10%	USFWS (2007), NPS (2018)	1.959	Nagy (2001)[e]	5.721	Caulder and Braun (1983)	2.8%	0.08%	0.055	Beyer et al. (1994)[l]
Long-tailed Weasel	*Mustela frenata*	small carnivore	12 ac	USCHPPM (2004)	1.0	Area specific	0.153	0.003	Brown and Lasiewski (1972), as cited in USCHPPM (2004)				100%	USCHPPM (2004)	0.0079	Nagy (2001)[e]	0.018	Caulder and Braun (1983)	1.6%	2.1%	0.0001	USEPA (2005)
Meadow Vole	*Microtus pennsylvanicus*	small terrestrial herbivore	0.13 ac	McCann (1976)[k]	1.0	Area specific	0.033	0.0082	Brochu et al. (1983), as cited in USEPA (1993)	100%				USCHPPM (2004)	0.0050	Nagy (2001)[f]	0.005	Caulder and Braun (1983)	1.3%	1.4%	0.00007	USEPA (2005)
Mink	*Mustela vison*	medium semi-aquatic piscivore	1.85 km	Sample and Suter (1994)	1.0	Area specific	0.550	---	Mitchell (1961), as cited in USEPA (1993)			100%		USEPA (1993); Sample and Suter (1994)	0.0238	Nagy (2001)[e]	0.058	Caulder and Braun (1983)	0%	---	0	Sample and Suter (1994)
North American Wolverine	*Gulo gulo luscus*	medium carnivore (Special Status)	26000 ac	Montana Field Guide (2018)	1.0	Area specific	8.0	---	USFWS (2018)				100%	Lofroth et al. (2007)	0.240	Nagy (2001)[e]	0.643	Caulder and Braun (1983)	2.8%	0.08%	0.007	Beyer et al. (1994)[l]
Short-tailed Shrew	*Blarina brevicauda*	small terrestrial invertivore	1 ac	Sample and Suter (1994)	1.0	Area specific	0.015	0.00078	Schlesinger and Porter (1974), as cited in Sample and Suter (1994)		100%			Sample and Suter (1994)	0.002	Nagy (2001)[g]	0.002	Caulder and Braun (1983)	1.1%	1.5%	0.00002	USEPA (2005)

Notes:
kg, kilograms
a, ac, acres; km, kilometers
b, Estimated food ingestion rate (kg/day dry weight) for insectivorous birds = (0.54[Body Weight in grams]$^{0.705}$)/1000 (Nagy 2001);
c, Estimated food ingestion rate (kg/day dry weight) for omnivorous birds = (0.670[Body Weight in grams] $^{0.627}$)/1000 (Nagy 2001);
d, Estimated food ingestion rate (kg/day dry weight) for carnivorous birds = (0.849[Body Weight in grams] $^{0.663}$)/1000 (Nagy 2001);
e, Estimated food ingestion rate (kg/day dry weight) for Carnivora = (0.102[Body Weight in grams] $^{0.864}$)/1000 (Nagy 2001);
f, Estimated food ingestion rate (kg/day dry weight) for Rodentia = (0.332[Body Weight in grams] $^{0.774}$)/1000 (Nagy 2001);
g, Estimated food ingestion rate (kg/day dry weight) for insectivorous mammals = (0.373[Body Weight in grams] $^{0.622}$)/1000 (Nagy 2001);
h, Based on assumption from Sample and Suter 1994 that substrate ingestion is negligible for piscivores;
i, Estimated drinking water ingestion rate for birds = (0.059×[body weight in kg]BW$^{0.67}$ (Caulder and Braun, 1983)
j, Estimated drinking water ingestion rate for mammals = (0.099×[body weight in kg]BW$^{0.90}$ (Caulder and Braun, 1983)
k, As cited in the Montana Field Guide, accessed at http://fieldguide.mt.gov/default.aspx
l, Based on red fox soil ingestion rate assuming the soil ingestion rate of top predators does not exceed the soil ingestion rate of red fox.
k, Literature-based incidental substrate ingestion rate was not identified; assumed limited incidental ingestion based on habitat preference for fast-moving, clear streams with sand, pebble, or rocky stream bottoms.
l, Incidental soil ingestion rate is assumed to be negligible based primary foraging strategies of gleaning from branchs or foliage or catching prey on the wing.

Table H0-3
Estimated Soil to Earthworm Bioaccumulation Factors (BAF) for Non-Ionic Organic Compounds
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	K_{ow}: Octanol to water partitioning coefficient	K_{ww} : worm to soil water partitioning coefficient			K_{oc}: water to soil organic carbon partitioning coefficient [c]				K_d: soil to water partitioning coefficient [d]	Soil to Earthworm BAF [e]
	log K_{ow} [f]	log K_{ww} [a]	K_{ww} wet (L/kg worm ww)	K_{ww} dry (L/kg worm dw) [b]	slope	intercept	log K_{oc}	K_{oc}	K_d (L/kg soil dw)	
Biphenyl (Diphenyl)	3.76	1.27	1.87E+01	1.17E+02	6.79E-01	6.63E-01	3.22E+00	1.64E+03	1.64E+01	**7.10E+00**
Bis(2-ethylhexyl)phthalate	8.39	5.30	2.00E+05	1.25E+06	6.79E-01	6.63E-01	6.36E+00	2.30E+06	2.30E+04	**5.44E+01**
Butylbenzylphthalate	4.84	2.21	1.64E+02	1.02E+03	6.79E-01	6.63E-01	3.95E+00	8.96E+03	8.96E+01	**1.14E+01**
Dibenzofuran	3.71	1.23	1.71E+01	1.07E+02	6.79E-01	6.63E-01	3.19E+00	1.53E+03	1.53E+01	**6.96E+00**
Di-n-butyl phthalate	4.61	2.01	1.02E+02	6.41E+02	6.79E-01	6.63E-01	3.79E+00	6.21E+03	6.21E+01	**1.03E+01**
Hexachlorobenzene	5.86	3.10	1.25E+03	7.84E+03	6.79E-01	6.63E-01	4.64E+00	4.38E+04	4.38E+02	**1.79E+01**
Pentachlorophenol	4.74	2.12	1.32E+02	8.23E+02	6.79E-01	6.63E-01	3.88E+00	7.56E+03	7.56E+01	**1.09E+01**
1,2,4,5-Tetrachlorobenzene	4.57	1.98	9.48E+01	5.92E+02	6.79E-01	6.63E-01	3.77E+00	5.84E+03	5.84E+01	**1.01E+01**
2-Chloronaphthalene	3.81	1.32	2.08E+01	1.30E+02	6.79E-01	6.63E-01	3.25E+00	1.79E+03	1.79E+01	**7.27E+00**
Di-n-butyl phthalate	4.61	2.01	1.02E+02	6.41E+02	6.79E-01	6.63E-01	3.79E+00	6.21E+03	6.21E+01	**1.03E+01**
Di-n-octyl phthalate	8.54	5.43	2.69E+05	1.68E+06	6.79E-01	6.63E-01	6.46E+00	2.90E+06	2.90E+04	**5.81E+01**
Hexachlorobutadiene	4.72	2.10	1.27E+02	7.94E+02	6.79E-01	6.63E-01	3.87E+00	7.34E+03	7.34E+01	**1.08E+01**
Hexachloroethane	4.03	1.51	3.24E+01	2.02E+02	6.79E-01	6.63E-01	3.40E+00	2.53E+03	2.53E+01	**8.01E+00**
Methylcyclohexane	3.59	1.12	1.33E+01	8.30E+01	6.79E-01	6.63E-01	3.10E+00	1.26E+03	1.26E+01	**6.59E+00**
PCBs										
Aroclor 1248	6.34	3.52	3.28E+03	2.05E+04	6.79E-01	6.63E-01	4.97E+00	9.29E+04	9.29E+02	**2.21E+01**
Aroclor 1254	6.98	4.07	1.18E+04	7.39E+04	6.79E-01	6.63E-01	5.40E+00	2.53E+05	2.53E+03	**2.92E+01**
Dioxin/Furans										
2,3,7,8-TCDD	6.92	4.02	1.05E+04	6.55E+04	6.79E-01	6.63E-01	5.36E+00	2.30E+05	2.30E+03	**2.85E+01**
1,2,3,7,8-PeCDD	7.56	4.58	3.78E+04	2.36E+05	6.79E-01	6.63E-01	5.80E+00	6.26E+05	6.26E+03	**3.77E+01**
1,2,3,4,7,8-HxCDD	8.21	5.14	1.39E+05	8.68E+05	6.79E-01	6.63E-01	6.24E+00	1.73E+06	1.73E+04	**5.02E+01**
1,2,3,6,7,8-HxCDD	8.21	5.14	1.39E+05	8.68E+05	6.79E-01	6.63E-01	6.24E+00	1.73E+06	1.73E+04	**5.02E+01**
1,2,3,7,8,9-HxCDD	8.21	5.14	1.39E+05	8.68E+05	6.79E-01	6.63E-01	6.24E+00	1.73E+06	1.73E+04	**5.02E+01**
1,2,3,4,6,7,8-HpCDD	8.85	5.70	5.01E+05	3.13E+06	6.79E-01	6.63E-01	6.67E+00	4.70E+06	4.70E+04	**6.66E+01**
OCDD	9.50	6.27	1.84E+06	1.15E+07	6.79E-01	6.63E-01	7.11E+00	1.30E+07	1.30E+05	**8.86E+01**
2,3,7,8-TCDF	6.29	3.47	2.97E+03	1.85E+04	6.79E-01	6.63E-01	4.93E+00	8.59E+04	8.59E+02	**2.16E+01**
1,2,3,7,8-PeCDF	6.94	4.04	1.09E+04	6.82E+04	6.79E-01	6.63E-01	5.38E+00	2.37E+05	2.37E+03	**2.87E+01**
2,3,4,7,8-PeCDF	6.94	4.04	1.09E+04	6.82E+04	6.79E-01	6.63E-01	5.38E+00	2.37E+05	2.37E+03	**2.87E+01**
1,2,3,4,7,8-HxCDF	7.92	4.89	7.77E+04	4.86E+05	6.79E-01	6.63E-01	6.04E+00	1.10E+06	1.10E+04	**4.42E+01**
1,2,3,6,7,8-HxCDF	7.92	4.89	7.77E+04	4.86E+05	6.79E-01	6.63E-01	6.04E+00	1.10E+06	1.10E+04	**4.42E+01**
2,3,4,6,7,8-HxCDF	7.92	4.89	7.77E+04	4.86E+05	6.79E-01	6.63E-01	6.04E+00	1.10E+06	1.10E+04	**4.42E+01**
1,2,3,7,8,9-HxCDF	7.58	4.59	3.93E+04	2.46E+05	6.79E-01	6.63E-01	5.81E+00	6.45E+05	6.45E+03	**3.81E+01**
1,2,3,4,6,7,8-HpCDF	8.23	5.16	1.45E+05	9.04E+05	6.79E-01	6.63E-01	6.25E+00	1.78E+06	1.78E+04	**5.07E+01**
1,2,3,4,7,8,9-HpCDF	8.23	5.16	1.45E+05	9.04E+05	6.79E-01	6.63E-01	6.25E+00	1.78E+06	1.78E+04	**5.07E+01**
OCDF	8.87	5.72	5.21E+05	3.26E+06	6.79E-01	6.63E-01	6.69E+00	4.85E+06	4.85E+04	**6.72E+01**

Notes:

a, log K_{ww} = 0.87*log K_{ow} - 2 (USEPA, 2007; Jager, 1998)

b, Converted from wet weight to dry weight assuming 16% solids (USEPA, 2005; Jager, 1998)

c, K_{oc} values modeled based on regression equations from Gerstl (1990), for All Compounds: $\log_{oc}K$= A*log K_{ow} + B, where A = slope and B = intercept.

d, K_d = f_{oc}*K_{oc}, where "foc" is the fraction of organic carbon in soil.

f_{oc} is assumed to be: 0.01

e, BAF = K_{ww} (L/kg worm dw) / K_d (L/kg soil dw)

Table H0-4
Estimated Soil to Small Mammal Bioaccumulation Factors (BAF) for Non-Ionic Organic Compounds
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Fat content of beef[c]	$BAF_{beef\ ww}$[b]	$BAF_{plant\ ww}$[d]	$BAF_{invert\ ww}$[e]	$BAF_{MAX\ plant/invert\ ww}$[f]	$BAF_{soil\text{-}mammal\ dw}$[a]
			d/kg $beef_{ww}$	mg/kg $plant_{ww}$ per mg COPEC/kg $soil_{dw}$	mg/kg inv_{ww} per mg COPEC/kg $soil_{dw}$	mg/kg $tissue_{ww}$ per mg COPEC/kg $soil_{dw}$	mg/kg $flesh_{dw}$ per mg COPEC/kg $soil_{dw}$
Aroclor 1248	6.34	19%	3.34E-02	2.43E-02	8.61E+00	8.61E+00	2.76E-01
Aroclor 1254	6.98	19%	2.31E-02	1.33E-02	1.14E+01	1.14E+01	2.53E-01
Biphenyl (Diphenyl)	3.76	19%	2.20E-02	2.70E-01	2.77E+00	2.77E+00	5.93E-02
Dibenzofuran	3.71	19%	2.13E-02	2.82E-01	2.71E+00	2.71E+00	5.62E-02
1,2,4,5-Tetrachlorobenzene	4.57	19%	3.48E-02	1.27E-01	3.95E+00	3.95E+00	1.33E-01
2-Chloronaphthalene	3.81	19%	2.29E-02	2.57E-01	2.83E+00	2.83E+00	6.32E-02
Hexachlorobutadiene	4.72	19%	3.66E-02	1.10E-01	4.22E+00	4.22E+00	1.49E-01
Hexachloroethane	4.03	19%	2.66E-02	2.09E-01	3.12E+00	3.12E+00	8.07E-02
Methylcyclohexane	3.59	19%	1.92E-02	3.17E-01	2.57E+00	2.57E+00	4.82E-02

Notes:

a, $BAF_{soil\text{-}mammal}$ model based on LANL (2015) equation for Transfer Factor from soil to dry weight flesh (TF_flesh_dw):

$$BAF_{soil-mammal} = BAF_{beef} \times \left[\frac{\left(FIR_{MAX} \times BAF_{MAX\ plant/invert} + SIR_{MAX}\right)}{(1-MC)}\right]$$

where:

$BAF_{soil\text{-}mammal\ dw}$ = Soil-to-small mammal BAF (mg/kg $flesh_{dw}$ per mg COPEC/kg $soil_{dw}$)
$BAF_{beef\ ww}$ = Diet-to-beef transfer factor (d/kg $beef_{ww}$)
$FIR_{MAX\ ww}$ = Maximum food ingestion rate for LANL prey species (0.305 kg $food_{ww}$/d; LANL, 2015)
$BAF_{MAXPlant/Invert}$ = Maximum BAF for plant or invertebrate dietary items of the prey species (mg/kg $tissue_{ww}$ per mg COPEC/kg $soil_{dw}$)
SIR_{MAX} = Maximum incidental soil ingestion rate for LANL prey species (0.0193 kg $soil_{dw}$/d; LANL, 2015)
MC = Moisture content of flesh (assumed 68 percent per LANL, 2015)

b, Diet-to-beef transfer factor calculated based on RTI (2005), consistent with LANL (2017):

$$LogBAF_{beef\ ww} = Fat_{beef} \times \left(-0.099 \times \log K_{ow}{}^2 + 1.07 \times logKow - 3.56\right)$$

where:

$BAF_{beef\ ww}$ = Diet-to-beef transfer factor (d/kg $beef_{ww}$)
$Fat_{beef\ ww}$ = Fat content of beef; assumed to be 19 percent or 0.19 based on LANL (2017)
K_{ow} = Octanol-water partitioning coefficient

c, Assumed fat content of beef of 19 percent consistent with LANL (2017)

d, $BAF_{plant\ ww}$, Soil-to-plant bioaccumulation factor calculated on wet weight basis by multiplying the plant BAF in Table 3 by 1-moisture content of plant leaves (1 - 0.85 = 0.15 per LANL, 2017).

e, $BAF_{invert\ ww}$, Soil-to-invertebrate bioaccumulation factor calculated on wet weight basis by multiplying the plant BAF in Table 3 by 1-moisture content in soil invertebrates (1 - 0.61 = 0.39; LANL, 2017).

f, Maximum soil-to-tissue BAF between higher of the $BAF_{plant\ ww}$ and $BAF_{invert\ ww}$

Table H0-5
Avian and Mammalian Toxicity Reference Values
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analytes	Avian Receptors				Mammalian Receptors			
	Chronic TRV_{NOAEL}[a] (mg/kg-bw/d)	Chronic TRV_{LOAEL}[b] (mg/kg-bw/d)	Test Animal	Source	Chronic TRV_{NOAEL}[a] (mg/kg-bw/d)	Chronic TRV_{LOAEL}[b] (mg/kg-bw/d)	Test Animal	Source
Metals								
Aluminum	110	1100	Ringed dove	Carriere et al. (1986); as cited in LANL EcoRisk	No TRV	No TRV	---	Narrative; USEPA (2003b)
Antimony	No TRV	No TRV	--	--	0.059	2.76	geometric mean	USEPA (2005b); TechLaw (2008)
Arsenic	2.24	4.51	geometric mean	USEPA (2005c); TechLaw (2008)	1.04	4.55	geometric mean	USEPA (2005c); TechLaw (2008)
Barium	73.5	131	geometric mean	LANL (2003)	51.8	82.7	geometric mean	USEPA (2005d); TechLaw (2008)
Beryllium	No TRV	No TRV	--	--	0.532	0.67	geometric mean	USEPA (2005e); TechLaw (2008)
Cadmium	1.47	6.35	geometric Mean	USEPA (2005f); TechLaw (2008)	0.77	6.87	geometric mean	USEPA (2005f); TechLaw (2008)
Chromium	2.66	15.6	geometric mean	USEPA (2008b); TechLaw (2008)	2.4	58.2	geometric mean	USEPA (2008b); TechLaw (2008)
Cobalt	7.61	20.16	geometric mean	USEPA (2005g); TechLaw (2008)	7.33	18.9	geometric mean	USEPA (2005g); TechLaw (2008)
Copper	4.05	34.8	geometric mean	USEPA (2007b); TechLaw (2008)	5.6	82.7	geometric mean	USEPA (2007b); TechLaw (2008)
Lead	1.63	44.6	geometric mean	USEPA (2005h); TechLaw (2008)	4.7	186.4	geometric mean	USEPA (2005h); TechLaw (2008)
Manganese	179	377	geometric mean	USEPA (2007c); TechLaw (2008)	51.5	146	geometric mean	USEPA (2007c); TechLaw (2008)
Mercury	0.45	0.91	Japanese quail	Hill and Schaffer (1976), as cited in Sample et al. (1996)	1.41	14.1	mink	LANL (2017)
Nickel	6.71	18.6	geometric mean	USEPA (2007d); TechLaw (2008)	1.7	14.8	geometric mean	USEPA (2007d); TechLaw (2008)
Selenium	0.3	0.82	geometric mean	USEPA (2007e); TechLaw (2008)	0.143	0.66	geometric mean	USEPA (2007e); TechLaw (2008)
Thallium	0.35	3.5	starling	Schafer (1972), as cited in LANL EcoRisk	0.48	1.43	rat	Engineering Field Activity West (1998)
Vanadium	0.344	1.7	geometric mean	USEPA (2005i) TechLaw (2008)	4.16	9.44	geometric mean	USEPA (2005i) TechLaw (2008)
Zinc	66.1	171	geometric mean	USEPA (2007e); TechLaw (2008)	75.4	298	geometric mean	USEPA (2007e); TechLaw (2008)
Inorganics - Other Inorganics								
Cyanide	0.04	0.4	American kestrel	Wiemeyer et al. (1986), as cited in LANL EcoRisk	68.7	687	rat	Tewe and Manner (1981), as cited in LANL EcoRisk
Fluoride	12.2	122	Eastern screech owl	Pattee et al. (1988), as cited in LANL EcoRisk	26.6	49	mink	Aulerich et al. (1987), as cited in LANL EcoRisk

Table H0-5
Avian and Mammalian Toxicity Reference Values
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analytes	Avian Receptors				Mammalian Receptors			
	Chronic TRV_{NOAEL} [a] (mg/kg-bw/d)	Chronic TRV_{LOAEL} [b] (mg/kg-bw/d)	Test Animal	Source	Chronic TRV_{NOAEL} [a] (mg/kg-bw/d)	Chronic TRV_{LOAEL} [b] (mg/kg-bw/d)	Test Animal	Source
Polychlorinated Biphenyls								
Aroclor 1248	0.18	1.8	Ring-neck pheasant	Sample et al. (1996)	0.068	0.68	mouse	Sample et al. (1996)
Aroclor 1254	0.18	1.8	Ring-neck pheasant	Sample et al. (1996)	0.068	0.68	mouse	Sample et al. (1996)
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)								
Total LMW PAHs	16.1	161	mallard	Patton and Dieter 1980	65.6	356	geometric mean	USEPA (2007g); TechLaw (2008)
Total HMW PAHs	2	20	European starling	USEPA (2007g)	0.615	38.4	geometric mean	USEPA (2007g); TechLaw (2008)
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs								
1,2,4,5-Tetrachlorobenzene	No TRV	No TRV	---	---	No TRV	No TRV	---	---
2,3,4,6-Tetrachlorophenol	No TRV	No TRV	---	---	No TRV	No TRV	---	---
2-Chloronaphthalene	No TRV	No TRV	---	---	No TRV	No TRV	---	---
Biphenyl (Diphenyl)	No TRV	No TRV	---	---	No TRV	No TRV	---	---
Bis(2-ethylhexyl)phthalate	1.1	11	Ringed dove	Sample et al. (1996), as cited in LANL EcoRisk	18.3	183	mouse	Sample et al. (1996), as cited in LANL EcoRisk
Butylbenzylphthalate	0.11	1.1	Ringed dove	Sample et al. (1996)	159	1590	rat	NTP (1985), as cited in LANL EcoRisk
Dibenzofuran	No TRV	No TRV	---	---	No TRV	No TRV	---	---
Di-n-butyl phthalate	0.11	1.1	Ringed dove	Sample et al. (1996)	550	1833	mouse	Sample et al. (1996)
Di-n-octyl phthalate	0.11	1.1	Ringed dove	Sample et al. (1996)	65.1	651	mouse	IT Corporation (1997), as cited in LANL (2017)
Hexachlorobenzene	5	50	Japanese quail	Carpenter et al. (1985), as cited in LANL EcoRisk	7.1	71	Deer mouse	Schafer et al. (1985), as cited in LANL EcoRisk
Hexachlorobutadiene	No TRV	No TRV	---	---	200	2000	Rat	Kociba et al. (1977), as cited in USEPA (1999)
Hexachloroethane	No TRV	No TRV	---	---	No TRV	No TRV	---	---
Pentachlorophenol	6.73	52	geometric mean	USEPA (2007h); TechLaw (2008)	8.42	22.7	geometric mean	USEPA (2007h); TechLaw (2008)

Table H0-5
Avian and Mammalian Toxicity Reference Values
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analytes	Avian Receptors				Mammalian Receptors			
	Chronic TRV_{NOAEL} [a] (mg/kg-bw/d)	Chronic TRV_{LOAEL} [b] (mg/kg-bw/d)	Test Animal	Source	Chronic TRV_{NOAEL} [a] (mg/kg-bw/d)	Chronic TRV_{LOAEL} [b] (mg/kg-bw/d)	Test Animal	Source
Volatile Organic Compounds (VOCs)								
Methylcyclohexane	No TRV	No TRV	---	---	No TRV	No TRV	---	---
Dioxin/Furans								
Total Dioxins/Furans	0.00000175	0.0000175	chicken	Sample et al (1996); Farmahin et al. (2012) [e]	0.000000562	0.00000376	geometric mean	Murray et al. (1979), as cited in LANL EcoRisk

Notes:
a, NOAEL is no observable adverse effects level.
b, LOAEL is low observable adverse effects level.
c, Aroclor 1254 used as a surrogate for Aroclor 1248 for both birds and mammals.
d, Di-n-butyl pthalate used as a surrogate for avian exposure to phthalates.
e, TRV based on the NOAEL for a ring-necked pheasant, divided by 8 based on the higher sensitivity of AHR1-dependent changes in gene expression of chickens and chicken-like birds, per Farmahin et al. (2012).
-- Appropriate data are not available from published literature to derive NOAEL and LOAEL values.

TechLaw, 2008, Close-out Letter for Calculating Effect-based Ecological Soil Screening Levels for Fort Devens Ayers, MA. Memorandum from Stan Pauwels (TechLaw) to Bart Hoskins (EPA Region I) dated November 18, 2008. TDF No. 1216, Task Order No. 26, Task No. 01.
United States Environmental Protection Agency (USEPA), 1999, Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities, EPA530-D-99-001A, August.

Appendix H1 Screening Level Food Chain Models

Table H1-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Main Plant Area (0-0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	2.45E+01	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	7.70E-03	6.10E-01	Regression[a]	2.48E-02	USEPA (2007)	1.00E+00	6.10E-01	Assumption[c]	5.00E-02	3.05E-02	Baes et al. (1984)[e]
Arsenic	NA	4.40E-03	7.60E+00	3.75E-02	2.85E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.01E+00	Sample et al. (1999)	Regression[f]	4.13E-02	Sample et al. (1998b)
Barium	NA	2.71E+00	0.00E+00	1.56E-01	0.00E+00	Bechtel-Jacobs (1998a)[g]	9.10E-02	0.00E+00	Sample et al. (1998a)	6.83E-04	0.00E+00	Baes et al. (1984)[e]
Beryllium	NA	1.50E-03	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	3.00E-03	1.70E+00	Regression[a]	8.31E-01	Bechtel-Jacobs (1998a)	Regression[d]	1.26E+01	Sample et al. (1999)	Regression[f]	3.66E-01	Sample et al. (1998b)
Chromium	NA	2.72E-02	8.08E+01	4.10E-02	3.31E+00	Bechtel-Jacobs (1998a)[g]	3.06E-01	2.47E+01	Sample et al. (1998a)	Regression[f]	5.83E+00	Sample et al. (1998b)
Cobalt	NA	1.55E-02	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	1.83E-01	3.45E+01	Regression[a]	7.87E+00	Bechtel-Jacobs (1998a)	5.15E-01	1.78E+01	Sample et al. (1998a)	Regression[f]	1.28E+01	Sample et al. (1998b)
Lead	NA	3.52E-02	5.77E+01	Regression[a]	2.58E+00	Bechtel-Jacobs (1998a)	Regression[d]	2.12E+01	Sample et al. (1999)	Regression[f]	6.48E+00	Sample et al. (1998b)
Manganese	NA	3.75E+00	0.00E+00	7.90E-02	0.00E+00	Bechtel-Jacobs (1998a)[g]	Regression[d]	0.00E+00	Sample et al. (1999)	2.05E-02	0.00E+00	Sample et al. (1998b)[i]
Mercury	NA	2.60E-04	6.90E-02	Regression[a]	8.63E-02	Bechtel-Jacobs (1998a)	3.93E+00	2.71E-01	Sample et al. (1998a)	3.81E-01	2.63E-02	LANL (2015)
Nickel	NA	5.59E-02	1.40E+02	Regression[a]	4.36E+00	Bechtel-Jacobs (1998a)	7.78E-01	1.09E+02	Sample et al. (1998a)	Regression[f]	7.81E+00	Sample et al. (1998b)
Selenium	NA	0.00E+00	6.60E-01	Regression[a]	3.21E-01	Bechtel-Jacobs (1998a)	Regression[d]	6.84E-01	Sample et al. (1998a)	Regression[f]	5.64E-01	Sample et al. (1998b)
Silver		1.50E-03	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	3.30E-04	0.00E+00	4.00E-03	0.00E+00	Baes et al. (1984)	5.41E-02	0.00E+00	USCHPPM (2004)	1.08E-01	0.00E+00	Baes et al. (1984)[e]
Vanadium	NA	2.48E-02	3.16E+01	4.85E-03	1.53E-01	Bechtel-Jacobs (1998a)[g]	4.20E-02	1.33E+00	Sample et al. (1998a)	1.23E-02	3.89E-01	Sample et al. (1998b)[i]
Zinc	NA	5.37E-01	1.51E+02	Regression[a]	7.78E+01	Bechtel-Jacobs (1998a)	Regression[d]	4.43E+02	Sample et al. (1998a)	Regression[f]	1.12E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	3.78E-01	9.90E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	2.24E+01	5.71E+02	6.00E-02	3.43E+01	Baes et al. (1984)	1.24E-01	7.08E+01	USCHPPM (2004)	1.60E-02	9.14E+00	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	0.00E+00	8.90E-02	0.00E+00	USEPA (2007a)	2.92E+01	0.00E+00	USEPA (2007a)	2.53E-01	0.00E+00	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:		0.00E+00										
Acenaphthene	3.92	0.00E+00	1.50E+01	Regression[a]	3.79E-04	USEPA (2007a)	1.47E+00	2.21E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	6.20E-04	2.20E+01	Regression[a]	4.13E+00	USEPA (2007a)	2.42E+00	5.32E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluoranthene	4.95	9.30E-03	1.70E+02	5.00E-01	8.50E+01	USEPA (2007a)	3.04E+00	5.17E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluorene	4.18	8.70E-04	1.00E+01	Regression[a]	5.36E-04	USEPA (2007a)	9.57E+00	9.57E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Naphthalene	3.36	8.70E-04	4.00E+00	1.22E+01	4.88E+01	USEPA (2007a)	4.40E+00	1.76E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Phenanthrene	4.55	1.50E-03	1.20E+02	Regression[a]	1.65E+01	USEPA (2007a)	1.72E+00	2.06E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
LMW PAHs												

Table H1-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Main Plant Area (0-0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
High Molecular Weight (HMW) PAHs:		0.00E+00										
Benzo(a)anthracene	5.7	3.00E-03	1.10E+02	Regression[a]	1.09E+00	USEPA (2007a)	1.59E+00	1.75E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	0.00E+00	1.30E+02	Regression[a]	1.46E+01	USEPA (2007a)	1.33E+00	1.73E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	1.00E-02	1.50E+02	3.10E-01	4.65E+01	USEPA (2007a)	2.60E+00	3.90E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	3.90E-03	9.90E+01	Regression[a]	9.04E+01	USEPA (2007a)	2.94E+00	2.91E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	4.60E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	7.60E-03	1.30E+02	Regression[a]	1.20E+00	USEPA (2007a)	2.29E+00	2.98E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	9.80E-05	2.80E+01	1.30E-01	3.64E+00	USEPA (2007a)	2.31E+00	6.47E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.10E-03	1.00E+02	1.10E-01	1.10E+01	USEPA (2007a)	2.86E+00	2.86E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Pyrene	4.88	7.00E-03	2.20E+02	7.20E-01	1.58E+02	USEPA (2007a)	1.75E+00	3.85E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	2.20E-02	5.80E+00	2.38E-02	1.38E-01	USEPA (2007a)	5.44E+01	3.16E+02	USEPA (2007a)	7.79E-01	4.52E+00	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	0.00E+00	6.54E-01	0.00E+00	USEPA (2007a)	1.14E+01	0.00E+00	USEPA (2007a)	1.22E-01	0.00E+00	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	8.50E-02	8.14E-01	6.92E-02	USEPA (2007a)	1.03E+01	8.77E-01	USEPA (2007a)	4.49E-01	3.82E-02	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	0.00E+00	2.53E-01	0.00E+00	USEPA (2007a)	1.79E+01	0.00E+00	USEPA (2007a)	2.65E+00	0.00E+00	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	0.00E+00	5.93E+00	0.00E+00	USEPA (2007a)	1.09E+01	0.00E+00	USEPA (2007a)	Regression[g]	0.00E+00	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)

Table H1-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Main Plant Area (0-0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	5.80E-07	9.41E-02	5.46E-08	USEPA (2007a)[b]	Regression[d]	1.45E-06	Sample et al. (1998a)	Regression[h]	3.14E-07	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	1.53E-06	5.17E-02	7.92E-08	USEPA (2007a)[b]	Regression[d]	4.58E-06	Sample et al. (1998a)	Regression[h]	9.11E-07	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	4.07E-06	2.82E-02	1.15E-07	USEPA (2007a)[b]	Regression[d]	1.46E-05	Sample et al. (1998a)	Regression[h]	2.67E-06	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	1.92E-05	2.82E-02	5.41E-07	USEPA (2007a)[b]	Regression[d]	9.10E-05	Sample et al. (1998a)	Regression[h]	1.47E-05	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	9.54E-06	2.82E-02	2.69E-07	USEPA (2007a)[b]	Regression[d]	3.98E-05	Sample et al. (1998a)	Regression[h]	6.81E-06	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	6.04E-04	1.55E-02	9.37E-06	USEPA (2007a)[b]	Regression[d]	5.36E-03	Sample et al. (1998a)	Regression[h]	6.51E-04	Sample et al. (1998b)
OCDD	9.50	0.00E+00	6.76E-03	8.45E-03	5.71E-05	USEPA (2007a)[b]	Regression[d]	9.32E-02	Sample et al. (1998a)	Regression[h]	9.26E-03	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	6.15E-06	1.69E-01	1.04E-06	USEPA (2007a)[b]	Regression[d]	2.37E-05	Sample et al. (1998a)	1.25E-01	7.69E-07	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	2.84E-06	9.24E-02	2.62E-07	USEPA (2007a)[b]	Regression[d]	9.51E-06	Sample et al. (1998a)	1.25E-01	3.55E-07	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	3.65E-06	9.24E-02	3.37E-07	USEPA (2007a)[b]	Regression[d]	1.28E-05	Sample et al. (1998a)	1.25E-01	4.57E-07	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	5.47E-06	3.70E-02	2.02E-07	USEPA (2007a)[b]	Regression[d]	2.06E-05	Sample et al. (1998a)	1.25E-01	6.84E-07	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	4.00E-06	3.70E-02	1.48E-07	USEPA (2007a)[b]	Regression[d]	1.43E-05	Sample et al. (1998a)	1.25E-01	5.00E-07	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	0.00E+00	3.70E-02	0.00E+00	USEPA (2007a)[b]	Regression[d]	0.00E+00	Sample et al. (1998a)	1.25E-01	0.00E+00	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	2.58E-06	5.08E-02	1.31E-07	USEPA (2007a)[b]	Regression[d]	8.49E-06	Sample et al. (1998a)	1.25E-01	3.23E-07	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	6.97E-05	2.77E-02	1.93E-06	USEPA (2007a)[b]	Regression[d]	4.18E-04	Sample et al. (1998a)	1.25E-01	8.72E-06	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	4.13E-06	2.77E-02	1.14E-07	USEPA (2007a)[b]	Regression[d]	1.48E-05	Sample et al. (1998a)	1.25E-01	5.17E-07	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	1.90E-04	1.52E-02	2.89E-06	USEPA (2007a)[b]	Regression[d]	1.37E-03	Sample et al. (1998a)	1.25E-01	2.38E-05	Sample et al. (1998b)[i]

Table H1-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors -Main Plant Area (0-0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	0.544	-0.996	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H1-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Main Plant Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	2.45E+01	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	7.70E-03	4.20E-01	Regression[a]	1.75E-02	USEPA (2007)	1.00E+00	4.20E-01	Assumption[c]	5.00E-02	2.10E-02	Baes et al. (1984)[e]
Arsenic	NA	4.40E-03	8.10E+00	3.75E-02	3.04E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.06E+00	Sample et al. (1999)	Regression[f]	4.35E-02	Sample et al. (1998b)
Barium	NA	2.71E+00	0.00E+00	1.56E-01	0.00E+00	Bechtel-Jacobs (1998a)[g]	9.10E-02	0.00E+00	Sample et al. (1998a)	6.83E-04	0.00E+00	Baes et al. (1984)[e]
Beryllium	NA	1.50E-03	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	3.00E-03	8.75E-01	Regression[a]	5.78E-01	Bechtel-Jacobs (1998a)	Regression[d]	7.45E+00	Sample et al. (1999)	Regression[f]	2.67E-01	Sample et al. (1998b)
Chromium	NA	2.72E-02	3.53E+01	4.10E-02	1.45E+00	Bechtel-Jacobs (1998a)[g]	3.06E-01	1.08E+01	Sample et al. (1998a)	Regression[f]	3.17E+00	Sample et al. (1998b)
Cobalt	NA	1.55E-02	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	1.83E-01	4.51E+01	Regression[a]	8.75E+00	Bechtel-Jacobs (1998a)	5.15E-01	2.32E+01	Sample et al. (1998a)	Regression[f]	1.34E+01	Sample et al. (1998b)
Lead	NA	3.52E-02	3.82E+01	Regression[a]	2.04E+00	Bechtel-Jacobs (1998a)	Regression[d]	1.52E+01	Sample et al. (1999)	Regression[f]	5.40E+00	Sample et al. (1998b)
Manganese	NA	3.75E+00	0.00E+00	7.90E-02	0.00E+00	Bechtel-Jacobs (1998a)[g]	Regression[d]	0.00E+00	Sample et al. (1999)	2.05E-02	0.00E+00	Sample et al. (1998b)[i]
Mercury	NA	2.60E-04	2.20E-01	Regression[a]	1.62E-01	Bechtel-Jacobs (1998a)	3.93E+00	8.64E-01	Sample et al. (1998a)	3.81E-01	8.37E-02	LANL (2015)
Nickel	NA	5.59E-02	9.27E+01	Regression[a]	3.21E+00	Bechtel-Jacobs (1998a)	7.78E-01	7.21E+01	Sample et al. (1998a)	Regression[f]	6.45E+00	Sample et al. (1998b)
Selenium	NA	0.00E+00	5.70E-01	Regression[a]	2.73E-01	Bechtel-Jacobs (1998a)	Regression[d]	6.14E-01	Sample et al. (1998a)	Regression[f]	5.34E-01	Sample et al. (1998b)
Silver		1.50E-03	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	3.30E-04	0.00E+00	4.00E-03	0.00E+00	Baes et al. (1984)	5.41E-02	0.00E+00	USCHPPM (2004)	1.08E-01	0.00E+00	Baes et al. (1984)[e]
Vanadium	NA	2.48E-02	2.88E+01	4.85E-03	1.40E-01	Bechtel-Jacobs (1998a)[g]	4.20E-02	1.21E+00	Sample et al. (1998a)	1.23E-02	3.54E-01	Sample et al. (1998b)[i]
Zinc	NA	5.37E-01	2.04E+02	Regression[a]	9.20E+01	Bechtel-Jacobs (1998a)	Regression[d]	4.90E+02	Sample et al. (1998a)	Regression[f]	1.14E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	3.78E-01	2.40E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	2.24E+01	4.18E+02	6.00E-02	2.51E+01	Baes et al. (1984)	1.24E-01	5.18E+01	USCHPPM (2004)	1.60E-02	6.69E+00	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	0.00E+00	8.90E-02	0.00E+00	USEPA (2007a)	2.92E+01	0.00E+00	USEPA (2007a)	2.53E-01	0.00E+00	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:		0.00E+00										
Acenaphthene	3.92	0.00E+00	5.70E+00	Regression[a]	8.66E-04	USEPA (2007a)	1.47E+00	8.38E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	6.20E-04	8.95E+00	Regression[a]	2.05E+00	USEPA (2007a)	2.42E+00	2.17E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluoranthene	4.95	9.30E-03	8.40E+01	5.00E-01	4.20E+01	USEPA (2007a)	3.04E+00	2.55E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluorene	4.18	8.70E-04	4.00E+00	Regression[a]	1.17E-03	USEPA (2007a)	9.57E+00	3.83E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Naphthalene	3.36	8.70E-04	2.43E+00	1.22E+01	2.96E+01	USEPA (2007a)	4.40E+00	1.07E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Phenanthrene	4.55	1.50E-03	5.03E+01	Regression[a]	9.61E+00	USEPA (2007a)	1.72E+00	8.64E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
LMW PAHs												
High Molecular Weight (HMW) PAHs:		0.00E+00										
Benzo(a)anthracene	5.7	3.00E-03	4.18E+01	Regression[a]	6.13E-01	USEPA (2007a)	1.59E+00	6.64E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	0.00E+00	5.05E+01	Regression[a]	5.83E+00	USEPA (2007a)	1.33E+00	6.72E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	1.00E-02	5.70E+01	3.10E-01	1.77E+01	USEPA (2007a)	2.60E+00	1.48E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	3.90E-03	4.20E+01	Regression[a]	3.28E+01	USEPA (2007a)	2.94E+00	1.23E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	4.60E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	7.60E-03	5.18E+01	Regression[a]	6.96E-01	USEPA (2007a)	2.29E+00	1.19E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	9.80E-05	1.00E+01	1.30E-01	1.30E+00	USEPA (2007a)	2.31E+00	2.31E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
ıo (1,2,3-CD) Pyrene	6.58	3.10E-03	4.38E+01	1.10E-01	4.81E+00	USEPA (2007a)	2.86E+00	1.25E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]

Table H1-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Main Plant Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Pyrene	4.88	7.00E-03	8.43E+01	7.20E-01	6.07E+01	USEPA (2007a)	1.75E+00	1.47E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	2.20E-02	1.56E+00	2.38E-02	3.70E-02	USEPA (2007a)	5.44E+01	8.46E+01	USEPA (2007a)	7.79E-01	1.21E+00	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	0.00E+00	6.54E-01	0.00E+00	USEPA (2007a)	1.14E+01	0.00E+00	USEPA (2007a)	1.22E-01	0.00E+00	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	1.63E-01	8.14E-01	1.32E-01	USEPA (2007a)	1.03E+01	1.68E+00	USEPA (2007a)	4.49E-01	7.30E-02	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	0.00E+00	2.53E-01	0.00E+00	USEPA (2007a)	1.79E+01	0.00E+00	USEPA (2007a)	2.65E+00	0.00E+00	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	0.00E+00	5.93E+00	0.00E+00	USEPA (2007a)	1.09E+01	0.00E+00	USEPA (2007a)	Regression[g]	0.00E+00	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	1.58E-07	9.41E-02	1.49E-08	USEPA (2007a)[b]	Regression[d]	3.13E-07	Sample et al. (1998a)	Regression[h]	7.51E-08	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	9.30E-07	5.17E-02	4.81E-08	USEPA (2007a)[b]	Regression[d]	2.54E-06	Sample et al. (1998a)	Regression[h]	5.27E-07	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	2.40E-06	2.82E-02	6.77E-08	USEPA (2007a)[b]	Regression[d]	7.79E-06	Sample et al. (1998a)	Regression[h]	1.49E-06	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	1.07E-05	2.82E-02	3.02E-07	USEPA (2007a)[b]	Regression[d]	4.56E-05	Sample et al. (1998a)	Regression[h]	7.73E-06	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	5.99E-06	2.82E-02	1.69E-07	USEPA (2007a)[b]	Regression[d]	2.30E-05	Sample et al. (1998a)	Regression[h]	4.08E-06	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	3.36E-04	1.55E-02	5.21E-06	USEPA (2007a)[b]	Regression[d]	2.68E-03	Sample et al. (1998a)	Regression[h]	3.42E-04	Sample et al. (1998b)
OCDD	9.50	0.00E+00	3.83E-03	8.45E-03	3.23E-05	USEPA (2007a)[b]	Regression[d]	4.76E-02	Sample et al. (1998a)	Regression[h]	4.96E-03	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	2.69E-06	1.69E-01	4.56E-07	USEPA (2007a)[b]	Regression[d]	8.92E-06	Sample et al. (1998a)	1.25E-01	3.37E-07	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	1.58E-06	9.24E-02	1.46E-07	USEPA (2007a)[b]	Regression[d]	4.76E-06	Sample et al. (1998a)	1.25E-01	1.98E-07	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	1.92E-06	9.24E-02	1.77E-07	USEPA (2007a)[b]	Regression[d]	5.99E-06	Sample et al. (1998a)	1.25E-01	2.40E-07	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	7.23E-06	3.70E-02	2.67E-07	USEPA (2007a)[b]	Regression[d]	2.87E-05	Sample et al. (1998a)	1.25E-01	9.04E-07	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	2.16E-06	3.70E-02	7.99E-08	USEPA (2007a)[b]	Regression[d]	6.88E-06	Sample et al. (1998a)	1.25E-01	2.70E-07	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	1.05E-07	3.70E-02	3.88E-09	USEPA (2007a)[b]	Regression[d]	1.93E-07	Sample et al. (1998a)	1.25E-01	1.31E-08	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	3.44E-06	5.08E-02	1.75E-07	USEPA (2007a)[b]	Regression[d]	1.19E-05	Sample et al. (1998a)	1.25E-01	4.30E-07	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	4.98E-05	2.77E-02	1.38E-06	USEPA (2007a)[b]	Regression[d]	2.81E-04	Sample et al. (1998a)	1.25E-01	6.23E-06	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	2.62E-06	2.77E-02	7.25E-08	USEPA (2007a)[b]	Regression[d]	8.65E-06	Sample et al. (1998a)	1.25E-01	3.28E-07	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	1.24E-04	1.52E-02	1.89E-06	USEPA (2007a)[b]	Regression[d]	8.26E-04	Sample et al. (1998a)	1.25E-01	1.55E-05	Sample et al. (1998b)[i]

Table H1-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Main Plant Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	0.544	-0.996	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H1-2
Screening-Level Exposure Evaluation - American Woodcock
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.88E+00	0.00E+00	2.88E+00	1.10E+02	<1	1.10E+03	<1
Antimony	6.10E-01	7.70E-03	2.91E-04	6.45E-02	0.00E+00	6.48E-02	9.05E-04	5.37E-03	7.11E-02	No TRV	--	No TRV	--
Arsenic	7.60E+00	4.40E-03	3.35E-03	1.07E-01	0.00E+00	1.10E-01	5.17E-04	6.70E-02	1.78E-01	2.24E+00	<1	4.51E+00	<1
Barium	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.18E-01	0.00E+00	3.18E-01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	1.76E-04	--	1.76E-04	No TRV	--	No TRV	--
Cadmium	1.70E+00	3.00E-03	9.76E-03	1.34E+00	0.00E+00	1.34E+00	3.52E-04	1.50E-02	1.36E+00	1.47E+00	<1	6.35E+00	<1
Chromium	8.08E+01	2.72E-02	3.89E-02	2.61E+00	0.00E+00	2.65E+00	3.20E-03	7.12E-01	3.37E+00	2.66E+00	1.27E+00	1.56E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.82E-03	0.00E+00	1.82E-03	7.61E+00	<1	2.02E+01	<1
Copper	3.45E+01	1.83E-01	9.25E-02	1.88E+00	0.00E+00	1.97E+00	2.15E-02	3.04E-01	2.30E+00	4.05E+00	<1	3.48E+01	<1
Lead	5.77E+01	3.52E-02	3.03E-02	2.24E+00	0.00E+00	2.27E+00	4.14E-03	5.08E-01	2.79E+00	1.63E+00	1.71E+00	4.46E+01	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.41E-01	0.00E+00	4.41E-01	1.79E+02	<1	3.77E+02	<1
Mercury	6.90E-02	2.60E-04	1.01E-03	2.87E-02	0.00E+00	2.97E-02	3.05E-05	6.08E-04	3.03E-02	4.50E-01	<1	9.10E-01	<1
Nickel	1.40E+02	5.59E-02	5.13E-02	1.15E+01	0.00E+00	1.16E+01	6.57E-03	1.23E+00	1.28E+01	6.71E+00	1.91E+00	1.86E+01	<1
Selenium	6.60E-01	0.00E+00	3.77E-03	7.23E-02	0.00E+00	7.61E-02	0.00E+00	5.82E-03	8.19E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	1.50E-03	--	--	--	0.00E+00	1.76E-04	--	1.76E-04	2.02E+00	<1	6.05E+01	<1
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.88E-05	0.00E+00	3.88E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	3.16E+01	2.48E-02	1.80E-03	1.40E-01	0.00E+00	1.42E-01	2.91E-03	2.78E-01	4.23E-01	3.44E-01	1.23E+00	1.70E+00	<1
Zinc	1.51E+02	5.37E-01	9.14E-01	4.69E+01	0.00E+00	4.78E+01	6.31E-02	1.33E+00	4.92E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	9.90E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.44E-02	8.72E-03	5.31E-02	4.00E-02	1.33E+00	4.00E-01	<1
Fluoride	5.71E+02	2.24E+01	4.02E-01	7.49E+00	0.00E+00	7.89E+00	2.63E+00	5.03E+00	1.56E+01	1.22E+01	1.27E+00	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.50E+01	0.00E+00	4.45E-06	2.33E+00	0.00E+00	2.33E+00	0.00E+00	1.32E-01	2.46E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	2.20E+01	6.20E-04	4.85E-02	5.63E+00	0.00E+00	5.68E+00	7.28E-05	1.94E-01	5.87E+00				
Fluoranthene	1.70E+02	9.30E-03	9.99E-01	5.46E+01	0.00E+00	5.56E+01	1.09E-03	1.50E+00	5.71E+01				
Fluorene	1.00E+01	8.70E-04	6.29E-06	1.01E+01	0.00E+00	1.01E+01	1.02E-04	8.81E-02	1.02E+01				
Naphthalene	4.00E+00	8.70E-04	5.73E-01	1.86E+00	0.00E+00	2.43E+00	1.02E-04	3.52E-02	2.47E+00				
Phenanthrene	1.20E+02	1.50E-03	1.94E-01	2.18E+01	0.00E+00	2.20E+01	1.76E-04	1.06E+00	2.31E+01				
Total LMW PAHs						9.82E+01	1.55E-03	3.00E+00	1.01E+02	1.61E+01	6.29E+00	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.10E+02	3.00E-03	1.28E-02	1.85E+01	0.00E+00	1.85E+01	3.52E-04	9.69E-01	1.95E+01				
Benzo[A]Pyrene	1.30E+02	0.00E+00	1.72E-01	1.83E+01	0.00E+00	1.85E+01	0.00E+00	1.15E+00	1.96E+01				
Benzo(b)fluoranthene	1.50E+02	1.00E-02	5.46E-01	4.12E+01	0.00E+00	4.18E+01	1.17E-03	1.32E+00	4.31E+01				
Benzo(g,h,i)perylene	9.90E+01	3.90E-03	1.06E+00	3.08E+01	0.00E+00	3.18E+01	4.58E-04	8.72E-01	3.27E+01				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	5.40E-05	--	5.40E-05				
Chrysene	1.30E+02	7.60E-03	1.41E-02	3.15E+01	0.00E+00	3.15E+01	8.93E-04	1.15E+00	3.26E+01				
Dibenz(A,H)Anthracene	2.80E+01	9.80E-05	4.28E-02	6.84E+00	0.00E+00	6.88E+00	1.15E-05	2.47E-01	7.13E+00				
Indeno (1,2,3-CD) Pyrene	1.00E+02	3.10E-03	1.29E-01	3.02E+01	0.00E+00	3.04E+01	3.64E-04	8.81E-01	3.13E+01				
Pyrene	2.20E+02	7.00E-03	1.86E+00	4.07E+01	0.00E+00	4.26E+01	8.22E-04	1.94E+00	4.45E+01				
Total HMW PAHs						2.22E+02	4.13E-03	8.52E+00	2.30E+02	2.00E+00	1.15E+02	2.00E+01	1.15E+01
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	5.80E+00	2.20E-02	1.62E-03	3.34E+01	0.00E+00	3.34E+01	2.58E-03	5.11E-02	3.34E+01	1.10E+00	3.04E+01	1.10E+01	3.04E+00
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	8.50E-02	0.00E+00	8.13E-04	9.27E-02	0.00E+00	9.35E-02	0.00E+00	7.49E-04	9.42E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H1-2
Screening-Level Exposure Evaluation - American Woodcock
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	5.80E-07	0.00E+00	6.41E-10	1.54E-07	0.00E+00	1.54E-07	0.00E+00	5.11E-09	1.60E-07				
1,2,3,7,8-PeCDD	1.53E-06	0.00E+00	9.30E-10	4.84E-07	0.00E+00	4.85E-07	0.00E+00	1.35E-08	4.98E-07				
1,2,3,4,7,8-HxCDD	4.07E-06	0.00E+00	1.35E-09	1.54E-06	0.00E+00	7.70E-08	0.00E+00	1.79E-09	7.88E-08				
1,2,3,6,7,8-HxCDD	1.92E-05	0.00E+00	6.36E-09	9.63E-06	0.00E+00	9.63E-08	0.00E+00	1.69E-09	9.80E-08				
1,2,3,7,8,9-HxCDD	9.54E-06	0.00E+00	3.16E-09	4.21E-06	0.00E+00	4.21E-07	0.00E+00	8.41E-09	4.30E-07				
1,2,3,4,6,7,8-HpCDD	6.04E-04	0.00E+00	1.10E-07	5.67E-04	0.00E+00	5.67E-07	0.00E+00	5.32E-09	5.73E-07				
OCDD	6.76E-03	0.00E+00	6.71E-07	9.85E-03	0.00E+00	9.85E-07	0.00E+00	5.96E-09	9.91E-07				
2,3,7,8-TCDF	6.15E-06	0.00E+00	1.22E-08	2.51E-06	0.00E+00	2.52E-06	0.00E+00	5.42E-08	2.57E-06				
1,2,3,7,8-PeCDF	2.84E-06	0.00E+00	3.08E-09	1.01E-06	0.00E+00	1.01E-07	0.00E+00	2.50E-09	1.03E-07				
2,3,4,7,8-PeCDF	3.65E-06	0.00E+00	3.96E-09	1.35E-06	0.00E+00	1.36E-06	0.00E+00	3.22E-08	1.39E-06				
1,2,3,4,7,8-HxCDF	5.47E-06	0.00E+00	2.38E-09	2.18E-06	0.00E+00	2.18E-07	0.00E+00	4.82E-09	2.23E-07				
1,2,3,6,7,8-HxCDF	4.00E-06	0.00E+00	1.74E-09	1.51E-06	0.00E+00	1.51E-07	0.00E+00	3.52E-09	1.54E-07				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	2.58E-06	0.00E+00	1.54E-09	8.98E-07	0.00E+00	8.99E-08	0.00E+00	2.27E-09	9.22E-08				
1,2,3,4,6,7,8-HpCDF	6.97E-05	0.00E+00	2.27E-08	4.42E-05	0.00E+00	4.42E-07	0.00E+00	6.14E-09	4.48E-07				
1,2,3,4,7,8,9-HpCDF	4.13E-06	0.00E+00	1.34E-09	1.57E-06	0.00E+00	1.57E-08	0.00E+00	3.64E-10	1.60E-08				
OCDF	1.90E-04	0.00E+00	3.40E-08	1.45E-04	0.00E+00	1.45E-08	0.00E+00	1.67E-10	1.46E-08				
Total Dioxins/Furans						7.69E-06	0.00E+00	1.48E-07	7.84E-06	1.75E-06	4.48E+00	1.75E-05	<1

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

Table H1-3
Screening-Level Exposure Evaluation - Mourning Dove
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.80E+00	0.00E+00	2.80E+00	1.10E+02	<1	1.10E+03	<1
Antimony	6.10E-01	7.70E-03	2.83E-03	0.00E+00	0.00E+00	2.83E-03	8.79E-04	4.73E-03	8.44E-03	No TRV	--	No TRV	--
Arsenic	7.60E+00	4.40E-03	3.25E-02	0.00E+00	0.00E+00	3.25E-02	5.02E-04	5.90E-02	9.20E-02	2.24E+00	<1	4.51E+00	<1
Barium	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.09E-01	0.00E+00	3.09E-01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	1.71E-04	--	1.71E-04	No TRV	--	No TRV	--
Cadmium	1.70E+00	3.00E-03	9.48E-02	0.00E+00	0.00E+00	9.48E-02	3.42E-04	1.32E-02	1.08E-01	1.47E+00	<1	6.35E+00	<1
Chromium	8.08E+01	2.72E-02	3.78E-01	0.00E+00	0.00E+00	3.78E-01	3.10E-03	6.27E-01	1.01E+00	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-03	0.00E+00	1.77E-03	7.61E+00	<1	2.02E+01	<1
Copper	3.45E+01	1.83E-01	8.98E-01	0.00E+00	0.00E+00	8.98E-01	2.09E-02	2.68E-01	1.19E+00	4.05E+00	<1	3.48E+01	<1
Lead	5.77E+01	3.52E-02	2.94E-01	0.00E+00	0.00E+00	2.94E-01	4.02E-03	4.48E-01	7.46E-01	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E-01	0.00E+00	4.28E-01	1.79E+02	<1	3.77E+02	<1
Mercury	6.90E-02	2.60E-04	9.84E-03	0.00E+00	0.00E+00	9.84E-03	2.97E-05	5.36E-04	1.04E-02	4.50E-01	<1	9.10E-01	<1
Nickel	1.40E+02	5.59E-02	4.98E-01	0.00E+00	0.00E+00	4.98E-01	6.38E-03	1.09E+00	1.59E+00	6.71E+00	<1	1.86E+01	<1
Selenium	6.60E-01	0.00E+00	3.67E-02	0.00E+00	0.00E+00	3.67E-02	0.00E+00	5.12E-03	4.18E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	1.50E-03	--	--	--	0.00E+00	1.71E-04	--	1.71E-04	2.02E+00	<1	6.05E+01	<1
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.77E-05	0.00E+00	3.77E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	3.16E+01	2.48E-02	1.75E-02	0.00E+00	0.00E+00	1.75E-02	2.83E-03	2.45E-01	2.66E-01	3.44E-01	<1	1.70E+00	<1
Zinc	1.51E+02	5.37E-01	8.88E+00	0.00E+00	0.00E+00	8.88E+00	6.13E-02	1.17E+00	1.01E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	9.90E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.31E-02	7.68E-03	5.08E-02	4.00E-02	1.27E+00	4.00E-01	<1
Fluoride	5.71E+02	2.24E+01	3.91E+00	0.00E+00	0.00E+00	3.91E+00	2.56E+00	4.43E+00	1.09E+01	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.50E+01	0.00E+00	4.32E-05	0.00E+00	0.00E+00	4.32E-05	0.00E+00	1.16E-01	1.16E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	2.20E+01	6.20E-04	4.71E-01	0.00E+00	0.00E+00	4.71E-01	7.08E-05	1.71E-01	6.42E-01				
Fluoranthene	1.70E+02	9.30E-03	9.70E+00	0.00E+00	0.00E+00	9.70E+00	1.06E-03	1.32E+00	1.10E+01				
Fluorene	1.00E+01	8.70E-04	6.11E-05	0.00E+00	0.00E+00	6.11E-05	9.93E-05	7.76E-02	7.78E-02				
Naphthalene	4.00E+00	8.70E-04	5.57E+00	0.00E+00	0.00E+00	5.57E+00	9.93E-05	3.10E-02	5.60E+00				
Phenanthrene	1.20E+02	1.50E-03	1.88E+00	0.00E+00	0.00E+00	1.88E+00	1.71E-04	9.31E-01	2.81E+00				
Total LMW PAHs						1.76E+01	1.50E-03	2.65E+00	2.03E+01	1.61E+01	1.26E+00	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.10E+02	3.00E-03	1.24E-01	0.00E+00	0.00E+00	1.24E-01	3.42E-04	8.54E-01	9.79E-01				
Benzo[A]Pyrene	1.30E+02	0.00E+00	1.67E+00	0.00E+00	0.00E+00	1.67E+00	0.00E+00	1.01E+00	2.68E+00				
Benzo(b)fluoranthene	1.50E+02	1.00E-02	5.31E+00	0.00E+00	0.00E+00	5.31E+00	1.14E-03	1.16E+00	6.47E+00				
Benzo(g,h,i)perylene	9.90E+01	3.90E-03	1.03E+01	0.00E+00	0.00E+00	1.03E+01	4.45E-04	7.68E-01	1.11E+01				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	5.25E-05	--	5.25E-05				
Chrysene	1.30E+02	7.60E-03	1.37E-01	0.00E+00	0.00E+00	1.37E-01	8.67E-04	1.01E+00	1.15E+00				
Dibenz(A,H)Anthracene	2.80E+01	9.80E-05	4.15E-01	0.00E+00	0.00E+00	4.15E-01	1.12E-05	2.17E-01	6.33E-01				
Indeno (1,2,3-CD) Pyrene	1.00E+02	3.10E-03	1.26E+00	0.00E+00	0.00E+00	1.26E+00	3.54E-04	7.76E-01	2.03E+00				
Pyrene	2.20E+02	7.00E-03	1.81E+01	0.00E+00	0.00E+00	1.81E+01	7.99E-04	1.71E+00	1.98E+01				
Total HMW PAHs						3.73E+01	4.01E-03	7.51E+00	4.48E+01	2.00E+00	2.24E+01	2.00E+01	2.24E+00
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	5.80E+00	2.20E-02	1.58E-02	0.00E+00	0.00E+00	1.58E-02	2.51E-03	4.50E-02	6.33E-02	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	8.50E-02	0.00E+00	7.90E-03	0.00E+00	0.00E+00	7.90E-03	0.00E+00	6.60E-04	8.56E-03	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H1-3
Screening-Level Exposure Evaluation - Mourning Dove
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	5.80E-07	0.00E+00	6.23E-09	0.00E+00	0.00E+00	6.23E-09	0.00E+00	4.50E-09	1.07E-08				
1,2,3,7,8-PeCDD	1.53E-06	0.00E+00	9.04E-09	0.00E+00	0.00E+00	9.04E-09	0.00E+00	1.19E-08	2.09E-08				
1,2,3,4,7,8-HxCDD	4.07E-06	0.00E+00	1.31E-08	0.00E+00	0.00E+00	6.55E-10	0.00E+00	1.58E-09	2.23E-09				
1,2,3,6,7,8-HxCDD	1.92E-05	0.00E+00	6.18E-08	0.00E+00	0.00E+00	6.18E-10	0.00E+00	1.49E-09	2.11E-09				
1,2,3,7,8,9-HxCDD	9.54E-06	0.00E+00	3.07E-08	0.00E+00	0.00E+00	3.07E-09	0.00E+00	7.40E-09	1.05E-08				
1,2,3,4,6,7,8-HpCDD	6.04E-04	0.00E+00	1.07E-06	0.00E+00	0.00E+00	1.07E-09	0.00E+00	4.69E-09	5.76E-09				
OCDD	6.76E-03	0.00E+00	6.52E-06	0.00E+00	0.00E+00	6.52E-10	0.00E+00	5.25E-09	5.90E-09				
2,3,7,8-TCDF	6.15E-06	0.00E+00	1.19E-07	0.00E+00	0.00E+00	1.19E-07	0.00E+00	4.77E-08	1.67E-07				
1,2,3,7,8-PeCDF	2.84E-06	0.00E+00	2.99E-08	0.00E+00	0.00E+00	2.99E-09	0.00E+00	2.20E-09	5.20E-09				
2,3,4,7,8-PeCDF	3.65E-06	0.00E+00	3.85E-08	0.00E+00	0.00E+00	3.85E-08	0.00E+00	2.83E-08	6.68E-08				
1,2,3,4,7,8-HxCDF	5.47E-06	0.00E+00	2.31E-08	0.00E+00	0.00E+00	2.31E-09	0.00E+00	4.25E-09	6.55E-09				
1,2,3,6,7,8-HxCDF	4.00E-06	0.00E+00	1.69E-08	0.00E+00	0.00E+00	1.69E-09	0.00E+00	3.10E-09	4.79E-09				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	2.58E-06	0.00E+00	1.50E-08	0.00E+00	0.00E+00	1.50E-09	0.00E+00	2.00E-09	3.50E-09				
1,2,3,4,6,7,8-HpCDF	6.97E-05	0.00E+00	2.20E-07	0.00E+00	0.00E+00	2.20E-09	0.00E+00	5.41E-09	7.61E-09				
1,2,3,4,7,8,9-HpCDF	4.13E-06	0.00E+00	1.30E-08	0.00E+00	0.00E+00	1.30E-10	0.00E+00	3.21E-10	4.51E-10				
OCDF	1.90E-04	0.00E+00	3.30E-07	0.00E+00	0.00E+00	3.30E-11	0.00E+00	1.47E-10	1.80E-10				
Total Dioxins/Furans						1.90E-07	0.00E+00	1.30E-07	3.20E-07	1.75E-06	<1	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H1-4
Screening-Level Exposure Evaluation - Red-tailed Hawk
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E+00	0.00E+00	2.01E+00	1.10E+02	<1	1.10E+03	<1
Antimony	6.10E-01	7.70E-03	0.00E+00	0.00E+00	2.50E-03	2.50E-03	6.31E-04	1.30E-03	4.43E-03	No TRV	--	No TRV	--
Arsenic	7.60E+00	4.40E-03	0.00E+00	0.00E+00	3.39E-03	3.39E-03	3.61E-04	1.62E-02	2.00E-02	2.24E+00	<1	4.51E+00	<1
Barium	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.22E-01	0.00E+00	2.22E-01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	1.23E-04	--	1.23E-04	No TRV	--	No TRV	--
Cadmium	1.70E+00	3.00E-03	0.00E+00	0.00E+00	3.00E-02	3.00E-02	2.46E-04	3.62E-03	3.38E-02	1.47E+00	<1	6.35E+00	<1
Chromium	8.08E+01	2.72E-02	0.00E+00	0.00E+00	4.78E-01	4.78E-01	2.23E-03	1.72E-01	6.53E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-03	0.00E+00	1.27E-03	7.61E+00	<1	2.02E+01	<1
Copper	3.45E+01	1.83E-01	0.00E+00	0.00E+00	1.05E+00	1.05E+00	1.50E-02	7.36E-02	1.14E+00	4.05E+00	<1	3.48E+01	<1
Lead	5.77E+01	3.52E-02	0.00E+00	0.00E+00	5.32E-01	5.32E-01	2.89E-03	1.23E-01	6.58E-01	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.08E-01	0.00E+00	3.08E-01	1.79E+02	<1	3.77E+02	<1
Mercury	6.90E-02	2.60E-04	0.00E+00	0.00E+00	2.16E-03	2.16E-03	2.13E-05	1.47E-04	2.32E-03	4.50E-01	<1	9.10E-01	<1
Nickel	1.40E+02	5.59E-02	0.00E+00	0.00E+00	6.41E-01	6.41E-01	4.58E-03	2.99E-01	9.44E-01	6.71E+00	<1	1.86E+01	<1
Selenium	6.60E-01	0.00E+00	0.00E+00	0.00E+00	4.63E-02	4.63E-02	0.00E+00	1.41E-03	4.77E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	1.50E-03	--	--	--	0.00E+00	1.23E-04	--	1.23E-04	2.02E+00	<1	6.05E+01	<1
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.71E-05	0.00E+00	2.71E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	3.16E+01	2.48E-02	0.00E+00	0.00E+00	3.19E-02	3.19E-02	2.03E-03	6.74E-02	1.01E-01	3.44E-01	<1	1.70E+00	<1
Zinc	1.51E+02	5.37E-01	0.00E+00	0.00E+00	9.18E+00	9.18E+00	4.40E-02	3.22E-01	9.54E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	9.90E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.10E-02	2.11E-03	3.31E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	5.71E+02	2.24E+01	0.00E+00	0.00E+00	7.49E-01	7.49E-01	1.84E+00	1.22E+00	3.80E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.50E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.20E-02	3.20E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	2.20E+01	6.20E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.08E-05	4.69E-02	4.70E-02				
Fluoranthene	1.70E+02	9.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.63E-04	3.62E-01	3.63E-01				
Fluorene	1.00E+01	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.13E-05	2.13E-02	2.14E-02				
Naphthalene	4.00E+00	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.13E-05	8.53E-03	8.60E-03				
Phenanthrene	1.20E+02	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-04	2.56E-01	2.56E-01				
Total LMW PAHs						0.00E+00	1.08E-03	7.27E-01	7.28E-01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.10E+02	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.46E-04	2.35E-01	2.35E-01				
Benzo[A]Pyrene	1.30E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.77E-01	2.77E-01				
Benzo(b)fluoranthene	1.50E+02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.20E-04	3.20E-01	3.21E-01				
Benzo(g,h,i)perylene	9.90E+01	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.20E-04	2.11E-01	2.11E-01				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	3.77E-05	--	3.77E-05				
Chrysene	1.30E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.23E-04	2.77E-01	2.78E-01				
Dibenz(A,H)Anthracene	2.80E+01	9.80E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.04E-06	5.97E-02	5.97E-02				
Indeno (1,2,3-CD) Pyrene	1.00E+02	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.54E-04	2.13E-01	2.13E-01				
Pyrene	2.20E+02	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.74E-04	4.69E-01	4.70E-01				
Total HMW PAHs						0.00E+00	2.88E-03	2.06E+00	2.06E+00	2.00E+00	1.03E+00	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	5.80E+00	2.20E-02	0.00E+00	0.00E+00	3.71E-01	3.71E-01	1.80E-03	1.24E-02	3.85E-01	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	8.50E-02	0.00E+00	0.00E+00	0.00E+00	3.13E-03	3.13E-03	0.00E+00	1.81E-04	3.31E-03	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H1-4
Screening-Level Exposure Evaluation - Red-tailed Hawk
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	5.80E-07	0.00E+00	0.00E+00	0.00E+00	2.57E-08	2.57E-08	0.00E+00	1.24E-09	2.70E-08				
1,2,3,7,8-PeCDD	1.53E-06	0.00E+00	0.00E+00	0.00E+00	7.47E-08	7.47E-08	0.00E+00	3.26E-09	7.80E-08				
1,2,3,4,7,8-HxCDD	4.07E-06	0.00E+00	0.00E+00	0.00E+00	2.19E-07	1.10E-08	0.00E+00	4.34E-10	1.14E-08				
1,2,3,6,7,8-HxCDD	1.92E-05	0.00E+00	0.00E+00	0.00E+00	1.21E-06	1.21E-08	0.00E+00	4.09E-10	1.25E-08				
1,2,3,7,8,9-HxCDD	9.54E-06	0.00E+00	0.00E+00	0.00E+00	5.59E-07	5.59E-08	0.00E+00	2.03E-09	5.79E-08				
1,2,3,4,6,7,8-HpCDD	6.04E-04	0.00E+00	0.00E+00	0.00E+00	5.34E-05	5.34E-08	0.00E+00	1.29E-09	5.47E-08				
OCDD	6.76E-03	0.00E+00	0.00E+00	0.00E+00	7.60E-04	7.60E-08	0.00E+00	1.44E-09	7.74E-08				
2,3,7,8-TCDF	6.15E-06	0.00E+00	0.00E+00	0.00E+00	6.31E-08	6.31E-08	0.00E+00	1.31E-08	7.62E-08				
1,2,3,7,8-PeCDF	2.84E-06	0.00E+00	0.00E+00	0.00E+00	2.91E-08	2.91E-09	0.00E+00	6.06E-10	3.52E-09				
2,3,4,7,8-PeCDF	3.65E-06	0.00E+00	0.00E+00	0.00E+00	3.74E-08	3.74E-08	0.00E+00	7.78E-09	4.52E-08				
1,2,3,4,7,8-HxCDF	5.47E-06	0.00E+00	0.00E+00	0.00E+00	5.61E-08	5.61E-09	0.00E+00	1.17E-09	6.78E-09				
1,2,3,6,7,8-HxCDF	4.00E-06	0.00E+00	0.00E+00	0.00E+00	4.10E-08	4.10E-09	0.00E+00	8.53E-10	4.96E-09				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	2.58E-06	0.00E+00	0.00E+00	0.00E+00	2.65E-08	2.65E-09	0.00E+00	5.50E-10	3.20E-09				
1,2,3,4,6,7,8-HpCDF	6.97E-05	0.00E+00	0.00E+00	0.00E+00	7.15E-07	7.15E-09	0.00E+00	1.49E-09	8.64E-09				
1,2,3,4,7,8,9-HpCDF	4.13E-06	0.00E+00	0.00E+00	0.00E+00	4.24E-08	4.24E-10	0.00E+00	8.81E-11	5.12E-10				
OCDF	1.90E-04	0.00E+00	0.00E+00	0.00E+00	1.95E-06	1.95E-10	0.00E+00	4.05E-11	2.35E-10				
Total Dioxins/Furans						4.32E-07	0.00E+00	3.58E-08	4.68E-07	1.75E-06	<1	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H1-5
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.88E+00	0.00E+00	3.88E+00	1.10E+02	<1	1.10E+03	<1
Antimony	6.10E-01	7.70E-03	0.00E+00	9.66E-02	0.00E+00	9.66E-02	1.22E-03	0.00E+00	9.78E-02	No TRV	--	No TRV	--
Arsenic	7.60E+00	4.40E-03	0.00E+00	1.60E-01	0.00E+00	1.60E-01	6.97E-04	0.00E+00	1.61E-01	2.24E+00	<1	4.51E+00	<1
Barium	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.29E-01	0.00E+00	4.29E-01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	2.37E-04	--	2.37E-04	No TRV	--	No TRV	--
Cadmium	1.70E+00	3.00E-03	0.00E+00	2.00E+00	0.00E+00	2.00E+00	4.75E-04	0.00E+00	2.00E+00	1.47E+00	1.36E+00	6.35E+00	<1
Chromium	8.08E+01	2.72E-02	0.00E+00	3.91E+00	0.00E+00	3.91E+00	4.31E-03	0.00E+00	3.92E+00	2.66E+00	1.47E+00	1.56E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.45E-03	0.00E+00	2.45E-03	7.61E+00	<1	2.02E+01	<1
Copper	3.45E+01	1.83E-01	0.00E+00	2.81E+00	0.00E+00	2.81E+00	2.90E-02	0.00E+00	2.84E+00	4.05E+00	<1	3.48E+01	<1
Lead	5.77E+01	3.52E-02	0.00E+00	3.36E+00	0.00E+00	3.36E+00	5.57E-03	0.00E+00	3.36E+00	1.63E+00	2.06E+00	4.46E+01	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.94E-01	0.00E+00	5.94E-01	1.79E+02	<1	3.77E+02	<1
Mercury	6.90E-02	2.60E-04	0.00E+00	4.29E-02	0.00E+00	4.29E-02	4.12E-05	0.00E+00	4.30E-02	4.50E-01	<1	9.10E-01	<1
Nickel	1.40E+02	5.59E-02	0.00E+00	1.72E+01	0.00E+00	1.72E+01	8.85E-03	0.00E+00	1.73E+01	6.71E+00	2.57E+00	1.86E+01	<1
Selenium	6.60E-01	0.00E+00	0.00E+00	1.08E-01	0.00E+00	1.08E-01	0.00E+00	0.00E+00	1.08E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	1.50E-03	--	--	--	0.00E+00	2.37E-04	--	2.37E-04	2.02E+00	<1	6.05E+01	<1
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.22E-05	0.00E+00	5.22E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	3.16E+01	2.48E-02	0.00E+00	2.10E-01	0.00E+00	2.10E-01	3.93E-03	0.00E+00	2.14E-01	3.44E-01	<1	1.70E+00	<1
Zinc	1.51E+02	5.37E-01	0.00E+00	7.02E+01	0.00E+00	7.02E+01	8.50E-02	0.00E+00	7.03E+01	6.61E+01	1.06E+00	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	9.90E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.98E-02	0.00E+00	5.98E-02	4.00E-02	1.50E+00	4.00E-01	<1
Fluoride	5.71E+02	2.24E+01	0.00E+00	1.12E+01	0.00E+00	1.12E+01	3.55E+00	0.00E+00	1.48E+01	1.22E+01	1.21E+00	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.50E+01	0.00E+00	0.00E+00	3.49E+00	0.00E+00	3.49E+00	0.00E+00	0.00E+00	3.49E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	2.20E+01	6.20E-04	0.00E+00	8.43E+00	0.00E+00	8.43E+00	9.82E-05	0.00E+00	8.43E+00				
Fluoranthene	1.70E+02	9.30E-03	0.00E+00	8.18E+01	0.00E+00	8.18E+01	1.47E-03	0.00E+00	8.18E+01				
Fluorene	1.00E+01	8.70E-04	0.00E+00	1.52E+01	0.00E+00	1.52E+01	1.38E-04	0.00E+00	1.52E+01				
Naphthalene	4.00E+00	8.70E-04	0.00E+00	2.79E+00	0.00E+00	2.79E+00	1.38E-04	0.00E+00	2.79E+00				
Phenanthrene	1.20E+02	1.50E-03	0.00E+00	3.27E+01	0.00E+00	3.27E+01	2.37E-04	0.00E+00	3.27E+01				
Total LMW PAHs						1.44E+02	2.08E-03	0.00E+00	1.44E+02	1.61E+01	8.97E+00	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.10E+02	3.00E-03	0.00E+00	2.77E+01	0.00E+00	2.77E+01	4.75E-04	0.00E+00	2.77E+01				
Benzo[A]Pyrene	1.30E+02	0.00E+00	0.00E+00	2.74E+01	0.00E+00	2.74E+01	0.00E+00	0.00E+00	2.74E+01				
Benzo(b)fluoranthene	1.50E+02	1.00E-02	0.00E+00	6.17E+01	0.00E+00	6.17E+01	1.58E-03	0.00E+00	6.18E+01				
Benzo(g,h,i)perylene	9.90E+01	3.90E-03	0.00E+00	4.61E+01	0.00E+00	4.61E+01	6.17E-04	0.00E+00	4.61E+01				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	7.28E-05	--	7.28E-05				
Chrysene	1.30E+02	7.60E-03	0.00E+00	4.71E+01	0.00E+00	4.71E+01	1.20E-03	0.00E+00	4.71E+01				
Dibenz(A,H)Anthracene	2.80E+01	9.80E-05	0.00E+00	1.02E+01	0.00E+00	1.02E+01	1.55E-05	0.00E+00	1.02E+01				
Indeno (1,2,3-CD) Pyrene	1.00E+02	3.10E-03	0.00E+00	4.53E+01	0.00E+00	4.53E+01	4.91E-04	0.00E+00	4.53E+01				
Pyrene	2.20E+02	7.00E-03	0.00E+00	6.10E+01	0.00E+00	6.10E+01	1.11E-03	0.00E+00	6.10E+01				
Total HMW PAHs						3.27E+02	5.57E-03	0.00E+00	3.27E+02	2.00E+00	1.63E+02	2.00E+01	1.63E+01
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	5.80E+00	2.20E-02	0.00E+00	5.00E+01	0.00E+00	5.00E+01	3.48E-03	0.00E+00	5.00E+01	1.10E+00	4.54E+01	1.10E+01	4.54E+00
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	8.50E-02	0.00E+00	0.00E+00	1.39E-01	0.00E+00	1.39E-01	0.00E+00	0.00E+00	1.39E-01	1.10E-01	1.26E+00	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H1-5
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	5.80E-07	0.00E+00	0.00E+00	2.30E-07	0.00E+00	2.30E-07	0.00E+00	0.00E+00	2.30E-07				
1,2,3,7,8-PeCDD	1.53E-06	0.00E+00	0.00E+00	7.25E-07	0.00E+00	7.25E-07	0.00E+00	0.00E+00	7.25E-07				
1,2,3,4,7,8-HxCDD	4.07E-06	0.00E+00	0.00E+00	2.30E-06	0.00E+00	1.15E-07	0.00E+00	0.00E+00	1.15E-07				
1,2,3,6,7,8-HxCDD	1.92E-05	0.00E+00	0.00E+00	1.44E-05	0.00E+00	1.44E-07	0.00E+00	0.00E+00	1.44E-07				
1,2,3,7,8,9-HxCDD	9.54E-06	0.00E+00	0.00E+00	6.31E-06	0.00E+00	6.31E-07	0.00E+00	0.00E+00	6.31E-07				
1,2,3,4,6,7,8-HpCDD	6.04E-04	0.00E+00	0.00E+00	8.49E-04	0.00E+00	8.49E-07	0.00E+00	0.00E+00	8.49E-07				
OCDD	6.76E-03	0.00E+00	0.00E+00	1.48E-02	0.00E+00	1.48E-06	0.00E+00	0.00E+00	1.48E-06				
2,3,7,8-TCDF	6.15E-06	0.00E+00	0.00E+00	3.75E-06	0.00E+00	3.75E-06	0.00E+00	0.00E+00	3.75E-06				
1,2,3,7,8-PeCDF	2.84E-06	0.00E+00	0.00E+00	1.51E-06	0.00E+00	1.51E-07	0.00E+00	0.00E+00	1.51E-07				
2,3,4,7,8-PeCDF	3.65E-06	0.00E+00	0.00E+00	2.03E-06	0.00E+00	2.03E-06	0.00E+00	0.00E+00	2.03E-06				
1,2,3,4,7,8-HxCDF	5.47E-06	0.00E+00	0.00E+00	3.27E-06	0.00E+00	3.27E-07	0.00E+00	0.00E+00	3.27E-07				
1,2,3,6,7,8-HxCDF	4.00E-06	0.00E+00	0.00E+00	2.26E-06	0.00E+00	2.26E-07	0.00E+00	0.00E+00	2.26E-07				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	2.58E-06	0.00E+00	0.00E+00	1.34E-06	0.00E+00	1.34E-07	0.00E+00	0.00E+00	1.34E-07				
1,2,3,4,6,7,8-HpCDF	6.97E-05	0.00E+00	0.00E+00	6.62E-05	0.00E+00	6.62E-07	0.00E+00	0.00E+00	6.62E-07				
1,2,3,4,7,8,9-HpCDF	4.13E-06	0.00E+00	0.00E+00	2.34E-06	0.00E+00	2.34E-08	0.00E+00	0.00E+00	2.34E-08				
OCDF	1.90E-04	0.00E+00	0.00E+00	2.16E-04	0.00E+00	2.16E-08	0.00E+00	0.00E+00	2.16E-08				
Total Dioxins/Furans						1.15E-05	0.00E+00	0.00E+00	1.15E-05	1.75E-06	6.57E+00	1.75E-05	<1

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_I	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H1-6
Screening-Level Exposure Evaluation - Canada Lynx
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.65E-01	0.00E+00	7.65E-01	No TRV	--	No TRV	--
Antimony	6.10E-01	7.70E-03	0.00E+00	0.00E+00	9.53E-04	9.53E-04	2.41E-04	5.34E-04	1.73E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	7.60E+00	4.40E-03	0.00E+00	0.00E+00	1.29E-03	1.29E-03	1.37E-04	6.65E-03	8.08E-03	1.04E+00	<1	4.55E+00	<1
Barium	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.47E-02	0.00E+00	8.47E-02	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	4.69E-05	--	4.69E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	1.70E+00	3.00E-03	0.00E+00	0.00E+00	1.14E-02	1.14E-02	9.37E-05	1.49E-03	1.30E-02	7.70E-01	<1	6.87E+00	<1
Chromium	8.08E+01	2.72E-02	0.00E+00	0.00E+00	1.82E-01	1.82E-01	8.50E-04	7.07E-02	2.54E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.84E-04	0.00E+00	4.84E-04	7.33E+00	<1	1.89E+01	<1
Copper	3.45E+01	1.83E-01	0.00E+00	0.00E+00	4.01E-01	4.01E-01	5.72E-03	3.02E-02	4.37E-01	5.60E+00	<1	8.27E+01	<1
Lead	5.77E+01	3.52E-02	0.00E+00	0.00E+00	2.03E-01	2.03E-01	1.10E-03	5.05E-02	2.54E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-01	0.00E+00	1.17E-01	5.15E+01	<1	1.46E+02	<1
Mercury	6.90E-02	2.60E-04	0.00E+00	0.00E+00	8.21E-04	8.21E-04	8.12E-06	6.04E-05	8.90E-04	1.41E+00	<1	1.41E+01	<1
Nickel	1.40E+02	5.59E-02	0.00E+00	0.00E+00	2.44E-01	2.44E-01	1.75E-03	1.22E-01	3.68E-01	1.70E+00	<1	1.48E+01	<1
Selenium	6.60E-01	0.00E+00	0.00E+00	0.00E+00	1.76E-02	1.76E-02	0.00E+00	5.77E-04	1.82E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	1.50E-03	--	--	--	0.00E+00	4.69E-05	--	4.69E-05	6.02E+00	<1	1.19E+02	<1
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-05	0.00E+00	1.03E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	3.16E+01	2.48E-02	0.00E+00	0.00E+00	1.21E-02	1.21E-02	7.75E-04	2.76E-02	4.06E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.51E+02	5.37E-01	0.00E+00	0.00E+00	3.50E+00	3.50E+00	1.68E-02	1.32E-01	3.64E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	9.90E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-02	8.66E-04	1.27E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	5.71E+02	2.24E+01	0.00E+00	0.00E+00	2.85E-01	2.85E-01	7.00E-01	5.00E-01	1.48E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.50E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.31E-02	1.31E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	2.20E+01	6.20E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-05	1.92E-02	1.93E-02				
Fluoranthene	1.70E+02	9.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.91E-04	1.49E-01	1.49E-01				
Fluorene	1.00E+01	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.72E-05	8.75E-03	8.78E-03				
Naphthalene	4.00E+00	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.72E-05	3.50E-03	3.53E-03				
Phenanthrene	1.20E+02	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.69E-05	1.05E-01	1.05E-01				
Total LMW PAHs						0.00E+00	4.11E-04	2.98E-01	2.99E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.10E+02	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.37E-05	9.62E-02	9.63E-02				
Benzo[A]Pyrene	1.30E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-01	1.14E-01				
Benzo(b)fluoranthene	1.50E+02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.12E-04	1.31E-01	1.32E-01				
Benzo(g,h,i)perylene	9.90E+01	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-04	8.66E-02	8.67E-02				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	1.44E-05	--	1.44E-05				
Chrysene	1.30E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.37E-04	1.14E-01	1.14E-01				
Dibenz(A,H)Anthracene	2.80E+01	9.80E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.06E-06	2.45E-02	2.45E-02				
Indeno (1,2,3-CD) Pyrene	1.00E+02	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.69E-05	8.75E-02	8.76E-02				
Pyrene	2.20E+02	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-04	1.92E-01	1.93E-01				
Total HMW PAHs						0.00E+00	1.10E-03	8.46E-01	8.47E-01	6.15E-01	1.38E+00	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	5.80E+00	2.20E-02	0.00E+00	0.00E+00	1.41E-01	1.41E-01	6.87E-04	5.07E-03	1.47E-01	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	8.50E-02	0.00E+00	0.00E+00	0.00E+00	1.19E-03	1.19E-03	0.00E+00	7.44E-05	1.27E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H1-6
Screening-Level Exposure Evaluation - Canada Lynx
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	5.80E-07	0.00E+00	0.00E+00	0.00E+00	9.80E-09	9.80E-09	0.00E+00	5.07E-10	1.03E-08				
1,2,3,7,8-PeCDD	1.53E-06	0.00E+00	0.00E+00	0.00E+00	2.85E-08	2.85E-08	0.00E+00	1.34E-09	2.98E-08				
1,2,3,4,7,8-HxCDD	4.07E-06	0.00E+00	0.00E+00	0.00E+00	8.35E-08	8.35E-09	0.00E+00	3.56E-10	8.70E-09				
1,2,3,6,7,8-HxCDD	1.92E-05	0.00E+00	0.00E+00	0.00E+00	4.59E-07	4.59E-08	0.00E+00	1.68E-09	4.76E-08				
1,2,3,7,8,9-HxCDD	9.54E-06	0.00E+00	0.00E+00	0.00E+00	2.13E-07	2.13E-08	0.00E+00	8.35E-10	2.21E-08				
1,2,3,4,6,7,8-HpCDD	6.04E-04	0.00E+00	0.00E+00	0.00E+00	2.03E-05	2.03E-07	0.00E+00	5.28E-09	2.09E-07				
OCDD	6.76E-03	0.00E+00	0.00E+00	0.00E+00	2.89E-04	8.68E-08	0.00E+00	1.77E-09	8.86E-08				
2,3,7,8-TCDF	6.15E-06	0.00E+00	0.00E+00	0.00E+00	2.40E-08	2.40E-09	0.00E+00	5.38E-10	2.94E-09				
1,2,3,7,8-PeCDF	2.84E-06	0.00E+00	0.00E+00	0.00E+00	1.11E-08	3.33E-10	0.00E+00	7.45E-11	4.08E-10				
2,3,4,7,8-PeCDF	3.65E-06	0.00E+00	0.00E+00	0.00E+00	1.43E-08	4.28E-09	0.00E+00	9.58E-10	5.24E-09				
1,2,3,4,7,8-HxCDF	5.47E-06	0.00E+00	0.00E+00	0.00E+00	2.14E-08	2.14E-09	0.00E+00	4.79E-10	2.62E-09				
1,2,3,6,7,8-HxCDF	4.00E-06	0.00E+00	0.00E+00	0.00E+00	1.56E-08	1.56E-09	0.00E+00	3.50E-10	1.91E-09				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	2.58E-06	0.00E+00	0.00E+00	0.00E+00	1.01E-08	1.01E-09	0.00E+00	2.26E-10	1.23E-09				
1,2,3,4,6,7,8-HpCDF	6.97E-05	0.00E+00	0.00E+00	0.00E+00	2.72E-07	2.72E-09	0.00E+00	6.10E-10	3.33E-09				
1,2,3,4,7,8,9-HpCDF	4.13E-06	0.00E+00	0.00E+00	0.00E+00	1.61E-08	1.61E-10	0.00E+00	3.61E-11	1.98E-10				
OCDF	1.90E-04	0.00E+00	0.00E+00	0.00E+00	7.43E-07	2.23E-10	0.00E+00	4.99E-11	2.73E-10				
Total Dioxins/Furans						4.19E-07	0.00E+00	1.51E-08	4.34E-07	5.62E-07	<1	3.76E-06	<1

Notes:
signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:
ADD_{diet} = Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet} = Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF = Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$ = COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i = Dietary fraction of food item i (proportion of food type in the diet)
AUF = Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW = Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$ = Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_S = Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$ = COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H1-7
Screening-Level Exposure Evaluation - Grizzly Bear
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)										
			Diet					Water	Substrate				
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.29E-01	0.00E+00	5.29E-01	No TRV	--	No TRV	--
Antimony	6.10E-01	7.70E-03	3.48E-04	1.98E-03	6.59E-05	0.00E+00	2.39E-03	1.66E-04	3.69E-04	2.56E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	7.60E+00	4.40E-03	4.00E-03	3.27E-03	8.92E-05	0.00E+00	7.37E-03	9.50E-05	4.60E-03	7.46E-03	1.04E+00	<1	4.55E+00	<1
Barium	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.85E-02	0.00E+00	5.85E-02	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	0.00E+00	3.24E-05	--	3.24E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	1.70E+00	3.00E-03	1.17E-02	4.09E-02	7.89E-04	0.00E+00	5.34E-02	6.48E-05	1.03E-03	5.34E-02	7.70E-01	<1	6.87E+00	<1
Chromium	8.08E+01	2.72E-02	4.65E-02	8.01E-02	1.26E-02	0.00E+00	1.39E-01	5.87E-04	4.89E-02	1.40E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-04	0.00E+00	3.35E-04	7.33E+00	<1	1.89E+01	<1
Copper	3.45E+01	1.83E-01	1.10E-01	5.76E-02	2.77E-02	0.00E+00	1.96E-01	3.95E-03	2.09E-02	2.00E-01	5.60E+00	<1	8.27E+01	<1
Lead	5.77E+01	3.52E-02	3.62E-02	6.87E-02	1.40E-02	0.00E+00	1.19E-01	7.60E-04	3.49E-02	1.20E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.10E-02	0.00E+00	8.10E-02	5.15E+01	<1	1.46E+02	<1
Mercury	6.90E-02	2.60E-04	1.21E-03	8.78E-04	5.68E-05	0.00E+00	2.15E-03	5.61E-06	4.17E-05	2.15E-03	1.41E+00	<1	1.41E+01	<1
Nickel	1.40E+02	5.59E-02	6.13E-02	3.53E-01	1.69E-02	0.00E+00	4.31E-01	1.21E-03	8.47E-02	4.32E-01	1.70E+00	<1	1.48E+01	<1
Selenium	6.60E-01	0.00E+00	4.51E-03	2.22E-03	1.22E-03	0.00E+00	7.94E-03	0.00E+00	3.99E-04	7.94E-03	1.43E-01	<1	6.60E-01	<1
Silver	ND	1.50E-03	--	--	--	0.00E+00	0.00E+00	3.24E-05	--	3.24E-05	6.02E+00	<1	1.19E+02	<1
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.13E-06	0.00E+00	7.13E-06	4.80E-01	<1	1.43E+00	<1
Vanadium	3.16E+01	2.48E-02	2.15E-03	4.30E-03	8.39E-04	0.00E+00	7.29E-03	5.36E-04	1.91E-02	7.83E-03	4.16E+00	<1	9.44E+00	<1
Zinc	1.51E+02	5.37E-01	1.09E+00	1.44E+00	2.42E-01	0.00E+00	2.77E+00	1.16E-02	9.13E-02	2.78E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	9.90E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.16E-03	5.99E-04	8.16E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	5.71E+02	2.24E+01	4.81E-01	2.29E-01	1.97E-02	0.00E+00	7.30E-01	4.84E-01	3.45E-01	1.21E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	1.50E+01	0.00E+00	5.31E-06	7.14E-02	0.00E+00	0.00E+00	7.14E-02	0.00E+00	9.07E-03	7.14E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	2.20E+01	6.20E-04	5.79E-02	1.72E-01	0.00E+00	0.00E+00	2.30E-01	1.34E-05	1.33E-02	2.30E-01				
Fluoranthene	1.70E+02	9.30E-03	1.19E+00	1.67E+00	0.00E+00	0.00E+00	2.87E+00	2.01E-04	1.03E-01	2.87E+00				
Fluorene	1.00E+01	8.70E-04	7.52E-06	3.10E-01	0.00E+00	0.00E+00	3.10E-01	1.88E-05	6.05E-03	3.10E-01				
Naphthalene	4.00E+00	8.70E-04	6.85E-01	5.70E-02	0.00E+00	0.00E+00	7.42E-01	1.88E-05	2.42E-03	7.42E-01				
Phenanthrene	1.20E+02	1.50E-03	2.32E-01	6.69E-01	0.00E+00	0.00E+00	9.00E-01	3.24E-05	7.26E-02	9.00E-01				
Total LMW PAHs							5.12E+00	2.84E-04	2.06E-01	5.33E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	1.10E+02	3.00E-03	1.53E-02	5.67E-01	0.00E+00	0.00E+00	5.82E-01	6.48E-05	6.65E-02	5.82E-01				
Benzo[A]Pyrene	1.30E+02	0.00E+00	2.06E-01	5.60E-01	0.00E+00	0.00E+00	7.66E-01	0.00E+00	7.86E-02	7.66E-01				
Benzo(b)fluoranthene	1.50E+02	1.00E-02	6.53E-01	1.26E+00	0.00E+00	0.00E+00	1.92E+00	2.16E-04	9.07E-02	1.92E+00				
Benzo(g,h,i)perylene	9.90E+01	3.90E-03	1.27E+00	9.43E-01	0.00E+00	0.00E+00	2.21E+00	8.42E-05	5.99E-02	2.21E+00				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	0.00E+00	9.93E-06	--	9.93E-06				
Chrysene	1.30E+02	7.60E-03	1.69E-02	9.64E-01	0.00E+00	0.00E+00	9.81E-01	1.64E-04	7.86E-02	9.81E-01				
Dibenz(A,H)Anthracene	2.80E+01	9.80E-05	5.11E-02	2.10E-01	0.00E+00	0.00E+00	2.61E-01	2.12E-06	1.69E-02	2.61E-01				
Indeno (1,2,3-CD) Pyrene	1.00E+02	3.10E-03	1.54E-01	9.26E-01	0.00E+00	0.00E+00	1.08E+00	6.69E-05	6.05E-02	1.08E+00				
Pyrene	2.20E+02	7.00E-03	2.22E+00	1.25E+00	0.00E+00	0.00E+00	3.47E+00	1.51E-04	1.33E-01	3.47E+00				
Total HMW PAHs							1.13E+01	7.59E-04	5.85E-01	1.19E+01	6.15E-01	1.93E+01	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	5.80E+00	2.20E-02	1.94E-03	1.02E+00	9.76E-03	0.00E+00	1.03E+00	4.75E-04	3.51E-03	1.03E+00	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	8.50E-02	0.00E+00	9.71E-04	2.84E-03	8.24E-05	0.00E+00	3.89E-03	0.00E+00	5.14E-05	3.89E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H1-7
Screening-Level Exposure Evaluation - Grizzly Bear
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	5.80E-07	0.00E+00	7.66E-10	4.71E-09	6.77E-10	0.00E+00	6.16E-09	0.00E+00	3.51E-10	6.16E-09				
1,2,3,7,8-PeCDD	1.53E-06	0.00E+00	1.11E-09	1.48E-08	1.97E-09	0.00E+00	1.79E-08	0.00E+00	9.25E-10	1.79E-08				
1,2,3,4,7,8-HxCDD	4.07E-06	0.00E+00	1.61E-09	4.71E-08	5.77E-09	0.00E+00	5.45E-09	0.00E+00	2.46E-10	5.45E-09				
1,2,3,6,7,8-HxCDD	1.92E-05	0.00E+00	7.60E-09	2.95E-07	3.17E-08	0.00E+00	3.34E-08	0.00E+00	1.16E-09	3.34E-08				
1,2,3,7,8,9-HxCDD	9.54E-06	0.00E+00	3.78E-09	1.29E-07	1.47E-08	0.00E+00	1.48E-08	0.00E+00	5.77E-10	1.48E-08				
1,2,3,4,6,7,8-HpCDD	6.04E-04	0.00E+00	1.31E-07	1.74E-05	1.41E-06	0.00E+00	1.89E-07	0.00E+00	3.65E-09	1.89E-07				
OCDD	6.76E-03	0.00E+00	8.02E-07	3.02E-04	2.00E-05	0.00E+00	9.68E-08	0.00E+00	1.23E-09	9.68E-08				
2,3,7,8-TCDF	6.15E-06	0.00E+00	1.46E-08	7.68E-08	1.66E-09	0.00E+00	9.31E-09	0.00E+00	3.72E-10	9.31E-09				
1,2,3,7,8-PeCDF	2.84E-06	0.00E+00	3.68E-09	3.08E-08	7.67E-10	0.00E+00	1.06E-09	0.00E+00	5.15E-11	1.06E-09				
2,3,4,7,8-PeCDF	3.65E-06	0.00E+00	4.73E-09	4.14E-08	9.86E-10	0.00E+00	1.41E-08	0.00E+00	6.62E-10	1.41E-08				
1,2,3,4,7,8-HxCDF	5.47E-06	0.00E+00	2.84E-09	6.69E-08	1.48E-09	0.00E+00	7.12E-09	0.00E+00	3.31E-10	7.12E-09				
1,2,3,6,7,8-HxCDF	4.00E-06	0.00E+00	2.08E-09	4.62E-08	1.08E-09	0.00E+00	4.93E-09	0.00E+00	2.42E-10	4.93E-09				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	2.58E-06	0.00E+00	1.84E-09	2.75E-08	6.97E-10	0.00E+00	3.00E-09	0.00E+00	1.56E-10	3.00E-09				
1,2,3,4,6,7,8-HpCDF	6.97E-05	0.00E+00	2.71E-08	1.35E-06	1.88E-08	0.00E+00	1.40E-08	0.00E+00	4.21E-10	1.40E-08				
1,2,3,4,7,8,9-HpCDF	4.13E-06	0.00E+00	1.60E-09	4.80E-08	1.12E-09	0.00E+00	5.07E-10	0.00E+00	2.50E-11	5.07E-10				
OCDF	1.90E-04	0.00E+00	4.06E-08	4.43E-06	5.13E-08	0.00E+00	1.36E-09	0.00E+00	3.45E-11	1.36E-09				
Total Dioxins/Furans						0.00E+00	4.19E-07	0.00E+00	1.04E-08	4.30E-07	5.62E-07	<1	3.76E-06	<1

Notes:

[redacted] signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H1-8
Screening-Level Exposure Evaluation - Long-tailed Weasel
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E+00	0.00E+00	1.26E+00	No TRV	--	No TRV	--
Antimony	4.20E-01	7.70E-03	0.00E+00	0.00E+00	1.08E-03	1.08E-03	3.96E-04	3.46E-04	1.82E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	8.10E+00	4.40E-03	0.00E+00	0.00E+00	2.24E-03	2.24E-03	2.26E-04	6.67E-03	9.14E-03	1.04E+00	<1	4.55E+00	<1
Barium	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E-01	0.00E+00	1.39E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	7.72E-05	--	7.72E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	8.75E-01	3.00E-03	0.00E+00	0.00E+00	1.37E-02	1.37E-02	1.54E-04	7.20E-04	1.46E-02	7.70E-01	<1	6.87E+00	<1
Chromium	3.53E+01	2.72E-02	0.00E+00	0.00E+00	1.63E-01	1.63E-01	1.40E-03	2.90E-02	1.94E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.98E-04	0.00E+00	7.98E-04	7.33E+00	<1	1.89E+01	<1
Copper	4.51E+01	1.83E-01	0.00E+00	0.00E+00	6.87E-01	6.87E-01	9.42E-03	3.71E-02	7.34E-01	5.60E+00	<1	8.27E+01	<1
Lead	3.82E+01	3.52E-02	0.00E+00	0.00E+00	2.78E-01	2.78E-01	1.81E-03	3.14E-02	3.11E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.93E-01	0.00E+00	1.93E-01	5.15E+01	<1	1.46E+02	<1
Mercury	2.20E-01	2.60E-04	0.00E+00	0.00E+00	4.31E-03	4.31E-03	1.34E-05	1.81E-04	4.50E-03	1.41E+00	<1	1.41E+01	<1
Nickel	9.27E+01	5.59E-02	0.00E+00	0.00E+00	3.32E-01	3.32E-01	2.88E-03	7.63E-02	4.11E-01	1.70E+00	<1	1.48E+01	<1
Selenium	5.70E-01	0.00E+00	0.00E+00	0.00E+00	2.75E-02	2.75E-02	0.00E+00	4.69E-04	2.79E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	1.50E-03	--	--	--	0.00E+00	7.72E-05	--	7.72E-05	6.02E+00	<1	1.19E+02	<1
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E-05	0.00E+00	1.70E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	2.88E+01	2.48E-02	0.00E+00	0.00E+00	1.82E-02	1.82E-02	1.28E-03	2.37E-02	4.32E-02	4.16E+00	<1	9.44E+00	<1
Zinc	2.04E+02	5.37E-01	0.00E+00	0.00E+00	5.88E+00	5.88E+00	2.76E-02	1.68E-01	6.08E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.40E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.95E-02	1.98E-03	2.14E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	4.18E+02	2.24E+01	0.00E+00	0.00E+00	3.44E-01	3.44E-01	1.15E+00	3.44E-01	1.84E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	5.70E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.69E-03	4.69E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	8.95E+00	6.20E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.19E-05	7.37E-03	7.40E-03				
Fluoranthene	8.40E+01	9.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.79E-04	6.92E-02	6.96E-02				
Fluorene	4.00E+00	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.48E-05	3.29E-03	3.34E-03				
Naphthalene	2.43E+00	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.48E-05	2.00E-03	2.04E-03				
Phenanthrene	5.03E+01	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.72E-05	4.14E-02	4.15E-02				
Total LMW PAHs						0.00E+00	6.77E-04	1.28E-01	1.29E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.18E+01	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-04	3.44E-02	3.45E-02				
Benzo[A]Pyrene	5.05E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.16E-02	4.16E-02				
Benzo(b)fluoranthene	5.70E+01	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E-04	4.69E-02	4.74E-02				
Benzo(g,h,i)perylene	4.20E+01	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E-04	3.46E-02	3.48E-02				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	2.37E-05	--	2.37E-05				
Chrysene	5.18E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.91E-04	4.26E-02	4.30E-02				
Dibenz(A,H)Anthracene	1.00E+01	9.80E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.04E-06	8.23E-03	8.24E-03				
Indeno (1,2,3-CD) Pyrene	4.38E+01	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.60E-04	3.60E-02	3.62E-02				
Pyrene	8.43E+01	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-04	6.94E-02	6.97E-02				
Total HMW PAHs						0.00E+00	1.81E-03	3.14E-01	3.16E-01	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.56E+00	2.20E-02	0.00E+00	0.00E+00	6.23E-02	6.23E-02	1.13E-03	1.28E-03	6.48E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.63E-01	0.00E+00	0.00E+00	0.00E+00	3.75E-03	3.75E-03	0.00E+00	1.34E-04	3.89E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H1-8
Screening-Level Exposure Evaluation - Long-tailed Weasel
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.58E-07	0.00E+00	0.00E+00	0.00E+00	3.86E-09	3.86E-09	0.00E+00	1.30E-10	3.99E-09				
1,2,3,7,8-PeCDD	9.30E-07	0.00E+00	0.00E+00	0.00E+00	2.71E-08	2.71E-08	0.00E+00	7.66E-10	2.79E-08				
1,2,3,4,7,8-HxCDD	2.40E-06	0.00E+00	0.00E+00	0.00E+00	7.69E-08	7.69E-09	0.00E+00	1.98E-10	7.89E-09				
1,2,3,6,7,8-HxCDD	1.07E-05	0.00E+00	0.00E+00	0.00E+00	3.98E-07	3.98E-08	0.00E+00	8.81E-10	4.07E-08				
1,2,3,7,8,9-HxCDD	5.99E-06	0.00E+00	0.00E+00	0.00E+00	2.10E-07	2.10E-08	0.00E+00	4.93E-10	2.15E-08				
1,2,3,4,6,7,8-HpCDD	3.36E-04	0.00E+00	0.00E+00	0.00E+00	1.76E-05	1.76E-07	0.00E+00	2.77E-09	1.79E-07				
OCDD	3.83E-03	0.00E+00	0.00E+00	0.00E+00	2.55E-04	7.65E-08	0.00E+00	9.45E-10	7.75E-08				
2,3,7,8-TCDF	2.69E-06	0.00E+00	0.00E+00	0.00E+00	1.73E-08	1.73E-09	0.00E+00	2.21E-10	1.95E-09				
1,2,3,7,8-PeCDF	1.58E-06	0.00E+00	0.00E+00	0.00E+00	1.02E-08	3.05E-10	0.00E+00	3.90E-11	3.44E-10				
2,3,4,7,8-PeCDF	1.92E-06	0.00E+00	0.00E+00	0.00E+00	1.24E-08	3.71E-09	0.00E+00	4.74E-10	4.18E-09				
1,2,3,4,7,8-HxCDF	7.23E-06	0.00E+00	0.00E+00	0.00E+00	4.65E-08	4.65E-09	0.00E+00	5.95E-10	5.25E-09				
1,2,3,6,7,8-HxCDF	2.16E-06	0.00E+00	0.00E+00	0.00E+00	1.39E-08	1.39E-09	0.00E+00	1.78E-10	1.57E-09				
2,3,4,6,7,8-HxCDF	1.05E-07	0.00E+00	0.00E+00	0.00E+00	6.76E-10	6.76E-11	0.00E+00	8.65E-12	7.62E-11				
1,2,3,7,8,9-HxCDF	3.44E-06	0.00E+00	0.00E+00	0.00E+00	2.21E-08	2.21E-09	0.00E+00	2.83E-10	2.50E-09				
1,2,3,4,6,7,8-HpCDF	4.98E-05	0.00E+00	0.00E+00	0.00E+00	3.21E-07	3.21E-09	0.00E+00	4.10E-10	3.62E-09				
1,2,3,4,7,8,9-HpCDF	2.62E-06	0.00E+00	0.00E+00	0.00E+00	1.69E-08	1.69E-10	0.00E+00	2.16E-11	1.90E-10				
OCDF	1.24E-04	0.00E+00	0.00E+00	0.00E+00	7.98E-07	2.39E-10	0.00E+00	3.06E-11	2.70E-10				
Total Dioxins/Furans						3.70E-07	0.00E+00	8.44E-09	3.78E-07	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H1-9
Screening-Level Exposure Evaluation - Meadow Vole
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.68E+00	0.00E+00	3.68E+00	No TRV	--	No TRV	--
Antimony	4.20E-01	7.70E-03	2.63E-03	0.00E+00	0.00E+00	2.63E-03	1.16E-03	8.20E-04	4.60E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	8.10E+00	4.40E-03	4.57E-02	0.00E+00	0.00E+00	4.57E-02	6.61E-04	1.58E-02	6.21E-02	1.04E+00	<1	4.55E+00	<1
Barium	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.07E-01	0.00E+00	4.07E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	2.25E-04	--	2.25E-04	5.32E-01	<1	6.70E-01	<1
Cadmium	8.75E-01	3.00E-03	8.69E-02	0.00E+00	0.00E+00	8.69E-02	4.51E-04	1.71E-03	8.90E-02	7.70E-01	<1	6.87E+00	<1
Chromium	3.53E+01	2.72E-02	2.17E-01	0.00E+00	0.00E+00	2.17E-01	4.09E-03	6.88E-02	2.90E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.33E-03	0.00E+00	2.33E-03	7.33E+00	<1	1.89E+01	<1
Copper	4.51E+01	1.83E-01	1.31E+00	0.00E+00	0.00E+00	1.31E+00	2.75E-02	8.81E-02	1.43E+00	5.60E+00	<1	8.27E+01	<1
Lead	3.82E+01	3.52E-02	3.07E-01	0.00E+00	0.00E+00	3.07E-01	5.29E-03	7.45E-02	3.87E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.63E-01	0.00E+00	5.63E-01	5.15E+01	<1	1.46E+02	<1
Mercury	2.20E-01	2.60E-04	2.43E-02	0.00E+00	0.00E+00	2.43E-02	3.91E-05	4.29E-04	2.48E-02	1.41E+00	<1	1.41E+01	<1
Nickel	9.27E+01	5.59E-02	4.82E-01	0.00E+00	0.00E+00	4.82E-01	8.40E-03	1.81E-01	6.71E-01	1.70E+00	<1	1.48E+01	<1
Selenium	5.70E-01	0.00E+00	4.10E-02	0.00E+00	0.00E+00	4.10E-02	0.00E+00	1.11E-03	4.22E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	1.50E-03	--	--	--	0.00E+00	2.25E-04	--	2.25E-04	6.02E+00	<1	1.19E+02	<1
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.96E-05	0.00E+00	4.96E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	2.88E+01	2.48E-02	2.10E-02	0.00E+00	0.00E+00	2.10E-02	3.73E-03	5.62E-02	8.09E-02	4.16E+00	<1	9.44E+00	<1
Zinc	2.04E+02	5.37E-01	1.38E+01	0.00E+00	0.00E+00	1.38E+01	8.07E-02	3.99E-01	1.43E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.40E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.68E-02	4.69E-03	6.15E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	4.18E+02	2.24E+01	3.77E+00	0.00E+00	0.00E+00	3.77E+00	3.37E+00	8.16E-01	7.95E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	5.70E+00	0.00E+00	1.30E-04	0.00E+00	0.00E+00	1.30E-04	0.00E+00	1.11E-02	1.13E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	8.95E+00	6.20E-04	3.08E-01	0.00E+00	0.00E+00	3.08E-01	9.31E-05	1.75E-02	3.25E-01				
Fluoranthene	8.40E+01	9.30E-03	6.31E+00	0.00E+00	0.00E+00	6.31E+00	1.40E-03	1.64E-01	6.48E+00				
Fluorene	4.00E+00	8.70E-04	1.76E-04	0.00E+00	0.00E+00	1.76E-04	1.31E-04	7.81E-03	8.12E-03				
Naphthalene	2.43E+00	8.70E-04	4.44E+00	0.00E+00	0.00E+00	4.44E+00	1.31E-04	4.74E-03	4.45E+00				
Phenanthrene	5.03E+01	1.50E-03	1.44E+00	0.00E+00	0.00E+00	1.44E+00	2.25E-04	9.81E-02	1.54E+00				
Total LMW PAHs						1.25E+01	1.98E-03	3.03E-01	1.28E+01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.18E+01	3.00E-03	9.21E-02	0.00E+00	0.00E+00	9.21E-02	4.51E-04	8.15E-02	1.74E-01				
Benzo[A]Pyrene	5.05E+01	0.00E+00	8.75E-01	0.00E+00	0.00E+00	8.75E-01	0.00E+00	9.86E-02	9.74E-01				
Benzo(b)fluoranthene	5.70E+01	1.00E-02	2.65E+00	0.00E+00	0.00E+00	2.65E+00	1.50E-03	1.11E-01	2.77E+00				
Benzo(g,h,i)perylene	4.20E+01	3.90E-03	4.93E+00	0.00E+00	0.00E+00	4.93E+00	5.86E-04	8.20E-02	5.01E+00				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	6.91E-05	--	6.91E-05				
Chrysene	5.18E+01	7.60E-03	1.05E-01	0.00E+00	0.00E+00	1.05E-01	1.14E-03	1.01E-01	2.07E-01				
Dibenz(A,H)Anthracene	1.00E+01	9.80E-05	1.95E-01	0.00E+00	0.00E+00	1.95E-01	1.47E-05	1.95E-02	2.15E-01				
Indeno (1,2,3-CD) Pyrene	4.38E+01	3.10E-03	7.23E-01	0.00E+00	0.00E+00	7.23E-01	4.66E-04	8.54E-02	8.09E-01				
Pyrene	8.43E+01	7.00E-03	9.11E+00	0.00E+00	0.00E+00	9.11E+00	1.05E-03	1.65E-01	9.28E+00				
Total HMW PAHs						1.87E+01	5.28E-03	7.44E-01	1.94E+01	6.15E-01	3.16E+01	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.56E+00	2.20E-02	5.56E-03	0.00E+00	0.00E+00	5.56E-03	3.31E-03	3.04E-03	1.19E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.63E-01	0.00E+00	1.99E-02	0.00E+00	0.00E+00	1.99E-02	0.00E+00	3.17E-04	2.02E-02	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H1-9
Screening-Level Exposure Evaluation - Meadow Vole
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.58E-07	0.00E+00	2.23E-09	0.00E+00	0.00E+00	2.23E-09	0.00E+00	3.09E-10	2.54E-09				
1,2,3,7,8-PeCDD	9.30E-07	0.00E+00	7.23E-09	0.00E+00	0.00E+00	7.23E-09	0.00E+00	1.82E-09	9.05E-09				
1,2,3,4,7,8-HxCDD	2.40E-06	0.00E+00	1.02E-08	0.00E+00	0.00E+00	1.02E-09	0.00E+00	4.69E-10	1.49E-09				
1,2,3,6,7,8-HxCDD	1.07E-05	0.00E+00	4.53E-08	0.00E+00	0.00E+00	4.53E-09	0.00E+00	2.09E-09	6.62E-09				
1,2,3,7,8,9-HxCDD	5.99E-06	0.00E+00	2.54E-08	0.00E+00	0.00E+00	2.54E-09	0.00E+00	1.17E-09	3.71E-09				
1,2,3,4,6,7,8-HpCDD	3.36E-04	0.00E+00	7.83E-07	0.00E+00	0.00E+00	7.83E-09	0.00E+00	6.56E-09	1.44E-08				
OCDD	3.83E-03	0.00E+00	4.86E-06	0.00E+00	0.00E+00	1.46E-09	0.00E+00	2.24E-09	3.70E-09				
2,3,7,8-TCDF	2.69E-06	0.00E+00	6.85E-08	0.00E+00	0.00E+00	6.85E-09	0.00E+00	5.25E-10	7.38E-09				
1,2,3,7,8-PeCDF	1.58E-06	0.00E+00	2.19E-08	0.00E+00	0.00E+00	6.58E-10	0.00E+00	9.26E-11	7.50E-10				
2,3,4,7,8-PeCDF	1.92E-06	0.00E+00	2.66E-08	0.00E+00	0.00E+00	7.99E-09	0.00E+00	1.12E-09	9.12E-09				
1,2,3,4,7,8-HxCDF	7.23E-06	0.00E+00	4.02E-08	0.00E+00	0.00E+00	4.02E-09	0.00E+00	1.41E-09	5.43E-09				
1,2,3,6,7,8-HxCDF	2.16E-06	0.00E+00	1.20E-08	0.00E+00	0.00E+00	1.20E-09	0.00E+00	4.22E-10	1.62E-09				
2,3,4,6,7,8-HxCDF	1.05E-07	0.00E+00	5.83E-10	0.00E+00	0.00E+00	5.83E-11	0.00E+00	2.05E-11	7.88E-11				
1,2,3,7,8,9-HxCDF	3.44E-06	0.00E+00	2.62E-08	0.00E+00	0.00E+00	2.62E-09	0.00E+00	6.72E-10	3.30E-09				
1,2,3,4,6,7,8-HpCDF	4.98E-05	0.00E+00	2.07E-07	0.00E+00	0.00E+00	2.07E-09	0.00E+00	9.73E-10	3.04E-09				
1,2,3,4,7,8,9-HpCDF	2.62E-06	0.00E+00	1.09E-08	0.00E+00	0.00E+00	1.09E-10	0.00E+00	5.12E-11	1.60E-10				
OCDF	1.24E-04	0.00E+00	2.84E-07	0.00E+00	0.00E+00	8.51E-11	0.00E+00	7.27E-11	1.58E-10				
Total Dioxins/Furans						5.25E-08	0.00E+00	2.00E-08	7.25E-08	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H1-10
Screening-Level Exposure Evaluation - North American Wolverine
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.36E-01	0.00E+00	7.36E-01	No TRV	--	No TRV	--
Antimony	4.20E-01	7.70E-03	0.00E+00	0.00E+00	6.31E-04	6.31E-04	2.31E-04	3.53E-04	1.22E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	8.10E+00	4.40E-03	0.00E+00	0.00E+00	1.31E-03	1.31E-03	1.32E-04	6.81E-03	8.25E-03	1.04E+00	<1	4.55E+00	<1
Barium	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.14E-02	0.00E+00	8.14E-02	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	4.51E-05	--	4.51E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	8.75E-01	3.00E-03	0.00E+00	0.00E+00	8.02E-03	8.02E-03	9.01E-05	7.36E-04	8.85E-03	7.70E-01	<1	6.87E+00	<1
Chromium	3.53E+01	2.72E-02	0.00E+00	0.00E+00	9.53E-02	9.53E-02	8.17E-04	2.97E-02	1.26E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E-04	0.00E+00	4.66E-04	7.33E+00	<1	1.89E+01	<1
Copper	4.51E+01	1.83E-01	0.00E+00	0.00E+00	4.01E-01	4.01E-01	5.50E-03	3.79E-02	4.45E-01	5.60E+00	<1	8.27E+01	<1
Lead	3.82E+01	3.52E-02	0.00E+00	0.00E+00	1.62E-01	1.62E-01	1.06E-03	3.21E-02	1.95E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.13E-01	0.00E+00	1.13E-01	5.15E+01	<1	1.46E+02	<1
Mercury	2.20E-01	2.60E-04	0.00E+00	0.00E+00	2.52E-03	2.52E-03	7.81E-06	1.85E-04	2.71E-03	1.41E+00	<1	1.41E+01	<1
Nickel	9.27E+01	5.59E-02	0.00E+00	0.00E+00	1.94E-01	1.94E-01	1.68E-03	7.80E-02	2.73E-01	1.70E+00	<1	1.48E+01	<1
Selenium	5.70E-01	0.00E+00	0.00E+00	0.00E+00	1.60E-02	1.60E-02	0.00E+00	4.80E-04	1.65E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	1.50E-03	--	--	--	0.00E+00	4.51E-05	--	4.51E-05	6.02E+00	<1	1.19E+02	<1
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.92E-06	0.00E+00	9.92E-06	4.80E-01	<1	1.43E+00	<1
Vanadium	2.88E+01	2.48E-02	0.00E+00	0.00E+00	1.06E-02	1.06E-02	7.45E-04	2.42E-02	3.56E-02	4.16E+00	<1	9.44E+00	<1
Zinc	2.04E+02	5.37E-01	0.00E+00	0.00E+00	3.43E+00	3.43E+00	1.61E-02	1.72E-01	3.62E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.40E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-02	2.02E-03	1.34E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	4.18E+02	2.24E+01	0.00E+00	0.00E+00	2.01E-01	2.01E-01	6.73E-01	3.52E-01	1.23E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	5.70E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-03	4.80E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	8.95E+00	6.20E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.86E-05	7.53E-03	7.55E-03				
Fluoranthene	8.40E+01	9.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.79E-04	7.07E-02	7.09E-02				
Fluorene	4.00E+00	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.61E-05	3.37E-03	3.39E-03				
Naphthalene	2.43E+00	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.61E-05	2.04E-03	2.07E-03				
Phenanthrene	5.03E+01	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.51E-05	4.23E-02	4.23E-02				
Total LMW PAHs						0.00E+00	3.95E-04	1.31E-01	1.31E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.18E+01	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.01E-05	3.51E-02	3.52E-02				
Benzo[A]Pyrene	5.05E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.25E-02	4.25E-02				
Benzo(b)fluoranthene	5.70E+01	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-04	4.80E-02	4.83E-02				
Benzo(g,h,i)perylene	4.20E+01	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-04	3.53E-02	3.55E-02				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	1.38E-05	--	1.38E-05				
Chrysene	5.18E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.28E-04	4.35E-02	4.38E-02				
Dibenz(A,H)Anthracene	1.00E+01	9.80E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.94E-06	8.41E-03	8.42E-03				
Indeno (1,2,3-CD) Pyrene	4.38E+01	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.31E-05	3.68E-02	3.69E-02				
Pyrene	8.43E+01	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-04	7.09E-02	7.11E-02				
Total HMW PAHs						0.00E+00	1.06E-03	3.21E-01	3.22E-01	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.56E+00	2.20E-02	0.00E+00	0.00E+00	3.64E-02	3.64E-02	6.61E-04	1.31E-03	3.84E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.63E-01	0.00E+00	0.00E+00	0.00E+00	2.19E-03	2.19E-03	0.00E+00	1.37E-04	2.33E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H1-10
Screening-Level Exposure Evaluation - North American Wolverine
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.58E-07	0.00E+00	0.00E+00	0.00E+00	2.26E-09	2.26E-09	0.00E+00	1.33E-10	2.39E-09				
1,2,3,7,8-PeCDD	9.30E-07	0.00E+00	0.00E+00	0.00E+00	1.58E-08	1.58E-08	0.00E+00	7.82E-10	1.66E-08				
1,2,3,4,7,8-HxCDD	2.40E-06	0.00E+00	0.00E+00	0.00E+00	4.49E-08	4.49E-09	0.00E+00	2.02E-10	4.69E-09				
1,2,3,6,7,8-HxCDD	1.07E-05	0.00E+00	0.00E+00	0.00E+00	2.32E-07	2.32E-08	0.00E+00	9.00E-10	2.41E-08				
1,2,3,7,8,9-HxCDD	5.99E-06	0.00E+00	0.00E+00	0.00E+00	1.23E-07	1.23E-08	0.00E+00	5.04E-10	1.28E-08				
1,2,3,4,6,7,8-HpCDD	3.36E-04	0.00E+00	0.00E+00	0.00E+00	1.03E-05	1.03E-07	0.00E+00	2.83E-09	1.06E-07				
OCDD	3.83E-03	0.00E+00	0.00E+00	0.00E+00	1.49E-04	4.47E-08	0.00E+00	9.66E-10	4.56E-08				
2,3,7,8-TCDF	2.69E-06	0.00E+00	0.00E+00	0.00E+00	1.01E-08	1.01E-09	0.00E+00	2.26E-10	1.24E-09				
1,2,3,7,8-PeCDF	1.58E-06	0.00E+00	0.00E+00	0.00E+00	5.94E-09	1.78E-10	0.00E+00	3.99E-11	2.18E-10				
2,3,4,7,8-PeCDF	1.92E-06	0.00E+00	0.00E+00	0.00E+00	7.22E-09	2.17E-09	0.00E+00	4.85E-10	2.65E-09				
1,2,3,4,7,8-HxCDF	7.23E-06	0.00E+00	0.00E+00	0.00E+00	2.72E-08	2.72E-09	0.00E+00	6.08E-10	3.33E-09				
1,2,3,6,7,8-HxCDF	2.16E-06	0.00E+00	0.00E+00	0.00E+00	8.12E-09	8.12E-10	0.00E+00	1.82E-10	9.94E-10				
2,3,4,6,7,8-HxCDF	1.05E-07	0.00E+00	0.00E+00	0.00E+00	3.95E-10	3.95E-11	0.00E+00	8.83E-12	4.83E-11				
1,2,3,7,8,9-HxCDF	3.44E-06	0.00E+00	0.00E+00	0.00E+00	1.29E-08	1.29E-09	0.00E+00	2.89E-10	1.58E-09				
1,2,3,4,6,7,8-HpCDF	4.98E-05	0.00E+00	0.00E+00	0.00E+00	1.87E-07	1.87E-09	0.00E+00	4.19E-10	2.29E-09				
1,2,3,4,7,8,9-HpCDF	2.62E-06	0.00E+00	0.00E+00	0.00E+00	9.85E-09	9.85E-11	0.00E+00	2.20E-11	1.21E-10				
OCDF	1.24E-04	0.00E+00	0.00E+00	0.00E+00	4.66E-07	1.40E-10	0.00E+00	3.13E-11	1.71E-10				
Total Dioxins/Furans						2.16E-07	0.00E+00	8.63E-09	2.24E-07	5.62E-07	<1	3.76E-06	<1

Notes:

[redacted] signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H1-11
Screening-Level Exposure Evaluation - Short-tailed Shrew
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.28E+00	0.00E+00	3.28E+00	No TRV	--	No TRV	--
Antimony	4.20E-01	7.70E-03	0.00E+00	5.63E-02	0.00E+00	5.63E-02	1.03E-03	6.19E-04	5.79E-02	5.90E-02	<1	2.76E+00	<1
Arsenic	8.10E+00	4.40E-03	0.00E+00	1.42E-01	0.00E+00	1.42E-01	5.90E-04	1.19E-02	1.54E-01	1.04E+00	<1	4.55E+00	<1
Barium	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.63E-01	0.00E+00	3.63E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	2.01E-04	--	2.01E-04	5.32E-01	<1	6.70E-01	<1
Cadmium	8.75E-01	3.00E-03	0.00E+00	9.98E-01	0.00E+00	9.98E-01	4.02E-04	1.29E-03	1.00E+00	7.70E-01	1.30E+00	6.87E+00	<1
Chromium	3.53E+01	2.72E-02	0.00E+00	1.45E+00	0.00E+00	1.45E+00	3.65E-03	5.20E-02	1.50E+00	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.08E-03	0.00E+00	2.08E-03	7.33E+00	<1	1.89E+01	<1
Copper	4.51E+01	1.83E-01	0.00E+00	3.11E+00	0.00E+00	3.11E+00	2.45E-02	6.65E-02	3.20E+00	5.60E+00	<1	8.27E+01	<1
Lead	3.82E+01	3.52E-02	0.00E+00	2.04E+00	0.00E+00	2.04E+00	4.72E-03	5.62E-02	2.10E+00	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.03E-01	0.00E+00	5.03E-01	5.15E+01	<1	1.46E+02	<1
Mercury	2.20E-01	2.60E-04	0.00E+00	1.16E-01	0.00E+00	1.16E-01	3.48E-05	3.24E-04	1.16E-01	1.41E+00	<1	1.41E+01	<1
Nickel	9.27E+01	5.59E-02	0.00E+00	9.66E+00	0.00E+00	9.66E+00	7.49E-03	1.37E-01	9.80E+00	1.70E+00	5.77E+00	1.48E+01	<1
Selenium	5.70E-01	0.00E+00	0.00E+00	8.23E-02	0.00E+00	8.23E-02	0.00E+00	8.40E-04	8.32E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	1.50E-03	--	--	--	0.00E+00	2.01E-04	--	2.01E-04	6.02E+00	<1	1.19E+02	<1
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.42E-05	0.00E+00	4.42E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	2.88E+01	2.48E-02	0.00E+00	1.62E-01	0.00E+00	1.62E-01	3.32E-03	4.24E-02	2.08E-01	4.16E+00	<1	9.44E+00	<1
Zinc	2.04E+02	5.37E-01	0.00E+00	6.56E+01	0.00E+00	6.56E+01	7.20E-02	3.01E-01	6.60E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.40E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.07E-02	3.54E-03	5.42E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	4.18E+02	2.24E+01	0.00E+00	6.95E+00	0.00E+00	6.95E+00	3.00E+00	6.16E-01	1.06E+01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	5.70E+00	0.00E+00	0.00E+00	1.12E+00	0.00E+00	1.12E+00	0.00E+00	8.40E-03	1.13E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	8.95E+00	6.20E-04	0.00E+00	2.90E+00	0.00E+00	2.90E+00	8.31E-05	1.32E-02	2.92E+00				
Fluoranthene	8.40E+01	9.30E-03	0.00E+00	3.42E+01	0.00E+00	3.42E+01	1.25E-03	1.24E-01	3.43E+01				
Fluorene	4.00E+00	8.70E-04	0.00E+00	5.13E+00	0.00E+00	5.13E+00	1.17E-04	5.90E-03	5.14E+00				
Naphthalene	2.43E+00	8.70E-04	0.00E+00	1.43E+00	0.00E+00	1.43E+00	1.17E-04	3.57E-03	1.43E+00				
Phenanthrene	5.03E+01	1.50E-03	0.00E+00	1.16E+01	0.00E+00	1.16E+01	2.01E-04	7.41E-02	1.17E+01				
Total LMW PAHs						5.64E+01	1.76E-03	2.29E-01	5.66E+01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.18E+01	3.00E-03	0.00E+00	8.90E+00	0.00E+00	8.90E+00	4.02E-04	6.15E-02	8.96E+00				
Benzo[A]Pyrene	5.05E+01	0.00E+00	0.00E+00	9.00E+00	0.00E+00	9.00E+00	0.00E+00	7.44E-02	9.08E+00				
Benzo(b)fluoranthene	5.70E+01	1.00E-02	0.00E+00	1.99E+01	0.00E+00	1.99E+01	1.34E-03	8.40E-02	1.99E+01				
Benzo(g,h,i)perylene	4.20E+01	3.90E-03	0.00E+00	1.65E+01	0.00E+00	1.65E+01	5.23E-04	6.19E-02	1.66E+01				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	6.16E-05	--	6.16E-05				
Chrysene	5.18E+01	7.60E-03	0.00E+00	1.59E+01	0.00E+00	1.59E+01	1.02E-03	7.63E-02	1.60E+01				
Dibenz(A,H)Anthracene	1.00E+01	9.80E-05	0.00E+00	3.10E+00	0.00E+00	3.10E+00	1.31E-05	1.47E-02	3.11E+00				
Indeno (1,2,3-CD) Pyrene	4.38E+01	3.10E-03	0.00E+00	1.68E+01	0.00E+00	1.68E+01	4.15E-04	6.45E-02	1.68E+01				
Pyrene	8.43E+01	7.00E-03	0.00E+00	1.98E+01	0.00E+00	1.98E+01	9.38E-04	1.24E-01	1.99E+01				
Total HMW PAHs						1.10E+02	4.71E-03	5.62E-01	1.10E+02	6.15E-01	1.79E+02	3.84E+01	2.87E+00
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.56E+00	2.20E-02	0.00E+00	1.13E+01	0.00E+00	1.13E+01	2.95E-03	2.29E-03	1.13E+01	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.63E-01	0.00E+00	0.00E+00	2.25E-01	0.00E+00	2.25E-01	0.00E+00	2.40E-04	2.25E-01	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H1-11
Screening-Level Exposure Evaluation - Short-tailed Shrew
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.58E-07	0.00E+00	0.00E+00	4.19E-08	0.00E+00	4.19E-08	0.00E+00	2.33E-10	4.21E-08				
1,2,3,7,8-PeCDD	9.30E-07	0.00E+00	0.00E+00	3.41E-07	0.00E+00	3.41E-07	0.00E+00	1.37E-09	3.42E-07				
1,2,3,4,7,8-HxCDD	2.40E-06	0.00E+00	0.00E+00	1.04E-06	0.00E+00	1.04E-07	0.00E+00	3.54E-10	1.05E-07				
1,2,3,6,7,8-HxCDD	1.07E-05	0.00E+00	0.00E+00	6.11E-06	0.00E+00	6.11E-07	0.00E+00	1.58E-09	6.13E-07				
1,2,3,7,8,9-HxCDD	5.99E-06	0.00E+00	0.00E+00	3.08E-06	0.00E+00	3.08E-07	0.00E+00	8.83E-10	3.09E-07				
1,2,3,4,6,7,8-HpCDD	3.36E-04	0.00E+00	0.00E+00	3.59E-04	0.00E+00	3.59E-06	0.00E+00	4.95E-09	3.60E-06				
OCDD	3.83E-03	0.00E+00	0.00E+00	6.38E-03	0.00E+00	1.91E-06	0.00E+00	1.69E-09	1.91E-06				
2,3,7,8-TCDF	2.69E-06	0.00E+00	0.00E+00	1.20E-06	0.00E+00	1.20E-07	0.00E+00	3.97E-10	1.20E-07				
1,2,3,7,8-PeCDF	1.58E-06	0.00E+00	0.00E+00	6.37E-07	0.00E+00	1.91E-08	0.00E+00	6.99E-11	1.92E-08				
2,3,4,7,8-PeCDF	1.92E-06	0.00E+00	0.00E+00	8.02E-07	0.00E+00	2.41E-07	0.00E+00	8.49E-10	2.42E-07				
1,2,3,4,7,8-HxCDF	7.23E-06	0.00E+00	0.00E+00	3.85E-06	0.00E+00	3.85E-07	0.00E+00	1.07E-09	3.86E-07				
1,2,3,6,7,8-HxCDF	2.16E-06	0.00E+00	0.00E+00	9.22E-07	0.00E+00	9.22E-08	0.00E+00	3.18E-10	9.25E-08				
2,3,4,6,7,8-HxCDF	1.05E-07	0.00E+00	0.00E+00	2.59E-08	0.00E+00	2.59E-09	0.00E+00	1.55E-11	2.60E-09				
1,2,3,7,8,9-HxCDF	3.44E-06	0.00E+00	0.00E+00	1.60E-06	0.00E+00	1.60E-07	0.00E+00	5.07E-10	1.60E-07				
1,2,3,4,6,7,8-HpCDF	4.98E-05	0.00E+00	0.00E+00	3.76E-05	0.00E+00	3.76E-07	0.00E+00	7.34E-10	3.77E-07				
1,2,3,4,7,8,9-HpCDF	2.62E-06	0.00E+00	0.00E+00	1.16E-06	0.00E+00	1.16E-08	0.00E+00	3.86E-11	1.16E-08				
OCDF	1.24E-04	0.00E+00	0.00E+00	1.11E-04	0.00E+00	3.32E-08	0.00E+00	5.48E-11	3.32E-08				
Total Dioxins/Furans						8.35E-06	0.00E+00	1.51E-08	8.37E-06	5.62E-07	1.49E+01	3.76E-06	2.23E+00

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H2-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Central Landfills Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	2.45E+01	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	7.70E-03	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	1.00E+00	0.00E+00	Assumption[c]	5.00E-02	0.00E+00	Baes et al. (1984)[e]
Arsenic	NA	4.40E-03	1.18E+01	3.75E-02	4.43E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.38E+00	Sample et al. (1999)	Regression[f]	5.92E-02	Sample et al. (1998b)
Barium	NA	2.71E+00	4.20E+02	1.56E-01	6.55E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	3.82E+01	Sample et al. (1998a)	6.83E-04	2.87E-01	Baes et al. (1984)[e]
Beryllium	NA	1.50E-03	1.50E+00	Regression[a]	7.88E-01	USEPA (2007)	4.50E-02	6.75E-02	Sample et al. (1998a)	2.25E-03	3.38E-03	Baes et al. (1984)[e]
Cadmium	NA	3.00E-03	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	Regression[d]	0.00E+00	Sample et al. (1999)	Regression[f]	0.00E+00	Sample et al. (1998b)
Chromium	NA	2.72E-02	8.48E+01	4.10E-02	3.48E+00	Bechtel-Jacobs (1998a)[g]	3.06E-01	2.59E+01	Sample et al. (1998a)	Regression[f]	6.04E+00	Sample et al. (1998b)
Cobalt	NA	1.55E-02	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	1.83E-01	7.26E+03	Regression[a]	6.48E+01	Bechtel-Jacobs (1998a)	5.15E-01	3.74E+03	Sample et al. (1998a)	Regression[f]	2.78E+01	Sample et al. (1998b)
Lead	NA	3.52E-02	4.80E+01	Regression[a]	2.33E+00	Bechtel-Jacobs (1998a)	Regression[d]	1.83E+01	Sample et al. (1999)	Regression[f]	5.98E+00	Sample et al. (1998b)
Manganese	NA	3.75E+00	1.14E+03	7.90E-02	9.01E+01	Bechtel-Jacobs (1998a)[g]	Regression[d]	5.41E+01	Sample et al. (1999)	2.05E-02	2.34E+01	Sample et al. (1998b)[i]
Mercury	NA	2.60E-04	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	5.59E-02	8.90E+01	Regression[a]	3.11E+00	Bechtel-Jacobs (1998a)	7.78E-01	6.92E+01	Sample et al. (1998a)	Regression[f]	6.33E+00	Sample et al. (1998b)
Selenium	NA	2.00E-03	1.20E+00	Regression[a]	6.21E-01	Bechtel-Jacobs (1998a)	Regression[d]	1.06E+00	Sample et al. (1998a)	Regression[f]	7.07E-01	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	3.30E-04	1.40E-01	4.00E-03	5.60E-04	Baes et al. (1984)	5.41E-02	7.57E-03	USCHPPM (2004)	1.08E-01	1.51E-02	Baes et al. (1984)[e]
Vanadium	NA	2.48E-02	2.77E+01	4.85E-03	1.34E-01	Bechtel-Jacobs (1998a)[g]	4.20E-02	1.16E+00	Sample et al. (1998a)	1.23E-02	3.41E-01	Sample et al. (1998b)[i]
Zinc	NA	5.37E-01	1.14E+02	Regression[a]	6.66E+01	Bechtel-Jacobs (1998a)	Regression[d]	4.04E+02	Sample et al. (1998a)	Regression[f]	1.10E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	3.78E-01	9.90E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	2.24E+01	7.96E+02	6.00E-02	4.78E+01	Baes et al. (1984)	1.24E-01	9.87E+01	USCHPPM (2004)	1.60E-02	1.27E+01	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	1.20E+00	8.90E-02	1.07E-01	USEPA (2007a)	2.92E+01	3.51E+01	USEPA (2007a)	2.53E-01	3.03E-01	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:		0.00E+00										
Acenaphthene	3.92	0.00E+00	2.20E+01	Regression[a]	2.73E-04	USEPA (2007a)	1.47E+00	3.23E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	6.20E-04	4.70E+01	Regression[a]	7.45E+00	USEPA (2007a)	2.42E+00	1.14E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluoranthene	4.95	9.30E-03	2.40E+02	5.00E-01	1.20E+02	USEPA (2007a)	3.04E+00	7.30E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluorene	4.18	8.70E-04	1.90E+01	Regression[a]	3.09E-04	USEPA (2007a)	9.57E+00	1.82E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Naphthalene	3.36	8.70E-04	4.60E+00	1.22E+01	5.61E+01	USEPA (2007a)	4.40E+00	2.02E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Phenanthrene	4.55	1.50E-03	1.80E+02	Regression[a]	2.12E+01	USEPA (2007a)	1.72E+00	3.10E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
LMW PAHs												
High Molecular Weight (HMW) PAHs:		0.00E+00										
Benzo(a)anthracene	5.7	3.00E-03	1.00E+02	Regression[a]	1.03E+00	USEPA (2007a)	1.59E+00	1.59E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	0.00E+00	1.00E+02	Regression[a]	1.13E+01	USEPA (2007a)	1.33E+00	1.33E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	1.00E-02	1.20E+02	3.10E-01	3.72E+01	USEPA (2007a)	2.60E+00	3.12E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	3.90E-03	6.20E+01	Regression[a]	5.20E+01	USEPA (2007a)	2.94E+00	1.82E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	4.60E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	7.60E-03	1.10E+02	Regression[a]	1.09E+00	USEPA (2007a)	2.29E+00	2.52E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	9.80E-05	2.10E+01	1.30E-01	2.73E+00	USEPA (2007a)	2.31E+00	4.85E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]

Table H2-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Central Landfills Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Indeno (1,2,3-CD) Pyrene	6.58	3.10E-03	7.60E+01	1.10E-01	8.36E+00	USEPA (2007a)	2.86E+00	2.17E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Pyrene	4.88	7.00E-03	1.50E+02	7.20E-01	1.08E+02	USEPA (2007a)	1.75E+00	2.63E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	2.20E-02	2.50E+00	2.38E-02	5.95E-02	USEPA (2007a)	5.44E+01	1.36E+02	USEPA (2007a)	7.79E-01	1.95E+00	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	0.00E+00	6.54E-01	0.00E+00	USEPA (2007a)	1.14E+01	0.00E+00	USEPA (2007a)	1.22E-01	0.00E+00	LANL (2015)
Dibenzofuran	3.71	0.00E+00	1.00E+01	1.88E+00	1.88E+01	USEPA (2007a)	6.96E+00	6.96E+01	USEPA (2007a)	5.60E-02	5.60E-01	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	5.60E-02	8.14E-01	4.56E-02	USEPA (2007a)	1.03E+01	5.78E-01	USEPA (2007a)	4.49E-01	2.51E-02	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	2.70E-07	9.41E-02	2.54E-08	USEPA (2007a)[b]	Regression[d]	5.89E-07	Sample et al. (1998a)	Regression[h]	1.35E-07	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	3.20E-07	5.17E-02	1.66E-08	USEPA (2007a)[b]	Regression[d]	7.20E-07	Sample et al. (1998a)	Regression[h]	1.63E-07	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	2.46E-06	2.82E-02	6.94E-08	USEPA (2007a)[b]	Regression[d]	8.03E-06	Sample et al. (1998a)	Regression[h]	1.54E-06	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	1.14E-06	2.82E-02	3.21E-08	USEPA (2007a)[b]	Regression[d]	3.23E-06	Sample et al. (1998a)	Regression[h]	6.59E-07	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	7.63E-05	1.55E-02	1.18E-06	USEPA (2007a)[b]	Regression[d]	4.65E-04	Sample et al. (1998a)	Regression[h]	6.70E-05	Sample et al. (1998b)
OCDD	9.50	0.00E+00	8.91E-04	8.45E-03	7.53E-06	USEPA (2007a)[b]	Regression[d]	8.49E-03	Sample et al. (1998a)	Regression[h]	9.98E-04	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	1.78E-06	1.69E-01	3.02E-07	USEPA (2007a)[b]	Regression[d]	5.47E-06	Sample et al. (1998a)	1.25E-01	2.23E-07	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	9.50E-07	9.24E-02	8.77E-08	USEPA (2007a)[b]	Regression[d]	2.61E-06	Sample et al. (1998a)	1.25E-01	1.19E-07	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	1.67E-06	3.70E-02	6.17E-08	USEPA (2007a)[b]	Regression[d]	5.08E-06	Sample et al. (1998a)	1.25E-01	2.09E-07	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	7.80E-07	3.70E-02	2.88E-08	USEPA (2007a)[b]	Regression[d]	2.06E-06	Sample et al. (1998a)	1.25E-01	9.76E-08	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	5.70E-07	5.08E-02	2.90E-08	USEPA (2007a)[b]	Regression[d]	1.42E-06	Sample et al. (1998a)	1.25E-01	7.13E-08	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	5.37E-06	2.77E-02	1.49E-07	USEPA (2007a)[b]	Regression[d]	2.02E-05	Sample et al. (1998a)	1.25E-01	6.72E-07	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	1.68E-05	1.52E-02	2.56E-07	USEPA (2007a)[b]	Regression[d]	7.77E-05	Sample et al. (1998a)	1.25E-01	2.10E-06	Sample et al. (1998b)[i]

Table H2-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors- Central Landfills Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	0.544	-0.996	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H2-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Central Landfills Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	2.45E+01	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	7.70E-03	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	1.00E+00	0.00E+00	Assumption[c]	5.00E-02	0.00E+00	Baes et al. (1984)[e]
Arsenic	NA	4.40E-03	1.45E+01	3.75E-02	5.45E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.60E+00	Sample et al. (1999)	Regression[f]	7.02E-02	Sample et al. (1998b)
Barium	NA	2.71E+00	4.31E+02	1.56E-01	6.72E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	3.92E+01	Sample et al. (1998a)	6.83E-04	2.94E-01	Baes et al. (1984)[e]
Beryllium	NA	1.50E-03	3.62E+00	Regression[a]	1.51E+00	USEPA (2007)	4.50E-02	1.63E-01	Sample et al. (1998a)	2.25E-03	8.15E-03	Baes et al. (1984)[e]
Cadmium	NA	3.00E-03	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	Regression[d]	0.00E+00	Sample et al. (1999)	Regression[f]	0.00E+00	Sample et al. (1998b)
Chromium	NA	2.72E-02	2.87E+01	4.10E-02	1.18E+00	Bechtel-Jacobs (1998a)[g]	3.06E-01	8.78E+00	Sample et al. (1998a)	Regression[f]	2.73E+00	Sample et al. (1998b)
Cobalt	NA	1.55E-02	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	1.83E-01	1.84E+03	Regression[a]	3.77E+01	Bechtel-Jacobs (1998a)	5.15E-01	9.48E+02	Sample et al. (1998a)	Regression[f]	2.28E+01	Sample et al. (1998b)
Lead	NA	3.52E-02	4.96E+01	Regression[a]	2.37E+00	Bechtel-Jacobs (1998a)	Regression[d]	1.88E+01	Sample et al. (1999)	Regression[f]	6.07E+00	Sample et al. (1998b)
Manganese	NA	3.75E+00	1.03E+03	7.90E-02	8.11E+01	Bechtel-Jacobs (1998a)[g]	Regression[d]	5.04E+01	Sample et al. (1999)	2.05E-02	2.10E+01	Sample et al. (1998b)[i]
Mercury	NA	2.60E-04	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	5.59E-02	4.04E+02	Regression[a]	9.64E+00	Bechtel-Jacobs (1998a)	7.78E-01	3.14E+02	Sample et al. (1998a)	Regression[f]	1.28E+01	Sample et al. (1998b)
Selenium	NA	2.00E-03	2.29E+00	Regression[a]	1.27E+00	Bechtel-Jacobs (1998a)	Regression[d]	1.70E+00	Sample et al. (1998a)	Regression[f]	9.01E-01	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	3.30E-04	8.41E-01	4.00E-03	3.37E-03	Baes et al. (1984)	5.41E-02	4.55E-02	USCHPPM (2004)	1.08E-01	9.10E-02	Baes et al. (1984)[e]
Vanadium	NA	2.48E-02	1.15E+02	4.85E-03	5.59E-01	Bechtel-Jacobs (1998a)[g]	4.20E-02	4.84E+00	Sample et al. (1998a)	1.23E-02	1.42E+00	Sample et al. (1998b)[i]
Zinc	NA	5.37E-01	1.12E+02	Regression[a]	6.59E+01	Bechtel-Jacobs (1998a)	Regression[d]	4.02E+02	Sample et al. (1998a)	Regression[f]	1.10E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	3.78E-01	1.22E+01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	2.24E+01	6.03E+02	6.00E-02	3.62E+01	Baes et al. (1984)	1.24E-01	7.47E+01	USCHPPM (2004)	1.60E-02	9.64E+00	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	9.83E-01	8.90E-02	8.74E-02	USEPA (2007a)	2.92E+01	2.87E+01	USEPA (2007a)	2.53E-01	2.48E-01	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:		0.00E+00										
Acenaphthene	3.92	0.00E+00	2.65E+01	Regression[a]	2.33E-04	USEPA (2007a)	1.47E+00	3.90E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	6.20E-04	4.78E+01	Regression[a]	7.54E+00	USEPA (2007a)	2.42E+00	1.16E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluoranthene	4.95	9.30E-03	2.40E+02	5.00E-01	1.20E+02	USEPA (2007a)	3.04E+00	7.30E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluorene	4.18	8.70E-04	2.35E+01	Regression[a]	2.58E-04	USEPA (2007a)	9.57E+00	2.25E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Naphthalene	3.36	8.70E-04	8.65E+00	1.22E+01	1.06E+02	USEPA (2007a)	4.40E+00	3.81E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Phenanthrene	4.55	1.50E-03	2.25E+02	Regression[a]	2.44E+01	USEPA (2007a)	1.72E+00	3.87E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
LMW PAHs												
High Molecular Weight (HMW) PAHs:		0.00E+00										
Benzo(a)anthracene	5.7	3.00E-03	9.18E+01	Regression[a]	9.79E-01	USEPA (2007a)	1.59E+00	1.46E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	0.00E+00	8.13E+01	Regression[a]	9.26E+00	USEPA (2007a)	1.33E+00	1.08E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	1.00E-02	1.05E+02	3.10E-01	3.26E+01	USEPA (2007a)	2.60E+00	2.73E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	3.90E-03	5.08E+01	Regression[a]	4.10E+01	USEPA (2007a)	2.94E+00	1.49E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	4.60E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	7.60E-03	1.10E+02	Regression[a]	1.09E+00	USEPA (2007a)	2.29E+00	2.52E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	9.80E-05	1.95E+01	1.30E-01	2.54E+00	USEPA (2007a)	2.31E+00	4.50E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]

Table H2-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Central Landfills Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Indeno (1,2,3-CD) Pyrene	6.58	3.10E-03	6.18E+01	1.10E-01	6.79E+00	USEPA (2007a)	2.86E+00	1.77E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Pyrene	4.88	7.00E-03	1.35E+02	7.20E-01	9.72E+01	USEPA (2007a)	1.75E+00	2.36E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[l]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[l]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[l]
Bis(2-ethylhexyl)phthalate	8.39	2.20E-02	6.39E-01	2.38E-02	1.52E-02	USEPA (2007a)	5.44E+01	3.48E+01	USEPA (2007a)	7.79E-01	4.98E-01	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	0.00E+00	6.54E-01	0.00E+00	USEPA (2007a)	1.14E+01	0.00E+00	USEPA (2007a)	1.22E-01	0.00E+00	LANL (2015)
Dibenzofuran	3.71	0.00E+00	1.38E+01	1.88E+00	2.58E+01	USEPA (2007a)	6.96E+00	9.57E+01	USEPA (2007a)	5.60E-02	7.70E-01	Calculated[l]
Di-n-butyl phthalate	4.61	0.00E+00	4.15E-02	8.14E-01	3.38E-02	USEPA (2007a)	1.03E+01	4.28E-01	USEPA (2007a)	4.49E-01	1.86E-02	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[l]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[l]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	2.70E-07	9.41E-02	2.54E-08	USEPA (2007a)[b]	Regression[d]	5.89E-07	Sample et al. (1998a)	Regression[h]	1.35E-07	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	3.20E-07	5.17E-02	1.66E-08	USEPA (2007a)[b]	Regression[d]	7.20E-07	Sample et al. (1998a)	Regression[h]	1.63E-07	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	2.46E-06	2.82E-02	6.94E-08	USEPA (2007a)[b]	Regression[d]	8.03E-06	Sample et al. (1998a)	Regression[h]	1.54E-06	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	1.14E-06	2.82E-02	3.21E-08	USEPA (2007a)[b]	Regression[d]	3.23E-06	Sample et al. (1998a)	Regression[h]	6.59E-07	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	7.63E-05	1.55E-02	1.18E-06	USEPA (2007a)[b]	Regression[d]	4.65E-04	Sample et al. (1998a)	Regression[h]	6.70E-05	Sample et al. (1998b)
OCDD	9.50	0.00E+00	8.91E-04	8.45E-03	7.53E-06	USEPA (2007a)[b]	Regression[d]	8.49E-03	Sample et al. (1998a)	Regression[h]	9.98E-04	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	1.78E-06	1.69E-01	3.02E-07	USEPA (2007a)[b]	Regression[d]	5.47E-06	Sample et al. (1998a)	1.25E-01	2.23E-07	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	9.50E-07	9.24E-02	8.77E-08	USEPA (2007a)[b]	Regression[d]	2.61E-06	Sample et al. (1998a)	1.25E-01	1.19E-07	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	1.67E-06	3.70E-02	6.17E-08	USEPA (2007a)[b]	Regression[d]	5.08E-06	Sample et al. (1998a)	1.25E-01	2.09E-07	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	7.80E-07	3.70E-02	2.88E-08	USEPA (2007a)[b]	Regression[d]	2.06E-06	Sample et al. (1998a)	1.25E-01	9.76E-08	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	5.70E-07	5.08E-02	2.90E-08	USEPA (2007a)[b]	Regression[d]	1.42E-06	Sample et al. (1998a)	1.25E-01	7.13E-08	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	5.37E-06	2.77E-02	1.49E-07	USEPA (2007a)[b]	Regression[d]	2.02E-05	Sample et al. (1998a)	1.25E-01	6.72E-07	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	1.68E-05	1.52E-02	2.56E-07	USEPA (2007a)[b]	Regression[d]	7.77E-05	Sample et al. (1998a)	1.25E-01	2.10E-06	Sample et al. (1998b)[i]

Table H2-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Central Landfills Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H2-2
Screening-Level Exposure Evaluation - American Woodcock
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.88E+00	0.00E+00	2.88E+00	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.05E-04	0.00E+00	9.05E-04	No TRV	--	No TRV	--
Arsenic	1.18E+01	4.40E-03	5.20E-03	1.46E-01	0.00E+00	1.51E-01	5.17E-04	1.04E-01	2.56E-01	2.24E+00	<1	4.51E+00	<1
Barium	4.20E+02	2.71E+00	7.70E-01	4.04E+00	0.00E+00	4.81E+00	3.18E-01	3.70E+00	8.83E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	1.50E+00	1.50E-03	9.26E-03	7.14E-03	0.00E+00	1.64E-02	1.76E-04	1.32E-02	2.98E-02	No TRV	--	No TRV	--
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.52E-04	0.00E+00	3.52E-04	1.47E+00	<1	6.35E+00	<1
Chromium	8.48E+01	2.72E-02	4.08E-02	2.74E+00	0.00E+00	2.78E+00	3.20E-03	7.47E-01	3.53E+00	2.66E+00	1.33E+00	1.56E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.82E-03	0.00E+00	1.82E-03	7.61E+00	<1	2.02E+01	<1
Copper	7.26E+03	1.83E-01	7.61E-01	3.95E+02	0.00E+00	3.96E+02	2.15E-02	6.40E+01	4.60E+02	4.05E+00	1.14E+02	3.48E+01	1.32E+01
Lead	4.80E+01	3.52E-02	2.73E-02	1.93E+00	0.00E+00	1.96E+00	4.14E-03	4.23E-01	2.39E+00	1.63E+00	1.46E+00	4.46E+01	<1
Manganese	1.14E+03	3.75E+00	1.06E+00	5.72E+00	0.00E+00	6.78E+00	4.41E-01	1.00E+01	1.73E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	3.05E-05	--	3.05E-05	4.50E-01	<1	9.10E-01	<1
Nickel	8.90E+01	5.59E-02	3.65E-02	7.32E+00	0.00E+00	7.36E+00	6.57E-03	7.84E-01	8.15E+00	6.71E+00	1.21E+00	1.86E+01	<1
Selenium	1.20E+00	2.00E-03	7.30E-03	1.12E-01	0.00E+00	1.19E-01	2.35E-04	1.06E-02	1.30E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.40E-01	3.30E-04	6.58E-06	8.01E-04	0.00E+00	8.07E-04	3.88E-05	1.23E-03	2.08E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	2.77E+01	2.48E-02	1.58E-03	1.23E-01	0.00E+00	1.25E-01	2.91E-03	2.44E-01	3.72E-01	3.44E-01	1.08E+00	1.70E+00	<1
Zinc	1.14E+02	5.37E-01	7.83E-01	4.28E+01	0.00E+00	4.35E+01	6.31E-02	1.00E+00	4.46E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	9.90E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.44E-02	8.72E-02	1.32E-01	4.00E-02	3.29E+00	4.00E-01	<1
Fluoride	7.96E+02	2.24E+01	5.61E-01	1.04E+01	0.00E+00	1.10E+01	2.63E+00	7.01E+00	2.06E+01	1.22E+01	1.69E+00	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	1.20E+00	0.00E+00	1.25E-03	3.71E+00	0.00E+00	3.71E+00	0.00E+00	1.06E-02	3.72E+00	1.80E-01	2.07E+01	1.80E+00	2.07E+00
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.20E+01	0.00E+00	3.21E-06	3.42E+00	0.00E+00	3.42E+00	0.00E+00	1.94E-01	3.61E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.70E+01	6.20E-04	8.75E-02	1.20E+01	0.00E+00	1.21E+01	7.28E-05	4.14E-01	1.25E+01				
Fluoranthene	2.40E+02	9.30E-03	1.41E+00	7.71E+01	0.00E+00	7.86E+01	1.09E-03	2.11E+00	8.07E+01				
Fluorene	1.90E+01	8.70E-04	3.63E-06	1.92E+01	0.00E+00	1.92E+01	1.02E-04	1.67E-01	1.94E+01				
Naphthalene	4.60E+00	8.70E-04	6.59E-01	2.14E+00	0.00E+00	2.80E+00	1.02E-04	4.05E-02	2.84E+00				
Phenanthrene	1.80E+02	1.50E-03	2.49E-01	3.27E+01	0.00E+00	3.30E+01	1.76E-04	1.59E+00	3.46E+01				
Total LMW PAHs						1.49E+02	1.55E-03	4.52E+00	1.54E+02	1.61E+01	9.54E+00	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.00E+02	3.00E-03	1.21E-02	1.68E+01	0.00E+00	1.68E+01	3.52E-04	8.81E-01	1.77E+01				
Benzo[A]Pyrene	1.00E+02	0.00E+00	1.33E-01	1.41E+01	0.00E+00	1.42E+01	0.00E+00	8.81E-01	1.51E+01				
Benzo(b)fluoranthene	1.20E+02	1.00E-02	4.37E-01	3.30E+01	0.00E+00	3.34E+01	1.17E-03	1.06E+00	3.45E+01				
Benzo(g,h,i)perylene	6.20E+01	3.90E-03	6.11E-01	1.93E+01	0.00E+00	1.99E+01	4.58E-04	5.46E-01	2.04E+01				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	5.40E-05	--	5.40E-05				
Chrysene	1.10E+02	7.60E-03	1.28E-02	2.66E+01	0.00E+00	2.66E+01	8.93E-04	9.69E-01	2.76E+01				
Dibenz(A,H)Anthracene	2.10E+01	9.80E-05	3.21E-02	5.13E+00	0.00E+00	5.16E+00	1.15E-05	1.85E-01	5.35E+00				
Indeno (1,2,3-CD) Pyrene	7.60E+01	3.10E-03	9.82E-02	2.30E+01	0.00E+00	2.31E+01	3.64E-04	6.70E-01	2.38E+01				
Pyrene	1.50E+02	7.00E-03	1.27E+00	2.78E+01	0.00E+00	2.90E+01	8.22E-04	1.32E+00	3.03E+01				
Total HMW PAHs						1.68E+02	4.13E-03	6.51E+00	1.75E+02	2.00E+00	8.74E+01	2.00E+01	8.74E+00
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.50E+00	2.20E-02	6.99E-04	1.44E+01	0.00E+00	1.44E+01	2.58E-03	2.20E-02	1.44E+01	1.10E+00	1.31E+01	1.10E+01	1.31E+00
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	1.00E+01	0.00E+00	2.21E-01	7.36E+00	0.00E+00	7.58E+00	0.00E+00	8.81E-02	7.66E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.60E-02	0.00E+00	5.36E-04	6.11E-02	0.00E+00	6.16E-02	0.00E+00	4.93E-04	6.21E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H2-2
Screening-Level Exposure Evaluation - American Woodcock
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	2.70E-07	0.00E+00	2.98E-10	6.23E-08	0.00E+00	6.26E-08	0.00E+00	2.38E-09	6.50E-08				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	1.95E-10	7.61E-08	0.00E+00	7.63E-08	0.00E+00	2.82E-09	7.92E-08				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	8.15E-10	8.49E-07	0.00E+00	8.49E-09	0.00E+00	2.17E-10	8.71E-09				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	3.78E-10	3.42E-07	0.00E+00	3.42E-08	0.00E+00	1.00E-09	3.52E-08				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	1.39E-08	4.92E-05	0.00E+00	4.92E-08	0.00E+00	6.72E-10	4.99E-08				
OCDD	8.91E-04	0.00E+00	8.84E-08	8.98E-04	0.00E+00	8.98E-08	0.00E+00	7.85E-10	9.06E-08				
2,3,7,8-TCDF	1.78E-06	0.00E+00	3.54E-09	5.79E-07	0.00E+00	5.82E-07	0.00E+00	1.57E-08	5.98E-07				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	1.03E-09	2.76E-07	0.00E+00	2.77E-07	0.00E+00	8.37E-09	2.85E-07				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	7.25E-10	5.37E-07	0.00E+00	5.38E-08	0.00E+00	1.47E-09	5.52E-08				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	3.39E-10	2.18E-07	0.00E+00	2.19E-08	0.00E+00	6.87E-10	2.25E-08				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	3.40E-10	1.51E-07	0.00E+00	1.51E-08	0.00E+00	5.02E-10	1.56E-08				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	1.75E-09	2.14E-06	0.00E+00	2.14E-08	0.00E+00	4.73E-10	2.18E-08				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	3.00E-09	8.22E-06	0.00E+00	8.22E-10	0.00E+00	1.48E-11	8.37E-10				
Total Dioxins/Furans						1.29E-06	0.00E+00	3.51E-08	1.33E-06	1.75E-06	<1	1.75E-05	<1

Notes:
a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H2-3
Screening-Level Exposure Evaluation - Mourning Dove
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.80E+00	0.00E+00	2.80E+00	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.79E-04	0.00E+00	8.79E-04	No TRV	--	No TRV	--
Arsenic	1.18E+01	4.40E-03	5.05E-02	0.00E+00	0.00E+00	5.05E-02	5.02E-04	9.16E-02	1.43E-01	2.24E+00	<1	4.51E+00	<1
Barium	4.20E+02	2.71E+00	7.48E+00	0.00E+00	0.00E+00	7.48E+00	3.09E-01	3.26E+00	1.10E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	1.50E+00	1.50E-03	8.99E-02	0.00E+00	0.00E+00	8.99E-02	1.71E-04	1.16E-02	1.02E-01	No TRV	--	No TRV	--
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.42E-04	0.00E+00	3.42E-04	1.47E+00	<1	6.35E+00	<1
Chromium	8.48E+01	2.72E-02	3.97E-01	0.00E+00	0.00E+00	3.97E-01	3.10E-03	6.58E-01	1.06E+00	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-03	0.00E+00	1.77E-03	7.61E+00	<1	2.02E+01	<1
Copper	7.26E+03	1.83E-01	7.39E+00	0.00E+00	0.00E+00	7.39E+00	2.09E-02	5.63E+01	6.38E+01	4.05E+00	1.57E+01	3.48E+01	1.83E+00
Lead	4.80E+01	3.52E-02	2.65E-01	0.00E+00	0.00E+00	2.65E-01	4.02E-03	3.73E-01	6.42E-01	1.63E+00	<1	4.46E+01	<1
Manganese	1.14E+03	3.75E+00	1.03E+01	0.00E+00	0.00E+00	1.03E+01	4.28E-01	8.85E+00	1.96E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	2.97E-05	--	2.97E-05	4.50E-01	<1	9.10E-01	<1
Nickel	8.90E+01	5.59E-02	3.55E-01	0.00E+00	0.00E+00	3.55E-01	6.38E-03	6.91E-01	1.05E+00	6.71E+00	<1	1.86E+01	<1
Selenium	1.20E+00	2.00E-03	7.09E-02	0.00E+00	0.00E+00	7.09E-02	2.28E-04	9.31E-03	8.05E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.40E-01	3.30E-04	6.39E-05	0.00E+00	0.00E+00	6.39E-05	3.77E-05	1.09E-03	1.19E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	2.77E+01	2.48E-02	1.53E-02	0.00E+00	0.00E+00	1.53E-02	2.83E-03	2.15E-01	2.33E-01	3.44E-01	<1	1.70E+00	<1
Zinc	1.14E+02	5.37E-01	7.60E+00	0.00E+00	0.00E+00	7.60E+00	6.13E-02	8.85E-01	8.55E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	9.90E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.31E-02	7.68E-02	1.20E-01	4.00E-02	3.00E+00	4.00E-01	<1
Fluoride	7.96E+02	2.24E+01	5.45E+00	0.00E+00	0.00E+00	5.45E+00	2.56E+00	6.18E+00	1.42E+01	1.22E+01	1.16E+00	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	1.20E+00	0.00E+00	1.22E-02	0.00E+00	0.00E+00	1.22E-02	0.00E+00	9.31E-03	2.15E-02	1.80E-01	<1	1.80E+00	<1
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.20E+01	0.00E+00	3.11E-05	0.00E+00	0.00E+00	3.11E-05	0.00E+00	1.71E-01	1.71E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.70E+01	6.20E-04	8.50E-01	0.00E+00	0.00E+00	8.50E-01	7.08E-05	3.65E-01	1.22E+00				
Fluoranthene	2.40E+02	9.30E-03	1.37E+01	0.00E+00	0.00E+00	1.37E+01	1.06E-03	1.86E+00	1.56E+01				
Fluorene	1.90E+01	8.70E-04	3.53E-05	0.00E+00	0.00E+00	3.53E-05	9.93E-05	1.47E-01	1.48E-01				
Naphthalene	4.60E+00	8.70E-04	6.41E+00	0.00E+00	0.00E+00	6.41E+00	9.93E-05	3.57E-02	6.44E+00				
Phenanthrene	1.80E+02	1.50E-03	2.42E+00	0.00E+00	0.00E+00	2.42E+00	1.71E-04	1.40E+00	3.82E+00				
Total LMW PAHs						2.34E+01	1.50E-03	3.98E+00	2.74E+01	1.61E+01	1.70E+00	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.00E+02	3.00E-03	1.18E-01	0.00E+00	0.00E+00	1.18E-01	3.42E-04	7.76E-01	8.94E-01				
Benzo[A]Pyrene	1.00E+02	0.00E+00	1.29E+00	0.00E+00	0.00E+00	1.29E+00	0.00E+00	7.76E-01	2.07E+00				
Benzo(b)fluoranthene	1.20E+02	1.00E-02	4.25E+00	0.00E+00	0.00E+00	4.25E+00	1.14E-03	9.31E-01	5.18E+00				
Benzo(g,h,i)perylene	6.20E+01	3.90E-03	5.93E+00	0.00E+00	0.00E+00	5.93E+00	4.45E-04	4.81E-01	6.41E+00				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	5.25E-05	--	5.25E-05				
Chrysene	1.10E+02	7.60E-03	1.24E-01	0.00E+00	0.00E+00	1.24E-01	8.67E-04	8.54E-01	9.79E-01				
Dibenz(A,H)Anthracene	2.10E+01	9.80E-05	3.12E-01	0.00E+00	0.00E+00	3.12E-01	1.12E-05	1.63E-01	4.75E-01				
Indeno (1,2,3-CD) Pyrene	7.60E+01	3.10E-03	9.54E-01	0.00E+00	0.00E+00	9.54E-01	3.54E-04	5.90E-01	1.54E+00				
Pyrene	1.50E+02	7.00E-03	1.23E+01	0.00E+00	0.00E+00	1.23E+01	7.99E-04	1.16E+00	1.35E+01				
Total HMW PAHs						2.53E+01	4.01E-03	5.74E+00	3.10E+01	2.00E+00	1.55E+01	2.00E+01	1.55E+00
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.50E+00	2.20E-02	6.79E-03	0.00E+00	0.00E+00	6.79E-03	2.51E-03	1.94E-02	2.87E-02	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	1.00E+01	0.00E+00	2.14E+00	0.00E+00	0.00E+00	2.14E+00	0.00E+00	7.76E-02	2.22E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.60E-02	0.00E+00	5.20E-03	0.00E+00	0.00E+00	5.20E-03	0.00E+00	4.35E-04	5.64E-03	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H2-3
Screening-Level Exposure Evaluation - Mourning Dove
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	2.70E-07	0.00E+00	2.90E-09	0.00E+00	0.00E+00	2.90E-09	0.00E+00	2.10E-09	5.00E-09				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	1.89E-09	0.00E+00	0.00E+00	1.89E-09	0.00E+00	2.48E-09	4.37E-09				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	7.92E-09	0.00E+00	0.00E+00	7.92E-11	0.00E+00	1.91E-10	2.70E-10				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	3.67E-09	0.00E+00	0.00E+00	3.67E-10	0.00E+00	8.85E-10	1.25E-09				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	1.35E-07	0.00E+00	0.00E+00	1.35E-10	0.00E+00	5.92E-10	7.27E-10				
OCDD	8.91E-04	0.00E+00	8.59E-07	0.00E+00	0.00E+00	8.59E-11	0.00E+00	6.92E-10	7.77E-10				
2,3,7,8-TCDF	1.78E-06	0.00E+00	3.44E-08	0.00E+00	0.00E+00	3.44E-08	0.00E+00	1.38E-08	4.83E-08				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	1.00E-08	0.00E+00	0.00E+00	1.00E-08	0.00E+00	7.37E-09	1.74E-08				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	7.05E-09	0.00E+00	0.00E+00	7.05E-10	0.00E+00	1.30E-09	2.00E-09				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	3.29E-09	0.00E+00	0.00E+00	3.29E-10	0.00E+00	6.05E-10	9.35E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	3.30E-09	0.00E+00	0.00E+00	3.30E-10	0.00E+00	4.42E-10	7.73E-10				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	1.70E-08	0.00E+00	0.00E+00	1.70E-10	0.00E+00	4.17E-10	5.86E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	2.92E-08	0.00E+00	0.00E+00	2.92E-12	0.00E+00	1.30E-11	1.60E-11				
Total Dioxins/Furans						5.14E-08	0.00E+00	3.09E-08	8.23E-08	1.75E-06	<1	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H2-4
Screening-Level Exposure Evaluation - Red-tailed Hawk
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E+00	0.00E+00	2.01E+00	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.31E-04	0.00E+00	6.31E-04	No TRV	--	No TRV	--
Arsenic	1.18E+01	4.40E-03	0.00E+00	0.00E+00	4.86E-03	4.86E-03	3.61E-04	2.52E-02	3.04E-02	2.24E+00	<1	4.51E+00	<1
Barium	4.20E+02	2.71E+00	0.00E+00	0.00E+00	2.35E-02	2.35E-02	2.22E-01	8.96E-01	1.14E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	1.50E+00	1.50E-03	0.00E+00	0.00E+00	2.77E-04	2.77E-04	1.23E-04	3.20E-03	3.60E-03	No TRV	--	No TRV	--
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.46E-04	0.00E+00	2.46E-04	1.47E+00	<1	6.35E+00	<1
Chromium	8.48E+01	2.72E-02	0.00E+00	0.00E+00	4.95E-01	4.95E-01	2.23E-03	1.81E-01	6.78E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-03	0.00E+00	1.27E-03	7.61E+00	<1	2.02E+01	<1
Copper	7.26E+03	1.83E-01	0.00E+00	0.00E+00	2.28E+00	2.28E+00	1.50E-02	1.55E+01	1.78E+01	4.05E+00	4.39E+00	3.48E+01	<1
Lead	4.80E+01	3.52E-02	0.00E+00	0.00E+00	4.90E-01	4.90E-01	2.89E-03	1.02E-01	5.95E-01	1.63E+00	<1	4.46E+01	<1
Manganese	1.14E+03	3.75E+00	0.00E+00	0.00E+00	1.92E+00	1.92E+00	3.08E-01	2.43E+00	4.65E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	2.13E-05	--	2.13E-05	4.50E-01	<1	9.10E-01	<1
Nickel	8.90E+01	5.59E-02	0.00E+00	0.00E+00	5.19E-01	5.19E-01	4.58E-03	1.90E-01	7.13E-01	6.71E+00	<1	1.86E+01	<1
Selenium	1.20E+00	2.00E-03	0.00E+00	0.00E+00	5.80E-02	5.80E-02	1.64E-04	2.56E-03	6.07E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.40E-01	3.30E-04	0.00E+00	0.00E+00	1.24E-03	1.24E-03	2.71E-05	2.99E-04	1.57E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	2.77E+01	2.48E-02	0.00E+00	0.00E+00	2.79E-02	2.79E-02	2.03E-03	5.91E-02	8.90E-02	3.44E-01	<1	1.70E+00	<1
Zinc	1.14E+02	5.37E-01	0.00E+00	0.00E+00	8.99E+00	8.99E+00	4.40E-02	2.43E-01	9.28E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	9.90E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.10E-02	2.11E-02	5.21E-02	4.00E-02	1.30E+00	4.00E-01	<1
Fluoride	7.96E+02	2.24E+01	0.00E+00	0.00E+00	1.04E+00	1.04E+00	1.84E+00	1.70E+00	4.58E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	1.20E+00	0.00E+00	0.00E+00	0.00E+00	2.49E-02	2.49E-02	0.00E+00	2.56E-03	2.74E-02	1.80E-01	<1	1.80E+00	<1
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.20E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.69E-02	4.69E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.70E+01	6.20E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.08E-05	1.00E-01	1.00E-01				
Fluoranthene	2.40E+02	9.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.63E-04	5.12E-01	5.13E-01				
Fluorene	1.90E+01	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.13E-05	4.05E-02	4.06E-02				
Naphthalene	4.60E+00	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.13E-05	9.81E-03	9.88E-03				
Phenanthrene	1.80E+02	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-04	3.84E-01	3.84E-01				
Total LMW PAHs						0.00E+00	1.08E-03	1.09E+00	1.09E+00	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.00E+02	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.46E-04	2.13E-01	2.13E-01				
Benzo[A]Pyrene	1.00E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.13E-01	2.13E-01				
Benzo(b)fluoranthene	1.20E+02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.20E-04	2.56E-01	2.57E-01				
Benzo(g,h,i)perylene	6.20E+01	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.20E-04	1.32E-01	1.33E-01				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	3.77E-05	--	3.77E-05				
Chrysene	1.10E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.23E-04	2.35E-01	2.35E-01				
Dibenz(A,H)Anthracene	2.10E+01	9.80E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.04E-06	4.48E-02	4.48E-02				
Indeno (1,2,3-CD) Pyrene	7.60E+01	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.54E-04	1.62E-01	1.62E-01				
Pyrene	1.50E+02	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.74E-04	3.20E-01	3.20E-01				
Total HMW PAHs						0.00E+00	2.88E-03	1.58E+00	1.58E+00	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.50E+00	2.20E-02	0.00E+00	0.00E+00	1.60E-01	1.60E-01	1.80E-03	5.33E-03	1.67E-01	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	1.00E+01	0.00E+00	0.00E+00	0.00E+00	4.60E-02	4.60E-02	0.00E+00	2.13E-02	6.73E-02	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.60E-02	0.00E+00	0.00E+00	0.00E+00	2.06E-03	2.06E-03	0.00E+00	1.19E-04	2.18E-03	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H2-4
Screening-Level Exposure Evaluation - Red-tailed Hawk
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	2.70E-07	0.00E+00	0.00E+00	0.00E+00	1.11E-08	1.11E-08	0.00E+00	5.76E-10	1.17E-08				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	0.00E+00	0.00E+00	1.34E-08	1.34E-08	0.00E+00	6.82E-10	1.41E-08				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	0.00E+00	0.00E+00	1.26E-07	1.26E-09	0.00E+00	5.25E-11	1.31E-09				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	0.00E+00	0.00E+00	5.41E-08	5.41E-09	0.00E+00	2.43E-10	5.65E-09				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	0.00E+00	0.00E+00	5.49E-06	5.49E-09	0.00E+00	1.63E-10	5.66E-09				
OCDD	8.91E-04	0.00E+00	0.00E+00	0.00E+00	8.19E-05	8.19E-09	0.00E+00	1.90E-10	8.38E-09				
2,3,7,8-TCDF	1.78E-06	0.00E+00	0.00E+00	0.00E+00	1.83E-08	1.83E-08	0.00E+00	3.80E-09	2.21E-08				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	0.00E+00	0.00E+00	9.75E-09	9.75E-09	0.00E+00	2.03E-09	1.18E-08				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	0.00E+00	0.00E+00	1.71E-08	1.71E-09	0.00E+00	3.56E-10	2.07E-09				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	0.00E+00	0.00E+00	8.00E-09	8.00E-10	0.00E+00	1.66E-10	9.67E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	0.00E+00	0.00E+00	5.85E-09	5.85E-10	0.00E+00	1.22E-10	7.06E-10				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	0.00E+00	0.00E+00	5.51E-08	5.51E-10	0.00E+00	1.15E-10	6.65E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	0.00E+00	0.00E+00	1.72E-07	1.72E-11	0.00E+00	3.58E-12	2.08E-11				
Total Dioxins/Furans						7.65E-08	0.00E+00	8.49E-09	8.50E-08	1.75E-06	<1	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H2-5
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.88E+00	0.00E+00	3.88E+00	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-03	0.00E+00	1.22E-03	No TRV	--	No TRV	--
Arsenic	1.18E+01	4.40E-03	0.00E+00	2.18E-01	0.00E+00	2.18E-01	6.97E-04	0.00E+00	2.19E-01	2.24E+00	<1	4.51E+00	<1
Barium	4.20E+02	2.71E+00	0.00E+00	6.05E+00	0.00E+00	6.05E+00	4.29E-01	0.00E+00	6.48E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	1.50E+00	1.50E-03	0.00E+00	1.07E-02	0.00E+00	1.07E-02	2.37E-04	0.00E+00	1.09E-02	No TRV	--	No TRV	--
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.75E-04	0.00E+00	4.75E-04	1.47E+00	<1	6.35E+00	<1
Chromium	8.48E+01	2.72E-02	0.00E+00	4.11E+00	0.00E+00	4.11E+00	4.31E-03	0.00E+00	4.11E+00	2.66E+00	1.55E+00	1.56E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.45E-03	0.00E+00	2.45E-03	7.61E+00	<1	2.02E+01	<1
Copper	7.26E+03	1.83E-01	0.00E+00	5.92E+02	0.00E+00	5.92E+02	2.90E-02	0.00E+00	5.92E+02	4.05E+00	1.46E+02	3.48E+01	1.70E+01
Lead	4.80E+01	3.52E-02	0.00E+00	2.90E+00	0.00E+00	2.90E+00	5.57E-03	0.00E+00	2.90E+00	1.63E+00	1.78E+00	4.46E+01	<1
Manganese	1.14E+03	3.75E+00	0.00E+00	8.57E+00	0.00E+00	8.57E+00	5.94E-01	0.00E+00	9.16E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	4.12E-05	--	4.12E-05	4.50E-01	<1	9.10E-01	<1
Nickel	8.90E+01	5.59E-02	0.00E+00	1.10E+01	0.00E+00	1.10E+01	8.85E-03	0.00E+00	1.10E+01	6.71E+00	1.63E+00	1.86E+01	<1
Selenium	1.20E+00	2.00E-03	0.00E+00	1.68E-01	0.00E+00	1.68E-01	3.17E-04	0.00E+00	1.68E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.40E-01	3.30E-04	0.00E+00	1.20E-03	0.00E+00	1.20E-03	5.22E-05	0.00E+00	1.25E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	2.77E+01	2.48E-02	0.00E+00	1.84E-01	0.00E+00	1.84E-01	3.93E-03	0.00E+00	1.88E-01	3.44E-01	<1	1.70E+00	<1
Zinc	1.14E+02	5.37E-01	0.00E+00	6.40E+01	0.00E+00	6.40E+01	8.50E-02	0.00E+00	6.41E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	9.90E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.98E-02	0.00E+00	5.98E-02	4.00E-02	1.50E+00	4.00E-01	<1
Fluoride	7.96E+02	2.24E+01	0.00E+00	1.56E+01	0.00E+00	1.56E+01	3.55E+00	0.00E+00	1.92E+01	1.22E+01	1.57E+00	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	1.20E+00	0.00E+00	0.00E+00	5.56E+00	0.00E+00	5.56E+00	0.00E+00	0.00E+00	5.56E+00	1.80E-01	3.09E+01	1.80E+00	3.09E+00
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.20E+01	0.00E+00	0.00E+00	5.12E+00	0.00E+00	5.12E+00	0.00E+00	0.00E+00	5.12E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.70E+01	6.20E-04	0.00E+00	1.80E+01	0.00E+00	1.80E+01	9.82E-05	0.00E+00	1.80E+01				
Fluoranthene	2.40E+02	9.30E-03	0.00E+00	1.16E+02	0.00E+00	1.16E+02	1.47E-03	0.00E+00	1.16E+02				
Fluorene	1.90E+01	8.70E-04	0.00E+00	2.88E+01	0.00E+00	2.88E+01	1.38E-04	0.00E+00	2.88E+01				
Naphthalene	4.60E+00	8.70E-04	0.00E+00	3.20E+00	0.00E+00	3.20E+00	1.38E-04	0.00E+00	3.20E+00				
Phenanthrene	1.80E+02	1.50E-03	0.00E+00	4.90E+01	0.00E+00	4.90E+01	2.37E-04	0.00E+00	4.90E+01				
Total LMW PAHs						2.20E+02	2.08E-03	0.00E+00	2.20E+02	1.61E+01	1.36E+01	1.61E+02	1.36E+00
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.00E+02	3.00E-03	0.00E+00	2.52E+01	0.00E+00	2.52E+01	4.75E-04	0.00E+00	2.52E+01				
Benzo[A]Pyrene	1.00E+02	0.00E+00	0.00E+00	2.11E+01	0.00E+00	2.11E+01	0.00E+00	0.00E+00	2.11E+01				
Benzo(b)fluoranthene	1.20E+02	1.00E-02	0.00E+00	4.94E+01	0.00E+00	4.94E+01	1.58E-03	0.00E+00	4.94E+01				
Benzo(g,h,i)perylene	6.20E+01	3.90E-03	0.00E+00	2.89E+01	0.00E+00	2.89E+01	6.17E-04	0.00E+00	2.89E+01				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	7.28E-05	--	7.28E-05				
Chrysene	1.10E+02	7.60E-03	0.00E+00	3.99E+01	0.00E+00	3.99E+01	1.20E-03	0.00E+00	3.99E+01				
Dibenz(A,H)Anthracene	2.10E+01	9.80E-05	0.00E+00	7.68E+00	0.00E+00	7.68E+00	1.55E-05	0.00E+00	7.68E+00				
Indeno (1,2,3-CD) Pyrene	7.60E+01	3.10E-03	0.00E+00	3.44E+01	0.00E+00	3.44E+01	4.91E-04	0.00E+00	3.44E+01				
Pyrene	1.50E+02	7.00E-03	0.00E+00	4.16E+01	0.00E+00	4.16E+01	1.11E-03	0.00E+00	4.16E+01				
Total HMW PAHs						2.48E+02	5.57E-03	0.00E+00	2.48E+02	2.00E+00	1.24E+02	2.00E+01	1.24E+01
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.50E+00	2.20E-02	0.00E+00	2.15E+01	0.00E+00	2.15E+01	3.48E-03	0.00E+00	2.15E+01	1.10E+00	1.96E+01	1.10E+01	1.96E+00
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	1.00E+01	0.00E+00	0.00E+00	1.10E+01	0.00E+00	1.10E+01	0.00E+00	0.00E+00	1.10E+01	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.60E-02	0.00E+00	0.00E+00	9.14E-02	0.00E+00	9.14E-02	0.00E+00	0.00E+00	9.14E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H2-5
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	2.70E-07	0.00E+00	0.00E+00	9.33E-08	0.00E+00	9.33E-08	0.00E+00	0.00E+00	9.33E-08				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	0.00E+00	1.14E-07	0.00E+00	1.14E-07	0.00E+00	0.00E+00	1.14E-07				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	0.00E+00	1.27E-06	0.00E+00	1.27E-08	0.00E+00	0.00E+00	1.27E-08				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	0.00E+00	5.12E-07	0.00E+00	5.12E-08	0.00E+00	0.00E+00	5.12E-08				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	0.00E+00	7.36E-05	0.00E+00	7.36E-08	0.00E+00	0.00E+00	7.36E-08				
OCDD	8.91E-04	0.00E+00	0.00E+00	1.34E-03	0.00E+00	1.34E-07	0.00E+00	0.00E+00	1.34E-07				
2,3,7,8-TCDF	1.78E-06	0.00E+00	0.00E+00	8.67E-07	0.00E+00	8.67E-07	0.00E+00	0.00E+00	8.67E-07				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	0.00E+00	4.13E-07	0.00E+00	4.13E-07	0.00E+00	0.00E+00	4.13E-07				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	0.00E+00	8.04E-07	0.00E+00	8.04E-08	0.00E+00	0.00E+00	8.04E-08				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	0.00E+00	3.27E-07	0.00E+00	3.27E-08	0.00E+00	0.00E+00	3.27E-08				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	0.00E+00	2.26E-07	0.00E+00	2.26E-08	0.00E+00	0.00E+00	2.26E-08				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	0.00E+00	3.20E-06	0.00E+00	3.20E-08	0.00E+00	0.00E+00	3.20E-08				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	0.00E+00	1.23E-05	0.00E+00	1.23E-09	0.00E+00	0.00E+00	1.23E-09				
Total Dioxins/Furans						1.93E-06	0.00E+00	0.00E+00	1.93E-06	1.75E-06	1.10E+00	1.75E-05	<1

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H2-6
Screening-Level Exposure Evaluation - Canada Lynx
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.65E-01	0.00E+00	7.65E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.41E-04	0.00E+00	2.41E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	1.18E+01	4.40E-03	0.00E+00	0.00E+00	1.85E-03	1.85E-03	1.37E-04	1.03E-02	1.23E-02	1.04E+00	<1	4.55E+00	<1
Barium	4.20E+02	2.71E+00	0.00E+00	0.00E+00	8.96E-03	8.96E-03	8.47E-02	3.67E-01	4.61E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	1.50E+00	1.50E-03	0.00E+00	0.00E+00	1.05E-04	1.05E-04	4.69E-05	1.31E-03	1.46E-03	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.37E-05	0.00E+00	9.37E-05	7.70E-01	<1	6.87E+00	<1
Chromium	8.48E+01	2.72E-02	0.00E+00	0.00E+00	1.89E-01	1.89E-01	8.50E-04	7.42E-02	2.64E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.84E-04	0.00E+00	4.84E-04	7.33E+00	<1	1.89E+01	<1
Copper	7.26E+03	1.83E-01	0.00E+00	0.00E+00	8.69E-01	8.69E-01	5.72E-03	6.35E+00	7.23E+00	5.60E+00	1.29E+00	8.27E+01	<1
Lead	4.80E+01	3.52E-02	0.00E+00	0.00E+00	1.87E-01	1.87E-01	1.10E-03	4.20E-02	2.30E-01	4.70E+00	<1	1.86E+02	<1
Manganese	1.14E+03	3.75E+00	0.00E+00	0.00E+00	7.30E-01	7.30E-01	1.17E-01	9.97E-01	1.84E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	8.12E-06	--	8.12E-06	1.41E+00	<1	1.41E+01	<1
Nickel	8.90E+01	5.59E-02	0.00E+00	0.00E+00	1.98E-01	1.98E-01	1.75E-03	7.79E-02	2.77E-01	1.70E+00	<1	1.48E+01	<1
Selenium	1.20E+00	2.00E-03	0.00E+00	0.00E+00	2.21E-02	2.21E-02	6.25E-05	1.05E-03	2.32E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.40E-01	3.30E-04	0.00E+00	0.00E+00	4.73E-04	4.73E-04	1.03E-05	1.22E-04	6.06E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	2.77E+01	2.48E-02	0.00E+00	0.00E+00	1.06E-02	1.06E-02	7.75E-04	2.42E-02	3.57E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.14E+02	5.37E-01	0.00E+00	0.00E+00	3.43E+00	3.43E+00	1.68E-02	9.97E-02	3.54E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	9.90E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-02	8.66E-03	2.05E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	7.96E+02	2.24E+01	0.00E+00	0.00E+00	3.98E-01	3.98E-01	7.00E-01	6.96E-01	1.79E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	1.20E+00	0.00E+00	0.00E+00	0.00E+00	9.48E-03	9.48E-03	0.00E+00	1.05E-03	1.05E-02	6.80E-02	<1	6.80E-01	<1
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.20E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.92E-02	1.92E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.70E+01	6.20E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-05	4.11E-02	4.11E-02				
Fluoranthene	2.40E+02	9.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.91E-04	2.10E-01	2.10E-01				
Fluorene	1.90E+01	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.72E-05	1.66E-02	1.66E-02				
Naphthalene	4.60E+00	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.72E-05	4.02E-03	4.05E-03				
Phenanthrene	1.80E+02	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.69E-05	1.57E-01	1.58E-01				
Total LMW PAHs						0.00E+00	4.11E-04	4.48E-01	4.49E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.00E+02	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.37E-05	8.75E-02	8.76E-02				
Benzo[A]Pyrene	1.00E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.75E-02	8.75E-02				
Benzo(b)fluoranthene	1.20E+02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.12E-04	1.05E-01	1.05E-01				
Benzo(g,h,i)perylene	6.20E+01	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-04	5.42E-02	5.44E-02				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	1.44E-05	--	1.44E-05				
Chrysene	1.10E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.37E-04	9.62E-02	9.65E-02				
Dibenz(A,H)Anthracene	2.10E+01	9.80E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.06E-06	1.84E-02	1.84E-02				
Indeno (1,2,3-CD) Pyrene	7.60E+01	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.69E-05	6.65E-02	6.66E-02				
Pyrene	1.50E+02	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-04	1.31E-01	1.31E-01				
Total HMW PAHs						0.00E+00	1.10E-03	6.47E-01	6.48E-01	6.15E-01	1.05E+00	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.50E+00	2.20E-02	0.00E+00	0.00E+00	6.08E-02	6.08E-02	6.87E-04	2.19E-03	6.37E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	1.00E+01	0.00E+00	0.00E+00	0.00E+00	1.75E-02	1.75E-02	0.00E+00	8.75E-03	2.63E-02	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.60E-02	0.00E+00	0.00E+00	0.00E+00	7.86E-04	7.86E-04	0.00E+00	4.90E-05	8.35E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H2-6
Screening-Level Exposure Evaluation - Canada Lynx
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	2.70E-07	0.00E+00	0.00E+00	0.00E+00	4.23E-09	4.23E-09	0.00E+00	2.36E-10	4.46E-09				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	0.00E+00	0.00E+00	5.10E-09	5.10E-09	0.00E+00	2.80E-10	5.38E-09				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	0.00E+00	0.00E+00	4.80E-08	4.80E-09	0.00E+00	2.15E-10	5.01E-09				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	0.00E+00	0.00E+00	2.06E-08	2.06E-09	0.00E+00	9.97E-11	2.16E-09				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	0.00E+00	0.00E+00	2.09E-06	2.09E-08	0.00E+00	6.68E-10	2.16E-08				
OCDD	8.91E-04	0.00E+00	0.00E+00	0.00E+00	3.12E-05	9.36E-09	0.00E+00	2.34E-10	9.59E-09				
2,3,7,8-TCDF	1.78E-06	0.00E+00	0.00E+00	0.00E+00	6.96E-09	6.96E-10	0.00E+00	1.56E-10	8.51E-10				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	0.00E+00	0.00E+00	3.71E-09	1.11E-09	0.00E+00	2.49E-10	1.36E-09				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	0.00E+00	0.00E+00	6.53E-09	6.53E-10	0.00E+00	1.46E-10	7.99E-10				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	0.00E+00	0.00E+00	3.05E-09	3.05E-10	0.00E+00	6.82E-11	3.73E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	0.00E+00	0.00E+00	2.23E-09	2.23E-10	0.00E+00	4.99E-11	2.73E-10				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	0.00E+00	0.00E+00	2.10E-08	2.10E-10	0.00E+00	4.70E-11	2.57E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	0.00E+00	0.00E+00	6.57E-08	1.97E-11	0.00E+00	4.41E-12	2.41E-11				
Total Dioxins/Furans						4.97E-08	0.00E+00	2.45E-09	5.21E-08	5.62E-07	<1	3.76E-06	<1

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H2-7
Screening-Level Exposure Evaluation - Grizzly Bear
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)										
			Diet					Water	Substrate				
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.29E-01	0.00E+00	5.29E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E-04	0.00E+00	1.66E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	1.18E+01	4.40E-03	6.21E-03	4.47E-03	1.28E-04	0.00E+00	1.08E-02	9.50E-05	7.14E-03	1.09E-02	1.04E+00	<1	4.55E+00	<1
Barium	4.20E+02	2.71E+00	9.20E-01	1.24E-01	6.19E-04	0.00E+00	1.04E+00	5.85E-02	2.54E-01	1.10E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	1.50E+00	1.50E-03	1.11E-02	2.19E-04	7.29E-06	0.00E+00	1.13E-02	3.24E-05	9.07E-04	1.13E-02	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.48E-05	0.00E+00	6.48E-05	7.70E-01	<1	6.87E+00	<1
Chromium	8.48E+01	2.72E-02	4.88E-02	8.41E-02	1.30E-02	0.00E+00	1.46E-01	5.87E-04	5.13E-02	1.46E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-04	0.00E+00	3.35E-04	7.33E+00	<1	1.89E+01	<1
Copper	7.26E+03	1.83E-01	9.09E-01	1.21E+01	6.01E-02	0.00E+00	1.31E+01	3.95E-03	4.39E+00	1.31E+01	5.60E+00	2.34E+00	8.27E+01	<1
Lead	4.80E+01	3.52E-02	3.26E-02	5.92E-02	1.29E-02	0.00E+00	1.05E-01	7.60E-04	2.90E-02	1.06E-01	4.70E+00	<1	1.86E+02	<1
Manganese	1.14E+03	3.75E+00	1.26E+00	1.75E-01	5.05E-02	0.00E+00	1.49E+00	8.10E-02	6.89E-01	1.57E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	0.00E+00	5.61E-06	--	5.61E-06	1.41E+00	<1	1.41E+01	<1
Nickel	8.90E+01	5.59E-02	4.37E-02	2.24E-01	1.37E-02	0.00E+00	2.82E-01	1.21E-03	5.38E-02	2.83E-01	1.70E+00	<1	1.48E+01	<1
Selenium	1.20E+00	2.00E-03	8.72E-03	3.43E-03	1.53E-03	0.00E+00	1.37E-02	4.32E-05	7.26E-04	1.37E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.40E-01	3.30E-04	7.86E-06	2.45E-05	3.27E-05	0.00E+00	6.51E-05	7.13E-06	8.47E-05	7.22E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	2.77E+01	2.48E-02	1.89E-03	3.77E-03	7.36E-04	0.00E+00	6.39E-03	5.36E-04	1.67E-02	6.93E-03	4.16E+00	<1	9.44E+00	<1
Zinc	1.14E+02	5.37E-01	9.35E-01	1.31E+00	2.37E-01	0.00E+00	2.48E+00	1.16E-02	6.89E-02	2.49E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	9.90E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.16E-03	5.99E-03	8.16E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	7.96E+02	2.24E+01	6.70E-01	3.20E-01	2.75E-02	0.00E+00	1.02E+00	4.84E-01	4.81E-01	1.50E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	1.20E+00	0.00E+00	1.50E-03	1.14E-01	6.55E-04	0.00E+00	1.16E-01	0.00E+00	7.26E-04	1.16E-01	6.80E-02	1.70E+00	6.80E-01	<1
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	2.20E+01	0.00E+00	3.83E-06	1.05E-01	0.00E+00	0.00E+00	1.05E-01	0.00E+00	1.33E-02	1.05E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.70E+01	6.20E-04	1.05E-01	3.68E-01	0.00E+00	0.00E+00	4.73E-01	1.34E-05	2.84E-02	4.73E-01				
Fluoranthene	2.40E+02	9.30E-03	1.68E+00	2.36E+00	0.00E+00	0.00E+00	4.05E+00	2.01E-04	1.45E-01	4.05E+00				
Fluorene	1.90E+01	8.70E-04	4.34E-06	5.89E-01	0.00E+00	0.00E+00	5.89E-01	1.88E-05	1.15E-02	5.89E-01				
Naphthalene	4.60E+00	8.70E-04	7.88E-01	6.56E-02	0.00E+00	0.00E+00	8.53E-01	1.88E-05	2.78E-03	8.53E-01				
Phenanthrene	1.80E+02	1.50E-03	2.98E-01	1.00E+00	0.00E+00	0.00E+00	1.30E+00	3.24E-05	1.09E-01	1.30E+00				
Total LMW PAHs							7.37E+00	2.84E-04	3.10E-01	7.68E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	1.00E+02	3.00E-03	1.45E-02	5.15E-01	0.00E+00	0.00E+00	5.30E-01	6.48E-05	6.05E-02	5.30E-01				
Benzo[A]Pyrene	1.00E+02	0.00E+00	1.59E-01	4.31E-01	0.00E+00	0.00E+00	5.90E-01	0.00E+00	6.05E-02	5.90E-01				
Benzo(b)fluoranthene	1.20E+02	1.00E-02	5.22E-01	1.01E+00	0.00E+00	0.00E+00	1.53E+00	2.16E-04	7.26E-02	1.53E+00				
Benzo(g,h,i)perylene	6.20E+01	3.90E-03	7.30E-01	5.90E-01	0.00E+00	0.00E+00	1.32E+00	8.42E-05	3.75E-02	1.32E+00				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	0.00E+00	9.93E-06	--	9.93E-06				
Chrysene	1.10E+02	7.60E-03	1.53E-02	8.16E-01	0.00E+00	0.00E+00	8.31E-01	1.64E-04	6.65E-02	8.31E-01				
Dibenz(A,H)Anthracene	2.10E+01	9.80E-05	3.83E-02	1.57E-01	0.00E+00	0.00E+00	1.95E-01	2.12E-06	1.27E-02	1.95E-01				
Indeno (1,2,3-CD) Pyrene	7.60E+01	3.10E-03	1.17E-01	7.04E-01	0.00E+00	0.00E+00	8.21E-01	6.69E-05	4.60E-02	8.22E-01				
Pyrene	1.50E+02	7.00E-03	1.52E+00	8.50E-01	0.00E+00	0.00E+00	2.37E+00	1.51E-04	9.07E-02	2.37E+00				
Total HMW PAHs							8.19E+00	7.59E-04	4.47E-01	8.63E+00	6.15E-01	1.40E+01	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.50E+00	2.20E-02	8.35E-04	4.41E-01	4.21E-03	0.00E+00	4.46E-01	4.75E-04	1.51E-03	4.46E-01	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	1.00E+01	0.00E+00	2.64E-01	2.25E-01	1.21E-03	0.00E+00	4.90E-01	0.00E+00	6.05E-03	4.90E-01	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.60E-02	0.00E+00	6.40E-04	1.87E-03	5.43E-05	0.00E+00	2.57E-03	0.00E+00	3.39E-05	2.57E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H2-7
Screening-Level Exposure Evaluation - Grizzly Bear
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)											
			Diet					Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	2.70E-07	0.00E+00	3.57E-10	1.91E-09	2.92E-10	0.00E+00	2.56E-09	0.00E+00	1.63E-10	2.56E-09				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	2.32E-10	2.33E-09	3.52E-10	0.00E+00	2.92E-09	0.00E+00	1.93E-10	2.92E-09				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	9.74E-10	2.60E-08	3.32E-09	0.00E+00	3.03E-09	0.00E+00	1.49E-10	3.03E-09				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	4.51E-10	1.05E-08	1.42E-09	0.00E+00	1.23E-09	0.00E+00	6.89E-11	1.23E-09				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	1.66E-08	1.51E-06	1.45E-07	0.00E+00	1.67E-08	0.00E+00	4.61E-10	1.67E-08				
OCDD	8.91E-04	0.00E+00	1.06E-07	2.75E-05	2.16E-06	0.00E+00	8.93E-09	0.00E+00	1.62E-10	8.93E-09				
2,3,7,8-TCDF	1.78E-06	0.00E+00	4.23E-09	1.77E-08	4.81E-10	0.00E+00	2.25E-09	0.00E+00	1.08E-10	2.25E-09				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	1.23E-09	8.44E-09	2.57E-10	0.00E+00	2.98E-09	0.00E+00	1.72E-10	2.98E-09				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	8.67E-10	1.64E-08	4.51E-10	0.00E+00	1.78E-09	0.00E+00	1.01E-10	1.78E-09				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	4.05E-10	6.69E-09	2.11E-10	0.00E+00	7.30E-10	0.00E+00	4.72E-11	7.30E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	4.06E-10	4.62E-09	1.54E-10	0.00E+00	5.18E-10	0.00E+00	3.45E-11	5.18E-10				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	2.09E-09	6.54E-08	1.45E-09	0.00E+00	6.89E-10	0.00E+00	3.25E-11	6.89E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	3.59E-09	2.52E-07	4.54E-09	0.00E+00	7.80E-11	0.00E+00	3.05E-12	7.80E-11				
Total Dioxins/Furans						0.00E+00	4.44E-08	0.00E+00	1.70E-09	4.61E-08	5.62E-07	<1	3.76E-06	<1

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H2-8
Screening-Level Exposure Evaluation - Long-tailed Weasel
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E+00	0.00E+00	1.26E+00	No TRV	--	No TRV	--
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.96E-04	0.00E+00	3.96E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	1.45E+01	4.40E-03	0.00E+00	0.00E+00	3.61E-03	3.61E-03	2.26E-04	1.20E-02	1.58E-02	1.04E+00	<1	4.55E+00	<1
Barium	4.31E+02	2.71E+00	0.00E+00	0.00E+00	1.51E-02	1.51E-02	1.39E-01	3.55E-01	5.09E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	3.62E+00	1.50E-03	0.00E+00	0.00E+00	4.19E-04	4.19E-04	7.72E-05	2.98E-03	3.48E-03	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-04	0.00E+00	1.54E-04	7.70E-01	<1	6.87E+00	<1
Chromium	2.87E+01	2.72E-02	0.00E+00	0.00E+00	1.40E-01	1.40E-01	1.40E-03	2.36E-02	1.65E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.98E-04	0.00E+00	7.98E-04	7.33E+00	<1	1.89E+01	<1
Copper	1.84E+03	1.83E-01	0.00E+00	0.00E+00	1.17E+00	1.17E+00	9.42E-03	1.52E+00	2.70E+00	5.60E+00	<1	8.27E+01	<1
Lead	4.96E+01	3.52E-02	0.00E+00	0.00E+00	3.12E-01	3.12E-01	1.81E-03	4.09E-02	3.55E-01	4.70E+00	<1	1.86E+02	<1
Manganese	1.03E+03	3.75E+00	0.00E+00	0.00E+00	1.08E+00	1.08E+00	1.93E-01	8.45E-01	2.12E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	1.34E-05	--	1.34E-05	1.41E+00	<1	1.41E+01	<1
Nickel	4.04E+02	5.59E-02	0.00E+00	0.00E+00	6.58E-01	6.58E-01	2.88E-03	3.32E-01	9.94E-01	1.70E+00	<1	1.48E+01	<1
Selenium	2.29E+00	2.00E-03	0.00E+00	0.00E+00	4.64E-02	4.64E-02	1.03E-04	1.88E-03	4.83E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	8.41E-01	3.30E-04	0.00E+00	0.00E+00	4.68E-03	4.68E-03	1.70E-05	6.93E-04	5.39E-03	4.80E-01	<1	1.43E+00	<1
Vanadium	1.15E+02	2.48E-02	0.00E+00	0.00E+00	7.29E-02	7.29E-02	1.28E-03	9.49E-02	1.69E-01	4.16E+00	<1	9.44E+00	<1
Zinc	1.12E+02	5.37E-01	0.00E+00	0.00E+00	5.64E+00	5.64E+00	2.76E-02	9.20E-02	5.76E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.22E+01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.95E-02	1.01E-02	2.95E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	6.03E+02	2.24E+01	0.00E+00	0.00E+00	4.96E-01	4.96E-01	1.15E+00	4.96E-01	2.14E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	9.83E-01	0.00E+00	0.00E+00	0.00E+00	1.28E-02	1.28E-02	0.00E+00	8.09E-04	1.36E-02	6.80E-02	<1	6.80E-01	<1
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.65E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.18E-02	2.18E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.78E+01	6.20E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.19E-05	3.93E-02	3.93E-02				
Fluoranthene	2.40E+02	9.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.79E-04	1.98E-01	1.98E-01				
Fluorene	2.35E+01	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.48E-05	1.93E-02	1.94E-02				
Naphthalene	8.65E+00	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.48E-05	7.12E-03	7.17E-03				
Phenanthrene	2.25E+02	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.72E-05	1.85E-01	1.85E-01				
Total LMW PAHs						0.00E+00	6.77E-04	4.70E-01	4.71E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	9.18E+01	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-04	7.55E-02	7.57E-02				
Benzo[A]Pyrene	8.13E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.69E-02	6.69E-02				
Benzo(b)fluoranthene	1.05E+02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E-04	8.65E-02	8.70E-02				
Benzo(g,h,i)perylene	5.08E+01	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E-04	4.18E-02	4.20E-02				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	2.37E-05	--	2.37E-05				
Chrysene	1.10E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.91E-04	9.06E-02	9.10E-02				
Dibenz(A,H)Anthracene	1.95E+01	9.80E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.04E-06	1.61E-02	1.61E-02				
Indeno (1,2,3-CD) Pyrene	6.18E+01	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.60E-04	5.08E-02	5.10E-02				
Pyrene	1.35E+02	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-04	1.11E-01	1.12E-01				
Total HMW PAHs						0.00E+00	1.81E-03	5.39E-01	5.41E-01	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	6.39E-01	2.20E-02	0.00E+00	0.00E+00	2.56E-02	2.56E-02	1.13E-03	5.26E-04	2.73E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	1.38E+01	0.00E+00	0.00E+00	0.00E+00	3.96E-02	3.96E-02	0.00E+00	1.13E-02	5.10E-02	No TRV	--	No TRV	--
Di-n-butyl phthalate	4.15E-02	0.00E+00	0.00E+00	0.00E+00	9.59E-04	9.59E-04	0.00E+00	3.42E-05	9.93E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H2-8
Screening-Level Exposure Evaluation - Long-tailed Weasel
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	2.70E-07	0.00E+00	0.00E+00	0.00E+00	6.97E-09	6.97E-09	0.00E+00	2.22E-10	7.19E-09				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	0.00E+00	0.00E+00	8.40E-09	8.40E-09	0.00E+00	2.63E-10	8.66E-09				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	0.00E+00	0.00E+00	7.90E-08	7.90E-09	0.00E+00	2.03E-10	8.11E-09				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	0.00E+00	0.00E+00	3.39E-08	3.39E-09	0.00E+00	9.39E-11	3.49E-09				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	0.00E+00	0.00E+00	3.45E-06	3.45E-08	0.00E+00	6.28E-10	3.51E-08				
OCDD	8.91E-04	0.00E+00	0.00E+00	0.00E+00	5.14E-05	1.54E-08	0.00E+00	2.20E-10	1.56E-08				
2,3,7,8-TCDF	1.78E-06	0.00E+00	0.00E+00	0.00E+00	1.15E-08	1.15E-09	0.00E+00	1.47E-10	1.29E-09				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	0.00E+00	0.00E+00	6.12E-09	1.83E-09	0.00E+00	2.35E-10	2.07E-09				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	0.00E+00	0.00E+00	1.08E-08	1.08E-09	0.00E+00	1.38E-10	1.21E-09				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	0.00E+00	0.00E+00	5.02E-09	5.02E-10	0.00E+00	6.42E-11	5.66E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	0.00E+00	0.00E+00	3.67E-09	3.67E-10	0.00E+00	4.69E-11	4.14E-10				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	0.00E+00	0.00E+00	3.46E-08	3.46E-10	0.00E+00	4.42E-11	3.90E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	0.00E+00	0.00E+00	1.08E-07	3.24E-11	0.00E+00	4.15E-12	3.66E-11				
Total Dioxins/Furans						8.18E-08	0.00E+00	2.31E-09	8.42E-08	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H2-9
Screening-Level Exposure Evaluation - Grizzly Bear
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)										
			Diet					Water	Substrate				
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.29E-01	0.00E+00	5.29E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E-04	0.00E+00	1.66E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	1.18E+01	4.40E-03	6.21E-03	4.47E-03	1.28E-04	0.00E+00	1.08E-02	9.50E-05	7.14E-03	1.09E-02	1.04E+00	<1	4.55E+00	<1
Barium	4.20E+02	2.71E+00	9.20E-01	1.24E-01	6.19E-04	0.00E+00	1.04E+00	5.85E-02	2.54E-01	1.10E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	1.50E+00	1.50E-03	1.11E-02	2.19E-04	7.29E-06	0.00E+00	1.13E-02	3.24E-05	9.07E-04	1.13E-02	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.48E-05	0.00E+00	6.48E-05	7.70E-01	<1	6.87E+00	<1
Chromium	8.48E+01	2.72E-02	4.88E-02	8.41E-02	1.30E-02	0.00E+00	1.46E-01	5.87E-04	5.13E-02	1.46E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-04	0.00E+00	3.35E-04	7.33E+00	<1	1.89E+01	<1
Copper	7.26E+03	1.83E-01	9.09E-01	1.21E+01	6.01E-02	0.00E+00	1.31E+01	3.95E-03	4.39E+00	1.31E+01	5.60E+00	2.34E+00	8.27E+01	<1
Lead	4.80E+01	3.52E-02	3.26E-02	5.92E-02	1.29E-02	0.00E+00	1.05E-01	7.60E-04	2.90E-02	1.06E-01	4.70E+00	<1	1.86E+02	<1
Manganese	1.14E+03	3.75E+00	1.26E+00	1.75E-01	5.05E-02	0.00E+00	1.49E+00	8.10E-02	6.89E-01	1.57E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	0.00E+00	5.61E-06	--	5.61E-06	1.41E+00	<1	1.41E+01	<1
Nickel	8.90E+01	5.59E-02	4.37E-02	2.24E-01	1.37E-02	0.00E+00	2.82E-01	1.21E-03	5.38E-02	2.83E-01	1.70E+00	<1	1.48E+01	<1
Selenium	1.20E+00	2.00E-03	8.72E-03	3.43E-03	1.53E-03	0.00E+00	1.37E-02	4.32E-05	7.26E-04	1.37E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.40E-01	3.30E-04	7.86E-06	2.45E-05	3.27E-05	0.00E+00	6.51E-05	7.13E-06	8.47E-05	7.22E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	2.77E+01	2.48E-02	1.89E-03	3.77E-03	7.36E-04	0.00E+00	6.39E-03	5.36E-04	1.67E-02	6.93E-03	4.16E+00	<1	9.44E+00	<1
Zinc	1.14E+02	5.37E-01	9.35E-01	1.31E+00	2.37E-01	0.00E+00	2.48E+00	1.16E-02	6.89E-02	2.49E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	9.90E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.16E-03	5.99E-03	8.16E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	7.96E+02	2.24E+01	6.70E-01	3.20E-01	2.75E-02	0.00E+00	1.02E+00	4.84E-01	4.81E-01	1.50E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	1.20E+00	0.00E+00	1.50E-03	1.14E-01	6.55E-04	0.00E+00	1.16E-01	0.00E+00	7.26E-04	1.16E-01	6.80E-02	1.70E+00	6.80E-01	<1
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	2.20E+01	0.00E+00	3.83E-06	1.05E-01	0.00E+00	0.00E+00	1.05E-01	0.00E+00	1.33E-02	1.05E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.70E+01	6.20E-04	1.05E-01	3.68E-01	0.00E+00	0.00E+00	4.73E-01	1.34E-05	2.84E-02	4.73E-01				
Fluoranthene	2.40E+02	9.30E-03	1.68E+00	2.36E+00	0.00E+00	0.00E+00	4.05E+00	2.01E-04	1.45E-01	4.05E+00				
Fluorene	1.90E+01	8.70E-04	4.34E-06	5.89E-01	0.00E+00	0.00E+00	5.89E-01	1.88E-05	1.15E-02	5.89E-01				
Naphthalene	4.60E+00	8.70E-04	7.88E-01	6.56E-02	0.00E+00	0.00E+00	8.53E-01	1.88E-05	2.78E-03	8.53E-01				
Phenanthrene	1.80E+02	1.50E-03	2.98E-01	1.00E+00	0.00E+00	0.00E+00	1.30E+00	3.24E-05	1.09E-01	1.30E+00				
Total LMW PAHs							7.37E+00	2.84E-04	3.10E-01	7.68E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	1.00E+02	3.00E-03	1.45E-02	5.15E-01	0.00E+00	0.00E+00	5.30E-01	6.48E-05	6.05E-02	5.30E-01				
Benzo[A]Pyrene	1.00E+02	0.00E+00	1.59E-01	4.31E-01	0.00E+00	0.00E+00	5.90E-01	0.00E+00	6.05E-02	5.90E-01				
Benzo(b)fluoranthene	1.20E+02	1.00E-02	5.22E-01	1.01E+00	0.00E+00	0.00E+00	1.53E+00	2.16E-04	7.26E-02	1.53E+00				
Benzo(g,h,i)perylene	6.20E+01	3.90E-03	7.30E-01	5.90E-01	0.00E+00	0.00E+00	1.32E+00	8.42E-05	3.75E-02	1.32E+00				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	0.00E+00	9.93E-06	--	9.93E-06				
Chrysene	1.10E+02	7.60E-03	1.53E-02	8.16E-01	0.00E+00	0.00E+00	8.31E-01	1.64E-04	6.65E-02	8.31E-01				
Dibenz(A,H)Anthracene	2.10E+01	9.80E-05	3.83E-02	1.57E-01	0.00E+00	0.00E+00	1.95E-01	2.12E-06	1.27E-02	1.95E-01				
Indeno (1,2,3-CD) Pyrene	7.60E+01	3.10E-03	1.17E-01	7.04E-01	0.00E+00	0.00E+00	8.21E-01	6.69E-05	4.60E-02	8.22E-01				
Pyrene	1.50E+02	7.00E-03	1.52E+00	8.50E-01	0.00E+00	0.00E+00	2.37E+00	1.51E-04	9.07E-02	2.37E+00				
Total HMW PAHs							8.19E+00	7.59E-04	4.47E-01	8.63E+00	6.15E-01	1.40E+01	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.50E+00	2.20E-02	8.35E-04	4.41E-01	4.21E-03	0.00E+00	4.46E-01	4.75E-04	1.51E-03	4.46E-01	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	1.00E+01	0.00E+00	2.64E-01	2.25E-01	1.21E-03	0.00E+00	4.90E-01	0.00E+00	6.05E-03	4.90E-01	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.60E-02	0.00E+00	6.40E-04	1.87E-03	5.43E-05	0.00E+00	2.57E-03	0.00E+00	3.39E-05	2.57E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H2-9
Screening-Level Exposure Evaluation - Grizzly Bear
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)											
			Diet					Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	2.70E-07	0.00E+00	3.57E-10	1.91E-09	2.92E-10	0.00E+00	2.56E-09	0.00E+00	1.63E-10	2.56E-09				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	2.32E-10	2.33E-09	3.52E-10	0.00E+00	2.92E-09	0.00E+00	1.93E-10	2.92E-09				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	9.74E-10	2.60E-08	3.32E-09	0.00E+00	3.03E-09	0.00E+00	1.49E-10	3.03E-09				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	4.51E-10	1.05E-08	1.42E-09	0.00E+00	1.23E-09	0.00E+00	6.89E-11	1.23E-09				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	1.66E-08	1.51E-06	1.45E-07	0.00E+00	1.67E-08	0.00E+00	4.61E-10	1.67E-08				
OCDD	8.91E-04	0.00E+00	1.06E-07	2.75E-05	2.16E-06	0.00E+00	8.93E-09	0.00E+00	1.62E-10	8.93E-09				
2,3,7,8-TCDF	1.78E-06	0.00E+00	4.23E-09	1.77E-08	4.81E-10	0.00E+00	2.25E-09	0.00E+00	1.08E-10	2.25E-09				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	1.23E-09	8.44E-09	2.57E-10	0.00E+00	2.98E-09	0.00E+00	1.72E-10	2.98E-09				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	8.67E-10	1.64E-08	4.51E-10	0.00E+00	1.78E-09	0.00E+00	1.01E-10	1.78E-09				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	4.05E-10	6.69E-09	2.11E-10	0.00E+00	7.30E-10	0.00E+00	4.72E-11	7.30E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	4.06E-10	4.62E-09	1.54E-10	0.00E+00	5.18E-10	0.00E+00	3.45E-11	5.18E-10				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	2.09E-09	6.54E-08	1.45E-09	0.00E+00	6.89E-10	0.00E+00	3.25E-11	6.89E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	3.59E-09	2.52E-07	4.54E-09	0.00E+00	7.80E-11	0.00E+00	3.05E-12	7.80E-11				
Total Dioxins/Furans						0.00E+00	4.44E-08	0.00E+00	1.70E-09	4.61E-08	5.62E-07	<1	3.76E-06	<1

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H2-10
Screening-Level Exposure Evaluation - North American Wolverine
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.36E-01	0.00E+00	7.36E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.31E-04	0.00E+00	2.31E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	1.45E+01	4.40E-03	0.00E+00	0.00E+00	2.11E-03	2.11E-03	1.32E-04	1.22E-02	1.45E-02	1.04E+00	<1	4.55E+00	<1
Barium	4.31E+02	2.71E+00	0.00E+00	0.00E+00	8.83E-03	8.83E-03	8.14E-02	3.62E-01	4.53E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	3.62E+00	1.50E-03	0.00E+00	0.00E+00	2.45E-04	2.45E-04	4.51E-05	3.05E-03	3.34E-03	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.01E-05	0.00E+00	9.01E-05	7.70E-01	<1	6.87E+00	<1
Chromium	2.87E+01	2.72E-02	0.00E+00	0.00E+00	8.19E-02	8.19E-02	8.17E-04	2.41E-02	1.07E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E-04	0.00E+00	4.66E-04	7.33E+00	<1	1.89E+01	<1
Copper	1.84E+03	1.83E-01	0.00E+00	0.00E+00	6.86E-01	6.86E-01	5.50E-03	1.55E+00	2.24E+00	5.60E+00	<1	8.27E+01	<1
Lead	4.96E+01	3.52E-02	0.00E+00	0.00E+00	1.82E-01	1.82E-01	1.06E-03	4.17E-02	2.25E-01	4.70E+00	<1	1.86E+02	<1
Manganese	1.03E+03	3.75E+00	0.00E+00	0.00E+00	6.32E-01	6.32E-01	1.13E-01	8.64E-01	1.61E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	7.81E-06	--	7.81E-06	1.41E+00	<1	1.41E+01	<1
Nickel	4.04E+02	5.59E-02	0.00E+00	0.00E+00	3.84E-01	3.84E-01	1.68E-03	3.40E-01	7.26E-01	1.70E+00	<1	1.48E+01	<1
Selenium	2.29E+00	2.00E-03	0.00E+00	0.00E+00	2.71E-02	2.71E-02	6.01E-05	1.92E-03	2.91E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	8.41E-01	3.30E-04	0.00E+00	0.00E+00	2.73E-03	2.73E-03	9.92E-06	7.08E-04	3.45E-03	4.80E-01	<1	1.43E+00	<1
Vanadium	1.15E+02	2.48E-02	0.00E+00	0.00E+00	4.26E-02	4.26E-02	7.45E-04	9.69E-02	1.40E-01	4.16E+00	<1	9.44E+00	<1
Zinc	1.12E+02	5.37E-01	0.00E+00	0.00E+00	3.29E+00	3.29E+00	1.61E-02	9.40E-02	3.40E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.22E+01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-02	1.03E-02	2.16E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	6.03E+02	2.24E+01	0.00E+00	0.00E+00	2.90E-01	2.90E-01	6.73E-01	5.07E-01	1.47E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	9.83E-01	0.00E+00	0.00E+00	0.00E+00	7.46E-03	7.46E-03	0.00E+00	8.27E-04	8.29E-03	6.80E-02	<1	6.80E-01	<1
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.65E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.23E-02	2.23E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.78E+01	6.20E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.86E-05	4.02E-02	4.02E-02				
Fluoranthene	2.40E+02	9.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.79E-04	2.02E-01	2.02E-01				
Fluorene	2.35E+01	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.61E-05	1.98E-02	1.98E-02				
Naphthalene	8.65E+00	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.61E-05	7.28E-03	7.30E-03				
Phenanthrene	2.25E+02	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.51E-05	1.89E-01	1.89E-01				
Total LMW PAHs						0.00E+00	3.95E-04	4.81E-01	4.81E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	9.18E+01	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.01E-05	7.72E-02	7.73E-02				
Benzo[A]Pyrene	8.13E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.84E-02	6.84E-02				
Benzo(b)fluoranthene	1.05E+02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-04	8.83E-02	8.86E-02				
Benzo(g,h,i)perylene	5.08E+01	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-04	4.27E-02	4.28E-02				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	1.38E-05	--	1.38E-05				
Chrysene	1.10E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.28E-04	9.25E-02	9.28E-02				
Dibenz(A,H)Anthracene	1.95E+01	9.80E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.94E-06	1.64E-02	1.64E-02				
Indeno (1,2,3-CD) Pyrene	6.18E+01	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.31E-05	5.19E-02	5.20E-02				
Pyrene	1.35E+02	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-04	1.14E-01	1.14E-01				
Total HMW PAHs						0.00E+00	1.06E-03	5.51E-01	5.52E-01	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	6.39E-01	2.20E-02	0.00E+00	0.00E+00	1.50E-02	1.50E-02	6.61E-04	5.37E-04	1.62E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	1.38E+01	0.00E+00	0.00E+00	0.00E+00	2.31E-02	2.31E-02	0.00E+00	1.16E-02	3.47E-02	No TRV	--	No TRV	--
Di-n-butyl phthalate	4.15E-02	0.00E+00	0.00E+00	0.00E+00	5.60E-04	5.60E-04	0.00E+00	3.49E-05	5.95E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H2-10
Screening-Level Exposure Evaluation - North American Wolverine
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	2.70E-07	0.00E+00	0.00E+00	0.00E+00	4.07E-09	4.07E-09	0.00E+00	2.27E-10	4.29E-09				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	0.00E+00	0.00E+00	4.90E-09	4.90E-09	0.00E+00	2.69E-10	5.17E-09				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	0.00E+00	0.00E+00	4.61E-08	4.61E-09	0.00E+00	2.07E-10	4.82E-09				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	0.00E+00	0.00E+00	1.98E-08	1.98E-09	0.00E+00	9.59E-11	2.08E-09				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	0.00E+00	0.00E+00	2.01E-06	2.01E-08	0.00E+00	6.42E-10	2.08E-08				
OCDD	8.91E-04	0.00E+00	0.00E+00	0.00E+00	3.00E-05	9.00E-09	0.00E+00	2.25E-10	9.22E-09				
2,3,7,8-TCDF	1.78E-06	0.00E+00	0.00E+00	0.00E+00	6.69E-09	6.69E-10	0.00E+00	1.50E-10	8.19E-10				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	0.00E+00	0.00E+00	3.57E-09	1.07E-09	0.00E+00	2.40E-10	1.31E-09				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	0.00E+00	0.00E+00	6.28E-09	6.28E-10	0.00E+00	1.40E-10	7.68E-10				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	0.00E+00	0.00E+00	2.93E-09	2.93E-10	0.00E+00	6.56E-11	3.59E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	0.00E+00	0.00E+00	2.14E-09	2.14E-10	0.00E+00	4.80E-11	2.62E-10				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	0.00E+00	0.00E+00	2.02E-08	2.02E-10	0.00E+00	4.52E-11	2.47E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	0.00E+00	0.00E+00	6.31E-08	1.89E-11	0.00E+00	4.24E-12	2.32E-11				
Total Dioxins/Furans						4.78E-08	0.00E+00	2.36E-09	5.01E-08	5.62E-07	<1	3.76E-06	<1

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H2-11
Screening-Level Exposure Evaluation -Short-tailed Shrew
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.28E+00	0.00E+00	3.28E+00	No TRV	--	No TRV	--
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-03	0.00E+00	1.03E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	1.45E+01	4.40E-03	0.00E+00	2.14E-01	0.00E+00	2.14E-01	5.90E-04	2.14E-02	2.36E-01	1.04E+00	<1	4.55E+00	<1
Barium	4.31E+02	2.71E+00	0.00E+00	5.25E+00	0.00E+00	5.25E+00	3.63E-01	6.35E-01	6.25E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	3.62E+00	1.50E-03	0.00E+00	2.18E-02	0.00E+00	2.18E-02	2.01E-04	5.34E-03	2.74E-02	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.02E-04	0.00E+00	4.02E-04	7.70E-01	<1	6.87E+00	<1
Chromium	2.87E+01	2.72E-02	0.00E+00	1.18E+00	0.00E+00	1.18E+00	3.65E-03	4.23E-02	1.22E+00	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.08E-03	0.00E+00	2.08E-03	7.33E+00	<1	1.89E+01	<1
Copper	1.84E+03	1.83E-01	0.00E+00	1.27E+02	0.00E+00	1.27E+02	2.45E-02	2.71E+00	1.30E+02	5.60E+00	2.32E+01	8.27E+01	1.57E+00
Lead	4.96E+01	3.52E-02	0.00E+00	2.52E+00	0.00E+00	2.52E+00	4.72E-03	7.32E-02	2.59E+00	4.70E+00	<1	1.86E+02	<1
Manganese	1.03E+03	3.75E+00	0.00E+00	6.75E+00	0.00E+00	6.75E+00	5.03E-01	1.51E+00	8.77E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	3.48E-05	--	3.48E-05	1.41E+00	<1	1.41E+01	<1
Nickel	4.04E+02	5.59E-02	0.00E+00	4.21E+01	0.00E+00	4.21E+01	7.49E-03	5.95E-01	4.27E+01	1.70E+00	2.51E+01	1.48E+01	2.88E+00
Selenium	2.29E+00	2.00E-03	0.00E+00	2.28E-01	0.00E+00	2.28E-01	2.68E-04	3.37E-03	2.32E-01	1.43E-01	1.62E+00	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	8.41E-01	3.30E-04	0.00E+00	6.10E-03	0.00E+00	6.10E-03	4.42E-05	1.24E-03	7.38E-03	4.80E-01	<1	1.43E+00	<1
Vanadium	1.15E+02	2.48E-02	0.00E+00	6.49E-01	0.00E+00	6.49E-01	3.32E-03	1.70E-01	8.22E-01	4.16E+00	<1	9.44E+00	<1
Zinc	1.12E+02	5.37E-01	0.00E+00	5.38E+01	0.00E+00	5.38E+01	7.20E-02	1.65E-01	5.41E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.22E+01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.07E-02	1.80E-02	6.87E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	6.03E+02	2.24E+01	0.00E+00	1.00E+01	0.00E+00	1.00E+01	3.00E+00	8.88E-01	1.39E+01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	9.83E-01	0.00E+00	0.00E+00	3.85E+00	0.00E+00	3.85E+00	0.00E+00	1.45E-03	3.85E+00	6.80E-02	5.66E+01	6.80E-01	5.66E+00
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.65E+01	0.00E+00	0.00E+00	5.22E+00	0.00E+00	5.22E+00	0.00E+00	3.91E-02	5.26E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.78E+01	6.20E-04	0.00E+00	1.55E+01	0.00E+00	1.55E+01	8.31E-05	7.04E-02	1.56E+01				
Fluoranthene	2.40E+02	9.30E-03	0.00E+00	9.78E+01	0.00E+00	9.78E+01	1.25E-03	3.54E-01	9.81E+01				
Fluorene	2.35E+01	8.70E-04	0.00E+00	3.01E+01	0.00E+00	3.01E+01	1.17E-04	3.46E-02	3.02E+01				
Naphthalene	8.65E+00	8.70E-04	0.00E+00	5.10E+00	0.00E+00	5.10E+00	1.17E-04	1.28E-02	5.11E+00				
Phenanthrene	2.25E+02	1.50E-03	0.00E+00	5.19E+01	0.00E+00	5.19E+01	2.01E-04	3.32E-01	5.22E+01				
Total LMW PAHs						2.06E+02	1.76E-03	8.42E-01	2.06E+02	6.56E+01	3.15E+00	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	9.18E+01	3.00E-03	0.00E+00	1.96E+01	0.00E+00	1.96E+01	4.02E-04	1.35E-01	1.97E+01				
Benzo[A]Pyrene	8.13E+01	0.00E+00	0.00E+00	1.45E+01	0.00E+00	1.45E+01	0.00E+00	1.20E-01	1.46E+01				
Benzo(b)fluoranthene	1.05E+02	1.00E-02	0.00E+00	3.66E+01	0.00E+00	3.66E+01	1.34E-03	1.55E-01	3.67E+01				
Benzo(g,h,i)perylene	5.08E+01	3.90E-03	0.00E+00	2.00E+01	0.00E+00	2.00E+01	5.23E-04	7.48E-02	2.01E+01				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	6.16E-05	--	6.16E-05				
Chrysene	1.10E+02	7.60E-03	0.00E+00	3.38E+01	0.00E+00	3.38E+01	1.02E-03	1.62E-01	3.39E+01				
Dibenz(A,H)Anthracene	1.95E+01	9.80E-05	0.00E+00	6.04E+00	0.00E+00	6.04E+00	1.31E-05	2.87E-02	6.07E+00				
Indeno (1,2,3-CD) Pyrene	6.18E+01	3.10E-03	0.00E+00	2.37E+01	0.00E+00	2.37E+01	4.15E-04	9.10E-02	2.38E+01				
Pyrene	1.35E+02	7.00E-03	0.00E+00	3.17E+01	0.00E+00	3.17E+01	9.38E-04	1.99E-01	3.19E+01				
Total HMW PAHs						1.86E+02	4.71E-03	9.66E-01	1.87E+02	6.15E-01	3.04E+02	3.84E+01	4.86E+00
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	6.39E-01	2.20E-02	0.00E+00	4.66E+00	0.00E+00	4.66E+00	2.95E-03	9.42E-04	4.66E+00	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	1.38E+01	0.00E+00	0.00E+00	1.28E+01	0.00E+00	1.28E+01	0.00E+00	2.03E-02	1.28E+01	No TRV	--	No TRV	--
Di-n-butyl phthalate	4.15E-02	0.00E+00	0.00E+00	5.74E-02	0.00E+00	5.74E-02	0.00E+00	6.12E-05	5.74E-02	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H2-11
Screening-Level Exposure Evaluation -Short-tailed Shrew
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	2.70E-07	0.00E+00	0.00E+00	7.90E-08	0.00E+00	7.90E-08	0.00E+00	3.98E-10	7.94E-08				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	0.00E+00	9.65E-08	0.00E+00	9.65E-08	0.00E+00	4.72E-10	9.70E-08				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	0.00E+00	1.08E-06	0.00E+00	1.08E-07	0.00E+00	3.63E-10	1.08E-07				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	0.00E+00	4.33E-07	0.00E+00	4.33E-08	0.00E+00	1.68E-10	4.35E-08				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	0.00E+00	6.23E-05	0.00E+00	6.23E-07	0.00E+00	1.12E-09	6.24E-07				
OCDD	8.91E-04	0.00E+00	0.00E+00	1.14E-03	0.00E+00	3.41E-07	0.00E+00	3.94E-10	3.42E-07				
2,3,7,8-TCDF	1.78E-06	0.00E+00	0.00E+00	7.34E-07	0.00E+00	7.34E-08	0.00E+00	2.62E-10	7.36E-08				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	0.00E+00	3.49E-07	0.00E+00	1.05E-07	0.00E+00	4.20E-10	1.05E-07				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	0.00E+00	6.80E-07	0.00E+00	6.80E-08	0.00E+00	2.46E-10	6.83E-08				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	0.00E+00	2.77E-07	0.00E+00	2.77E-08	0.00E+00	1.15E-10	2.78E-08				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	0.00E+00	1.91E-07	0.00E+00	1.91E-08	0.00E+00	8.40E-11	1.92E-08				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	0.00E+00	2.71E-06	0.00E+00	2.71E-08	0.00E+00	7.92E-11	2.71E-08				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	0.00E+00	1.04E-05	0.00E+00	3.13E-09	0.00E+00	7.43E-12	3.13E-09				
Total Dioxins/Furans						1.61E-06	0.00E+00	4.13E-09	1.62E-06	5.62E-07	2.88E+00	3.76E-06	<1

Notes:
a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H3-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Industrial Landfill Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
					Plants			Soil Invertebrates			Small Mammals		
					Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals													
Aluminum	NA	2.45E+01	0.00E+00	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	7.70E-03	2.80E+00	2.80E+00	Regression[a]	1.04E-01	USEPA (2007)	1.00E+00	2.80E+00	Assumption[c]	5.00E-02	1.40E-01	Baes et al. (1984)[e]
Arsenic	NA	4.40E-03	2.35E+01	2.35E+01	3.75E-02	8.82E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	2.24E+00	Sample et al. (1999)	Regression[f]	1.04E-01	Sample et al. (1998b)
Barium	NA	2.71E+00	2.27E+02	2.27E+02	1.56E-01	3.54E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	2.07E+01	Sample et al. (1998a)	6.83E-04	1.55E-01	Baes et al. (1984)[e]
Beryllium	NA	1.50E-03	7.20E+00	7.20E+00	Regression[a]	2.49E+00	USEPA (2007)	4.50E-02	3.24E-01	Sample et al. (1998a)	2.25E-03	1.62E-02	Baes et al. (1984)[e]
Cadmium	NA	3.00E-03	9.40E-01	9.40E-01	Regression[a]	6.01E-01	Bechtel-Jacobs (1998a)	Regression[d]	7.88E+00	Sample et al. (1999)	Regression[f]	2.76E-01	Sample et al. (1998b)
Chromium	NA	2.72E-02	3.92E+01	3.92E+01	4.10E-02	1.61E+00	Bechtel-Jacobs (1998a)[g]	3.06E-01	1.20E+01	Sample et al. (1998a)	Regression[f]	3.43E+00	Sample et al. (1998b)
Cobalt	NA	1.55E-02	1.60E+01	1.60E+01	7.50E-03	1.20E-01	Bechtel-Jacobs (1998a)[g]	1.22E-01	1.95E+00	Sample et al. (1998a)	Regression[f]	4.30E-01	Sample et al. (1998b)
Copper	NA	1.83E-01	5.46E+01	5.46E+01	Regression[a]	9.43E+00	Bechtel-Jacobs (1998a)	5.15E-01	2.81E+01	Sample et al. (1998a)	Regression[f]	1.37E+01	Sample et al. (1998b)
Lead	NA	3.52E-02	1.94E+01	1.94E+01	Regression[a]	1.40E+00	Bechtel-Jacobs (1998a)	Regression[d]	8.80E+00	Sample et al. (1999)	Regression[f]	4.00E+00	Sample et al. (1998b)
Manganese	NA	3.75E+00	0.00E+00	0.00E+00	7.90E-02	0.00E+00	Bechtel-Jacobs (1998a)[g]	Regression[d]	0.00E+00	Sample et al. (1999)	2.05E-02	0.00E+00	Sample et al. (1998b)[i]
Mercury	NA	2.60E-04	ND	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	5.59E-02	4.63E+02	4.63E+02	Regression[a]	1.07E+01	Bechtel-Jacobs (1998a)	7.78E-01	3.60E+02	Sample et al. (1998a)	Regression[f]	1.36E+01	Sample et al. (1998b)
Selenium	NA	2.00E-03	7.50E-01	7.50E-01	Regression[a]	3.70E-01	Bechtel-Jacobs (1998a)	Regression[d]	7.51E-01	Sample et al. (1998a)	Regression[f]	5.92E-01	Sample et al. (1998b)
Silver		0.00E+00	ND	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	3.30E-04	1.70E-01	1.70E-01	4.00E-03	6.80E-04	Baes et al. (1984)	5.41E-02	9.20E-03	USCHPPM (2004)	1.08E-01	1.84E-02	Baes et al. (1984)[e]
Vanadium	NA	2.48E-02	1.69E+02	1.69E+02	4.85E-03	8.20E-01	Bechtel-Jacobs (1998a)[g]	4.20E-02	7.10E+00	Sample et al. (1998a)	1.23E-02	2.08E+00	Sample et al. (1998b)[i]
Zinc	NA	5.37E-01	6.70E+01	6.70E+01	Regression[a]	4.96E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.40E+02	Sample et al. (1998a)	Regression[f]	1.06E+02	Sample et al. (1998b)
Inorganics - Other Inorganics													
Cyanide	NA	3.78E-01	1.90E-01	1.90E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	2.24E+01	3.98E+02	3.98E+02	6.00E-02	2.39E+01	Baes et al. (1984)	1.24E-01	4.94E+01	USCHPPM (2004)	1.60E-02	6.37E+00	LANL (2015)
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	6.34	0.00E+00	ND	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	ND	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	3.92	0.00E+00	3.40E+00	3.40E+00	Regression[a]	1.35E-03	USEPA (2007a)	1.47E+00	5.00E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	6.20E-04	ND	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	9.30E-03	7.10E+01	7.10E+01	5.00E-01	3.55E+01	USEPA (2007a)	3.04E+00	2.16E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluorene	4.18	8.70E-04	ND	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	8.70E-04	1.80E+00	1.80E+00	1.22E+01	2.20E+01	USEPA (2007a)	4.40E+00	7.92E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Phenanthrene	4.55	1.50E-03	4.00E+01	4.00E+01	Regression[a]	8.35E+00	USEPA (2007a)	1.72E+00	6.88E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
LMW PAHs													
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	5.7	3.00E-03	4.30E+01	4.30E+01	Regression[a]	6.24E-01	USEPA (2007a)	1.59E+00	6.84E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	0.00E+00	5.30E+01	5.30E+01	Regression[a]	6.11E+00	USEPA (2007a)	1.33E+00	7.05E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	1.00E-02	6.00E+01	6.00E+01	3.10E-01	1.86E+01	USEPA (2007a)	2.60E+00	1.56E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	3.90E-03	4.30E+01	4.30E+01	Regression[a]	3.37E+01	USEPA (2007a)	2.94E+00	1.26E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	4.60E-04	ND	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	7.60E-03	5.10E+01	5.10E+01	Regression[a]	6.90E-01	USEPA (2007a)	2.29E+00	1.17E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	9.80E-05	ND	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]

Table H3-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Industrial Landfill Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
					Plants			Soil Invertebrates			Small Mammals		
					Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Indeno (1,2,3-CD) Pyrene	6.58	3.10E-03	ND	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	7.00E-03	6.70E+01	6.70E+01	7.20E-01	4.82E+01	USEPA (2007a)	1.75E+00	1.17E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
HMW PAHs													
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	2.20E-02	ND	ND	2.38E-02	0	USEPA (2007a)	5.44E+01	0	USEPA (2007a)	7.79E-01	0	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	ND	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	ND	ND	8.14E-01	0	USEPA (2007a)	1.03E+01	0	USEPA (2007a)	4.49E-01	0	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	3.59	0.00E+00	ND	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans													
2,3,7,8-TCDD	6.92	0.00E+00	ND	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	ND	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	ND	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	ND	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	ND	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	ND	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	0.00E+00	ND	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	ND	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	ND	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	ND	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	ND	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	ND	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	ND	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	ND	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H3-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Industrial Landfill Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assummed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H3-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Industrial Landfill Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	2.45E+01	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	7.70E-03	2.88E+00	Regression[a]	1.06E-01	USEPA (2007)	1.00E+00	2.88E+00	Assumption[c]	5.00E-02	1.44E-01	Baes et al. (1984)[e]
Arsenic	NA	4.40E-03	2.33E+01	3.75E-02	8.73E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	2.23E+00	Sample et al. (1999)	Regression[f]	1.03E-01	Sample et al. (1998b)
Barium	NA	2.71E+00	2.32E+02	1.56E-01	3.62E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	2.11E+01	Sample et al. (1998a)	6.83E-04	1.59E-01	Baes et al. (1984)[e]
Beryllium	NA	1.50E-03	7.58E+00	Regression[a]	2.59E+00	USEPA (2007)	4.50E-02	3.41E-01	Sample et al. (1998a)	2.25E-03	1.70E-02	Baes et al. (1984)[e]
Cadmium	NA	3.00E-03	1.17E+00	Regression[a]	6.77E-01	Bechtel-Jacobs (1998a)	Regression[d]	9.37E+00	Sample et al. (1999)	Regression[f]	3.06E-01	Sample et al. (1998b)
Chromium	NA	2.72E-02	2.56E+01	4.10E-02	1.05E+00	Bechtel-Jacobs (1998a)[g]	3.06E-01	7.82E+00	Sample et al. (1998a)	Regression[f]	2.50E+00	Sample et al. (1998b)
Cobalt	NA	1.55E-02	1.57E+01	7.50E-03	1.18E-01	Bechtel-Jacobs (1998a)[g]	1.22E-01	1.92E+00	Sample et al. (1998a)	Regression[f]	4.20E-01	Sample et al. (1998b)
Copper	NA	1.83E-01	5.96E+02	Regression[a]	2.42E+01	Bechtel-Jacobs (1998a)	5.15E-01	3.07E+02	Sample et al. (1998a)	Regression[f]	1.94E+01	Sample et al. (1998b)
Lead	NA	3.52E-02	1.90E+01	Regression[a]	1.38E+00	Bechtel-Jacobs (1998a)	Regression[d]	8.64E+00	Sample et al. (1999)	Regression[f]	3.96E+00	Sample et al. (1998b)
Manganese	NA	3.75E+00	0.00E+00	7.90E-02	0.00E+00	Bechtel-Jacobs (1998a)[g]	Regression[d]	0.00E+00	Sample et al. (1999)	2.05E-02	0.00E+00	Sample et al. (1998b)[i]
Mercury	NA	2.60E-04	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	5.59E-02	5.01E+02	Regression[a]	1.13E+01	Bechtel-Jacobs (1998a)	7.78E-01	3.89E+02	Sample et al. (1998a)	Regression[f]	1.41E+01	Sample et al. (1998b)
Selenium	NA	2.00E-03	4.80E-01	Regression[a]	2.26E-01	Bechtel-Jacobs (1998a)	Regression[d]	5.42E-01	Sample et al. (1998a)	Regression[f]	5.01E-01	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	3.30E-04	1.85E-01	4.00E-03	7.40E-04	Baes et al. (1984)	5.41E-02	1.00E-02	USCHPPM (2004)	1.08E-01	2.00E-02	Baes et al. (1984)[e]
Vanadium	NA	2.48E-02	1.65E+02	4.85E-03	7.98E-01	Bechtel-Jacobs (1998a)[g]	4.20E-02	6.91E+00	Sample et al. (1998a)	1.23E-02	2.02E+00	Sample et al. (1998b)[i]
Zinc	NA	5.37E-01	5.82E+01	Regression[a]	4.59E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.24E+02	Sample et al. (1998a)	Regression[f]	1.05E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	3.78E-01	1.73E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	2.24E+01	6.14E+02	6.00E-02	3.68E+01	Baes et al. (1984)	1.24E-01	7.61E+01	USCHPPM (2004)	1.60E-02	9.82E+00	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	1.45E+00	Regression[a]	2.80E-03	USEPA (2007a)	1.47E+00	2.13E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	6.20E-04	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	9.30E-03	2.32E+01	5.00E-01	1.16E+01	USEPA (2007a)	3.04E+00	7.04E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluorene	4.18	8.70E-04	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	8.70E-04	5.55E-01	1.22E+01	6.77E+00	USEPA (2007a)	4.40E+00	2.44E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Phenanthrene	4.55	1.50E-03	1.27E+01	Regression[a]	4.10E+00	USEPA (2007a)	1.72E+00	2.18E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
LMW PAHs												

Table H3-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Industrial Landfill Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	5.7	3.00E-03	1.42E+01	Regression[a]	3.23E-01	USEPA (2007a)	1.59E+00	2.26E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	0.00E+00	1.79E+01	Regression[a]	2.12E+00	USEPA (2007a)	1.33E+00	2.38E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	1.00E-02	1.97E+01	3.10E-01	6.11E+00	USEPA (2007a)	2.60E+00	5.13E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	3.90E-03	1.54E+01	Regression[a]	1.00E+01	USEPA (2007a)	2.94E+00	4.53E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	4.60E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	7.60E-03	1.69E+01	Regression[a]	3.58E-01	USEPA (2007a)	2.29E+00	3.86E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	9.80E-05	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.10E-03	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	7.00E-03	2.25E+01	7.20E-01	1.62E+01	USEPA (2007a)	1.75E+00	3.93E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	2.20E-02	ND	2.38E-02	0	USEPA (2007a)	5.44E+01	0	USEPA (2007a)	7.79E-01	0	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	ND	8.14E-01	0	USEPA (2007a)	1.03E+01	0	USEPA (2007a)	4.49E-01	0	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	0.00E+00	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)

Table H3-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Industrial Landfill Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
2,3,7,8-TCDF	6.29	0.00E+00	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H3-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Industrial Landfill Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H3-2
Screening-Level Exposure Evaluation - American Woodcock
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.88E+00	0.00E+00	2.88E+00	1.10E+02	<1	1.10E+03	<1
Antimony	2.80E+00	7.70E-03	1.22E-03	2.96E-01	0.00E+00	2.97E-01	9.05E-04	2.47E-02	3.23E-01	No TRV	--	No TRV	--
Arsenic	2.35E+01	4.40E-03	1.04E-02	2.37E-01	0.00E+00	2.48E-01	5.17E-04	2.07E-01	4.55E-01	2.24E+00	<1	4.51E+00	<1
Barium	2.27E+02	2.71E+00	4.16E-01	2.18E+00	0.00E+00	2.60E+00	3.18E-01	2.00E+00	4.92E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	7.20E+00	1.50E-03	2.93E-02	3.43E-02	0.00E+00	6.36E-02	1.76E-04	6.34E-02	1.27E-01	No TRV	--	No TRV	--
Cadmium	9.40E-01	3.00E-03	7.06E-03	8.34E-01	0.00E+00	8.41E-01	3.52E-04	8.28E-03	8.49E-01	1.47E+00	<1	6.35E+00	<1
Chromium	3.92E+01	2.72E-02	1.89E-02	1.27E+00	0.00E+00	1.29E+00	3.20E-03	3.45E-01	1.64E+00	2.66E+00	<1	1.56E+01	<1
Cobalt	1.60E+01	1.55E-02	1.41E-03	2.06E-01	0.00E+00	2.08E-01	1.82E-03	1.41E-01	3.51E-01	7.61E+00	<1	2.02E+01	<1
Copper	5.46E+01	1.83E-01	1.11E-01	2.97E+00	0.00E+00	3.08E+00	2.15E-02	4.81E-01	3.59E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.94E+01	3.52E-02	1.64E-02	9.31E-01	0.00E+00	9.47E-01	4.14E-03	1.71E-01	1.12E+00	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.41E-01	0.00E+00	4.41E-01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	3.05E-05	--	3.05E-05	4.50E-01	<1	9.10E-01	<1
Nickel	4.63E+02	5.59E-02	1.25E-01	3.81E+01	0.00E+00	3.82E+01	6.57E-03	4.08E+00	4.23E+01	6.71E+00	6.30E+00	1.86E+01	2.27E+00
Selenium	7.50E-01	2.00E-03	4.35E-03	7.94E-02	0.00E+00	8.38E-02	2.35E-04	6.61E-03	9.06E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.70E-01	3.30E-04	7.99E-06	9.72E-04	0.00E+00	9.80E-04	3.88E-05	1.50E-03	2.52E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	1.69E+02	2.48E-02	9.63E-03	7.50E-01	0.00E+00	7.60E-01	2.91E-03	1.49E+00	2.25E+00	3.44E-01	6.55E+00	1.70E+00	1.32E+00
Zinc	6.70E+01	5.37E-01	5.83E-01	3.59E+01	0.00E+00	3.65E+01	6.31E-02	5.90E-01	3.72E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.90E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.44E-02	1.67E-03	4.61E-02	4.00E-02	1.15E+00	4.00E-01	<1
Fluoride	3.98E+02	2.24E+01	2.81E-01	5.22E+00	0.00E+00	5.50E+00	2.63E+00	3.51E+00	1.16E+01	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	3.40E+00	0.00E+00	1.58E-05	5.28E-01	0.00E+00	5.28E-01	0.00E+00	3.00E-02	5.58E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	7.28E-05	--	7.28E-05				
Fluoranthene	7.10E+01	9.30E-03	4.17E-01	2.28E+01	0.00E+00	2.32E+01	1.09E-03	6.26E-01	2.39E+01				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.02E-04	--	1.02E-04				
Naphthalene	1.80E+00	8.70E-04	2.58E-01	8.37E-01	0.00E+00	1.10E+00	1.02E-04	1.59E-02	1.11E+00				
Phenanthrene	4.00E+01	1.50E-03	9.80E-02	7.27E+00	0.00E+00	7.37E+00	1.76E-04	3.52E-01	7.73E+00				
Total LMW PAHs						3.22E+01	1.55E-03	1.02E+00	3.33E+01	1.61E+01	2.07E+00	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.30E+01	3.00E-03	7.33E-03	7.23E+00	0.00E+00	7.24E+00	3.52E-04	3.79E-01	7.62E+00				
Benzo[A]Pyrene	5.30E+01	0.00E+00	7.18E-02	7.45E+00	0.00E+00	7.52E+00	0.00E+00	4.67E-01	7.99E+00				
Benzo(b)fluoranthene	6.00E+01	1.00E-02	2.19E-01	1.65E+01	0.00E+00	1.67E+01	1.17E-03	5.29E-01	1.72E+01				
Benzo(g,h,i)perylene	4.30E+01	3.90E-03	3.96E-01	1.34E+01	0.00E+00	1.38E+01	4.58E-04	3.79E-01	1.41E+01				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	5.40E-05	--	5.40E-05				
Chrysene	5.10E+01	7.60E-03	8.11E-03	1.23E+01	0.00E+00	1.24E+01	8.93E-04	4.49E-01	1.28E+01				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.15E-05	--	1.15E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	3.64E-04	--	3.64E-04				
Pyrene	6.70E+01	7.00E-03	5.67E-01	1.24E+01	0.00E+00	1.30E+01	8.22E-04	5.90E-01	1.36E+01				
Total HMW PAHs						7.06E+01	4.13E-03	2.79E+00	7.34E+01	2.00E+00	3.67E+01	2.00E+01	3.67E+00
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	2.58E-03	--	2.58E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H3-2
Screening-Level Exposure Evaluation - American Woodcock
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_S	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H3-3
Screening-Level Exposure Evaluation - Mourning Dove
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.80E+00	0.00E+00	2.80E+00	1.10E+02	<1	1.10E+03	<1
Antimony	2.80E+00	7.70E-03	1.18E-02	0.00E+00	0.00E+00	1.18E-02	8.79E-04	2.17E-02	3.44E-02	No TRV	--	No TRV	--
Arsenic	2.35E+01	4.40E-03	1.01E-01	0.00E+00	0.00E+00	1.01E-01	5.02E-04	1.82E-01	2.84E-01	2.24E+00	<1	4.51E+00	<1
Barium	2.27E+02	2.71E+00	4.04E+00	0.00E+00	0.00E+00	4.04E+00	3.09E-01	1.76E+00	6.11E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	7.20E+00	1.50E-03	2.85E-01	0.00E+00	0.00E+00	2.85E-01	1.71E-04	5.59E-02	3.41E-01	No TRV	--	No TRV	--
Cadmium	9.40E-01	3.00E-03	6.86E-02	0.00E+00	0.00E+00	6.86E-02	3.42E-04	7.30E-03	7.63E-02	1.47E+00	<1	6.35E+00	<1
Chromium	3.92E+01	2.72E-02	1.83E-01	0.00E+00	0.00E+00	1.83E-01	3.10E-03	3.04E-01	4.91E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	1.60E+01	1.55E-02	1.37E-02	0.00E+00	0.00E+00	1.37E-02	1.77E-03	1.24E-01	1.40E-01	7.61E+00	<1	2.02E+01	<1
Copper	5.46E+01	1.83E-01	1.08E+00	0.00E+00	0.00E+00	1.08E+00	2.09E-02	4.24E-01	1.52E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.94E+01	3.52E-02	1.60E-01	0.00E+00	0.00E+00	1.60E-01	4.02E-03	1.51E-01	3.14E-01	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E-01	0.00E+00	4.28E-01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	2.97E-05	--	2.97E-05	4.50E-01	<1	9.10E-01	<1
Nickel	4.63E+02	5.59E-02	1.22E+00	0.00E+00	0.00E+00	1.22E+00	6.38E-03	3.59E+00	4.82E+00	6.71E+00	<1	1.86E+01	<1
Selenium	7.50E-01	2.00E-03	4.22E-02	0.00E+00	0.00E+00	4.22E-02	2.28E-04	5.82E-03	4.83E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.70E-01	3.30E-04	7.76E-05	0.00E+00	0.00E+00	7.76E-05	3.77E-05	1.32E-03	1.43E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	1.69E+02	2.48E-02	9.36E-02	0.00E+00	0.00E+00	9.36E-02	2.83E-03	1.31E+00	1.41E+00	3.44E-01	4.09E+00	1.70E+00	<1
Zinc	6.70E+01	5.37E-01	5.66E+00	0.00E+00	0.00E+00	5.66E+00	6.13E-02	5.20E-01	6.24E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.90E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.31E-02	1.47E-03	4.46E-02	4.00E-02	1.12E+00	4.00E-01	<1
Fluoride	3.98E+02	2.24E+01	2.73E+00	0.00E+00	0.00E+00	2.73E+00	2.56E+00	3.09E+00	8.37E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	3.40E+00	0.00E+00	1.54E-04	0.00E+00	0.00E+00	1.54E-04	0.00E+00	2.64E-02	2.65E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	7.08E-05	--	7.08E-05				
Fluoranthene	7.10E+01	9.30E-03	4.05E+00	0.00E+00	0.00E+00	4.05E+00	1.06E-03	5.51E-01	4.60E+00				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	9.93E-05	--	9.93E-05				
Naphthalene	1.80E+00	8.70E-04	2.51E+00	0.00E+00	0.00E+00	2.51E+00	9.93E-05	1.40E-02	2.52E+00				
Phenanthrene	4.00E+01	1.50E-03	9.53E-01	0.00E+00	0.00E+00	9.53E-01	1.71E-04	3.10E-01	1.26E+00				
Total LMW PAHs						7.51E+00	1.50E-03	9.02E-01	8.41E+00	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.30E+01	3.00E-03	7.12E-02	0.00E+00	0.00E+00	7.12E-02	3.42E-04	3.34E-01	4.05E-01				
Benzo[A]Pyrene	5.30E+01	0.00E+00	6.97E-01	0.00E+00	0.00E+00	6.97E-01	0.00E+00	4.11E-01	1.11E+00				
Benzo(b)fluoranthene	6.00E+01	1.00E-02	2.12E+00	0.00E+00	0.00E+00	2.12E+00	1.14E-03	4.66E-01	2.59E+00				
Benzo(g,h,i)perylene	4.30E+01	3.90E-03	3.85E+00	0.00E+00	0.00E+00	3.85E+00	4.45E-04	3.34E-01	4.18E+00				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	5.25E-05	--	5.25E-05				
Chrysene	5.10E+01	7.60E-03	7.88E-02	0.00E+00	0.00E+00	7.88E-02	8.67E-04	3.96E-01	4.75E-01				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.12E-05	--	1.12E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	3.54E-04	--	3.54E-04				
Pyrene	6.70E+01	7.00E-03	5.51E+00	0.00E+00	0.00E+00	5.51E+00	7.99E-04	5.20E-01	6.03E+00				
Total HMW PAHs						1.23E+01	4.01E-03	2.46E+00	1.48E+01	2.00E+00	7.39E+00	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	2.51E-03	--	2.51E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H3-3
Screening-Level Exposure Evaluation - Mourning Dove
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H3-4
Screening-Level Exposure Evaluation - Red-tailed Hawk
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E+00	0.00E+00	2.01E+00	1.10E+02	<1	1.10E+03	<1
Antimony	2.80E+00	7.70E-03	0.00E+00	0.00E+00	1.15E-02	1.15E-02	6.31E-04	5.97E-03	1.81E-02	No TRV	--	No TRV	--
Arsenic	2.35E+01	4.40E-03	0.00E+00	0.00E+00	8.54E-03	8.54E-03	3.61E-04	5.01E-02	5.90E-02	2.24E+00	<1	4.51E+00	<1
Barium	2.27E+02	2.71E+00	0.00E+00	0.00E+00	1.27E-02	1.27E-02	2.22E-01	4.84E-01	7.19E-01	7.35E+01	<1	1.31E+02	<1
Beryllium	7.20E+00	1.50E-03	0.00E+00	0.00E+00	1.33E-03	1.33E-03	1.23E-04	1.54E-02	1.68E-02	No TRV	--	No TRV	--
Cadmium	9.40E-01	3.00E-03	0.00E+00	0.00E+00	2.27E-02	2.27E-02	2.46E-04	2.00E-03	2.49E-02	1.47E+00	<1	6.35E+00	<1
Chromium	3.92E+01	2.72E-02	0.00E+00	0.00E+00	2.81E-01	2.81E-01	2.23E-03	8.36E-02	3.67E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	1.60E+01	1.55E-02	0.00E+00	0.00E+00	3.53E-02	3.53E-02	1.27E-03	3.41E-02	7.07E-02	7.61E+00	<1	2.02E+01	<1
Copper	5.46E+01	1.83E-01	0.00E+00	0.00E+00	1.13E+00	1.13E+00	1.50E-02	1.16E-01	1.26E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.94E+01	3.52E-02	0.00E+00	0.00E+00	3.28E-01	3.28E-01	2.89E-03	4.14E-02	3.73E-01	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.08E-01	0.00E+00	3.08E-01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	2.13E-05	--	2.13E-05	4.50E-01	<1	9.10E-01	<1
Nickel	4.63E+02	5.59E-02	0.00E+00	0.00E+00	1.12E+00	1.12E+00	4.58E-03	9.87E-01	2.11E+00	6.71E+00	<1	1.86E+01	<1
Selenium	7.50E-01	2.00E-03	0.00E+00	0.00E+00	4.86E-02	4.86E-02	1.64E-04	1.60E-03	5.03E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.70E-01	3.30E-04	0.00E+00	0.00E+00	1.51E-03	1.51E-03	2.71E-05	3.62E-04	1.90E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	1.69E+02	2.48E-02	0.00E+00	0.00E+00	1.70E-01	1.70E-01	2.03E-03	3.60E-01	5.33E-01	3.44E-01	1.55E+00	1.70E+00	<1
Zinc	6.70E+01	5.37E-01	0.00E+00	0.00E+00	8.66E+00	8.66E+00	4.40E-02	1.43E-01	8.85E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.90E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.10E-02	4.05E-04	3.14E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	3.98E+02	2.24E+01	0.00E+00	0.00E+00	5.22E-01	5.22E-01	1.84E+00	8.49E-01	3.21E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	3.40E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.25E-03	7.25E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	5.08E-05	--	5.08E-05				
Fluoranthene	7.10E+01	9.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.63E-04	1.51E-01	1.52E-01				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	7.13E-05	--	7.13E-05				
Naphthalene	1.80E+00	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.13E-05	3.84E-03	3.91E-03				
Phenanthrene	4.00E+01	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-04	8.53E-02	8.54E-02				
Total LMW PAHs						0.00E+00	1.08E-03	2.48E-01	2.49E-01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.30E+01	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.46E-04	9.17E-02	9.19E-02				
Benzo[A]Pyrene	5.30E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.13E-01	1.13E-01				
Benzo(b)fluoranthene	6.00E+01	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.20E-04	1.28E-01	1.29E-01				
Benzo(g,h,i)perylene	4.30E+01	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.20E-04	9.17E-02	9.20E-02				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	3.77E-05	--	3.77E-05				
Chrysene	5.10E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.23E-04	1.09E-01	1.09E-01				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	8.04E-06	--	8.04E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	2.54E-04	--	2.54E-04				
Pyrene	6.70E+01	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.74E-04	1.43E-01	1.43E-01				
Total HMW PAHs						0.00E+00	2.88E-03	6.76E-01	6.79E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	1.80E-03	--	1.80E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H3-4
Screening-Level Exposure Evaluation - Red-tailed Hawk
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H3-5
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.88E+00	0.00E+00	3.88E+00	1.10E+02	<1	1.10E+03	<1
Antimony	2.80E+00	7.70E-03	0.00E+00	4.43E-01	0.00E+00	4.43E-01	1.22E-03	0.00E+00	4.45E-01	No TRV	--	No TRV	--
Arsenic	2.35E+01	4.40E-03	0.00E+00	3.55E-01	0.00E+00	3.55E-01	6.97E-04	0.00E+00	3.56E-01	2.24E+00	<1	4.51E+00	<1
Barium	2.27E+02	2.71E+00	0.00E+00	3.27E+00	0.00E+00	3.27E+00	4.29E-01	0.00E+00	3.70E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	7.20E+00	1.50E-03	0.00E+00	5.13E-02	0.00E+00	5.13E-02	2.37E-04	0.00E+00	5.15E-02	No TRV	--	No TRV	--
Cadmium	9.40E-01	3.00E-03	0.00E+00	1.25E+00	0.00E+00	1.25E+00	4.75E-04	0.00E+00	1.25E+00	1.47E+00	<1	6.35E+00	<1
Chromium	3.92E+01	2.72E-02	0.00E+00	1.90E+00	0.00E+00	1.90E+00	4.31E-03	0.00E+00	1.90E+00	2.66E+00	<1	1.56E+01	<1
Cobalt	1.60E+01	1.55E-02	0.00E+00	3.09E-01	0.00E+00	3.09E-01	2.45E-03	0.00E+00	3.12E-01	7.61E+00	<1	2.02E+01	<1
Copper	5.46E+01	1.83E-01	0.00E+00	4.45E+00	0.00E+00	4.45E+00	2.90E-02	0.00E+00	4.48E+00	4.05E+00	1.11E+00	3.48E+01	<1
Lead	1.94E+01	3.52E-02	0.00E+00	1.39E+00	0.00E+00	1.39E+00	5.57E-03	0.00E+00	1.40E+00	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.94E-01	0.00E+00	5.94E-01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	4.12E-05	--	4.12E-05	4.50E-01	<1	9.10E-01	<1
Nickel	4.63E+02	5.59E-02	0.00E+00	5.70E+01	0.00E+00	5.70E+01	8.85E-03	0.00E+00	5.70E+01	6.71E+00	8.50E+00	1.86E+01	3.07E+00
Selenium	7.50E-01	2.00E-03	0.00E+00	1.19E-01	0.00E+00	1.19E-01	3.17E-04	0.00E+00	1.19E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.70E-01	3.30E-04	0.00E+00	1.46E-03	0.00E+00	1.46E-03	5.22E-05	0.00E+00	1.51E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	1.69E+02	2.48E-02	0.00E+00	1.12E+00	0.00E+00	1.12E+00	3.93E-03	0.00E+00	1.13E+00	3.44E-01	3.28E+00	1.70E+00	<1
Zinc	6.70E+01	5.37E-01	0.00E+00	5.38E+01	0.00E+00	5.38E+01	8.50E-02	0.00E+00	5.39E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.90E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.98E-02	0.00E+00	5.98E-02	4.00E-02	1.50E+00	4.00E-01	<1
Fluoride	3.98E+02	2.24E+01	0.00E+00	7.81E+00	0.00E+00	7.81E+00	3.55E+00	0.00E+00	1.14E+01	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	3.40E+00	0.00E+00	0.00E+00	7.91E-01	0.00E+00	7.91E-01	0.00E+00	0.00E+00	7.91E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	9.82E-05	--	9.82E-05				
Fluoranthene	7.10E+01	9.30E-03	0.00E+00	3.42E+01	0.00E+00	3.42E+01	1.47E-03	0.00E+00	3.42E+01				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.38E-04	--	1.38E-04				
Naphthalene	1.80E+00	8.70E-04	0.00E+00	1.25E+00	0.00E+00	1.25E+00	1.38E-04	0.00E+00	1.25E+00				
Phenanthrene	4.00E+01	1.50E-03	0.00E+00	1.09E+01	0.00E+00	1.09E+01	2.37E-04	0.00E+00	1.09E+01				
Total LMW PAHs						4.71E+01	2.08E-03	0.00E+00	4.71E+01	1.61E+01	2.93E+00	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.30E+01	3.00E-03	0.00E+00	1.08E+01	0.00E+00	1.08E+01	4.75E-04	0.00E+00	1.08E+01				
Benzo[A]Pyrene	5.30E+01	0.00E+00	0.00E+00	1.12E+01	0.00E+00	1.12E+01	0.00E+00	0.00E+00	1.12E+01				
Benzo(b)fluoranthene	6.00E+01	1.00E-02	0.00E+00	2.47E+01	0.00E+00	2.47E+01	1.58E-03	0.00E+00	2.47E+01				
Benzo(g,h,i)perylene	4.30E+01	3.90E-03	0.00E+00	2.00E+01	0.00E+00	2.00E+01	6.17E-04	0.00E+00	2.00E+01				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	7.28E-05	--	7.28E-05				
Chrysene	5.10E+01	7.60E-03	0.00E+00	1.85E+01	0.00E+00	1.85E+01	1.20E-03	0.00E+00	1.85E+01				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.55E-05	--	1.55E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	4.91E-04	--	4.91E-04				
Pyrene	6.70E+01	7.00E-03	0.00E+00	1.86E+01	0.00E+00	1.86E+01	1.11E-03	0.00E+00	1.86E+01				
Total HMW PAHs						1.04E+02	5.57E-03	0.00E+00	1.04E+02	2.00E+00	5.19E+01	2.00E+01	5.19E+00
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	3.48E-03	--	3.48E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H3-5
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H3-6
Screening-Level Exposure Evaluation - Canada Lynx
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.65E-01	0.00E+00	7.65E-01	No TRV	--	No TRV	--
Antimony	2.80E+00	7.70E-03	0.00E+00	0.00E+00	4.37E-03	4.37E-03	2.41E-04	2.45E-03	7.06E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	2.35E+01	4.40E-03	0.00E+00	0.00E+00	3.25E-03	3.25E-03	1.37E-04	2.06E-02	2.39E-02	1.04E+00	<1	4.55E+00	<1
Barium	2.27E+02	2.71E+00	0.00E+00	0.00E+00	4.84E-03	4.84E-03	8.47E-02	1.99E-01	2.88E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	7.20E+00	1.50E-03	0.00E+00	0.00E+00	5.06E-04	5.06E-04	4.69E-05	6.30E-03	6.85E-03	5.32E-01	<1	6.70E-01	<1
Cadmium	9.40E-01	3.00E-03	0.00E+00	0.00E+00	8.63E-03	8.63E-03	9.37E-05	8.22E-04	9.55E-03	7.70E-01	<1	6.87E+00	<1
Chromium	3.92E+01	2.72E-02	0.00E+00	0.00E+00	1.07E-01	1.07E-01	8.50E-04	3.43E-02	1.42E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	1.60E+01	1.55E-02	0.00E+00	0.00E+00	1.34E-02	1.34E-02	4.84E-04	1.40E-02	2.79E-02	7.33E+00	<1	1.89E+01	<1
Copper	5.46E+01	1.83E-01	0.00E+00	0.00E+00	4.29E-01	4.29E-01	5.72E-03	4.78E-02	4.82E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.94E+01	3.52E-02	0.00E+00	0.00E+00	1.25E-01	1.25E-01	1.10E-03	1.70E-02	1.43E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-01	0.00E+00	1.17E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	8.12E-06	--	8.12E-06	1.41E+00	<1	1.41E+01	<1
Nickel	4.63E+02	5.59E-02	0.00E+00	0.00E+00	4.26E-01	4.26E-01	1.75E-03	4.05E-01	8.33E-01	1.70E+00	<1	1.48E+01	<1
Selenium	7.50E-01	2.00E-03	0.00E+00	0.00E+00	1.85E-02	1.85E-02	6.25E-05	6.56E-04	1.92E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.70E-01	3.30E-04	0.00E+00	0.00E+00	5.75E-04	5.75E-04	1.03E-05	1.49E-04	7.34E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.69E+02	2.48E-02	0.00E+00	0.00E+00	6.49E-02	6.49E-02	7.75E-04	1.48E-01	2.14E-01	4.16E+00	<1	9.44E+00	<1
Zinc	6.70E+01	5.37E-01	0.00E+00	0.00E+00	3.30E+00	3.30E+00	1.68E-02	5.86E-02	3.38E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.90E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-02	1.66E-04	1.20E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	3.98E+02	2.24E+01	0.00E+00	0.00E+00	1.99E-01	1.99E-01	7.00E-01	3.48E-01	1.25E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	3.40E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.97E-03	2.97E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	1.94E-05	--	1.94E-05				
Fluoranthene	7.10E+01	9.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.91E-04	6.21E-02	6.24E-02				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	2.72E-05	--	2.72E-05				
Naphthalene	1.80E+00	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.72E-05	1.57E-03	1.60E-03				
Phenanthrene	4.00E+01	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.69E-05	3.50E-02	3.50E-02				
Total LMW PAHs						0.00E+00	4.11E-04	1.02E-01	1.02E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.30E+01	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.37E-05	3.76E-02	3.77E-02				
Benzo[A]Pyrene	5.30E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.64E-02	4.64E-02				
Benzo(b)fluoranthene	6.00E+01	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.12E-04	5.25E-02	5.28E-02				
Benzo(g,h,i)perylene	4.30E+01	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-04	3.76E-02	3.77E-02				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	1.44E-05	--	1.44E-05				
Chrysene	5.10E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.37E-04	4.46E-02	4.49E-02				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	3.06E-06	--	3.06E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	9.69E-05	--	9.69E-05				
Pyrene	6.70E+01	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-04	5.86E-02	5.88E-02				
Total HMW PAHs						0.00E+00	1.10E-03	2.77E-01	2.78E-01	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	6.87E-04	--	6.87E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H3-6
Screening-Level Exposure Evaluation - Canada Lynx
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H3-7
Screening-Level Exposure Evaluation - Grizzly Bear
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate						
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.29E-01	0.00E+00	5.29E-01	No TRV	--	No TRV	--
Antimony	2.80E+00	7.70E-03	1.45E-03	9.07E-03	3.02E-04	0.00E+00	1.08E-02	1.66E-04	1.69E-03	1.10E-02	5.90E-02	<1	2.76E+00	<1
Arsenic	2.35E+01	4.40E-03	1.24E-02	7.27E-03	2.25E-04	0.00E+00	1.99E-02	9.50E-05	1.42E-02	2.00E-02	1.04E+00	<1	4.55E+00	<1
Barium	2.27E+02	2.71E+00	4.97E-01	6.69E-02	3.35E-04	0.00E+00	5.64E-01	5.85E-02	1.37E-01	6.23E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	7.20E+00	1.50E-03	3.50E-02	1.05E-03	3.50E-05	0.00E+00	3.61E-02	3.24E-05	4.35E-03	3.61E-02	5.32E-01	<1	6.70E-01	<1
Cadmium	9.40E-01	3.00E-03	8.44E-03	2.55E-02	5.97E-04	0.00E+00	3.46E-02	6.48E-05	5.68E-04	3.46E-02	7.70E-01	<1	6.87E+00	<1
Chromium	3.92E+01	2.72E-02	2.26E-02	3.89E-02	7.40E-03	0.00E+00	6.88E-02	5.87E-04	2.37E-02	6.94E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	1.60E+01	1.55E-02	1.68E-03	6.32E-03	9.29E-04	0.00E+00	8.94E-03	3.35E-04	9.67E-03	9.27E-03	7.33E+00	<1	1.89E+01	<1
Copper	5.46E+01	1.83E-01	1.32E-01	9.11E-02	2.97E-02	0.00E+00	2.53E-01	3.95E-03	3.30E-02	2.57E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.94E+01	3.52E-02	1.96E-02	2.85E-02	8.65E-03	0.00E+00	5.68E-02	7.60E-04	1.17E-02	5.76E-02	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.10E-02	0.00E+00	8.10E-02	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	0.00E+00	5.61E-06	--	5.61E-06	1.41E+00	<1	1.41E+01	<1
Nickel	4.63E+02	5.59E-02	1.50E-01	1.17E+00	2.94E-02	0.00E+00	1.35E+00	1.21E-03	2.80E-01	1.35E+00	1.70E+00	<1	1.48E+01	<1
Selenium	7.50E-01	2.00E-03	5.19E-03	2.43E-03	1.28E-03	0.00E+00	8.90E-03	4.32E-05	4.54E-04	8.95E-03	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.70E-01	3.30E-04	9.55E-06	2.98E-05	3.97E-05	0.00E+00	7.91E-05	7.13E-06	1.03E-04	8.62E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	1.69E+02	2.48E-02	1.15E-02	2.30E-02	4.49E-03	0.00E+00	3.90E-02	5.36E-04	1.02E-01	3.95E-02	4.16E+00	<1	9.44E+00	<1
Zinc	6.70E+01	5.37E-01	6.97E-01	1.10E+00	2.28E-01	0.00E+00	2.03E+00	1.16E-02	4.05E-02	2.04E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	1.90E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.16E-03	1.15E-04	8.16E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	3.98E+02	2.24E+01	3.35E-01	1.60E-01	1.38E-02	0.00E+00	5.09E-01	4.84E-01	2.41E-01	9.93E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	3.40E+00	0.00E+00	1.89E-05	1.62E-02	0.00E+00	0.00E+00	1.62E-02	0.00E+00	2.06E-03	1.62E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	0.00E+00	1.34E-05	--	1.34E-05				
Fluoranthene	7.10E+01	9.30E-03	4.98E-01	6.99E-01	0.00E+00	0.00E+00	1.20E+00	2.01E-04	4.29E-02	1.20E+00				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	0.00E+00	1.88E-05	--	1.88E-05				
Naphthalene	1.80E+00	8.70E-04	3.08E-01	2.57E-02	0.00E+00	0.00E+00	3.34E-01	1.88E-05	1.09E-03	3.34E-01				
Phenanthrene	4.00E+01	1.50E-03	1.17E-01	2.23E-01	0.00E+00	0.00E+00	3.40E-01	3.24E-05	2.42E-02	3.40E-01				
Total LMW PAHs							1.89E+00	2.84E-04	7.03E-02	1.96E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	4.30E+01	3.00E-03	8.75E-03	2.21E-01	0.00E+00	0.00E+00	2.30E-01	6.48E-05	2.60E-02	2.30E-01				
Benzo[A]Pyrene	5.30E+01	0.00E+00	8.57E-02	2.28E-01	0.00E+00	0.00E+00	3.14E-01	0.00E+00	3.20E-02	3.14E-01				
Benzo(b)fluoranthene	6.00E+01	1.00E-02	2.61E-01	5.05E-01	0.00E+00	0.00E+00	7.66E-01	2.16E-04	3.63E-02	7.67E-01				
Benzo(g,h,i)perylene	4.30E+01	3.90E-03	4.73E-01	4.10E-01	0.00E+00	0.00E+00	8.83E-01	8.42E-05	2.60E-02	8.83E-01				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	0.00E+00	9.93E-06	--	9.93E-06				
Chrysene	5.10E+01	7.60E-03	9.69E-03	3.78E-01	0.00E+00	0.00E+00	3.88E-01	1.64E-04	3.08E-02	3.88E-01				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	0.00E+00	2.12E-06	--	2.12E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	0.00E+00	6.69E-05	--	6.69E-05				
Pyrene	6.70E+01	7.00E-03	6.77E-01	3.80E-01	0.00E+00	0.00E+00	1.06E+00	1.51E-04	4.05E-02	1.06E+00				
Total HMW PAHs							3.64E+00	7.59E-04	1.92E-01	3.83E+00	6.15E-01	6.23E+00	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	0.00E+00	4.75E-04	--	4.75E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H3-7
Screening-Level Exposure Evaluation - Grizzly Bear
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)										
			Diet					Water	Substrate				
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H3-8
Screening-Level Exposure Evaluation - Long-tailed Weasel
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E+00	0.00E+00	1.26E+00	No TRV	--	No TRV	--
Antimony	2.88E+00	7.70E-03	0.00E+00	0.00E+00	7.40E-03	7.40E-03	3.96E-04	2.37E-03	1.02E-02	5.90E-02	<1	2.76E+00	<1
Arsenic	2.33E+01	4.40E-03	0.00E+00	0.00E+00	5.32E-03	5.32E-03	2.26E-04	1.92E-02	2.47E-02	1.04E+00	<1	4.55E+00	<1
Barium	2.32E+02	2.71E+00	0.00E+00	0.00E+00	8.16E-03	8.16E-03	1.39E-01	1.91E-01	3.39E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	7.58E+00	1.50E-03	0.00E+00	0.00E+00	8.77E-04	8.77E-04	7.72E-05	6.24E-03	7.19E-03	5.32E-01	<1	6.70E-01	<1
Cadmium	1.17E+00	3.00E-03	0.00E+00	0.00E+00	1.58E-02	1.58E-02	1.54E-04	9.61E-04	1.69E-02	7.70E-01	<1	6.87E+00	<1
Chromium	2.56E+01	2.72E-02	0.00E+00	0.00E+00	1.29E-01	1.29E-01	1.40E-03	2.10E-02	1.51E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	1.57E+01	1.55E-02	0.00E+00	0.00E+00	2.16E-02	2.16E-02	7.98E-04	1.29E-02	3.53E-02	7.33E+00	<1	1.89E+01	<1
Copper	5.96E+02	1.83E-01	0.00E+00	0.00E+00	9.98E-01	9.98E-01	9.42E-03	4.90E-01	1.50E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.90E+01	3.52E-02	0.00E+00	0.00E+00	2.04E-01	2.04E-01	1.81E-03	1.56E-02	2.21E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.93E-01	0.00E+00	1.93E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	1.34E-05	--	1.34E-05	1.41E+00	<1	1.41E+01	<1
Nickel	5.01E+02	5.59E-02	0.00E+00	0.00E+00	7.28E-01	7.28E-01	2.88E-03	4.12E-01	1.14E+00	1.70E+00	<1	1.48E+01	<1
Selenium	4.80E-01	2.00E-03	0.00E+00	0.00E+00	2.58E-02	2.58E-02	1.03E-04	3.95E-04	2.63E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.85E-01	3.30E-04	0.00E+00	0.00E+00	1.03E-03	1.03E-03	1.70E-05	1.52E-04	1.20E-03	4.80E-01	<1	1.43E+00	<1
Vanadium	1.65E+02	2.48E-02	0.00E+00	0.00E+00	1.04E-01	1.04E-01	1.28E-03	1.35E-01	2.41E-01	4.16E+00	<1	9.44E+00	<1
Zinc	5.82E+01	5.37E-01	0.00E+00	0.00E+00	5.38E+00	5.38E+00	2.76E-02	4.79E-02	5.46E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.73E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.95E-02	1.42E-04	1.96E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	6.14E+02	2.24E+01	0.00E+00	0.00E+00	5.06E-01	5.06E-01	1.15E+00	5.06E-01	2.16E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.45E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.19E-03	1.19E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	3.19E-05	--	3.19E-05				
Fluoranthene	2.32E+01	9.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.79E-04	1.91E-02	1.95E-02				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	4.48E-05	--	4.48E-05				
Naphthalene	5.55E-01	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.48E-05	4.57E-04	5.02E-04				
Phenanthrene	1.27E+01	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.72E-05	1.05E-02	1.05E-02				
Total LMW PAHs						0.00E+00	6.77E-04	3.12E-02	3.18E-02	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.42E+01	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-04	1.17E-02	1.18E-02				
Benzo[A]Pyrene	1.79E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E-02	1.47E-02				
Benzo(b)fluoranthene	1.97E+01	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E-04	1.62E-02	1.68E-02				
Benzo(g,h,i)perylene	1.54E+01	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E-04	1.27E-02	1.29E-02				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	2.37E-05	--	2.37E-05				
Chrysene	1.69E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.91E-04	1.39E-02	1.43E-02				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	5.04E-06	--	5.04E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	1.60E-04	--	1.60E-04				
Pyrene	2.25E+01	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-04	1.85E-02	1.88E-02				
Total HMW PAHs						0.00E+00	1.81E-03	8.77E-02	8.95E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	1.13E-03	--	1.13E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H3-8
Screening-Level Exposure Evaluation - Long-tailed Weasel
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

where:

ADD_{diet} = Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet} = Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF = Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$ = COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i = Dietary fraction of food item i (proportion of food type in the diet)
AUF = Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW = Body weight of the receptor, wet weight (kg)

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

where:

$ADD_{substrate}$ = Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s = Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$ = COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

Table H3-9
Screening-Level Exposure Evaluation - Meadow Vole
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.68E+00	0.00E+00	3.68E+00	No TRV	--	No TRV	--
Antimony	2.88E+00	7.70E-03	1.60E-02	0.00E+00	0.00E+00	1.60E-02	1.16E-03	5.62E-03	2.27E-02	5.90E-02	<1	2.76E+00	<1
Arsenic	2.33E+01	4.40E-03	1.31E-01	0.00E+00	0.00E+00	1.31E-01	6.61E-04	4.55E-02	1.77E-01	1.04E+00	<1	4.55E+00	<1
Barium	2.32E+02	2.71E+00	5.44E+00	0.00E+00	0.00E+00	5.44E+00	4.07E-01	4.54E-01	6.30E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	7.58E+00	1.50E-03	3.89E-01	0.00E+00	0.00E+00	3.89E-01	2.25E-04	1.48E-02	4.04E-01	5.32E-01	<1	6.70E-01	<1
Cadmium	1.17E+00	3.00E-03	1.02E-01	0.00E+00	0.00E+00	1.02E-01	4.51E-04	2.28E-03	1.04E-01	7.70E-01	<1	6.87E+00	<1
Chromium	2.56E+01	2.72E-02	1.57E-01	0.00E+00	0.00E+00	1.57E-01	4.09E-03	4.99E-02	2.11E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	1.57E+01	1.55E-02	1.77E-02	0.00E+00	0.00E+00	1.77E-02	2.33E-03	3.07E-02	5.07E-02	7.33E+00	<1	1.89E+01	<1
Copper	5.96E+02	1.83E-01	3.63E+00	0.00E+00	0.00E+00	3.63E+00	2.75E-02	1.16E+00	4.82E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.90E+01	3.52E-02	2.07E-01	0.00E+00	0.00E+00	2.07E-01	5.29E-03	3.70E-02	2.50E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.63E-01	0.00E+00	5.63E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	3.91E-05	--	3.91E-05	1.41E+00	<1	1.41E+01	<1
Nickel	5.01E+02	5.59E-02	1.70E+00	0.00E+00	0.00E+00	1.70E+00	8.40E-03	9.78E-01	2.69E+00	1.70E+00	1.58E+00	1.48E+01	<1
Selenium	4.80E-01	2.00E-03	3.40E-02	0.00E+00	0.00E+00	3.40E-02	3.00E-04	9.37E-04	3.52E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.85E-01	3.30E-04	1.11E-04	0.00E+00	0.00E+00	1.11E-04	4.96E-05	3.61E-04	5.22E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.65E+02	2.48E-02	1.20E-01	0.00E+00	0.00E+00	1.20E-01	3.73E-03	3.21E-01	4.45E-01	4.16E+00	<1	9.44E+00	<1
Zinc	5.82E+01	5.37E-01	6.90E+00	0.00E+00	0.00E+00	6.90E+00	8.07E-02	1.14E-01	7.09E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.73E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.68E-02	3.37E-04	5.71E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	6.14E+02	2.24E+01	5.53E+00	0.00E+00	0.00E+00	5.53E+00	3.37E+00	1.20E+00	1.01E+01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.45E+00	0.00E+00	4.20E-04	0.00E+00	0.00E+00	4.20E-04	0.00E+00	2.83E-03	3.25E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	9.31E-05	--	9.31E-05				
Fluoranthene	2.32E+01	9.30E-03	1.74E+00	0.00E+00	0.00E+00	1.74E+00	1.40E-03	4.52E-02	1.79E+00				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.31E-04	--	1.31E-04				
Naphthalene	5.55E-01	8.70E-04	1.02E+00	0.00E+00	0.00E+00	1.02E+00	1.31E-04	1.08E-03	1.02E+00				
Phenanthrene	1.27E+01	1.50E-03	6.15E-01	0.00E+00	0.00E+00	6.15E-01	2.25E-04	2.48E-02	6.40E-01				
Total LMW PAHs						3.37E+00	1.98E-03	7.39E-02	3.45E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.42E+01	3.00E-03	4.85E-02	0.00E+00	0.00E+00	4.85E-02	4.51E-04	2.77E-02	7.67E-02				
Benzo[A]Pyrene	1.79E+01	0.00E+00	3.18E-01	0.00E+00	0.00E+00	3.18E-01	0.00E+00	3.50E-02	3.53E-01				
Benzo(b)fluoranthene	1.97E+01	1.00E-02	9.19E-01	0.00E+00	0.00E+00	9.19E-01	1.50E-03	3.85E-02	9.59E-01				
Benzo(g,h,i)perylene	1.54E+01	3.90E-03	1.50E+00	0.00E+00	0.00E+00	1.50E+00	5.86E-04	3.01E-02	1.53E+00				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	6.91E-05	--	6.91E-05				
Chrysene	1.69E+01	7.60E-03	5.37E-02	0.00E+00	0.00E+00	5.37E-02	1.14E-03	3.30E-02	8.78E-02				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.47E-05	--	1.47E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	4.66E-04	--	4.66E-04				
Pyrene	2.25E+01	7.00E-03	2.43E+00	0.00E+00	0.00E+00	2.43E+00	1.05E-03	4.38E-02	2.47E+00				
Total HMW PAHs						5.27E+00	5.28E-03	2.08E-01	5.48E+00	6.15E-01	8.92E+00	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	3.31E-03	--	3.31E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H3-9
Screening-Level Exposure Evaluation - Meadow Vole
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

where:

$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

Table H3-10
Screening-Level Exposure Evaluation - North American Wolverine
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.36E-01	0.00E+00	7.36E-01	No TRV	--	No TRV	--
Antimony	2.88E+00	7.70E-03	0.00E+00	0.00E+00	4.32E-03	4.32E-03	2.31E-04	2.42E-03	6.97E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	2.33E+01	4.40E-03	0.00E+00	0.00E+00	3.10E-03	3.10E-03	1.32E-04	1.96E-02	2.28E-02	1.04E+00	<1	4.55E+00	<1
Barium	2.32E+02	2.71E+00	0.00E+00	0.00E+00	4.76E-03	4.76E-03	8.14E-02	1.95E-01	2.82E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	7.58E+00	1.50E-03	0.00E+00	0.00E+00	5.12E-04	5.12E-04	4.51E-05	6.37E-03	6.93E-03	5.32E-01	<1	6.70E-01	<1
Cadmium	1.17E+00	3.00E-03	0.00E+00	0.00E+00	9.20E-03	9.20E-03	9.01E-05	9.82E-04	1.03E-02	7.70E-01	<1	6.87E+00	<1
Chromium	2.56E+01	2.72E-02	0.00E+00	0.00E+00	7.52E-02	7.52E-02	8.17E-04	2.15E-02	9.76E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	1.57E+01	1.55E-02	0.00E+00	0.00E+00	1.26E-02	1.26E-02	4.66E-04	1.32E-02	2.63E-02	7.33E+00	<1	1.89E+01	<1
Copper	5.96E+02	1.83E-01	0.00E+00	0.00E+00	5.83E-01	5.83E-01	5.50E-03	5.01E-01	1.09E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.90E+01	3.52E-02	0.00E+00	0.00E+00	1.19E-01	1.19E-01	1.06E-03	1.59E-02	1.36E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.13E-01	0.00E+00	1.13E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	7.81E-06	--	7.81E-06	1.41E+00	<1	1.41E+01	<1
Nickel	5.01E+02	5.59E-02	0.00E+00	0.00E+00	4.25E-01	4.25E-01	1.68E-03	4.21E-01	8.48E-01	1.70E+00	<1	1.48E+01	<1
Selenium	4.80E-01	2.00E-03	0.00E+00	0.00E+00	1.50E-02	1.50E-02	6.01E-05	4.04E-04	1.55E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.85E-01	3.30E-04	0.00E+00	0.00E+00	6.01E-04	6.01E-04	9.92E-06	1.56E-04	7.67E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.65E+02	2.48E-02	0.00E+00	0.00E+00	6.08E-02	6.08E-02	7.45E-04	1.38E-01	2.00E-01	4.16E+00	<1	9.44E+00	<1
Zinc	5.82E+01	5.37E-01	0.00E+00	0.00E+00	3.14E+00	3.14E+00	1.61E-02	4.90E-02	3.21E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.73E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-02	1.45E-04	1.15E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	6.14E+02	2.24E+01	0.00E+00	0.00E+00	2.95E-01	2.95E-01	6.73E-01	5.17E-01	1.48E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.45E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-03	1.22E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	1.86E-05	--	1.86E-05				
Fluoranthene	2.32E+01	9.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.79E-04	1.95E-02	1.98E-02				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	2.61E-05	--	2.61E-05				
Naphthalene	5.55E-01	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.61E-05	4.67E-04	4.93E-04				
Phenanthrene	1.27E+01	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.51E-05	1.07E-02	1.07E-02				
Total LMW PAHs						0.00E+00	3.95E-04	3.18E-02	3.22E-02	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.42E+01	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.01E-05	1.19E-02	1.20E-02				
Benzo[A]Pyrene	1.79E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.51E-02	1.51E-02				
Benzo(b)fluoranthene	1.97E+01	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-04	1.66E-02	1.69E-02				
Benzo(g,h,i)perylene	1.54E+01	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-04	1.30E-02	1.31E-02				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	1.38E-05	--	1.38E-05				
Chrysene	1.69E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.28E-04	1.42E-02	1.44E-02				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	2.94E-06	--	2.94E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	9.31E-05	--	9.31E-05				
Pyrene	2.25E+01	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-04	1.89E-02	1.91E-02				
Total HMW PAHs						0.00E+00	1.06E-03	8.96E-02	9.07E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	6.61E-04	--	6.61E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H3-10
Screening-Level Exposure Evaluation - North American Wolverine
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H3-11
Screening-Level Exposure Evaluation - Short-tailed Shrew
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.28E+00	0.00E+00	3.28E+00	No TRV	--	No TRV	--
Antimony	2.88E+00	7.70E-03	0.00E+00	3.85E-01	0.00E+00	3.85E-01	1.03E-03	4.24E-03	3.91E-01	5.90E-02	6.62E+00	2.76E+00	<1
Arsenic	2.33E+01	4.40E-03	0.00E+00	2.99E-01	0.00E+00	2.99E-01	5.90E-04	3.43E-02	3.33E-01	1.04E+00	<1	4.55E+00	<1
Barium	2.32E+02	2.71E+00	0.00E+00	2.83E+00	0.00E+00	2.83E+00	3.63E-01	3.42E-01	3.54E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	7.58E+00	1.50E-03	0.00E+00	4.57E-02	0.00E+00	4.57E-02	2.01E-04	1.12E-02	5.70E-02	5.32E-01	<1	6.70E-01	<1
Cadmium	1.17E+00	3.00E-03	0.00E+00	1.26E+00	0.00E+00	1.26E+00	4.02E-04	1.72E-03	1.26E+00	7.70E-01	1.63E+00	6.87E+00	<1
Chromium	2.56E+01	2.72E-02	0.00E+00	1.05E+00	0.00E+00	1.05E+00	3.65E-03	3.77E-02	1.09E+00	2.40E+00	<1	5.82E+01	<1
Cobalt	1.57E+01	1.55E-02	0.00E+00	2.57E-01	0.00E+00	2.57E-01	2.08E-03	2.31E-02	2.82E-01	7.33E+00	<1	1.89E+01	<1
Copper	5.96E+02	1.83E-01	0.00E+00	4.11E+01	0.00E+00	4.11E+01	2.45E-02	8.78E-01	4.20E+01	5.60E+00	7.50E+00	8.27E+01	<1
Lead	1.90E+01	3.52E-02	0.00E+00	1.16E+00	0.00E+00	1.16E+00	4.72E-03	2.79E-02	1.19E+00	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.03E-01	0.00E+00	5.03E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	3.48E-05	--	3.48E-05	1.41E+00	<1	1.41E+01	<1
Nickel	5.01E+02	5.59E-02	0.00E+00	5.22E+01	0.00E+00	5.22E+01	7.49E-03	7.38E-01	5.29E+01	1.70E+00	3.11E+01	1.48E+01	3.58E+00
Selenium	4.80E-01	2.00E-03	0.00E+00	7.26E-02	0.00E+00	7.26E-02	2.68E-04	7.08E-04	7.36E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.85E-01	3.30E-04	0.00E+00	1.34E-03	0.00E+00	1.34E-03	4.42E-05	2.73E-04	1.66E-03	4.80E-01	<1	1.43E+00	<1
Vanadium	1.65E+02	2.48E-02	0.00E+00	9.26E-01	0.00E+00	9.26E-01	3.32E-03	2.42E-01	1.17E+00	4.16E+00	<1	9.44E+00	<1
Zinc	5.82E+01	5.37E-01	0.00E+00	4.35E+01	0.00E+00	4.35E+01	7.20E-02	8.58E-02	4.36E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.73E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.07E-02	2.54E-04	5.09E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	6.14E+02	2.24E+01	0.00E+00	1.02E+01	0.00E+00	1.02E+01	3.00E+00	9.05E-01	1.41E+01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.45E+00	0.00E+00	0.00E+00	2.86E-01	0.00E+00	2.86E-01	0.00E+00	2.14E-03	2.88E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	8.31E-05	--	8.31E-05				
Fluoranthene	2.32E+01	9.30E-03	0.00E+00	9.43E+00	0.00E+00	9.43E+00	1.25E-03	3.41E-02	9.47E+00				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.17E-04	--	1.17E-04				
Naphthalene	5.55E-01	8.70E-04	0.00E+00	3.27E-01	0.00E+00	3.27E-01	1.17E-04	8.18E-04	3.28E-01				
Phenanthrene	1.27E+01	1.50E-03	0.00E+00	2.93E+00	0.00E+00	2.93E+00	2.01E-04	1.87E-02	2.95E+00				
Total LMW PAHs						1.30E+01	1.76E-03	5.58E-02	1.30E+01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.42E+01	3.00E-03	0.00E+00	3.03E+00	0.00E+00	3.03E+00	4.02E-04	2.09E-02	3.05E+00				
Benzo[A]Pyrene	1.79E+01	0.00E+00	0.00E+00	3.19E+00	0.00E+00	3.19E+00	0.00E+00	2.64E-02	3.22E+00				
Benzo(b)fluoranthene	1.97E+01	1.00E-02	0.00E+00	6.87E+00	0.00E+00	6.87E+00	1.34E-03	2.91E-02	6.90E+00				
Benzo(g,h,i)perylene	1.54E+01	3.90E-03	0.00E+00	6.07E+00	0.00E+00	6.07E+00	5.23E-04	2.27E-02	6.09E+00				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	6.16E-05	--	6.16E-05				
Chrysene	1.69E+01	7.60E-03	0.00E+00	5.18E+00	0.00E+00	5.18E+00	1.02E-03	2.49E-02	5.20E+00				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.31E-05	--	1.31E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	4.15E-04	--	4.15E-04				
Pyrene	2.25E+01	7.00E-03	0.00E+00	5.27E+00	0.00E+00	5.27E+00	9.38E-04	3.31E-02	5.30E+00				
Total HMW PAHs						2.96E+01	4.71E-03	1.57E-01	2.98E+01	6.15E-01	4.84E+01	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	2.95E-03	--	2.95E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H3-11
Screening-Level Exposure Evaluation - Short-tailed Shrew
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H4-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Eastern Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	2.45E+01	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	7.70E-03	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	4.40E-03	1.24E+01	3.75E-02	4.65E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.43E+00	Sample et al. (1999)	Regression[f]	6.17E-02	Sample et al. (1998b)
Barium	NA	2.71E+00	1.06E+03	1.56E-01	1.65E+02	Bechtel-Jacobs (1998a)[g]	9.10E-02	9.65E+01	Sample et al. (1998a)	6.83E-04	7.23E-01	Baes et al. (1984)[e]
Beryllium	NA	1.50E-03	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	3.00E-03	7.00E-01	Regression[a]	5.12E-01	Bechtel-Jacobs (1998a)	Regression[d]	6.24E+00	Sample et al. (1999)	Regression[f]	2.40E-01	Sample et al. (1998b)
Chromium	NA	2.72E-02	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	1.55E-02	7.30E+00	7.50E-03	5.48E-02	Bechtel-Jacobs (1998a)[g]	1.22E-01	8.91E-01	Sample et al. (1998a)	Regression[f]	1.54E-01	Sample et al. (1998b)
Copper	NA	1.83E-01	2.55E+01	Regression[a]	6.99E+00	Bechtel-Jacobs (1998a)	5.15E-01	1.31E+01	Sample et al. (1998a)	Regression[f]	1.23E+01	Sample et al. (1998b)
Lead	NA	3.52E-02	3.62E+01	Regression[a]	1.98E+00	Bechtel-Jacobs (1998a)	Regression[d]	1.46E+01	Sample et al. (1999)	Regression[f]	5.28E+00	Sample et al. (1998b)
Manganese	NA	3.75E+00	3.95E+03	7.90E-02	3.12E+02	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.26E+02	Sample et al. (1999)	2.05E-02	8.10E+01	Sample et al. (1998b)[i]
Mercury	NA	2.60E-04	1.20E-01	Regression[a]	1.17E-01	Bechtel-Jacobs (1998a)	3.93E+00	4.72E-01	Sample et al. (1998a)	3.81E-01	4.57E-02	LANL (2015)
Nickel	NA	5.59E-02	6.89E+01	Regression[a]	2.57E+00	Bechtel-Jacobs (1998a)	7.78E-01	5.36E+01	Sample et al. (1998a)	Regression[f]	5.61E+00	Sample et al. (1998b)
Selenium	NA	2.00E-03	6.40E-01	Regression[a]	3.10E-01	Bechtel-Jacobs (1998a)	Regression[d]	6.69E-01	Sample et al. (1998a)	Regression[f]	5.58E-01	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	3.30E-04	1.50E-01	4.00E-03	6.00E-04	Baes et al. (1984)	5.41E-02	8.12E-03	USCHPPM (2004)	1.08E-01	1.62E-02	Baes et al. (1984)[e]
Vanadium	NA	2.48E-02	2.57E+01	4.85E-03	1.25E-01	Bechtel-Jacobs (1998a)[g]	4.20E-02	1.08E+00	Sample et al. (1998a)	1.23E-02	3.16E-01	Sample et al. (1998b)[i]
Zinc	NA	5.37E-01	1.50E+02	Regression[a]	7.75E+01	Bechtel-Jacobs (1998a)	Regression[d]	4.43E+02	Sample et al. (1998a)	Regression[f]	1.12E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	3.78E-01	6.40E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	2.24E+01	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	6.20E-04	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	9.30E-03	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	8.70E-04	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	8.70E-04	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Phenanthrene	4.55	1.50E-03	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]

Table H4-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Eastern Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
LMW PAHs												
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	5.7	3.00E-03	1.50E+00	Regression[a]	8.49E-02	USEPA (2007a)	1.59E+00	2.39E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	0.00E+00	1.90E+00	Regression[a]	2.38E-01	USEPA (2007a)	1.33E+00	2.53E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	1.00E-02	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	3.90E-03	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	4.60E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	7.60E-03	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	9.80E-05	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.10E-03	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	7.00E-03	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	2.20E-02	1.50E-01	2.38E-02	3.57E-03	USEPA (2007a)	5.44E+01	8.16E+00	USEPA (2007a)	7.79E-01	1.17E-01	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	8.14E-01	0.00E+00	USEPA (2007a)	1.03E+01	0.00E+00	USEPA (2007a)	4.49E-01	0.00E+00	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)

Table H4-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Eastern Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	0.00E+00	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H4-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Eastern Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H4-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Eastern Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	2.45E+01	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	7.70E-03	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	4.40E-03	7.98E+00	3.75E-02	2.99E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.05E+00	Sample et al. (1999)	Regression[f]	4.30E-02	Sample et al. (1998b)
Barium	NA	2.71E+00	7.22E+02	1.56E-01	1.13E+02	Bechtel-Jacobs (1998a)[g]	9.10E-02	6.57E+01	Sample et al. (1998a)	6.83E-04	4.92E-01	Baes et al. (1984)[e]
Beryllium	NA	1.50E-03	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	3.00E-03	2.99E-01	Regression[a]	3.22E-01	Bechtel-Jacobs (1998a)	Regression[d]	3.17E+00	Sample et al. (1999)	Regression[f]	1.61E-01	Sample et al. (1998b)
Chromium	NA	2.72E-02	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	1.55E-02	6.20E+00	7.50E-03	4.65E-02	Bechtel-Jacobs (1998a)[g]	1.22E-01	7.56E-01	Sample et al. (1998a)	Regression[f]	1.25E-01	Sample et al. (1998b)
Copper	NA	1.83E-01	2.55E+01	Regression[a]	6.99E+00	Bechtel-Jacobs (1998a)	5.15E-01	1.31E+01	Sample et al. (1998a)	Regression[f]	1.23E+01	Sample et al. (1998b)
Lead	NA	3.52E-02	1.69E+01	Regression[a]	1.29E+00	Bechtel-Jacobs (1998a)	Regression[d]	7.86E+00	Sample et al. (1999)	Regression[f]	3.76E+00	Sample et al. (1998b)
Manganese	NA	3.75E+00	1.96E+03	7.90E-02	1.54E+02	Bechtel-Jacobs (1998a)[g]	Regression[d]	7.82E+01	Sample et al. (1999)	2.05E-02	4.01E+01	Sample et al. (1998b)[i]
Mercury	NA	2.60E-04	6.80E-02	Regression[a]	8.56E-02	Bechtel-Jacobs (1998a)	3.93E+00	2.67E-01	Sample et al. (1998a)	3.81E-01	2.59E-02	LANL (2015)
Nickel	NA	5.59E-02	2.70E+01	Regression[a]	1.27E+00	Bechtel-Jacobs (1998a)	7.78E-01	2.10E+01	Sample et al. (1998a)	Regression[f]	3.63E+00	Sample et al. (1998b)
Selenium	NA	2.00E-03	6.40E-01	Regression[a]	3.10E-01	Bechtel-Jacobs (1998a)	Regression[d]	6.69E-01	Sample et al. (1998a)	Regression[f]	5.58E-01	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	3.30E-04	1.30E-01	4.00E-03	5.20E-04	Baes et al. (1984)	5.41E-02	7.03E-03	USCHPPM (2004)	1.08E-01	1.41E-02	Baes et al. (1984)[e]
Vanadium	NA	2.48E-02	1.75E+01	4.85E-03	8.46E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	7.33E-01	Sample et al. (1998a)	1.23E-02	2.15E-01	Sample et al. (1998b)[i]
Zinc	NA	5.37E-01	1.07E+02	Regression[a]	6.45E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.97E+02	Sample et al. (1998a)	Regression[f]	1.09E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	3.78E-01	4.50E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	2.24E+01	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	6.20E-04	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	9.30E-03	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	8.70E-04	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	8.70E-04	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Phenanthrene	4.55	1.50E-03	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs												

Table H4-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Eastern Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	5.7	3.00E-03	5.50E-01	Regression[a]	4.67E-02	USEPA (2007a)	1.59E+00	8.75E-01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	0.00E+00	8.50E-01	Regression[a]	1.09E-01	USEPA (2007a)	1.33E+00	1.13E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	1.00E-02	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	3.90E-03	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	4.60E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	7.60E-03	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	9.80E-05	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.10E-03	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	7.00E-03	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	2.20E-02	2.59E-01	2.38E-02	6.16E-03	USEPA (2007a)	5.44E+01	1.41E+01	USEPA (2007a)	7.79E-01	2.02E-01	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	8.14E-01	0.00E+00	USEPA (2007a)	1.03E+01	0.00E+00	USEPA (2007a)	4.49E-01	0.00E+00	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)

Table H4-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Eastern Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	0.00E+00	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H4-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Eastern Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H4-2
Screening-Level Exposure Evaluation - American Woodcock
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.88E+00	0.00E+00	2.88E+00	1.10E+02	<1	1.10E+03	<1
Antimony	ND	7.70E-03	--	--	--	0.00E+00	9.05E-04	--	9.05E-04	No TRV	--	No TRV	--
Arsenic	1.24E+01	4.40E-03	5.47E-03	1.51E-01	0.00E+00	1.56E-01	5.17E-04	1.09E-01	2.66E-01	2.24E+00	<1	4.51E+00	<1
Barium	1.06E+03	2.71E+00	1.94E+00	1.02E+01	0.00E+00	1.21E+01	3.18E-01	9.34E+00	2.18E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	1.76E-04	--	1.76E-04	No TRV	--	No TRV	--
Cadmium	7.00E-01	3.00E-03	6.01E-03	6.59E-01	0.00E+00	6.65E-01	3.52E-04	6.17E-03	6.72E-01	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	3.20E-03	--	3.20E-03	2.66E+00	<1	1.56E+01	<1
Cobalt	7.30E+00	1.55E-02	6.43E-04	9.42E-02	0.00E+00	9.48E-02	1.82E-03	6.43E-02	1.61E-01	7.61E+00	<1	2.02E+01	<1
Copper	2.55E+01	1.83E-01	8.21E-02	1.39E+00	0.00E+00	1.47E+00	2.15E-02	2.25E-01	1.72E+00	4.05E+00	<1	3.48E+01	<1
Lead	3.62E+01	3.52E-02	2.33E-02	1.54E+00	0.00E+00	1.56E+00	4.14E-03	3.19E-01	1.89E+00	1.63E+00	1.16E+00	4.46E+01	<1
Manganese	3.95E+03	3.75E+00	3.67E+00	1.34E+01	0.00E+00	1.70E+01	4.41E-01	3.48E+01	5.23E+01	1.79E+02	<1	3.77E+02	<1
Mercury	1.20E-01	2.60E-04	1.37E-03	4.99E-02	0.00E+00	5.12E-02	3.05E-05	1.06E-03	5.23E-02	4.50E-01	<1	9.10E-01	<1
Nickel	6.89E+01	5.59E-02	3.02E-02	5.67E+00	0.00E+00	5.70E+00	6.57E-03	6.07E-01	6.31E+00	6.71E+00	<1	1.86E+01	<1
Selenium	6.40E-01	2.00E-03	3.65E-03	7.07E-02	0.00E+00	7.44E-02	2.35E-04	5.64E-03	8.02E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.50E-01	3.30E-04	7.05E-06	8.58E-04	0.00E+00	8.65E-04	3.88E-05	1.32E-03	2.23E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	2.57E+01	2.48E-02	1.46E-03	1.14E-01	0.00E+00	1.16E-01	2.91E-03	2.26E-01	3.45E-01	3.44E-01	1.00E+00	1.70E+00	<1
Zinc	1.50E+02	5.37E-01	9.11E-01	4.68E+01	0.00E+00	4.77E+01	6.31E-02	1.32E+00	4.91E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	6.40E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.44E-02	5.64E-03	5.00E-02	4.00E-02	1.25E+00	4.00E-01	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	2.63E+00	--	2.63E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	7.28E-05	--	7.28E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.09E-03	--	1.09E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.02E-04	--	1.02E-04				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	1.02E-04	--	1.02E-04				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	1.76E-04	--	1.76E-04				
Total LMW PAHs						0.00E+00	1.55E-03	0.00E+00	1.55E-03	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.50E+00	3.00E-03	9.97E-04	2.52E-01	0.00E+00	2.53E-01	3.52E-04	1.32E-02	2.67E-01				
Benzo[A]Pyrene	1.90E+00	0.00E+00	2.80E-03	2.67E-01	0.00E+00	2.70E-01	0.00E+00	1.67E-02	2.87E-01				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.17E-03	--	1.17E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	4.58E-04	--	4.58E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	5.40E-05	--	5.40E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	8.93E-04	--	8.93E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.15E-05	--	1.15E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	3.64E-04	--	3.64E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	8.22E-04	--	8.22E-04				
Total HMW PAHs						5.23E-01	4.13E-03	3.00E-02	5.57E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.50E-01	2.20E-02	4.19E-05	8.63E-01	0.00E+00	8.63E-01	2.58E-03	1.32E-03	8.67E-01	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H4-2
Screening-Level Exposure Evaluation - American Woodcock
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:
a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H4-3
Screening-Level Exposure Evaluation - Mourning Dove
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.80E+00	0.00E+00	2.80E+00	1.10E+02	<1	1.10E+03	<1
Antimony	ND	7.70E-03	--	--	--	0.00E+00	8.79E-04	--	8.79E-04	No TRV	--	No TRV	--
Arsenic	1.24E+01	4.40E-03	5.31E-02	0.00E+00	0.00E+00	5.31E-02	5.02E-04	9.62E-02	1.50E-01	2.24E+00	<1	4.51E+00	<1
Barium	1.06E+03	2.71E+00	1.89E+01	0.00E+00	0.00E+00	1.89E+01	3.09E-01	8.23E+00	2.74E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	1.71E-04	--	1.71E-04	No TRV	--	No TRV	--
Cadmium	7.00E-01	3.00E-03	5.84E-02	0.00E+00	0.00E+00	5.84E-02	3.42E-04	5.43E-03	6.42E-02	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	3.10E-03	--	3.10E-03	2.66E+00	<1	1.56E+01	<1
Cobalt	7.30E+00	1.55E-02	6.25E-03	0.00E+00	0.00E+00	6.25E-03	1.77E-03	5.67E-02	6.47E-02	7.61E+00	<1	2.02E+01	<1
Copper	2.55E+01	1.83E-01	7.97E-01	0.00E+00	0.00E+00	7.97E-01	2.09E-02	1.98E-01	1.02E+00	4.05E+00	<1	3.48E+01	<1
Lead	3.62E+01	3.52E-02	2.27E-01	0.00E+00	0.00E+00	2.27E-01	4.02E-03	2.81E-01	5.12E-01	1.63E+00	<1	4.46E+01	<1
Manganese	3.95E+03	3.75E+00	3.56E+01	0.00E+00	0.00E+00	3.56E+01	4.28E-01	3.07E+01	6.67E+01	1.79E+02	<1	3.77E+02	<1
Mercury	1.20E-01	2.60E-04	1.33E-02	0.00E+00	0.00E+00	1.33E-02	2.97E-05	9.31E-04	1.43E-02	4.50E-01	<1	9.10E-01	<1
Nickel	6.89E+01	5.59E-02	2.93E-01	0.00E+00	0.00E+00	2.93E-01	6.38E-03	5.35E-01	8.34E-01	6.71E+00	<1	1.86E+01	<1
Selenium	6.40E-01	2.00E-03	3.54E-02	0.00E+00	0.00E+00	3.54E-02	2.28E-04	4.97E-03	4.06E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.50E-01	3.30E-04	6.85E-05	0.00E+00	0.00E+00	6.85E-05	3.77E-05	1.16E-03	1.27E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	2.57E+01	2.48E-02	1.42E-02	0.00E+00	0.00E+00	1.42E-02	2.83E-03	1.99E-01	2.17E-01	3.44E-01	<1	1.70E+00	<1
Zinc	1.50E+02	5.37E-01	8.85E+00	0.00E+00	0.00E+00	8.85E+00	6.13E-02	1.16E+00	1.01E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	6.40E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.31E-02	4.97E-03	4.81E-02	4.00E-02	1.20E+00	4.00E-01	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	2.56E+00	--	2.56E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	7.08E-05	--	7.08E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.06E-03	--	1.06E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	9.93E-05	--	9.93E-05				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	9.93E-05	--	9.93E-05				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	1.71E-04	--	1.71E-04				
Total LMW PAHs						0.00E+00	1.50E-03	0.00E+00	1.50E-03	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.50E+00	3.00E-03	9.69E-03	0.00E+00	0.00E+00	9.69E-03	3.42E-04	1.16E-02	2.17E-02				
Benzo[A]Pyrene	1.90E+00	0.00E+00	2.72E-02	0.00E+00	0.00E+00	2.72E-02	0.00E+00	1.47E-02	4.19E-02				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.14E-03	--	1.14E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	4.45E-04	--	4.45E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	5.25E-05	--	5.25E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	8.67E-04	--	8.67E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.12E-05	--	1.12E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	3.54E-04	--	3.54E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	7.99E-04	--	7.99E-04				
Total HMW PAHs						3.68E-02	4.01E-03	2.64E-02	6.72E-02	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.50E-01	2.20E-02	4.07E-04	0.00E+00	0.00E+00	4.07E-04	2.51E-03	1.16E-03	4.08E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H4-3
Screening-Level Exposure Evaluation - Mourning Dove
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H4-4
Screening-Level Exposure Evaluation - Red-tailed Hawk
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E+00	0.00E+00	2.01E+00	1.10E+02	<1	1.10E+03	<1
Antimony	ND	7.70E-03	--	--	--	0.00E+00	6.31E-04	--	6.31E-04	No TRV	--	No TRV	--
Arsenic	1.24E+01	4.40E-03	0.00E+00	0.00E+00	5.06E-03	5.06E-03	3.61E-04	2.64E-02	3.19E-02	2.24E+00	<1	4.51E+00	<1
Barium	1.06E+03	2.71E+00	0.00E+00	0.00E+00	5.93E-02	5.93E-02	2.22E-01	2.26E+00	2.54E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	1.23E-04	--	1.23E-04	No TRV	--	No TRV	--
Cadmium	7.00E-01	3.00E-03	0.00E+00	0.00E+00	1.97E-02	1.97E-02	2.46E-04	1.49E-03	2.15E-02	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	2.23E-03	--	2.23E-03	2.66E+00	<1	1.56E+01	<1
Cobalt	7.30E+00	1.55E-02	0.00E+00	0.00E+00	1.27E-02	1.27E-02	1.27E-03	1.56E-02	2.95E-02	7.61E+00	<1	2.02E+01	<1
Copper	2.55E+01	1.83E-01	0.00E+00	0.00E+00	1.01E+00	1.01E+00	1.50E-02	5.44E-02	1.08E+00	4.05E+00	<1	3.48E+01	<1
Lead	3.62E+01	3.52E-02	0.00E+00	0.00E+00	4.33E-01	4.33E-01	2.89E-03	7.72E-02	5.13E-01	1.63E+00	<1	4.46E+01	<1
Manganese	3.95E+03	3.75E+00	0.00E+00	0.00E+00	6.64E+00	6.64E+00	3.08E-01	8.42E+00	1.54E+01	1.79E+02	<1	3.77E+02	<1
Mercury	1.20E-01	2.60E-04	0.00E+00	0.00E+00	3.75E-03	3.75E-03	2.13E-05	2.56E-04	4.03E-03	4.50E-01	<1	9.10E-01	<1
Nickel	6.89E+01	5.59E-02	0.00E+00	0.00E+00	4.60E-01	4.60E-01	4.58E-03	1.47E-01	6.12E-01	6.71E+00	<1	1.86E+01	<1
Selenium	6.40E-01	2.00E-03	0.00E+00	0.00E+00	4.57E-02	4.57E-02	1.64E-04	1.36E-03	4.73E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.50E-01	3.30E-04	0.00E+00	0.00E+00	1.33E-03	1.33E-03	2.71E-05	3.20E-04	1.68E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	2.57E+01	2.48E-02	0.00E+00	0.00E+00	2.59E-02	2.59E-02	2.03E-03	5.48E-02	8.28E-02	3.44E-01	<1	1.70E+00	<1
Zinc	1.50E+02	5.37E-01	0.00E+00	0.00E+00	9.17E+00	9.17E+00	4.40E-02	3.20E-01	9.53E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	6.40E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.10E-02	1.36E-03	3.24E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	1.84E+00	--	1.84E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	5.08E-05	--	5.08E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	7.63E-04	--	7.63E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	7.13E-05	--	7.13E-05				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	7.13E-05	--	7.13E-05				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	1.23E-04	--	1.23E-04				
Total LMW PAHs						0.00E+00	1.08E-03	0.00E+00	1.08E-03	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.50E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.46E-04	3.20E-03	3.44E-03				
Benzo[A]Pyrene	1.90E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.05E-03	4.05E-03				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	8.20E-04	--	8.20E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	3.20E-04	--	3.20E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	3.77E-05	--	3.77E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	6.23E-04	--	6.23E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	8.04E-06	--	8.04E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	2.54E-04	--	2.54E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	5.74E-04	--	5.74E-04				
Total HMW PAHs						0.00E+00	2.88E-03	7.25E-03	1.01E-02	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.50E-01	2.20E-02	0.00E+00	0.00E+00	9.58E-03	9.58E-03	1.80E-03	3.20E-04	1.17E-02	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H4-4
Screening-Level Exposure Evaluation - Red-tailed Hawk
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H4-5
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.88E+00	0.00E+00	3.88E+00	1.10E+02	<1	1.10E+03	<1
Antimony	ND	7.70E-03	--	--	--	0.00E+00	1.22E-03	--	1.22E-03	No TRV	--	No TRV	--
Arsenic	1.24E+01	4.40E-03	0.00E+00	2.26E-01	0.00E+00	2.26E-01	6.97E-04	0.00E+00	2.27E-01	2.24E+00	<1	4.51E+00	<1
Barium	1.06E+03	2.71E+00	0.00E+00	1.53E+01	0.00E+00	1.53E+01	4.29E-01	0.00E+00	1.57E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	2.37E-04	--	2.37E-04	No TRV	--	No TRV	--
Cadmium	7.00E-01	3.00E-03	0.00E+00	9.87E-01	0.00E+00	9.87E-01	4.75E-04	0.00E+00	9.88E-01	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	4.31E-03	--	4.31E-03	2.66E+00	<1	1.56E+01	<1
Cobalt	7.30E+00	1.55E-02	0.00E+00	1.41E-01	0.00E+00	1.41E-01	2.45E-03	0.00E+00	1.43E-01	7.61E+00	<1	2.02E+01	<1
Copper	2.55E+01	1.83E-01	0.00E+00	2.08E+00	0.00E+00	2.08E+00	2.90E-02	0.00E+00	2.11E+00	4.05E+00	<1	3.48E+01	<1
Lead	3.62E+01	3.52E-02	0.00E+00	2.31E+00	0.00E+00	2.31E+00	5.57E-03	0.00E+00	2.31E+00	1.63E+00	1.42E+00	4.46E+01	<1
Manganese	3.95E+03	3.75E+00	0.00E+00	2.00E+01	0.00E+00	2.00E+01	5.94E-01	0.00E+00	2.06E+01	1.79E+02	<1	3.77E+02	<1
Mercury	1.20E-01	2.60E-04	0.00E+00	7.47E-02	0.00E+00	7.47E-02	4.12E-05	0.00E+00	7.47E-02	4.50E-01	<1	9.10E-01	<1
Nickel	6.89E+01	5.59E-02	0.00E+00	8.49E+00	0.00E+00	8.49E+00	8.85E-03	0.00E+00	8.49E+00	6.71E+00	1.27E+00	1.86E+01	<1
Selenium	6.40E-01	2.00E-03	0.00E+00	1.06E-01	0.00E+00	1.06E-01	3.17E-04	0.00E+00	1.06E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.50E-01	3.30E-04	0.00E+00	1.28E-03	0.00E+00	1.28E-03	5.22E-05	0.00E+00	1.34E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	2.57E+01	2.48E-02	0.00E+00	1.71E-01	0.00E+00	1.71E-01	3.93E-03	0.00E+00	1.75E-01	3.44E-01	<1	1.70E+00	<1
Zinc	1.50E+02	5.37E-01	0.00E+00	7.01E+01	0.00E+00	7.01E+01	8.50E-02	0.00E+00	7.02E+01	6.61E+01	1.06E+00	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	6.40E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.98E-02	0.00E+00	5.98E-02	4.00E-02	1.50E+00	4.00E-01	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	3.55E+00	--	3.55E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	9.82E-05	--	9.82E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.47E-03	--	1.47E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.38E-04	--	1.38E-04				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	1.38E-04	--	1.38E-04				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	2.37E-04	--	2.37E-04				
Total LMW PAHs						0.00E+00	2.08E-03	0.00E+00	2.08E-03	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.50E+00	3.00E-03	0.00E+00	3.78E-01	0.00E+00	3.78E-01	4.75E-04	0.00E+00	3.78E-01				
Benzo[A]Pyrene	1.90E+00	0.00E+00	0.00E+00	4.00E-01	0.00E+00	4.00E-01	0.00E+00	0.00E+00	4.00E-01				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.58E-03	--	1.58E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	6.17E-04	--	6.17E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	7.28E-05	--	7.28E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	1.20E-03	--	1.20E-03				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.55E-05	--	1.55E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	4.91E-04	--	4.91E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	1.11E-03	--	1.11E-03				
Total HMW PAHs						7.78E-01	5.57E-03	0.00E+00	7.83E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.50E-01	2.20E-02	0.00E+00	1.29E+00	0.00E+00	1.29E+00	3.48E-03	0.00E+00	1.30E+00	1.10E+00	1.18E+00	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H4-5
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H4-6
Screening-Level Exposure Evaluation - Canada Lynx
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.65E-01	0.00E+00	7.65E-01	No TRV	--	No TRV	--
Antimony	ND	7.70E-03	--	--	--	0.00E+00	2.41E-04	--	2.41E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	1.24E+01	4.40E-03	0.00E+00	0.00E+00	1.93E-03	1.93E-03	1.37E-04	1.08E-02	1.29E-02	1.04E+00	<1	4.55E+00	<1
Barium	1.06E+03	2.71E+00	0.00E+00	0.00E+00	2.26E-02	2.26E-02	8.47E-02	9.27E-01	1.03E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	4.69E-05	--	4.69E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	7.00E-01	3.00E-03	0.00E+00	0.00E+00	7.51E-03	7.51E-03	9.37E-05	6.12E-04	8.22E-03	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	8.50E-04	--	8.50E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	7.30E+00	1.55E-02	0.00E+00	0.00E+00	4.82E-03	4.82E-03	4.84E-04	6.39E-03	1.17E-02	7.33E+00	<1	1.89E+01	<1
Copper	2.55E+01	1.83E-01	0.00E+00	0.00E+00	3.84E-01	3.84E-01	5.72E-03	2.23E-02	4.12E-01	5.60E+00	<1	8.27E+01	<1
Lead	3.62E+01	3.52E-02	0.00E+00	0.00E+00	1.65E-01	1.65E-01	1.10E-03	3.17E-02	1.98E-01	4.70E+00	<1	1.86E+02	<1
Manganese	3.95E+03	3.75E+00	0.00E+00	0.00E+00	2.53E+00	2.53E+00	1.17E-01	3.46E+00	6.10E+00	5.15E+01	<1	1.46E+02	<1
Mercury	1.20E-01	2.60E-04	0.00E+00	0.00E+00	1.43E-03	1.43E-03	8.12E-06	1.05E-04	1.54E-03	1.41E+00	<1	1.41E+01	<1
Nickel	6.89E+01	5.59E-02	0.00E+00	0.00E+00	1.75E-01	1.75E-01	1.75E-03	6.03E-02	2.37E-01	1.70E+00	<1	1.48E+01	<1
Selenium	6.40E-01	2.00E-03	0.00E+00	0.00E+00	1.74E-02	1.74E-02	6.25E-05	5.60E-04	1.81E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.50E-01	3.30E-04	0.00E+00	0.00E+00	5.07E-04	5.07E-04	1.03E-05	1.31E-04	6.49E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	2.57E+01	2.48E-02	0.00E+00	0.00E+00	9.88E-03	9.88E-03	7.75E-04	2.25E-02	3.31E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.50E+02	5.37E-01	0.00E+00	0.00E+00	3.49E+00	3.49E+00	1.68E-02	1.31E-01	3.64E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	6.40E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-02	5.60E-04	1.24E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	7.00E-01	--	7.00E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	1.94E-05	--	1.94E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	2.91E-04	--	2.91E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	2.72E-05	--	2.72E-05				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	2.72E-05	--	2.72E-05				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	4.69E-05	--	4.69E-05				
Total LMW PAHs						0.00E+00	4.11E-04	0.00E+00	4.11E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.50E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.37E-05	1.31E-03	1.41E-03				
Benzo[A]Pyrene	1.90E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E-03	1.66E-03				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	3.12E-04	--	3.12E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	1.22E-04	--	1.22E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	1.44E-05	--	1.44E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	2.37E-04	--	2.37E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	3.06E-06	--	3.06E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	9.69E-05	--	9.69E-05				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	2.19E-04	--	2.19E-04				
Total HMW PAHs						0.00E+00	1.10E-03	2.97E-03	4.07E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.50E-01	2.20E-02	0.00E+00	0.00E+00	3.65E-03	3.65E-03	6.87E-04	1.31E-04	4.47E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H4-6
Screening-Level Exposure Evaluation - Canada Lynx
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H4-7
Screening-Level Exposure Evaluation - Grizzly Bear
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)											
			Diet					Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.29E-01	0.00E+00	5.29E-01	No TRV	--	No TRV	--
Antimony	ND	7.70E-03	--	--	--	0.00E+00	0.00E+00	1.66E-04	--	1.66E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	1.24E+01	4.40E-03	6.53E-03	4.63E-03	1.33E-04	0.00E+00	1.13E-02	9.50E-05	7.50E-03	1.14E-02	1.04E+00	<1	4.55E+00	<1
Barium	1.06E+03	2.71E+00	2.32E+00	3.12E-01	1.56E-03	0.00E+00	2.64E+00	5.85E-02	6.41E-01	2.69E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	0.00E+00	3.24E-05	--	3.24E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	7.00E-01	3.00E-03	7.18E-03	2.02E-02	5.19E-04	0.00E+00	2.79E-02	6.48E-05	4.23E-04	2.80E-02	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	0.00E+00	5.87E-04	--	5.87E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	7.30E+00	1.55E-02	7.69E-04	2.88E-03	3.33E-04	0.00E+00	3.99E-03	3.35E-04	4.41E-03	4.32E-03	7.33E+00	<1	1.89E+01	<1
Copper	2.55E+01	1.83E-01	9.81E-02	4.25E-02	2.66E-02	0.00E+00	1.67E-01	3.95E-03	1.54E-02	1.71E-01	5.60E+00	<1	8.27E+01	<1
Lead	3.62E+01	3.52E-02	2.79E-02	4.72E-02	1.14E-02	0.00E+00	8.64E-02	7.60E-04	2.19E-02	8.72E-02	4.70E+00	<1	1.86E+02	<1
Manganese	3.95E+03	3.75E+00	4.38E+00	4.09E-01	1.75E-01	0.00E+00	4.96E+00	8.10E-02	2.39E+00	5.05E+00	5.15E+01	<1	1.46E+02	<1
Mercury	1.20E-01	2.60E-04	1.64E-03	1.53E-03	9.87E-05	0.00E+00	3.26E-03	5.61E-06	7.26E-05	3.27E-03	1.41E+00	<1	1.41E+01	<1
Nickel	6.89E+01	5.59E-02	3.60E-02	1.74E-01	1.21E-02	0.00E+00	2.22E-01	1.21E-03	4.17E-02	2.23E-01	1.70E+00	<1	1.48E+01	<1
Selenium	6.40E-01	2.00E-03	4.36E-03	2.17E-03	1.20E-03	0.00E+00	7.73E-03	4.32E-05	3.87E-04	7.77E-03	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.50E-01	3.30E-04	8.42E-06	2.63E-05	3.50E-05	0.00E+00	6.98E-05	7.13E-06	9.07E-05	7.69E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	2.57E+01	2.48E-02	1.75E-03	3.50E-03	6.83E-04	0.00E+00	5.93E-03	5.36E-04	1.55E-02	6.46E-03	4.16E+00	<1	9.44E+00	<1
Zinc	1.50E+02	5.37E-01	1.09E+00	1.43E+00	2.41E-01	0.00E+00	2.76E+00	1.16E-02	9.07E-02	2.78E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	6.40E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.16E-03	3.87E-04	8.16E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	0.00E+00	4.84E-01	--	4.84E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	0.00E+00	1.34E-05	--	1.34E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	0.00E+00	2.01E-04	--	2.01E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	0.00E+00	1.88E-05	--	1.88E-05				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	0.00E+00	1.88E-05	--	1.88E-05				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	0.00E+00	3.24E-05	--	3.24E-05				
Total LMW PAHs							0.00E+00	2.84E-04	0.00E+00	2.84E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	1.50E+00	3.00E-03	1.19E-03	7.73E-03	0.00E+00	0.00E+00	8.92E-03	6.48E-05	9.07E-04	8.98E-03				
Benzo[A]Pyrene	1.90E+00	0.00E+00	3.34E-03	8.19E-03	0.00E+00	0.00E+00	1.15E-02	0.00E+00	1.15E-03	1.15E-02				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	0.00E+00	2.16E-04	--	2.16E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	0.00E+00	8.42E-05	--	8.42E-05				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	0.00E+00	9.93E-06	--	9.93E-06				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	0.00E+00	1.64E-04	--	1.64E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	0.00E+00	2.12E-06	--	2.12E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	0.00E+00	6.69E-05	--	6.69E-05				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	0.00E+00	1.51E-04	--	1.51E-04				
Total HMW PAHs							2.04E-02	7.59E-04	2.06E-03	2.33E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.50E-01	2.20E-02	5.01E-05	2.64E-02	2.52E-04	0.00E+00	2.67E-02	4.75E-04	9.07E-05	2.72E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H4-7
Screening-Level Exposure Evaluation - Grizzly Bear
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)											
			Diet					Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H4-8
Screening-Level Exposure Evaluation - Long-tailed Weasel
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E+00	0.00E+00	1.26E+00	No TRV	--	No TRV	--
Antimony	ND	7.70E-03	--	--	--	0.00E+00	3.96E-04	--	3.96E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	7.98E+00	4.40E-03	0.00E+00	0.00E+00	2.21E-03	2.21E-03	2.26E-04	6.57E-03	9.00E-03	1.04E+00	<1	4.55E+00	<1
Barium	7.22E+02	2.71E+00	0.00E+00	0.00E+00	2.53E-02	2.53E-02	1.39E-01	5.94E-01	7.59E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	7.72E-05	--	7.72E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	2.99E-01	3.00E-03	0.00E+00	0.00E+00	8.27E-03	8.27E-03	1.54E-04	2.46E-04	8.67E-03	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	1.40E-03	--	1.40E-03	2.40E+00	<1	5.82E+01	<1
Cobalt	6.20E+00	1.55E-02	0.00E+00	0.00E+00	6.41E-03	6.41E-03	7.98E-04	5.10E-03	1.23E-02	7.33E+00	<1	1.89E+01	<1
Copper	2.55E+01	1.83E-01	0.00E+00	0.00E+00	6.33E-01	6.33E-01	9.42E-03	2.10E-02	6.63E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.69E+01	3.52E-02	0.00E+00	0.00E+00	1.94E-01	1.94E-01	1.81E-03	1.39E-02	2.09E-01	4.70E+00	<1	1.86E+02	<1
Manganese	1.96E+03	3.75E+00	0.00E+00	0.00E+00	2.06E+00	2.06E+00	1.93E-01	1.61E+00	3.87E+00	5.15E+01	<1	1.46E+02	<1
Mercury	6.80E-02	2.60E-04	0.00E+00	0.00E+00	1.33E-03	1.33E-03	1.34E-05	5.60E-05	1.40E-03	1.41E+00	<1	1.41E+01	<1
Nickel	2.70E+01	5.59E-02	0.00E+00	0.00E+00	1.87E-01	1.87E-01	2.88E-03	2.22E-02	2.12E-01	1.70E+00	<1	1.48E+01	<1
Selenium	6.40E-01	2.00E-03	0.00E+00	0.00E+00	2.87E-02	2.87E-02	1.03E-04	5.27E-04	2.93E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.30E-01	3.30E-04	0.00E+00	0.00E+00	7.24E-04	7.24E-04	1.70E-05	1.07E-04	8.48E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.75E+01	2.48E-02	0.00E+00	0.00E+00	1.10E-02	1.10E-02	1.28E-03	1.44E-02	2.67E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.07E+02	5.37E-01	0.00E+00	0.00E+00	5.62E+00	5.62E+00	2.76E-02	8.85E-02	5.74E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.50E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.95E-02	3.71E-04	1.98E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	1.15E+00	--	1.15E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	3.19E-05	--	3.19E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	4.79E-04	--	4.79E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	4.48E-05	--	4.48E-05				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	4.48E-05	--	4.48E-05				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	7.72E-05	--	7.72E-05				
Total LMW PAHs						0.00E+00	6.77E-04	0.00E+00	6.77E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	5.50E-01	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-04	4.53E-04	6.07E-04				
Benzo[A]Pyrene	8.50E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.00E-04	7.00E-04				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	5.15E-04	--	5.15E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	2.01E-04	--	2.01E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	2.37E-05	--	2.37E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	3.91E-04	--	3.91E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	5.04E-06	--	5.04E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	1.60E-04	--	1.60E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	3.60E-04	--	3.60E-04				
Total HMW PAHs						0.00E+00	1.81E-03	1.15E-03	2.96E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.59E-01	2.20E-02	0.00E+00	0.00E+00	1.04E-02	1.04E-02	1.13E-03	2.13E-04	1.17E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H4-8
Screening-Level Exposure Evaluation - Long-tailed Weasel
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H4-9
Screening-Level Exposure Evaluation - Meadow Vole
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.68E+00	0.00E+00	3.68E+00	No TRV	--	No TRV	--
Antimony	ND	7.70E-03	--	--	--	0.00E+00	1.16E-03	--	1.16E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	7.98E+00	4.40E-03	4.50E-02	0.00E+00	0.00E+00	4.50E-02	6.61E-04	1.56E-02	6.12E-02	1.04E+00	<1	4.55E+00	<1
Barium	7.22E+02	2.71E+00	1.69E+01	0.00E+00	0.00E+00	1.69E+01	4.07E-01	1.41E+00	1.87E+01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	2.25E-04	--	2.25E-04	5.32E-01	<1	6.70E-01	<1
Cadmium	2.99E-01	3.00E-03	4.83E-02	0.00E+00	0.00E+00	4.83E-02	4.51E-04	5.83E-04	4.93E-02	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	4.09E-03	--	4.09E-03	2.40E+00	<1	5.82E+01	<1
Cobalt	6.20E+00	1.55E-02	6.99E-03	0.00E+00	0.00E+00	6.99E-03	2.33E-03	1.21E-02	2.14E-02	7.33E+00	<1	1.89E+01	<1
Copper	2.55E+01	1.83E-01	1.05E+00	0.00E+00	0.00E+00	1.05E+00	2.75E-02	4.98E-02	1.13E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.69E+01	3.52E-02	1.94E-01	0.00E+00	0.00E+00	1.94E-01	5.29E-03	3.29E-02	2.32E-01	4.70E+00	<1	1.86E+02	<1
Manganese	1.96E+03	3.75E+00	2.32E+01	0.00E+00	0.00E+00	2.32E+01	5.63E-01	3.82E+00	2.76E+01	5.15E+01	<1	1.46E+02	<1
Mercury	6.80E-02	2.60E-04	1.29E-02	0.00E+00	0.00E+00	1.29E-02	3.91E-05	1.33E-04	1.30E-02	1.41E+00	<1	1.41E+01	<1
Nickel	2.70E+01	5.59E-02	1.91E-01	0.00E+00	0.00E+00	1.91E-01	8.40E-03	5.27E-02	2.52E-01	1.70E+00	<1	1.48E+01	<1
Selenium	6.40E-01	2.00E-03	4.66E-02	0.00E+00	0.00E+00	4.66E-02	3.00E-04	1.25E-03	4.82E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.30E-01	3.30E-04	7.81E-05	0.00E+00	0.00E+00	7.81E-05	4.96E-05	2.54E-04	3.82E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.75E+01	2.48E-02	1.27E-02	0.00E+00	0.00E+00	1.27E-02	3.73E-03	3.41E-02	5.05E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.07E+02	5.37E-01	9.69E+00	0.00E+00	0.00E+00	9.69E+00	8.07E-02	2.10E-01	9.98E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.50E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.68E-02	8.79E-04	5.77E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	3.37E+00	--	3.37E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	9.31E-05	--	9.31E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.40E-03	--	1.40E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.31E-04	--	1.31E-04				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	1.31E-04	--	1.31E-04				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	2.25E-04	--	2.25E-04				
Total LMW PAHs						0.00E+00	1.98E-03	0.00E+00	1.98E-03	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	5.50E-01	3.00E-03	7.02E-03	0.00E+00	0.00E+00	7.02E-03	4.51E-04	1.07E-03	8.55E-03				
Benzo[A]Pyrene	8.50E-01	0.00E+00	1.63E-02	0.00E+00	0.00E+00	1.63E-02	0.00E+00	1.66E-03	1.80E-02				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.50E-03	--	1.50E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	5.86E-04	--	5.86E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	6.91E-05	--	6.91E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	1.14E-03	--	1.14E-03				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.47E-05	--	1.47E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	4.66E-04	--	4.66E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	1.05E-03	--	1.05E-03				
Total HMW PAHs						2.33E-02	5.28E-03	2.73E-03	3.14E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.59E-01	2.20E-02	9.26E-04	0.00E+00	0.00E+00	9.26E-04	3.31E-03	5.06E-04	4.74E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H4-9
Screening-Level Exposure Evaluation - Meadow Vole
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H4-10
Screening-Level Exposure Evaluation - North American Wolverine
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.36E-01	0.00E+00	7.36E-01	No TRV	--	No TRV	--
Antimony	ND	7.70E-03	--	--	--	0.00E+00	2.31E-04	--	2.31E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	7.98E+00	4.40E-03	0.00E+00	0.00E+00	1.29E-03	1.29E-03	1.32E-04	6.71E-03	8.13E-03	1.04E+00	<1	4.55E+00	<1
Barium	7.22E+02	2.71E+00	0.00E+00	0.00E+00	1.48E-02	1.48E-02	8.14E-02	6.07E-01	7.03E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	4.51E-05	--	4.51E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	2.99E-01	3.00E-03	0.00E+00	0.00E+00	4.83E-03	4.83E-03	9.01E-05	2.51E-04	5.17E-03	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	8.17E-04	--	8.17E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	6.20E+00	1.55E-02	0.00E+00	0.00E+00	3.75E-03	3.75E-03	4.66E-04	5.22E-03	9.43E-03	7.33E+00	<1	1.89E+01	<1
Copper	2.55E+01	1.83E-01	0.00E+00	0.00E+00	3.70E-01	3.70E-01	5.50E-03	2.15E-02	3.97E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.69E+01	3.52E-02	0.00E+00	0.00E+00	1.13E-01	1.13E-01	1.06E-03	1.42E-02	1.28E-01	4.70E+00	<1	1.86E+02	<1
Manganese	1.96E+03	3.75E+00	0.00E+00	0.00E+00	1.20E+00	1.20E+00	1.13E-01	1.64E+00	2.96E+00	5.15E+01	<1	1.46E+02	<1
Mercury	6.80E-02	2.60E-04	0.00E+00	0.00E+00	7.78E-04	7.78E-04	7.81E-06	5.72E-05	8.43E-04	1.41E+00	<1	1.41E+01	<1
Nickel	2.70E+01	5.59E-02	0.00E+00	0.00E+00	1.09E-01	1.09E-01	1.68E-03	2.27E-02	1.33E-01	1.70E+00	<1	1.48E+01	<1
Selenium	6.40E-01	2.00E-03	0.00E+00	0.00E+00	1.68E-02	1.68E-02	6.01E-05	5.38E-04	1.74E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.30E-01	3.30E-04	0.00E+00	0.00E+00	4.23E-04	4.23E-04	9.92E-06	1.09E-04	5.42E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.75E+01	2.48E-02	0.00E+00	0.00E+00	6.45E-03	6.45E-03	7.45E-04	1.47E-02	2.19E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.07E+02	5.37E-01	0.00E+00	0.00E+00	3.28E+00	3.28E+00	1.61E-02	9.04E-02	3.39E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.50E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-02	3.79E-04	1.17E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	6.73E-01	--	6.73E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	1.86E-05	--	1.86E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	2.79E-04	--	2.79E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	2.61E-05	--	2.61E-05				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	2.61E-05	--	2.61E-05				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	4.51E-05	--	4.51E-05				
Total LMW PAHs						0.00E+00	3.95E-04	0.00E+00	3.95E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	5.50E-01	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.01E-05	4.63E-04	5.53E-04				
Benzo[A]Pyrene	8.50E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.15E-04	7.15E-04				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	3.00E-04	--	3.00E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	1.17E-04	--	1.17E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	1.38E-05	--	1.38E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	2.28E-04	--	2.28E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	2.94E-06	--	2.94E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	9.31E-05	--	9.31E-05				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	2.10E-04	--	2.10E-04				
Total HMW PAHs						0.00E+00	1.06E-03	1.18E-03	2.23E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.59E-01	2.20E-02	0.00E+00	0.00E+00	6.06E-03	6.06E-03	6.61E-04	2.18E-04	6.94E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H4-10
Screening-Level Exposure Evaluation - North American Wolverine
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H4-11
Screening-Level Exposure Evaluation - Short-tailed Shrew
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.28E+00	0.00E+00	3.28E+00	No TRV	--	No TRV	--
Antimony	ND	7.70E-03	--	--	--	0.00E+00	1.03E-03	--	1.03E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	7.98E+00	4.40E-03	0.00E+00	1.40E-01	0.00E+00	1.40E-01	5.90E-04	1.18E-02	1.53E-01	1.04E+00	<1	4.55E+00	<1
Barium	7.22E+02	2.71E+00	0.00E+00	8.80E+00	0.00E+00	8.80E+00	3.63E-01	1.06E+00	1.02E+01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	2.01E-04	--	2.01E-04	5.32E-01	<1	6.70E-01	<1
Cadmium	2.99E-01	3.00E-03	0.00E+00	4.25E-01	0.00E+00	4.25E-01	4.02E-04	4.40E-04	4.26E-01	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	3.65E-03	--	3.65E-03	2.40E+00	<1	5.82E+01	<1
Cobalt	6.20E+00	1.55E-02	0.00E+00	1.01E-01	0.00E+00	1.01E-01	2.08E-03	9.14E-03	1.13E-01	7.33E+00	<1	1.89E+01	<1
Copper	2.55E+01	1.83E-01	0.00E+00	1.76E+00	0.00E+00	1.76E+00	2.45E-02	3.76E-02	1.82E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.69E+01	3.52E-02	0.00E+00	1.05E+00	0.00E+00	1.05E+00	4.72E-03	2.48E-02	1.08E+00	4.70E+00	<1	1.86E+02	<1
Manganese	1.96E+03	3.75E+00	0.00E+00	1.05E+01	0.00E+00	1.05E+01	5.03E-01	2.88E+00	1.39E+01	5.15E+01	<1	1.46E+02	<1
Mercury	6.80E-02	2.60E-04	0.00E+00	3.58E-02	0.00E+00	3.58E-02	3.48E-05	1.00E-04	3.59E-02	1.41E+00	<1	1.41E+01	<1
Nickel	2.70E+01	5.59E-02	0.00E+00	2.81E+00	0.00E+00	2.81E+00	7.49E-03	3.98E-02	2.86E+00	1.70E+00	1.68E+00	1.48E+01	<1
Selenium	6.40E-01	2.00E-03	0.00E+00	8.96E-02	0.00E+00	8.96E-02	2.68E-04	9.43E-04	9.09E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.30E-01	3.30E-04	0.00E+00	9.43E-04	0.00E+00	9.43E-04	4.42E-05	1.92E-04	1.18E-03	4.80E-01	<1	1.43E+00	<1
Vanadium	1.75E+01	2.48E-02	0.00E+00	9.82E-02	0.00E+00	9.82E-02	3.32E-03	2.57E-02	1.27E-01	4.16E+00	<1	9.44E+00	<1
Zinc	1.07E+02	5.37E-01	0.00E+00	5.32E+01	0.00E+00	5.32E+01	7.20E-02	1.58E-01	5.34E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.50E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.07E-02	6.63E-04	5.13E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	3.00E+00	--	3.00E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	8.31E-05	--	8.31E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.25E-03	--	1.25E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.17E-04	--	1.17E-04				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	1.17E-04	--	1.17E-04				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	2.01E-04	--	2.01E-04				
Total LMW PAHs						0.00E+00	1.76E-03	0.00E+00	1.76E-03	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	5.50E-01	3.00E-03	0.00E+00	1.17E-01	0.00E+00	1.17E-01	4.02E-04	8.11E-04	1.18E-01				
Benzo[A]Pyrene	8.50E-01	0.00E+00	0.00E+00	1.52E-01	0.00E+00	1.52E-01	0.00E+00	1.25E-03	1.53E-01				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.34E-03	--	1.34E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	5.23E-04	--	5.23E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	6.16E-05	--	6.16E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	1.02E-03	--	1.02E-03				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.31E-05	--	1.31E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	4.15E-04	--	4.15E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	9.38E-04	--	9.38E-04				
Total HMW PAHs						2.69E-01	4.71E-03	2.06E-03	2.75E-01	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.59E-01	2.20E-02	0.00E+00	1.89E+00	0.00E+00	1.89E+00	2.95E-03	3.82E-04	1.89E+00	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H4-11
Screening-Level Exposure Evaluation - Short-tailed Shrew
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

	ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
	IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
	B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
	$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
	DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
	AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
	BW	= Body weight of the receptor, wet weight (kg)
	$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
	IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
	$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H5-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North-Central Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	2.45E+01	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	7.70E-03	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	4.40E-03	1.53E+01	3.75E-02	5.74E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.66E+00	Sample et al. (1999)	Regression[f]	7.33E-02	Sample et al. (1998b)
Barium	NA	2.71E+00	4.82E+02	1.56E-01	7.52E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	4.39E+01	Sample et al. (1998a)	6.83E-04	3.29E-01	Baes et al. (1984)[e]
Beryllium	NA	1.50E-03	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	3.00E-03	3.90E-01	Regression[a]	3.72E-01	Bechtel-Jacobs (1998a)	Regression[d]	3.92E+00	Sample et al. (1999)	Regression[f]	1.82E-01	Sample et al. (1998b)
Chromium	NA	2.72E-02	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	1.55E-02	8.60E+00	7.50E-03	6.45E-02	Bechtel-Jacobs (1998a)[g]	1.22E-01	1.05E+00	Sample et al. (1998a)	Regression[f]	1.91E-01	Sample et al. (1998b)
Copper	NA	1.83E-01	2.67E+01	Regression[a]	7.11E+00	Bechtel-Jacobs (1998a)	5.15E-01	1.38E+01	Sample et al. (1998a)	Regression[f]	1.24E+01	Sample et al. (1998b)
Lead	NA	3.52E-02	2.18E+01	Regression[a]	1.49E+00	Bechtel-Jacobs (1998a)	Regression[d]	9.67E+00	Sample et al. (1999)	Regression[f]	4.22E+00	Sample et al. (1998b)
Manganese	NA	3.75E+00	2.62E+03	7.90E-02	2.07E+02	Bechtel-Jacobs (1998a)[g]	Regression[d]	9.55E+01	Sample et al. (1999)	2.05E-02	5.37E+01	Sample et al. (1998b)[i]
Mercury	NA	2.60E-04	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	5.59E-02	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	7.78E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Selenium	NA	2.00E-03	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	Regression[d]	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	3.30E-04	1.90E-01	4.00E-03	7.60E-04	Baes et al. (1984)	5.41E-02	1.03E-02	USCHPPM (2004)	1.08E-01	2.06E-02	Baes et al. (1984)[e]
Vanadium	NA	2.48E-02	2.04E+01	4.85E-03	9.89E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	8.57E-01	Sample et al. (1998a)	1.23E-02	2.51E-01	Sample et al. (1998b)[i]
Zinc	NA	5.37E-01	1.16E+02	Regression[a]	6.73E+01	Bechtel-Jacobs (1998a)	Regression[d]	4.07E+02	Sample et al. (1998a)	Regression[f]	1.10E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	3.78E-01	4.20E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	2.24E+01	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	6.20E-04	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	9.30E-03	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	8.70E-04	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	8.70E-04	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Phenanthrene	4.55	1.50E-03	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs												

Table H5-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North-Central Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	5.7	3.00E-03	ND	Regression[a]	0	USEPA (2007a)	1.59E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	1.00E-02	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	3.90E-03	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	4.60E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	7.60E-03	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	9.80E-05	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.10E-03	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	7.00E-03	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	2.20E-02	6.60E-01	2.38E-02	1.57E-02	USEPA (2007a)	5.44E+01	3.59E+01	USEPA (2007a)	7.79E-01	5.14E-01	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	8.14E-01	0.00E+00	USEPA (2007a)	1.03E+01	0.00E+00	USEPA (2007a)	4.49E-01	0.00E+00	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)

Table H5-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North-Central Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	0.00E+00	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H5-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North-Central Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assummed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([diet$_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H5-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North-Central Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	2.45E+01	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	7.70E-03	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	4.40E-03	1.34E+01	3.75E-02	5.03E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.51E+00	Sample et al. (1999)	Regression[f]	6.57E-02	Sample et al. (1998b)
Barium	NA	2.71E+00	4.72E+02	1.56E-01	7.37E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	4.30E+01	Sample et al. (1998a)	6.83E-04	3.22E-01	Baes et al. (1984)[e]
Beryllium	NA	1.50E-03	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	3.00E-03	2.14E-01	Regression[a]	2.68E-01	Bechtel-Jacobs (1998a)	Regression[d]	2.43E+00	Sample et al. (1999)	Regression[f]	1.37E-01	Sample et al. (1998b)
Chromium	NA	2.72E-02	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	1.55E-02	8.50E+00	7.50E-03	6.38E-02	Bechtel-Jacobs (1998a)[g]	1.22E-01	1.04E+00	Sample et al. (1998a)	Regression[f]	1.88E-01	Sample et al. (1998b)
Copper	NA	1.83E-01	2.20E+01	Regression[a]	6.60E+00	Bechtel-Jacobs (1998a)	5.15E-01	1.13E+01	Sample et al. (1998a)	Regression[f]	1.20E+01	Sample et al. (1998b)
Lead	NA	3.52E-02	2.04E+01	Regression[a]	1.44E+00	Bechtel-Jacobs (1998a)	Regression[d]	9.15E+00	Sample et al. (1999)	Regression[f]	4.09E+00	Sample et al. (1998b)
Manganese	NA	3.75E+00	9.50E+02	7.90E-02	7.50E+01	Bechtel-Jacobs (1998a)[g]	Regression[d]	4.78E+01	Sample et al. (1999)	2.05E-02	1.95E+01	Sample et al. (1998b)[i]
Mercury	NA	2.60E-04	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	5.59E-02	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	7.78E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Selenium	NA	2.00E-03	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	Regression[d]	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	3.30E-04	1.13E-01	4.00E-03	4.50E-04	Baes et al. (1984)	5.41E-02	6.09E-03	USCHPPM (2004)	1.08E-01	1.22E-02	Baes et al. (1984)[e]
Vanadium	NA	2.48E-02	1.88E+01	4.85E-03	9.13E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	7.91E-01	Sample et al. (1998a)	1.23E-02	2.32E-01	Sample et al. (1998b)[i]
Zinc	NA	5.37E-01	1.15E+02	Regression[a]	6.69E+01	Bechtel-Jacobs (1998a)	Regression[d]	4.06E+02	Sample et al. (1998a)	Regression[f]	1.10E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	3.78E-01	2.80E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	2.24E+01	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	6.20E-04	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	9.30E-03	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	8.70E-04	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	8.70E-04	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Phenanthrene	4.55	1.50E-03	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs												

Table H5-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North-Central Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	5.7	3.00E-03	ND	Regression[a]	0	USEPA (2007a)	1.59E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	1.00E-02	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	3.90E-03	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	4.60E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	7.60E-03	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	9.80E-05	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.10E-03	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	7.00E-03	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	2.20E-02	5.33E-01	2.38E-02	1.27E-02	USEPA (2007a)	5.44E+01	2.90E+01	USEPA (2007a)	7.79E-01	4.15E-01	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	8.14E-01	0.00E+00	USEPA (2007a)	1.03E+01	0.00E+00	USEPA (2007a)	4.49E-01	0.00E+00	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)

Table H5-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North-Central Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	0.00E+00	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H5-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North-Central Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H5-2
Screening-Level Exposure Evaluation - American Woodcock
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.88E+00	0.00E+00	2.88E+00	1.10E+02	<1	1.10E+03	<1
Antimony	ND	7.70E-03	--	--	--	0.00E+00	9.05E-04	--	9.05E-04	No TRV	--	No TRV	--
Arsenic	1.53E+01	4.40E-03	6.74E-03	1.75E-01	0.00E+00	1.82E-01	5.17E-04	1.35E-01	3.17E-01	2.24E+00	<1	4.51E+00	<1
Barium	4.82E+02	2.71E+00	8.83E-01	4.64E+00	0.00E+00	5.52E+00	3.18E-01	4.25E+00	1.01E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	1.76E-04	--	1.76E-04	No TRV	--	No TRV	--
Cadmium	3.90E-01	3.00E-03	4.37E-03	4.14E-01	0.00E+00	4.19E-01	3.52E-04	3.44E-03	4.22E-01	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	3.20E-03	--	3.20E-03	2.66E+00	<1	1.56E+01	<1
Cobalt	8.60E+00	1.55E-02	7.58E-04	1.11E-01	0.00E+00	1.12E-01	1.82E-03	7.58E-02	1.89E-01	7.61E+00	<1	2.02E+01	<1
Copper	2.67E+01	1.83E-01	8.36E-02	1.45E+00	0.00E+00	1.54E+00	2.15E-02	2.35E-01	1.79E+00	4.05E+00	<1	3.48E+01	<1
Lead	2.18E+01	3.52E-02	1.75E-02	1.02E+00	0.00E+00	1.04E+00	4.14E-03	1.92E-01	1.24E+00	1.63E+00	<1	4.46E+01	<1
Manganese	2.62E+03	3.75E+00	2.43E+00	1.01E+01	0.00E+00	1.25E+01	4.41E-01	2.31E+01	3.61E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	3.05E-05	--	3.05E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.57E-03	0.00E+00	6.57E-03	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.35E-04	0.00E+00	2.35E-04	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.90E-01	3.30E-04	8.93E-06	1.09E-03	0.00E+00	1.10E-03	3.88E-05	1.67E-03	2.81E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	2.04E+01	2.48E-02	1.16E-03	9.06E-02	0.00E+00	9.18E-02	2.91E-03	1.80E-01	2.74E-01	3.44E-01	<1	1.70E+00	<1
Zinc	1.16E+02	5.37E-01	7.90E-01	4.30E+01	0.00E+00	4.38E+01	6.31E-02	1.02E+00	4.49E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.20E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.44E-02	3.70E-03	4.81E-02	4.00E-02	1.20E+00	4.00E-01	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	2.63E+00	--	2.63E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	7.28E-05	--	7.28E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.09E-03	--	1.09E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.02E-04	--	1.02E-04				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	1.02E-04	--	1.02E-04				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	1.76E-04	--	1.76E-04				
Total LMW PAHs						0.00E+00	1.55E-03	0.00E+00	1.55E-03	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	3.52E-04	--	3.52E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.17E-03	--	1.17E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	4.58E-04	--	4.58E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	5.40E-05	--	5.40E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	8.93E-04	--	8.93E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.15E-05	--	1.15E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	3.64E-04	--	3.64E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	8.22E-04	--	8.22E-04				
Total HMW PAHs						0.00E+00	4.13E-03	0.00E+00	4.13E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	6.60E-01	2.20E-02	1.84E-04	3.80E+00	0.00E+00	3.80E+00	2.58E-03	5.82E-03	3.81E+00	1.10E+00	3.46E+00	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H5-2
Screening-Level Exposure Evaluation - American Woodcock
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H5-3
Screening-Level Exposure Evaluation - Mourning Dove
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.80E+00	0.00E+00	2.80E+00	1.10E+02	<1	1.10E+03	<1
Antimony	ND	7.70E-03	--	--	--	0.00E+00	8.79E-04	--	8.79E-04	No TRV	--	No TRV	--
Arsenic	1.53E+01	4.40E-03	6.55E-02	0.00E+00	0.00E+00	6.55E-02	5.02E-04	1.19E-01	1.85E-01	2.24E+00	<1	4.51E+00	<1
Barium	4.82E+02	2.71E+00	8.58E+00	0.00E+00	0.00E+00	8.58E+00	3.09E-01	3.74E+00	1.26E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	1.71E-04	--	1.71E-04	No TRV	--	No TRV	--
Cadmium	3.90E-01	3.00E-03	4.24E-02	0.00E+00	0.00E+00	4.24E-02	3.42E-04	3.03E-03	4.58E-02	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	3.10E-03	--	3.10E-03	2.66E+00	<1	1.56E+01	<1
Cobalt	8.60E+00	1.55E-02	7.36E-03	0.00E+00	0.00E+00	7.36E-03	1.77E-03	6.67E-02	7.59E-02	7.61E+00	<1	2.02E+01	<1
Copper	2.67E+01	1.83E-01	8.12E-01	0.00E+00	0.00E+00	8.12E-01	2.09E-02	2.07E-01	1.04E+00	4.05E+00	<1	3.48E+01	<1
Lead	2.18E+01	3.52E-02	1.70E-01	0.00E+00	0.00E+00	1.70E-01	4.02E-03	1.69E-01	3.44E-01	1.63E+00	<1	4.46E+01	<1
Manganese	2.62E+03	3.75E+00	2.36E+01	0.00E+00	0.00E+00	2.36E+01	4.28E-01	2.03E+01	4.44E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	2.97E-05	--	2.97E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.38E-03	0.00E+00	6.38E-03	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.28E-04	0.00E+00	2.28E-04	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.90E-01	3.30E-04	8.67E-05	0.00E+00	0.00E+00	8.67E-05	3.77E-05	1.47E-03	1.60E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	2.04E+01	2.48E-02	1.13E-02	0.00E+00	0.00E+00	1.13E-02	2.83E-03	1.58E-01	1.72E-01	3.44E-01	<1	1.70E+00	<1
Zinc	1.16E+02	5.37E-01	7.68E+00	0.00E+00	0.00E+00	7.68E+00	6.13E-02	9.00E-01	8.64E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.20E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.31E-02	3.26E-03	4.64E-02	4.00E-02	1.16E+00	4.00E-01	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	2.56E+00	--	2.56E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	7.08E-05	--	7.08E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.06E-03	--	1.06E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	9.93E-05	--	9.93E-05				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	9.93E-05	--	9.93E-05				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	1.71E-04	--	1.71E-04				
Total LMW PAHs						0.00E+00	1.50E-03	0.00E+00	1.50E-03	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	3.42E-04	--	3.42E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.14E-03	--	1.14E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	4.45E-04	--	4.45E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	5.25E-05	--	5.25E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	8.67E-04	--	8.67E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.12E-05	--	1.12E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	3.54E-04	--	3.54E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	7.99E-04	--	7.99E-04				
Total HMW PAHs						0.00E+00	4.01E-03	0.00E+00	4.01E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	6.60E-01	2.20E-02	1.79E-03	0.00E+00	0.00E+00	1.79E-03	2.51E-03	5.12E-03	9.43E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H5-3
Screening-Level Exposure Evaluation - Mourning Dove
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H5-4
Screening-Level Exposure Evaluation - Red-tailed Hawk
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E+00	0.00E+00	2.01E+00	1.10E+02	<1	1.10E+03	<1
Antimony	ND	7.70E-03	--	--	--	0.00E+00	6.31E-04	--	6.31E-04	No TRV	--	No TRV	--
Arsenic	1.53E+01	4.40E-03	0.00E+00	0.00E+00	6.01E-03	6.01E-03	3.61E-04	3.26E-02	3.90E-02	2.24E+00	<1	4.51E+00	<1
Barium	4.82E+02	2.71E+00	0.00E+00	0.00E+00	2.70E-02	2.70E-02	2.22E-01	1.03E+00	1.28E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	1.23E-04	--	1.23E-04	No TRV	--	No TRV	--
Cadmium	3.90E-01	3.00E-03	0.00E+00	0.00E+00	1.50E-02	1.50E-02	2.46E-04	8.32E-04	1.60E-02	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	2.23E-03	--	2.23E-03	2.66E+00	<1	1.56E+01	<1
Cobalt	8.60E+00	1.55E-02	0.00E+00	0.00E+00	1.57E-02	1.57E-02	1.27E-03	1.83E-02	3.53E-02	7.61E+00	<1	2.02E+01	<1
Copper	2.67E+01	1.83E-01	0.00E+00	0.00E+00	1.02E+00	1.02E+00	1.50E-02	5.69E-02	1.09E+00	4.05E+00	<1	3.48E+01	<1
Lead	2.18E+01	3.52E-02	0.00E+00	0.00E+00	3.46E-01	3.46E-01	2.89E-03	4.65E-02	3.95E-01	1.63E+00	<1	4.46E+01	<1
Manganese	2.62E+03	3.75E+00	0.00E+00	0.00E+00	4.40E+00	4.40E+00	3.08E-01	5.59E+00	1.03E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	2.13E-05	--	2.13E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.58E-03	0.00E+00	4.58E-03	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.64E-04	0.00E+00	1.64E-04	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.90E-01	3.30E-04	0.00E+00	0.00E+00	1.69E-03	1.69E-03	2.71E-05	4.05E-04	2.12E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	2.04E+01	2.48E-02	0.00E+00	0.00E+00	2.06E-02	2.06E-02	2.03E-03	4.35E-02	6.61E-02	3.44E-01	<1	1.70E+00	<1
Zinc	1.16E+02	5.37E-01	0.00E+00	0.00E+00	9.01E+00	9.01E+00	4.40E-02	2.47E-01	9.30E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.20E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.10E-02	8.96E-04	3.19E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	1.84E+00	--	1.84E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	5.08E-05	--	5.08E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	7.63E-04	--	7.63E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	7.13E-05	--	7.13E-05				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	7.13E-05	--	7.13E-05				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	1.23E-04	--	1.23E-04				
Total LMW PAHs						0.00E+00	1.08E-03	0.00E+00	1.08E-03	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	2.46E-04	--	2.46E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	8.20E-04	--	8.20E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	3.20E-04	--	3.20E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	3.77E-05	--	3.77E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	6.23E-04	--	6.23E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	8.04E-06	--	8.04E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	2.54E-04	--	2.54E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	5.74E-04	--	5.74E-04				
Total HMW PAHs						0.00E+00	2.88E-03	0.00E+00	2.88E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	6.60E-01	2.20E-02	0.00E+00	0.00E+00	4.22E-02	4.22E-02	1.80E-03	1.41E-03	4.54E-02	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H5-4
Screening-Level Exposure Evaluation - Red-tailed Hawk
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H5-5
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.88E+00	0.00E+00	3.88E+00	1.10E+02	<1	1.10E+03	<1
Antimony	ND	7.70E-03	--	--	--	0.00E+00	1.22E-03	--	1.22E-03	No TRV	--	No TRV	--
Arsenic	1.53E+01	4.40E-03	0.00E+00	2.62E-01	0.00E+00	2.62E-01	6.97E-04	0.00E+00	2.63E-01	2.24E+00	<1	4.51E+00	<1
Barium	4.82E+02	2.71E+00	0.00E+00	6.94E+00	0.00E+00	6.94E+00	4.29E-01	0.00E+00	7.37E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	2.37E-04	--	2.37E-04	No TRV	--	No TRV	--
Cadmium	3.90E-01	3.00E-03	0.00E+00	6.20E-01	0.00E+00	6.20E-01	4.75E-04	0.00E+00	6.21E-01	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	4.31E-03	--	4.31E-03	2.66E+00	<1	1.56E+01	<1
Cobalt	8.60E+00	1.55E-02	0.00E+00	1.66E-01	0.00E+00	1.66E-01	2.45E-03	0.00E+00	1.69E-01	7.61E+00	<1	2.02E+01	<1
Copper	2.67E+01	1.83E-01	0.00E+00	2.18E+00	0.00E+00	2.18E+00	2.90E-02	0.00E+00	2.21E+00	4.05E+00	<1	3.48E+01	<1
Lead	2.18E+01	3.52E-02	0.00E+00	1.53E+00	0.00E+00	1.53E+00	5.57E-03	0.00E+00	1.54E+00	1.63E+00	<1	4.46E+01	<1
Manganese	2.62E+03	3.75E+00	0.00E+00	1.51E+01	0.00E+00	1.51E+01	5.94E-01	0.00E+00	1.57E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	4.12E-05	--	4.12E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.85E-03	0.00E+00	8.85E-03	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.17E-04	0.00E+00	3.17E-04	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.90E-01	3.30E-04	0.00E+00	1.63E-03	0.00E+00	1.63E-03	5.22E-05	0.00E+00	1.68E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	2.04E+01	2.48E-02	0.00E+00	1.36E-01	0.00E+00	1.36E-01	3.93E-03	0.00E+00	1.40E-01	3.44E-01	<1	1.70E+00	<1
Zinc	1.16E+02	5.37E-01	0.00E+00	6.44E+01	0.00E+00	6.44E+01	8.50E-02	0.00E+00	6.45E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.20E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.98E-02	0.00E+00	5.98E-02	4.00E-02	1.50E+00	4.00E-01	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	3.55E+00	--	3.55E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	9.82E-05	--	9.82E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.47E-03	--	1.47E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.38E-04	--	1.38E-04				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	1.38E-04	--	1.38E-04				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	2.37E-04	--	2.37E-04				
Total LMW PAHs						0.00E+00	2.08E-03	0.00E+00	2.08E-03	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	4.75E-04	--	4.75E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.58E-03	--	1.58E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	6.17E-04	--	6.17E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	7.28E-05	--	7.28E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	1.20E-03	--	1.20E-03				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.55E-05	--	1.55E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	4.91E-04	--	4.91E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	1.11E-03	--	1.11E-03				
Total HMW PAHs						0.00E+00	5.57E-03	0.00E+00	5.57E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	6.60E-01	2.20E-02	0.00E+00	5.69E+00	0.00E+00	5.69E+00	3.48E-03	0.00E+00	5.69E+00	1.10E+00	5.17E+00	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H5-5
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H5-6
Screening-Level Exposure Evaluation - Canada Lynx
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.65E-01	0.00E+00	7.65E-01	No TRV	--	No TRV	--
Antimony	ND	7.70E-03	--	--	--	0.00E+00	2.41E-04	--	2.41E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	1.53E+01	4.40E-03	0.00E+00	0.00E+00	2.29E-03	2.29E-03	1.37E-04	1.34E-02	1.58E-02	1.04E+00	<1	4.55E+00	<1
Barium	4.82E+02	2.71E+00	0.00E+00	0.00E+00	1.03E-02	1.03E-02	8.47E-02	4.22E-01	5.17E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	4.69E-05	--	4.69E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	3.90E-01	3.00E-03	0.00E+00	0.00E+00	5.70E-03	5.70E-03	9.37E-05	3.41E-04	6.13E-03	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	8.50E-04	--	8.50E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	8.60E+00	1.55E-02	0.00E+00	0.00E+00	5.97E-03	5.97E-03	4.84E-04	7.52E-03	1.40E-02	7.33E+00	<1	1.89E+01	<1
Copper	2.67E+01	1.83E-01	0.00E+00	0.00E+00	3.87E-01	3.87E-01	5.72E-03	2.34E-02	4.16E-01	5.60E+00	<1	8.27E+01	<1
Lead	2.18E+01	3.52E-02	0.00E+00	0.00E+00	1.32E-01	1.32E-01	1.10E-03	1.91E-02	1.52E-01	4.70E+00	<1	1.86E+02	<1
Manganese	2.62E+03	3.75E+00	0.00E+00	0.00E+00	1.68E+00	1.68E+00	1.17E-01	2.29E+00	4.09E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	8.12E-06	--	8.12E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-03	0.00E+00	1.75E-03	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.25E-05	0.00E+00	6.25E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.90E-01	3.30E-04	0.00E+00	0.00E+00	6.42E-04	6.42E-04	1.03E-05	1.66E-04	8.19E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	2.04E+01	2.48E-02	0.00E+00	0.00E+00	7.84E-03	7.84E-03	7.75E-04	1.78E-02	2.65E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.16E+02	5.37E-01	0.00E+00	0.00E+00	3.43E+00	3.43E+00	1.68E-02	1.01E-01	3.55E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.20E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-02	3.67E-04	1.22E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	7.00E-01	--	7.00E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	1.94E-05	--	1.94E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	2.91E-04	--	2.91E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	2.72E-05	--	2.72E-05				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	2.72E-05	--	2.72E-05				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	4.69E-05	--	4.69E-05				
Total LMW PAHs						0.00E+00	4.11E-04	0.00E+00	4.11E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	9.37E-05	--	9.37E-05				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	3.12E-04	--	3.12E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	1.22E-04	--	1.22E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	1.44E-05	--	1.44E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	2.37E-04	--	2.37E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	3.06E-06	--	3.06E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	9.69E-05	--	9.69E-05				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	2.19E-04	--	2.19E-04				
Total HMW PAHs						0.00E+00	1.10E-03	0.00E+00	1.10E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	6.60E-01	2.20E-02	0.00E+00	0.00E+00	1.61E-02	1.61E-02	6.87E-04	5.77E-04	1.73E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H5-6
Screening-Level Exposure Evaluation - Canada Lynx
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H5-7
Screening-Level Exposure Evaluation - Grizzly Bear
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate						
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.29E-01	0.00E+00	5.29E-01	No TRV	--	No TRV	--
Antimony	ND	7.70E-03	--	--	--	0.00E+00	0.00E+00	1.66E-04	--	1.66E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	1.53E+01	4.40E-03	8.06E-03	5.37E-03	1.58E-04	0.00E+00	1.36E-02	9.50E-05	9.25E-03	1.37E-02	1.04E+00	<1	4.55E+00	<1
Barium	4.82E+02	2.71E+00	1.06E+00	1.42E-01	7.10E-04	0.00E+00	1.20E+00	5.85E-02	2.91E-01	1.26E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	0.00E+00	3.24E-05	--	3.24E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	3.90E-01	3.00E-03	5.22E-03	1.27E-02	3.94E-04	0.00E+00	1.83E-02	6.48E-05	2.36E-04	1.84E-02	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	0.00E+00	5.87E-04	--	5.87E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	8.60E+00	1.55E-02	9.05E-04	3.40E-03	4.13E-04	0.00E+00	4.72E-03	3.35E-04	5.20E-03	5.05E-03	7.33E+00	<1	1.89E+01	<1
Copper	2.67E+01	1.83E-01	9.99E-02	4.45E-02	2.67E-02	0.00E+00	1.71E-01	3.95E-03	1.61E-02	1.75E-01	5.60E+00	<1	8.27E+01	<1
Lead	2.18E+01	3.52E-02	2.10E-02	3.13E-02	9.11E-03	0.00E+00	6.14E-02	7.60E-04	1.32E-02	6.22E-02	4.70E+00	<1	1.86E+02	<1
Manganese	2.62E+03	3.75E+00	2.91E+00	3.09E-01	1.16E-01	0.00E+00	3.33E+00	8.10E-02	1.58E+00	3.41E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	0.00E+00	5.61E-06	--	5.61E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.21E-03	0.00E+00	1.21E-03	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.32E-05	0.00E+00	4.32E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.90E-01	3.30E-04	1.07E-05	3.33E-05	4.44E-05	0.00E+00	8.84E-05	7.13E-06	1.15E-04	9.55E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	2.04E+01	2.48E-02	1.39E-03	2.78E-03	5.42E-04	0.00E+00	4.71E-03	5.36E-04	1.23E-02	5.24E-03	4.16E+00	<1	9.44E+00	<1
Zinc	1.16E+02	5.37E-01	9.44E-01	1.32E+00	2.37E-01	0.00E+00	2.50E+00	1.16E-02	7.01E-02	2.51E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	4.20E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.16E-03	2.54E-04	8.16E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	0.00E+00	4.84E-01	--	4.84E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	0.00E+00	1.34E-05	--	1.34E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	0.00E+00	2.01E-04	--	2.01E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	0.00E+00	1.88E-05	--	1.88E-05				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	0.00E+00	1.88E-05	--	1.88E-05				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	0.00E+00	3.24E-05	--	3.24E-05				
Total LMW PAHs							0.00E+00	2.84E-04	0.00E+00	2.84E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	0.00E+00	6.48E-05	--	6.48E-05				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	0.00E+00	2.16E-04	--	2.16E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	0.00E+00	8.42E-05	--	8.42E-05				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	0.00E+00	9.93E-06	--	9.93E-06				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	0.00E+00	1.64E-04	--	1.64E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	0.00E+00	2.12E-06	--	2.12E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	0.00E+00	6.69E-05	--	6.69E-05				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	0.00E+00	1.51E-04	--	1.51E-04				
Total HMW PAHs							0.00E+00	7.59E-04	0.00E+00	7.59E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	6.60E-01	2.20E-02	2.20E-04	1.16E-01	1.11E-03	0.00E+00	1.18E-01	4.75E-04	3.99E-04	1.18E-01	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H5-7
Screening-Level Exposure Evaluation - Grizzly Bear
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)										
			Diet					Water	Substrate				
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H5-8
Screening-Level Exposure Evaluation - Long-tailed Weasel
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E+00	0.00E+00	1.26E+00	No TRV	--	No TRV	--
Antimony	ND	7.70E-03	--	--	--	0.00E+00	3.96E-04	--	3.96E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	1.34E+01	4.40E-03	0.00E+00	0.00E+00	3.38E-03	3.38E-03	2.26E-04	1.10E-02	1.46E-02	1.04E+00	<1	4.55E+00	<1
Barium	4.72E+02	2.71E+00	0.00E+00	0.00E+00	1.66E-02	1.66E-02	1.39E-01	3.89E-01	5.45E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	7.72E-05	--	7.72E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	2.14E-01	3.00E-03	0.00E+00	0.00E+00	7.06E-03	7.06E-03	1.54E-04	1.76E-04	7.39E-03	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	1.40E-03	--	1.40E-03	2.40E+00	<1	5.82E+01	<1
Cobalt	8.50E+00	1.55E-02	0.00E+00	0.00E+00	9.69E-03	9.69E-03	7.98E-04	7.00E-03	1.75E-02	7.33E+00	<1	1.89E+01	<1
Copper	2.20E+01	1.83E-01	0.00E+00	0.00E+00	6.20E-01	6.20E-01	9.42E-03	1.81E-02	6.47E-01	5.60E+00	<1	8.27E+01	<1
Lead	2.04E+01	3.52E-02	0.00E+00	0.00E+00	2.10E-01	2.10E-01	1.81E-03	1.68E-02	2.29E-01	4.70E+00	<1	1.86E+02	<1
Manganese	9.50E+02	3.75E+00	0.00E+00	0.00E+00	1.00E+00	1.00E+00	1.93E-01	7.82E-01	1.98E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	1.34E-05	--	1.34E-05	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.88E-03	0.00E+00	2.88E-03	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-04	0.00E+00	1.03E-04	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.13E-01	3.30E-04	0.00E+00	0.00E+00	6.26E-04	6.26E-04	1.70E-05	9.26E-05	7.36E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.88E+01	2.48E-02	0.00E+00	0.00E+00	1.19E-02	1.19E-02	1.28E-03	1.55E-02	2.87E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.15E+02	5.37E-01	0.00E+00	0.00E+00	5.65E+00	5.65E+00	2.76E-02	9.47E-02	5.77E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.80E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.95E-02	2.31E-04	1.97E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	1.15E+00	--	1.15E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	3.19E-05	--	3.19E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	4.79E-04	--	4.79E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	4.48E-05	--	4.48E-05				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	4.48E-05	--	4.48E-05				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	7.72E-05	--	7.72E-05				
Total LMW PAHs						0.00E+00	6.77E-04	0.00E+00	6.77E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	1.54E-04	--	1.54E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	5.15E-04	--	5.15E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	2.01E-04	--	2.01E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	2.37E-05	--	2.37E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	3.91E-04	--	3.91E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	5.04E-06	--	5.04E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	1.60E-04	--	1.60E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	3.60E-04	--	3.60E-04				
Total HMW PAHs						0.00E+00	1.81E-03	0.00E+00	1.81E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	5.33E-01	2.20E-02	0.00E+00	0.00E+00	2.13E-02	2.13E-02	1.13E-03	4.38E-04	2.29E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H5-8
Screening-Level Exposure Evaluation - Long-tailed Weasel
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H5-9
Screening-Level Exposure Evaluation - Meadow Vole
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.68E+00	0.00E+00	3.68E+00	No TRV	--	No TRV	--
Antimony	ND	7.70E-03	--	--	--	0.00E+00	1.16E-03	--	1.16E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	1.34E+01	4.40E-03	7.55E-02	0.00E+00	0.00E+00	7.55E-02	6.61E-04	2.62E-02	1.02E-01	1.04E+00	<1	4.55E+00	<1
Barium	4.72E+02	2.71E+00	1.11E+01	0.00E+00	0.00E+00	1.11E+01	4.07E-01	9.22E-01	1.24E+01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	2.25E-04	--	2.25E-04	5.32E-01	<1	6.70E-01	<1
Cadmium	2.14E-01	3.00E-03	4.02E-02	0.00E+00	0.00E+00	4.02E-02	4.51E-04	4.17E-04	4.11E-02	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	4.09E-03	--	4.09E-03	2.40E+00	<1	5.82E+01	<1
Cobalt	8.50E+00	1.55E-02	9.58E-03	0.00E+00	0.00E+00	9.58E-03	2.33E-03	1.66E-02	2.85E-02	7.33E+00	<1	1.89E+01	<1
Copper	2.20E+01	1.83E-01	9.91E-01	0.00E+00	0.00E+00	9.91E-01	2.75E-02	4.30E-02	1.06E+00	5.60E+00	<1	8.27E+01	<1
Lead	2.04E+01	3.52E-02	2.16E-01	0.00E+00	0.00E+00	2.16E-01	5.29E-03	3.97E-02	2.61E-01	4.70E+00	<1	1.86E+02	<1
Manganese	9.50E+02	3.75E+00	1.13E+01	0.00E+00	0.00E+00	1.13E+01	5.63E-01	1.85E+00	1.37E+01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	3.91E-05	--	3.91E-05	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.40E-03	0.00E+00	8.40E-03	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-04	0.00E+00	3.00E-04	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.13E-01	3.30E-04	6.76E-05	0.00E+00	0.00E+00	6.76E-05	4.96E-05	2.20E-04	3.37E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.88E+01	2.48E-02	1.37E-02	0.00E+00	0.00E+00	1.37E-02	3.73E-03	3.68E-02	5.42E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.15E+02	5.37E-01	1.01E+01	0.00E+00	0.00E+00	1.01E+01	8.07E-02	2.25E-01	1.04E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.80E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.68E-02	5.47E-04	5.73E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	3.37E+00	--	3.37E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	9.31E-05	--	9.31E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.40E-03	--	1.40E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.31E-04	--	1.31E-04				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	1.31E-04	--	1.31E-04				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	2.25E-04	--	2.25E-04				
Total LMW PAHs						0.00E+00	1.98E-03	0.00E+00	1.98E-03	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	4.51E-04	--	4.51E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.50E-03	--	1.50E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	5.86E-04	--	5.86E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	6.91E-05	--	6.91E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	1.14E-03	--	1.14E-03				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.47E-05	--	1.47E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	4.66E-04	--	4.66E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	1.05E-03	--	1.05E-03				
Total HMW PAHs						0.00E+00	5.28E-03	0.00E+00	5.28E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	5.33E-01	2.20E-02	1.90E-03	0.00E+00	0.00E+00	1.90E-03	3.31E-03	1.04E-03	6.25E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H5-9
Screening-Level Exposure Evaluation - Meadow Vole
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H5-10
Screening-Level Exposure Evaluation - North American Wolverine
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.36E-01	0.00E+00	7.36E-01	No TRV	--	No TRV	--
Antimony	ND	7.70E-03	--	--	--	0.00E+00	2.31E-04	--	2.31E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	1.34E+01	4.40E-03	0.00E+00	0.00E+00	1.98E-03	1.98E-03	1.32E-04	1.13E-02	1.34E-02	1.04E+00	<1	4.55E+00	<1
Barium	4.72E+02	2.71E+00	0.00E+00	0.00E+00	9.68E-03	9.68E-03	8.14E-02	3.97E-01	4.88E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	4.51E-05	--	4.51E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	2.14E-01	3.00E-03	0.00E+00	0.00E+00	4.12E-03	4.12E-03	9.01E-05	1.80E-04	4.39E-03	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	8.17E-04	--	8.17E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	8.50E+00	1.55E-02	0.00E+00	0.00E+00	5.66E-03	5.66E-03	4.66E-04	7.15E-03	1.33E-02	7.33E+00	<1	1.89E+01	<1
Copper	2.20E+01	1.83E-01	0.00E+00	0.00E+00	3.62E-01	3.62E-01	5.50E-03	1.85E-02	3.86E-01	5.60E+00	<1	8.27E+01	<1
Lead	2.04E+01	3.52E-02	0.00E+00	0.00E+00	1.23E-01	1.23E-01	1.06E-03	1.71E-02	1.41E-01	4.70E+00	<1	1.86E+02	<1
Manganese	9.50E+02	3.75E+00	0.00E+00	0.00E+00	5.85E-01	5.85E-01	1.13E-01	7.99E-01	1.50E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	7.81E-06	--	7.81E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.68E-03	0.00E+00	1.68E-03	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.01E-05	0.00E+00	6.01E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.13E-01	3.30E-04	0.00E+00	0.00E+00	3.66E-04	3.66E-04	9.92E-06	9.46E-05	4.70E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.88E+01	2.48E-02	0.00E+00	0.00E+00	6.96E-03	6.96E-03	7.45E-04	1.58E-02	2.35E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.15E+02	5.37E-01	0.00E+00	0.00E+00	3.30E+00	3.30E+00	1.61E-02	9.67E-02	3.41E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.80E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-02	2.36E-04	1.16E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	6.73E-01	--	6.73E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	1.86E-05	--	1.86E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	2.79E-04	--	2.79E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	2.61E-05	--	2.61E-05				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	2.61E-05	--	2.61E-05				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	4.51E-05	--	4.51E-05				
Total LMW PAHs						0.00E+00	3.95E-04	0.00E+00	3.95E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	9.01E-05	--	9.01E-05				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	3.00E-04	--	3.00E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	1.17E-04	--	1.17E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	1.38E-05	--	1.38E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	2.28E-04	--	2.28E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	2.94E-06	--	2.94E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	9.31E-05	--	9.31E-05				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	2.10E-04	--	2.10E-04				
Total HMW PAHs						0.00E+00	1.06E-03	0.00E+00	1.06E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	5.33E-01	2.20E-02	0.00E+00	0.00E+00	1.25E-02	1.25E-02	6.61E-04	4.48E-04	1.36E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H5-10
Screening-Level Exposure Evaluation - North American Wolverine
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H5-11
Screening-Level Exposure Evaluation - Short-tailed Shrew
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.28E+00	0.00E+00	3.28E+00	No TRV	--	No TRV	--
Antimony	ND	7.70E-03	--	--	--	0.00E+00	1.03E-03	--	1.03E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	1.34E+01	4.40E-03	0.00E+00	2.02E-01	0.00E+00	2.02E-01	5.90E-04	1.98E-02	2.23E-01	1.04E+00	<1	4.55E+00	<1
Barium	4.72E+02	2.71E+00	0.00E+00	5.76E+00	0.00E+00	5.76E+00	3.63E-01	6.96E-01	6.82E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	2.01E-04	--	2.01E-04	5.32E-01	<1	6.70E-01	<1
Cadmium	2.14E-01	3.00E-03	0.00E+00	3.25E-01	0.00E+00	3.25E-01	4.02E-04	3.15E-04	3.26E-01	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	3.65E-03	--	3.65E-03	2.40E+00	<1	5.82E+01	<1
Cobalt	8.50E+00	1.55E-02	0.00E+00	1.39E-01	0.00E+00	1.39E-01	2.08E-03	1.25E-02	1.54E-01	7.33E+00	<1	1.89E+01	<1
Copper	2.20E+01	1.83E-01	0.00E+00	1.52E+00	0.00E+00	1.52E+00	2.45E-02	3.25E-02	1.58E+00	5.60E+00	<1	8.27E+01	<1
Lead	2.04E+01	3.52E-02	0.00E+00	1.23E+00	0.00E+00	1.23E+00	4.72E-03	3.00E-02	1.26E+00	4.70E+00	<1	1.86E+02	<1
Manganese	9.50E+02	3.75E+00	0.00E+00	6.41E+00	0.00E+00	6.41E+00	5.03E-01	1.40E+00	8.31E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	3.48E-05	--	3.48E-05	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.49E-03	0.00E+00	7.49E-03	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.68E-04	0.00E+00	2.68E-04	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.13E-01	3.30E-04	0.00E+00	8.16E-04	0.00E+00	8.16E-04	4.42E-05	1.66E-04	1.03E-03	4.80E-01	<1	1.43E+00	<1
Vanadium	1.88E+01	2.48E-02	0.00E+00	1.06E-01	0.00E+00	1.06E-01	3.32E-03	2.78E-02	1.37E-01	4.16E+00	<1	9.44E+00	<1
Zinc	1.15E+02	5.37E-01	0.00E+00	5.44E+01	0.00E+00	5.44E+01	7.20E-02	1.70E-01	5.46E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.80E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.07E-02	4.13E-04	5.11E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	3.00E+00	--	3.00E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	8.31E-05	--	8.31E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.25E-03	--	1.25E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.17E-04	--	1.17E-04				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	1.17E-04	--	1.17E-04				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	2.01E-04	--	2.01E-04				
Total LMW PAHs						0.00E+00	1.76E-03	0.00E+00	1.76E-03	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	4.02E-04	--	4.02E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.34E-03	--	1.34E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	5.23E-04	--	5.23E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	6.16E-05	--	6.16E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	1.02E-03	--	1.02E-03				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.31E-05	--	1.31E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	4.15E-04	--	4.15E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	9.38E-04	--	9.38E-04				
Total HMW PAHs						0.00E+00	4.71E-03	0.00E+00	4.71E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	5.33E-01	2.20E-02	0.00E+00	3.88E+00	0.00E+00	3.88E+00	2.95E-03	7.85E-04	3.89E+00	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H5-11
Screening-Level Exposure Evaluation - Short-tailed Shrew
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H6-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Western Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	2.45E+01	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	7.70E-03	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	1.00E+00	0.00E+00	Assumption[c]	5.00E-02	0.00E+00	Baes et al. (1984)[e]
Arsenic	NA	4.40E-03	1.58E+01	3.75E-02	5.93E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.69E+00	Sample et al. (1999)	Regression[f]	7.52E-02	Sample et al. (1998b)
Barium	NA	2.71E+00	5.33E+02	1.56E-01	8.31E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	4.85E+01	Sample et al. (1998a)	6.83E-04	3.64E-01	Baes et al. (1984)[e]
Beryllium	NA	1.50E-03	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	4.50E-02	0.00E+00	Sample et al. (1998a)	2.25E-03	0.00E+00	Baes et al. (1984)[e]
Cadmium	NA	3.00E-03	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	Regression[d]	0.00E+00	Sample et al. (1999)	Regression[f]	0.00E+00	Sample et al. (1998b)
Chromium	NA	2.72E-02	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	1.55E-02	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	1.83E-01	3.32E+01	Regression[a]	7.75E+00	Bechtel-Jacobs (1998a)	5.15E-01	1.71E+01	Sample et al. (1998a)	Regression[f]	1.28E+01	Sample et al. (1998b)
Lead	NA	3.52E-02	4.48E+01	Regression[a]	2.24E+00	Bechtel-Jacobs (1998a)	Regression[d]	1.73E+01	Sample et al. (1999)	Regression[f]	5.80E+00	Sample et al. (1998b)
Manganese	NA	3.75E+00	2.21E+03	7.90E-02	1.75E+02	Bechtel-Jacobs (1998a)[g]	Regression[d]	8.50E+01	Sample et al. (1999)	2.05E-02	4.53E+01	Sample et al. (1998b)[i]
Mercury	NA	2.60E-04	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	5.59E-02	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	7.78E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Selenium	NA	2.00E-03	1.10E+00	Regression[a]	5.65E-01	Bechtel-Jacobs (1998a)	Regression[d]	9.95E-01	Sample et al. (1998a)	Regression[f]	6.84E-01	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	3.30E-04	0.00E+00	4.00E-03	0.00E+00	Baes et al. (1984)	5.41E-02	0.00E+00	USCHPPM (2004)	1.08E-01	0.00E+00	Baes et al. (1984)[e]
Vanadium	NA	2.48E-02	2.14E+01	4.85E-03	1.04E-01	Bechtel-Jacobs (1998a)[g]	4.20E-02	8.99E-01	Sample et al. (1998a)	1.23E-02	2.63E-01	Sample et al. (1998b)[i]
Zinc	NA	5.37E-01	2.38E+02	Regression[a]	1.00E+02	Bechtel-Jacobs (1998a)	Regression[d]	5.15E+02	Sample et al. (1998a)	Regression[f]	1.16E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	3.78E-01	2.20E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	2.24E+01	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polycholrinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	6.20E-04	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	9.30E-03	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	8.70E-04	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	8.70E-04	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Phenanthrene	4.55	1.50E-03	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]

Table H6-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Western Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
LMW PAHs												
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	5.7	3.00E-03	ND	Regression[a]	0	USEPA (2007a)	1.59E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	1.00E-02	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	3.90E-03	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	4.60E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	7.60E-03	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	9.80E-05	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.10E-03	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	7.00E-03	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	2.20E-02	3.50E-01	2.38E-02	8.33E-03	USEPA (2007a)	5.44E+01	1.90E+01	USEPA (2007a)	7.79E-01	2.73E-01	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	8.14E-01	0.00E+00	USEPA (2007a)	1.03E+01	0.00E+00	USEPA (2007a)	4.49E-01	0.00E+00	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	1.84E-06	9.41E-02	1.73E-07	USEPA (2007a)[b]	Regression[d]	5.69E-06	Sample et al. (1998a)	Regression[h]	1.12E-06	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	3.10E-07	5.17E-02	1.60E-08	USEPA (2007a)[b]	Regression[d]	6.94E-07	Sample et al. (1998a)	Regression[h]	1.58E-07	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	1.07E-06	2.82E-02	3.02E-08	USEPA (2007a)[b]	Regression[d]	3.00E-06	Sample et al. (1998a)	Regression[h]	6.15E-07	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	1.11E-06	2.82E-02	3.13E-08	USEPA (2007a)[b]	Regression[d]	3.13E-06	Sample et al. (1998a)	Regression[h]	6.40E-07	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	1.29E-06	2.82E-02	3.64E-08	USEPA (2007a)[b]	Regression[d]	3.74E-06	Sample et al. (1998a)	Regression[h]	7.55E-07	Sample et al. (1998b)

Table H6-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Western Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	6.36E-06	1.55E-02	9.86E-08	USEPA (2007a)[b]	Regression[d]	2.47E-05	Sample et al. (1998a)	Regression[h]	4.36E-06	Sample et al. (1998b)
OCDD	9.50	0.00E+00	3.35E-05	8.45E-03	2.83E-07	USEPA (2007a)[b]	Regression[d]	1.76E-04	Sample et al. (1998a)	Regression[h]	2.71E-05	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	2.80E-07	9.24E-02	2.59E-08	USEPA (2007a)[b]	Regression[d]	6.15E-07	Sample et al. (1998a)	1.25E-01	3.50E-08	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	8.00E-07	3.70E-02	2.96E-08	USEPA (2007a)[b]	Regression[d]	2.13E-06	Sample et al. (1998a)	1.25E-01	1.00E-07	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	7.60E-07	3.70E-02	2.81E-08	USEPA (2007a)[b]	Regression[d]	2.00E-06	Sample et al. (1998a)	1.25E-01	9.51E-08	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	9.20E-07	5.08E-02	4.67E-08	USEPA (2007a)[b]	Regression[d]	2.51E-06	Sample et al. (1998a)	1.25E-01	1.15E-07	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	2.03E-06	2.77E-02	5.62E-08	USEPA (2007a)[b]	Regression[d]	6.39E-06	Sample et al. (1998a)	1.25E-01	2.54E-07	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	7.38E-06	1.52E-02	1.12E-07	USEPA (2007a)[b]	Regression[d]	2.94E-05	Sample et al. (1998a)	1.25E-01	9.23E-07	Sample et al. (1998b)[i]

Table H6-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Western Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assummed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([diet$_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H6-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Western Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	2.45E+01	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	7.70E-03	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	1.00E+00	0.00E+00	Assumption[c]	5.00E-02	0.00E+00	Baes et al. (1984)[e]
Arsenic	NA	4.40E-03	1.42E+01	3.75E-02	5.34E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.57E+00	Sample et al. (1999)	Regression[f]	6.90E-02	Sample et al. (1998b)
Barium	NA	2.71E+00	4.93E+02	1.56E-01	7.68E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	4.48E+01	Sample et al. (1998a)	6.83E-04	3.36E-01	Baes et al. (1984)[e]
Beryllium	NA	1.50E-03	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	4.50E-02	0.00E+00	Sample et al. (1998a)	2.25E-03	0.00E+00	Baes et al. (1984)[e]
Cadmium	NA	3.00E-03	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	Regression[d]	0.00E+00	Sample et al. (1999)	Regression[f]	0.00E+00	Sample et al. (1998b)
Chromium	NA	2.72E-02	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	1.55E-02	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	1.83E-01	2.90E+01	Regression[a]	7.35E+00	Bechtel-Jacobs (1998a)	5.15E-01	1.49E+01	Sample et al. (1998a)	Regression[f]	1.25E+01	Sample et al. (1998b)
Lead	NA	3.52E-02	1.98E+01	Regression[a]	1.41E+00	Bechtel-Jacobs (1998a)	Regression[d]	8.93E+00	Sample et al. (1999)	Regression[f]	4.04E+00	Sample et al. (1998b)
Manganese	NA	3.75E+00	7.45E+02	7.90E-02	5.88E+01	Bechtel-Jacobs (1998a)[g]	Regression[d]	4.05E+01	Sample et al. (1999)	2.05E-02	1.53E+01	Sample et al. (1998b)[i]
Mercury	NA	2.60E-04	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	5.59E-02	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	7.78E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Selenium	NA	2.00E-03	1.05E+00	Regression[a]	5.36E-01	Bechtel-Jacobs (1998a)	Regression[d]	9.62E-01	Sample et al. (1998a)	Regression[f]	6.72E-01	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	3.30E-04	0.00E+00	4.00E-03	0.00E+00	Baes et al. (1984)	5.41E-02	0.00E+00	USCHPPM (2004)	1.08E-01	0.00E+00	Baes et al. (1984)[e]
Vanadium	NA	2.48E-02	2.00E+01	4.85E-03	9.68E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	8.38E-01	Sample et al. (1998a)	1.23E-02	2.45E-01	Sample et al. (1998b)[i]
Zinc	NA	5.37E-01	1.65E+02	Regression[a]	8.16E+01	Bechtel-Jacobs (1998a)	Regression[d]	4.56E+02	Sample et al. (1998a)	Regression[f]	1.13E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	3.78E-01	5.82E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	2.24E+01	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polycholrinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	6.20E-04	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	9.30E-03	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	8.70E-04	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	8.70E-04	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Phenanthrene	4.55	1.50E-03	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]

Table H6-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Western Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
LMW PAHs												
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	5.7	3.00E-03	ND	Regression[a]	0	USEPA (2007a)	1.59E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	1.00E-02	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	3.90E-03	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	4.60E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	7.60E-03	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	9.80E-05	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.10E-03	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	7.00E-03	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	2.20E-02	2.45E-01	2.38E-02	5.83E-03	USEPA (2007a)	5.44E+01	1.33E+01	USEPA (2007a)	7.79E-01	1.91E-01	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	8.14E-01	0.00E+00	USEPA (2007a)	1.03E+01	0.00E+00	USEPA (2007a)	4.49E-01	0.00E+00	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	1.39E-06	9.41E-02	1.31E-07	USEPA (2007a)[b]	Regression[d]	4.09E-06	Sample et al. (1998a)	Regression[h]	8.20E-07	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	1.60E-07	5.17E-02	8.28E-09	USEPA (2007a)[b]	Regression[d]	3.17E-07	Sample et al. (1998a)	Regression[h]	7.61E-08	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	1.07E-06	2.82E-02	3.02E-08	USEPA (2007a)[b]	Regression[d]	3.00E-06	Sample et al. (1998a)	Regression[h]	6.15E-07	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	2.90E-07	2.82E-02	8.18E-09	USEPA (2007a)[b]	Regression[d]	6.41E-07	Sample et al. (1998a)	Regression[h]	1.46E-07	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	6.00E-07	2.82E-02	1.69E-08	USEPA (2007a)[b]	Regression[d]	1.51E-06	Sample et al. (1998a)	Regression[h]	3.26E-07	Sample et al. (1998b)

Table H6-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Western Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	2.59E-06	1.55E-02	4.02E-08	USEPA (2007a)[b]	Regression[d]	8.53E-06	Sample et al. (1998a)	Regression[h]	1.63E-06	Sample et al. (1998b)
OCDD	9.50	0.00E+00	1.79E-05	8.45E-03	1.51E-07	USEPA (2007a)[b]	Regression[d]	8.38E-05	Sample et al. (1998a)	Regression[h]	1.36E-05	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	1.53E-07	9.24E-02	1.41E-08	USEPA (2007a)[b]	Regression[d]	3.01E-07	Sample et al. (1998a)	1.25E-01	1.91E-08	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	2.35E-07	3.70E-02	8.69E-09	USEPA (2007a)[b]	Regression[d]	5.00E-07	Sample et al. (1998a)	1.25E-01	2.94E-08	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	3.63E-07	3.70E-02	1.34E-08	USEPA (2007a)[b]	Regression[d]	8.36E-07	Sample et al. (1998a)	1.25E-01	4.54E-08	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	2.64E-07	5.08E-02	1.34E-08	USEPA (2007a)[b]	Regression[d]	5.74E-07	Sample et al. (1998a)	1.25E-01	3.30E-08	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	7.25E-07	2.77E-02	2.01E-08	USEPA (2007a)[b]	Regression[d]	1.89E-06	Sample et al. (1998a)	1.25E-01	9.07E-08	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	2.22E-06	1.52E-02	3.38E-08	USEPA (2007a)[b]	Regression[d]	7.11E-06	Sample et al. (1998a)	1.25E-01	2.78E-07	Sample et al. (1998b)[i]

Table H6-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Western Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H6-2
Screening-Level Exposure Evaluation - American Woodcock
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.88E+00	0.00E+00	2.88E+00	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.05E-04	0.00E+00	9.05E-04	No TRV	--	No TRV	--
Arsenic	1.58E+01	4.40E-03	6.96E-03	1.79E-01	0.00E+00	1.86E-01	5.17E-04	1.39E-01	3.26E-01	2.24E+00	<1	4.51E+00	<1
Barium	5.33E+02	2.71E+00	9.77E-01	5.13E+00	0.00E+00	6.11E+00	3.18E-01	4.70E+00	1.11E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.76E-04	0.00E+00	1.76E-04	No TRV	--	No TRV	--
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.52E-04	0.00E+00	3.52E-04	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	3.20E-03	--	3.20E-03	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.82E-03	0.00E+00	1.82E-03	7.61E+00	<1	2.02E+01	<1
Copper	3.32E+01	1.83E-01	9.11E-02	1.81E+00	0.00E+00	1.90E+00	2.15E-02	2.93E-01	2.21E+00	4.05E+00	<1	3.48E+01	<1
Lead	4.48E+01	3.52E-02	2.63E-02	1.83E+00	0.00E+00	1.85E+00	4.14E-03	3.95E-01	2.25E+00	1.63E+00	1.38E+00	4.46E+01	<1
Manganese	2.21E+03	3.75E+00	2.05E+00	8.99E+00	0.00E+00	1.10E+01	4.41E-01	1.95E+01	3.10E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	3.05E-05	--	3.05E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.57E-03	0.00E+00	6.57E-03	6.71E+00	<1	1.86E+01	<1
Selenium	1.10E+00	2.00E-03	6.63E-03	1.05E-01	0.00E+00	1.12E-01	2.35E-04	9.69E-03	1.22E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.88E-05	0.00E+00	3.88E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	2.14E+01	2.48E-02	1.22E-03	9.50E-02	0.00E+00	9.63E-02	2.91E-03	1.89E-01	2.88E-01	3.44E-01	<1	1.70E+00	<1
Zinc	2.38E+02	5.37E-01	1.18E+00	5.44E+01	0.00E+00	5.56E+01	6.31E-02	2.10E+00	5.78E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.20E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.44E-02	1.94E-02	6.38E-02	4.00E-02	1.59E+00	4.00E-01	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	2.63E+00	--	2.63E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	7.28E-05	--	7.28E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.09E-03	--	1.09E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.02E-04	--	1.02E-04				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	1.02E-04	--	1.02E-04				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	1.76E-04	--	1.76E-04				
Total LMW PAHs						0.00E+00	1.55E-03	0.00E+00	1.55E-03	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	3.52E-04	--	3.52E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.17E-03	--	1.17E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	4.58E-04	--	4.58E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	5.40E-05	--	5.40E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	8.93E-04	--	8.93E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.15E-05	--	1.15E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	3.64E-04	--	3.64E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	8.22E-04	--	8.22E-04				
Total HMW PAHs						0.00E+00	4.13E-03	0.00E+00	4.13E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	3.50E-01	2.20E-02	9.78E-05	2.01E+00	0.00E+00	2.01E+00	2.58E-03	3.08E-03	2.02E+00	1.10E+00	1.84E+00	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H6-2
Screening-Level Exposure Evaluation - American Woodcock
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.84E-06	0.00E+00	2.03E-09	6.02E-07	0.00E+00	6.04E-07	0.00E+00	1.62E-08	6.20E-07				
1,2,3,7,8-PeCDD	3.10E-07	0.00E+00	1.88E-10	7.33E-08	0.00E+00	7.35E-08	0.00E+00	2.73E-09	7.63E-08				
1,2,3,4,7,8-HxCDD	1.07E-06	0.00E+00	3.54E-10	3.17E-07	0.00E+00	1.59E-08	0.00E+00	4.71E-10	1.63E-08				
1,2,3,6,7,8-HxCDD	1.11E-06	0.00E+00	3.68E-10	3.31E-07	0.00E+00	3.32E-09	0.00E+00	9.78E-11	3.41E-09				
1,2,3,7,8,9-HxCDD	1.29E-06	0.00E+00	4.27E-10	3.96E-07	0.00E+00	3.96E-08	0.00E+00	1.14E-09	4.07E-08				
1,2,3,4,6,7,8-HpCDD	6.36E-06	0.00E+00	1.16E-09	2.61E-06	0.00E+00	2.61E-09	0.00E+00	5.60E-11	2.66E-09				
OCDD	3.35E-05	0.00E+00	3.33E-09	1.86E-05	0.00E+00	1.86E-09	0.00E+00	2.95E-11	1.89E-09				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	2.80E-07	0.00E+00	3.04E-10	6.50E-08	0.00E+00	6.53E-08	0.00E+00	2.47E-09	6.78E-08				
1,2,3,4,7,8-HxCDF	8.00E-07	0.00E+00	3.47E-10	2.25E-07	0.00E+00	2.25E-08	0.00E+00	7.05E-10	2.32E-08				
1,2,3,6,7,8-HxCDF	7.60E-07	0.00E+00	3.30E-10	2.12E-07	0.00E+00	2.12E-08	0.00E+00	6.70E-10	2.19E-08				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	9.20E-07	0.00E+00	5.49E-10	2.65E-07	0.00E+00	2.66E-08	0.00E+00	8.11E-10	2.74E-08				
1,2,3,4,6,7,8-HpCDF	2.03E-06	0.00E+00	6.60E-10	6.76E-07	0.00E+00	6.77E-09	0.00E+00	1.79E-10	6.95E-09				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	7.38E-06	0.00E+00	1.32E-09	3.11E-06	0.00E+00	3.11E-10	0.00E+00	6.50E-12	3.18E-10				
Total Dioxins/Furans						8.84E-07	0.00E+00	2.56E-08	9.09E-07	1.75E-06	<1	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H6-3
Screening-Level Exposure Evaluation - Mourning Dove
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.80E+00	0.00E+00	2.80E+00	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.79E-04	0.00E+00	8.79E-04	No TRV	--	No TRV	--
Arsenic	1.58E+01	4.40E-03	6.77E-02	0.00E+00	0.00E+00	6.77E-02	5.02E-04	1.23E-01	1.91E-01	2.24E+00	<1	4.51E+00	<1
Barium	5.33E+02	2.71E+00	9.49E+00	0.00E+00	0.00E+00	9.49E+00	3.09E-01	4.14E+00	1.39E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E-04	0.00E+00	1.71E-04	No TRV	--	No TRV	--
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.42E-04	0.00E+00	3.42E-04	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	3.10E-03	--	3.10E-03	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-03	0.00E+00	1.77E-03	7.61E+00	<1	2.02E+01	<1
Copper	3.32E+01	1.83E-01	8.85E-01	0.00E+00	0.00E+00	8.85E-01	2.09E-02	2.58E-01	1.16E+00	4.05E+00	<1	3.48E+01	<1
Lead	4.48E+01	3.52E-02	2.55E-01	0.00E+00	0.00E+00	2.55E-01	4.02E-03	3.48E-01	6.07E-01	1.63E+00	<1	4.46E+01	<1
Manganese	2.21E+03	3.75E+00	1.99E+01	0.00E+00	0.00E+00	1.99E+01	4.28E-01	1.72E+01	3.75E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	2.97E-05	--	2.97E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.38E-03	0.00E+00	6.38E-03	6.71E+00	<1	1.86E+01	<1
Selenium	1.10E+00	2.00E-03	6.44E-02	0.00E+00	0.00E+00	6.44E-02	2.28E-04	8.54E-03	7.32E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.77E-05	0.00E+00	3.77E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	2.14E+01	2.48E-02	1.18E-02	0.00E+00	0.00E+00	1.18E-02	2.83E-03	1.66E-01	1.81E-01	3.44E-01	<1	1.70E+00	<1
Zinc	2.38E+02	5.37E-01	1.14E+01	0.00E+00	0.00E+00	1.14E+01	6.13E-02	1.85E+00	1.33E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.20E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.31E-02	1.71E-02	6.02E-02	4.00E-02	1.51E+00	4.00E-01	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	2.56E+00	--	2.56E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	7.08E-05	--	7.08E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.06E-03	--	1.06E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	9.93E-05	--	9.93E-05				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	9.93E-05	--	9.93E-05				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	1.71E-04	--	1.71E-04				
Total LMW PAHs						0.00E+00	1.50E-03	0.00E+00	1.50E-03	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	3.42E-04	--	3.42E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.14E-03	--	1.14E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	4.45E-04	--	4.45E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	5.25E-05	--	5.25E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	8.67E-04	--	8.67E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.12E-05	--	1.12E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	3.54E-04	--	3.54E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	7.99E-04	--	7.99E-04				
Total HMW PAHs						0.00E+00	4.01E-03	0.00E+00	4.01E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	3.50E-01	2.20E-02	9.50E-04	0.00E+00	0.00E+00	9.50E-04	2.51E-03	2.72E-03	6.18E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H6-3
Screening-Level Exposure Evaluation - Mourning Dove
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.84E-06	0.00E+00	1.98E-08	0.00E+00	0.00E+00	1.98E-08	0.00E+00	1.43E-08	3.40E-08				
1,2,3,7,8-PeCDD	3.10E-07	0.00E+00	1.83E-09	0.00E+00	0.00E+00	1.83E-09	0.00E+00	2.41E-09	4.24E-09				
1,2,3,4,7,8-HxCDD	1.07E-06	0.00E+00	3.44E-09	0.00E+00	0.00E+00	1.72E-10	0.00E+00	4.15E-10	5.87E-10				
1,2,3,6,7,8-HxCDD	1.11E-06	0.00E+00	3.57E-09	0.00E+00	0.00E+00	3.57E-11	0.00E+00	8.62E-11	1.22E-10				
1,2,3,7,8,9-HxCDD	1.29E-06	0.00E+00	4.15E-09	0.00E+00	0.00E+00	4.15E-10	0.00E+00	1.00E-09	1.42E-09				
1,2,3,4,6,7,8-HpCDD	6.36E-06	0.00E+00	1.13E-08	0.00E+00	0.00E+00	1.13E-11	0.00E+00	4.94E-11	6.06E-11				
OCDD	3.35E-05	0.00E+00	3.23E-08	0.00E+00	0.00E+00	3.23E-12	0.00E+00	2.60E-11	2.92E-11				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	2.80E-07	0.00E+00	2.95E-09	0.00E+00	0.00E+00	2.95E-09	0.00E+00	2.17E-09	5.12E-09				
1,2,3,4,7,8-HxCDF	8.00E-07	0.00E+00	3.38E-09	0.00E+00	0.00E+00	3.38E-10	0.00E+00	6.21E-10	9.58E-10				
1,2,3,6,7,8-HxCDF	7.60E-07	0.00E+00	3.21E-09	0.00E+00	0.00E+00	3.21E-10	0.00E+00	5.90E-10	9.11E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	9.20E-07	0.00E+00	5.33E-09	0.00E+00	0.00E+00	5.33E-10	0.00E+00	7.14E-10	1.25E-09				
1,2,3,4,6,7,8-HpCDF	2.03E-06	0.00E+00	6.41E-09	0.00E+00	0.00E+00	6.41E-11	0.00E+00	1.58E-10	2.22E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	7.38E-06	0.00E+00	1.28E-08	0.00E+00	0.00E+00	1.28E-12	0.00E+00	5.73E-12	7.01E-12				
Total Dioxins/Furans						2.64E-08	0.00E+00	2.25E-08	4.90E-08	1.75E-06	<1	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H6-4
Screening-Level Exposure Evaluation - Red-tailed Hawk
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E+00	0.00E+00	2.01E+00	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.31E-04	0.00E+00	6.31E-04	No TRV	--	No TRV	--
Arsenic	1.58E+01	4.40E-03	0.00E+00	0.00E+00	6.17E-03	6.17E-03	3.61E-04	3.37E-02	4.02E-02	2.24E+00	<1	4.51E+00	<1
Barium	5.33E+02	2.71E+00	0.00E+00	0.00E+00	2.98E-02	2.98E-02	2.22E-01	1.14E+00	1.39E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-04	0.00E+00	1.23E-04	No TRV	--	No TRV	--
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.46E-04	0.00E+00	2.46E-04	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	2.23E-03	--	2.23E-03	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-03	0.00E+00	1.27E-03	7.61E+00	<1	2.02E+01	<1
Copper	3.32E+01	1.83E-01	0.00E+00	0.00E+00	1.05E+00	1.05E+00	1.50E-02	7.08E-02	1.13E+00	4.05E+00	<1	3.48E+01	<1
Lead	4.48E+01	3.52E-02	0.00E+00	0.00E+00	4.75E-01	4.75E-01	2.89E-03	9.55E-02	5.74E-01	1.63E+00	<1	4.46E+01	<1
Manganese	2.21E+03	3.75E+00	0.00E+00	0.00E+00	3.72E+00	3.72E+00	3.08E-01	4.71E+00	8.74E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	2.13E-05	--	2.13E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.58E-03	0.00E+00	4.58E-03	6.71E+00	<1	1.86E+01	<1
Selenium	1.10E+00	2.00E-03	0.00E+00	0.00E+00	5.61E-02	5.61E-02	1.64E-04	2.35E-03	5.86E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.71E-05	0.00E+00	2.71E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	2.14E+01	2.48E-02	0.00E+00	0.00E+00	2.16E-02	2.16E-02	2.03E-03	4.56E-02	6.93E-02	3.44E-01	<1	1.70E+00	<1
Zinc	2.38E+02	5.37E-01	0.00E+00	0.00E+00	9.47E+00	9.47E+00	4.40E-02	5.07E-01	1.00E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.20E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.10E-02	4.69E-03	3.57E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	1.84E+00	--	1.84E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	5.08E-05	--	5.08E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	7.63E-04	--	7.63E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	7.13E-05	--	7.13E-05				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	7.13E-05	--	7.13E-05				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	1.23E-04	--	1.23E-04				
Total LMW PAHs						0.00E+00	1.08E-03	0.00E+00	1.08E-03	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	2.46E-04	--	2.46E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	8.20E-04	--	8.20E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	3.20E-04	--	3.20E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	3.77E-05	--	3.77E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	6.23E-04	--	6.23E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	8.04E-06	--	8.04E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	2.54E-04	--	2.54E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	5.74E-04	--	5.74E-04				
Total HMW PAHs						0.00E+00	2.88E-03	0.00E+00	2.88E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	3.50E-01	2.20E-02	0.00E+00	0.00E+00	2.24E-02	2.24E-02	1.80E-03	7.46E-04	2.49E-02	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H6-4
Screening-Level Exposure Evaluation - Red-tailed Hawk
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.84E-06	0.00E+00	0.00E+00	0.00E+00	9.15E-08	9.15E-08	0.00E+00	3.92E-09	9.54E-08				
1,2,3,7,8-PeCDD	3.10E-07	0.00E+00	0.00E+00	0.00E+00	1.29E-08	1.29E-08	0.00E+00	6.61E-10	1.36E-08				
1,2,3,4,7,8-HxCDD	1.07E-06	0.00E+00	0.00E+00	0.00E+00	5.04E-08	2.52E-09	0.00E+00	1.14E-10	2.64E-09				
1,2,3,6,7,8-HxCDD	1.11E-06	0.00E+00	0.00E+00	0.00E+00	5.25E-08	5.25E-10	0.00E+00	2.37E-11	5.49E-10				
1,2,3,7,8,9-HxCDD	1.29E-06	0.00E+00	0.00E+00	0.00E+00	6.19E-08	6.19E-09	0.00E+00	2.75E-10	6.47E-09				
1,2,3,4,6,7,8-HpCDD	6.36E-06	0.00E+00	0.00E+00	0.00E+00	3.58E-07	3.58E-10	0.00E+00	1.36E-11	3.71E-10				
OCDD	3.35E-05	0.00E+00	0.00E+00	0.00E+00	2.22E-06	2.22E-10	0.00E+00	7.14E-12	2.29E-10				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	2.80E-07	0.00E+00	0.00E+00	0.00E+00	2.87E-09	2.87E-09	0.00E+00	5.97E-10	3.47E-09				
1,2,3,4,7,8-HxCDF	8.00E-07	0.00E+00	0.00E+00	0.00E+00	8.21E-09	8.21E-10	0.00E+00	1.71E-10	9.91E-10				
1,2,3,6,7,8-HxCDF	7.60E-07	0.00E+00	0.00E+00	0.00E+00	7.80E-09	7.80E-10	0.00E+00	1.62E-10	9.42E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	9.20E-07	0.00E+00	0.00E+00	0.00E+00	9.44E-09	9.44E-10	0.00E+00	1.96E-10	1.14E-09				
1,2,3,4,6,7,8-HpCDF	2.03E-06	0.00E+00	0.00E+00	0.00E+00	2.08E-08	2.08E-10	0.00E+00	4.33E-11	2.52E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	7.38E-06	0.00E+00	0.00E+00	0.00E+00	7.57E-08	7.57E-12	0.00E+00	1.57E-12	9.15E-12				
Total Dioxins/Furans						1.20E-07	0.00E+00	6.19E-09	1.26E-07	1.75E-06	<1	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H6-5
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.88E+00	0.00E+00	3.88E+00	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-03	0.00E+00	1.22E-03	No TRV	--	No TRV	--
Arsenic	1.58E+01	4.40E-03	0.00E+00	2.68E-01	0.00E+00	2.68E-01	6.97E-04	0.00E+00	2.69E-01	2.24E+00	<1	4.51E+00	<1
Barium	5.33E+02	2.71E+00	0.00E+00	7.68E+00	0.00E+00	7.68E+00	4.29E-01	0.00E+00	8.11E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.37E-04	0.00E+00	2.37E-04	No TRV	--	No TRV	--
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.75E-04	0.00E+00	4.75E-04	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	4.31E-03	--	4.31E-03	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.45E-03	0.00E+00	2.45E-03	7.61E+00	<1	2.02E+01	<1
Copper	3.32E+01	1.83E-01	0.00E+00	2.71E+00	0.00E+00	2.71E+00	2.90E-02	0.00E+00	2.74E+00	4.05E+00	<1	3.48E+01	<1
Lead	4.48E+01	3.52E-02	0.00E+00	2.74E+00	0.00E+00	2.74E+00	5.57E-03	0.00E+00	2.74E+00	1.63E+00	1.68E+00	4.46E+01	<1
Manganese	2.21E+03	3.75E+00	0.00E+00	1.35E+01	0.00E+00	1.35E+01	5.94E-01	0.00E+00	1.41E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	4.12E-05	--	4.12E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.85E-03	0.00E+00	8.85E-03	6.71E+00	<1	1.86E+01	<1
Selenium	1.10E+00	2.00E-03	0.00E+00	1.58E-01	0.00E+00	1.58E-01	3.17E-04	0.00E+00	1.58E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.22E-05	0.00E+00	5.22E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	2.14E+01	2.48E-02	0.00E+00	1.42E-01	0.00E+00	1.42E-01	3.93E-03	0.00E+00	1.46E-01	3.44E-01	<1	1.70E+00	<1
Zinc	2.38E+02	5.37E-01	0.00E+00	8.15E+01	0.00E+00	8.15E+01	8.50E-02	0.00E+00	8.16E+01	6.61E+01	1.23E+00	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.20E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.98E-02	0.00E+00	5.98E-02	4.00E-02	1.50E+00	4.00E-01	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	3.55E+00	--	3.55E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	9.82E-05	--	9.82E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.47E-03	--	1.47E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.38E-04	--	1.38E-04				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	1.38E-04	--	1.38E-04				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	2.37E-04	--	2.37E-04				
Total LMW PAHs						0.00E+00	2.08E-03	0.00E+00	2.08E-03	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	4.75E-04	--	4.75E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.58E-03	--	1.58E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	6.17E-04	--	6.17E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	7.28E-05	--	7.28E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	1.20E-03	--	1.20E-03				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.55E-05	--	1.55E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	4.91E-04	--	4.91E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	1.11E-03	--	1.11E-03				
Total HMW PAHs						0.00E+00	5.57E-03	0.00E+00	5.57E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	3.50E-01	2.20E-02	0.00E+00	3.02E+00	0.00E+00	3.02E+00	3.48E-03	0.00E+00	3.02E+00	1.10E+00	2.74E+00	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H6-5
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.84E-06	0.00E+00	0.00E+00	9.01E-07	0.00E+00	9.01E-07	0.00E+00	0.00E+00	9.01E-07				
1,2,3,7,8-PeCDD	3.10E-07	0.00E+00	0.00E+00	1.10E-07	0.00E+00	1.10E-07	0.00E+00	0.00E+00	1.10E-07				
1,2,3,4,7,8-HxCDD	1.07E-06	0.00E+00	0.00E+00	4.75E-07	0.00E+00	2.37E-08	0.00E+00	0.00E+00	2.37E-08				
1,2,3,6,7,8-HxCDD	1.11E-06	0.00E+00	0.00E+00	4.96E-07	0.00E+00	4.96E-09	0.00E+00	0.00E+00	4.96E-09				
1,2,3,7,8,9-HxCDD	1.29E-06	0.00E+00	0.00E+00	5.92E-07	0.00E+00	5.92E-08	0.00E+00	0.00E+00	5.92E-08				
1,2,3,4,6,7,8-HpCDD	6.36E-06	0.00E+00	0.00E+00	3.90E-06	0.00E+00	3.90E-09	0.00E+00	0.00E+00	3.90E-09				
OCDD	3.35E-05	0.00E+00	0.00E+00	2.78E-05	0.00E+00	2.78E-09	0.00E+00	0.00E+00	2.78E-09				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	2.80E-07	0.00E+00	0.00E+00	9.74E-08	0.00E+00	9.74E-08	0.00E+00	0.00E+00	9.74E-08				
1,2,3,4,7,8-HxCDF	8.00E-07	0.00E+00	0.00E+00	3.37E-07	0.00E+00	3.37E-08	0.00E+00	0.00E+00	3.37E-08				
1,2,3,6,7,8-HxCDF	7.60E-07	0.00E+00	0.00E+00	3.17E-07	0.00E+00	3.17E-08	0.00E+00	0.00E+00	3.17E-08				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	9.20E-07	0.00E+00	0.00E+00	3.97E-07	0.00E+00	3.97E-08	0.00E+00	0.00E+00	3.97E-08				
1,2,3,4,6,7,8-HpCDF	2.03E-06	0.00E+00	0.00E+00	1.01E-06	0.00E+00	1.01E-08	0.00E+00	0.00E+00	1.01E-08				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	7.38E-06	0.00E+00	0.00E+00	4.66E-06	0.00E+00	4.66E-10	0.00E+00	0.00E+00	4.66E-10				
Total Dioxins/Furans						1.32E-06	0.00E+00	0.00E+00	1.32E-06	1.75E-06	<1	1.75E-05	<1

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H6-6
Screening-Level Exposure Evaluation - Canada Lynx
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.65E-01	0.00E+00	7.65E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.41E-04	0.00E+00	2.41E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	1.58E+01	4.40E-03	0.00E+00	0.00E+00	2.35E-03	2.35E-03	1.37E-04	1.38E-02	1.63E-02	1.04E+00	<1	4.55E+00	<1
Barium	5.33E+02	2.71E+00	0.00E+00	0.00E+00	1.14E-02	1.14E-02	8.47E-02	4.66E-01	5.62E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.69E-05	0.00E+00	4.69E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.37E-05	0.00E+00	9.37E-05	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	8.50E-04	--	8.50E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.84E-04	0.00E+00	4.84E-04	7.33E+00	<1	1.89E+01	<1
Copper	3.32E+01	1.83E-01	0.00E+00	0.00E+00	3.99E-01	3.99E-01	5.72E-03	2.90E-02	4.34E-01	5.60E+00	<1	8.27E+01	<1
Lead	4.48E+01	3.52E-02	0.00E+00	0.00E+00	1.81E-01	1.81E-01	1.10E-03	3.92E-02	2.21E-01	4.70E+00	<1	1.86E+02	<1
Manganese	2.21E+03	3.75E+00	0.00E+00	0.00E+00	1.42E+00	1.42E+00	1.17E-01	1.93E+00	3.47E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	8.12E-06	--	8.12E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-03	0.00E+00	1.75E-03	1.70E+00	<1	1.48E+01	<1
Selenium	1.10E+00	2.00E-03	0.00E+00	0.00E+00	2.14E-02	2.14E-02	6.25E-05	9.62E-04	2.24E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-05	0.00E+00	1.03E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	2.14E+01	2.48E-02	0.00E+00	0.00E+00	8.22E-03	8.22E-03	7.75E-04	1.87E-02	2.77E-02	4.16E+00	<1	9.44E+00	<1
Zinc	2.38E+02	5.37E-01	0.00E+00	0.00E+00	3.61E+00	3.61E+00	1.68E-02	2.08E-01	3.83E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.20E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-02	1.92E-03	1.37E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	7.00E-01	--	7.00E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	1.94E-05	--	1.94E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	2.91E-04	--	2.91E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	2.72E-05	--	2.72E-05				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	2.72E-05	--	2.72E-05				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	4.69E-05	--	4.69E-05				
Total LMW PAHs						0.00E+00	4.11E-04	0.00E+00	4.11E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	9.37E-05	--	9.37E-05				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	3.12E-04	--	3.12E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	1.22E-04	--	1.22E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	1.44E-05	--	1.44E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	2.37E-04	--	2.37E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	3.06E-06	--	3.06E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	9.69E-05	--	9.69E-05				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	2.19E-04	--	2.19E-04				
Total HMW PAHs						0.00E+00	1.10E-03	0.00E+00	1.10E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	3.50E-01	2.20E-02	0.00E+00	0.00E+00	8.52E-03	8.52E-03	6.87E-04	3.06E-04	9.51E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H6-6
Screening-Level Exposure Evaluation - Canada Lynx
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.84E-06	0.00E+00	0.00E+00	0.00E+00	3.49E-08	3.49E-08	0.00E+00	1.61E-09	3.65E-08				
1,2,3,7,8-PeCDD	3.10E-07	0.00E+00	0.00E+00	0.00E+00	4.92E-09	4.92E-09	0.00E+00	2.71E-10	5.19E-09				
1,2,3,4,7,8-HxCDD	1.07E-06	0.00E+00	0.00E+00	0.00E+00	1.92E-08	1.92E-09	0.00E+00	9.36E-11	2.02E-09				
1,2,3,6,7,8-HxCDD	1.11E-06	0.00E+00	0.00E+00	0.00E+00	2.00E-08	2.00E-09	0.00E+00	9.71E-11	2.10E-09				
1,2,3,7,8,9-HxCDD	1.29E-06	0.00E+00	0.00E+00	0.00E+00	2.36E-08	2.36E-09	0.00E+00	1.13E-10	2.47E-09				
1,2,3,4,6,7,8-HpCDD	6.36E-06	0.00E+00	0.00E+00	0.00E+00	1.36E-07	1.36E-09	0.00E+00	5.56E-11	1.42E-09				
OCDD	3.35E-05	0.00E+00	0.00E+00	0.00E+00	8.47E-07	2.54E-10	0.00E+00	8.79E-12	2.63E-10				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	2.80E-07	0.00E+00	0.00E+00	0.00E+00	1.09E-09	3.28E-10	0.00E+00	7.35E-11	4.02E-10				
1,2,3,4,7,8-HxCDF	8.00E-07	0.00E+00	0.00E+00	0.00E+00	3.13E-09	3.13E-10	0.00E+00	7.00E-11	3.83E-10				
1,2,3,6,7,8-HxCDF	7.60E-07	0.00E+00	0.00E+00	0.00E+00	2.97E-09	2.97E-10	0.00E+00	6.65E-11	3.64E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	9.20E-07	0.00E+00	0.00E+00	0.00E+00	3.60E-09	3.60E-10	0.00E+00	8.05E-11	4.40E-10				
1,2,3,4,6,7,8-HpCDF	2.03E-06	0.00E+00	0.00E+00	0.00E+00	7.93E-09	7.93E-11	0.00E+00	1.78E-11	9.71E-11				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	7.38E-06	0.00E+00	0.00E+00	0.00E+00	2.88E-08	8.65E-12	0.00E+00	1.94E-12	1.06E-11				
Total Dioxins/Furans						4.91E-08	0.00E+00	2.56E-09	5.16E-08	5.62E-07	<1	3.76E-06	<1

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H6-7
Screening-Level Exposure Evaluation - Grizzly Bear
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)										
			Diet					Water	Substrate				
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.29E-01	0.00E+00	5.29E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E-04	0.00E+00	1.66E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	1.58E+01	4.40E-03	8.32E-03	5.49E-03	1.62E-04	0.00E+00	1.40E-02	9.50E-05	9.55E-03	1.41E-02	1.04E+00	<1	4.55E+00	<1
Barium	5.33E+02	2.71E+00	1.17E+00	1.57E-01	7.86E-04	0.00E+00	1.33E+00	5.85E-02	3.22E-01	1.38E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.24E-05	0.00E+00	3.24E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.48E-05	0.00E+00	6.48E-05	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	0.00E+00	5.87E-04	--	5.87E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-04	0.00E+00	3.35E-04	7.33E+00	<1	1.89E+01	<1
Copper	3.32E+01	1.83E-01	1.09E-01	5.54E-02	2.76E-02	0.00E+00	1.92E-01	3.95E-03	2.01E-02	1.96E-01	5.60E+00	<1	8.27E+01	<1
Lead	4.48E+01	3.52E-02	3.14E-02	5.60E-02	1.25E-02	0.00E+00	9.99E-02	7.60E-04	2.71E-02	1.01E-01	4.70E+00	<1	1.86E+02	<1
Manganese	2.21E+03	3.75E+00	2.45E+00	2.75E-01	9.78E-02	0.00E+00	2.82E+00	8.10E-02	1.34E+00	2.90E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	0.00E+00	5.61E-06	--	5.61E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.21E-03	0.00E+00	1.21E-03	1.70E+00	<1	1.48E+01	<1
Selenium	1.10E+00	2.00E-03	7.92E-03	3.22E-03	1.48E-03	0.00E+00	1.26E-02	4.32E-05	6.65E-04	1.27E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.13E-06	0.00E+00	7.13E-06	4.80E-01	<1	1.43E+00	<1
Vanadium	2.14E+01	2.48E-02	1.46E-03	2.91E-03	5.68E-04	0.00E+00	4.94E-03	5.36E-04	1.29E-02	5.47E-03	4.16E+00	<1	9.44E+00	<1
Zinc	2.38E+02	5.37E-01	1.41E+00	1.67E+00	2.49E-01	0.00E+00	3.32E+00	1.16E-02	1.44E-01	3.33E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	2.20E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.16E-03	1.33E-03	8.16E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	0.00E+00	4.84E-01	--	4.84E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	0.00E+00	1.34E-05	--	1.34E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	0.00E+00	2.01E-04	--	2.01E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	0.00E+00	1.88E-05	--	1.88E-05				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	0.00E+00	1.88E-05	--	1.88E-05				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	0.00E+00	3.24E-05	--	3.24E-05				
Total LMW PAHs							0.00E+00	2.84E-04	0.00E+00	2.84E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	0.00E+00	6.48E-05	--	6.48E-05				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	0.00E+00	2.16E-04	--	2.16E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	0.00E+00	8.42E-05	--	8.42E-05				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	0.00E+00	9.93E-06	--	9.93E-06				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	0.00E+00	1.64E-04	--	1.64E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	0.00E+00	2.12E-06	--	2.12E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	0.00E+00	6.69E-05	--	6.69E-05				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	0.00E+00	1.51E-04	--	1.51E-04				
Total HMW PAHs							0.00E+00	7.59E-04	0.00E+00	7.59E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	3.50E-01	2.20E-02	1.17E-04	6.17E-02	5.89E-04	0.00E+00	6.24E-02	4.75E-04	2.12E-04	6.29E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H6-7
Screening-Level Exposure Evaluation - Grizzly Bear
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)											
			Diet					Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	1.84E-06	0.00E+00	2.43E-09	1.84E-08	2.41E-09	0.00E+00	2.33E-08	0.00E+00	1.11E-09	2.33E-08				
1,2,3,7,8-PeCDD	3.10E-07	0.00E+00	2.25E-10	2.25E-09	3.40E-10	0.00E+00	2.81E-09	0.00E+00	1.87E-10	2.81E-09				
1,2,3,4,7,8-HxCDD	1.07E-06	0.00E+00	4.24E-10	9.72E-09	1.33E-09	0.00E+00	1.15E-09	0.00E+00	6.47E-11	1.15E-09				
1,2,3,6,7,8-HxCDD	1.11E-06	0.00E+00	4.39E-10	1.01E-08	1.38E-09	0.00E+00	1.20E-09	0.00E+00	6.71E-11	1.20E-09				
1,2,3,7,8,9-HxCDD	1.29E-06	0.00E+00	5.11E-10	1.21E-08	1.63E-09	0.00E+00	1.43E-09	0.00E+00	7.80E-11	1.43E-09				
1,2,3,4,6,7,8-HpCDD	6.36E-06	0.00E+00	1.38E-09	7.99E-08	9.42E-09	0.00E+00	9.07E-10	0.00E+00	3.85E-11	9.07E-10				
OCDD	3.35E-05	0.00E+00	3.97E-09	5.69E-07	5.85E-08	0.00E+00	1.90E-10	0.00E+00	6.08E-12	1.90E-10				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	2.80E-07	0.00E+00	3.63E-10	1.99E-09	7.56E-11	0.00E+00	7.29E-10	0.00E+00	5.08E-11	7.29E-10				
1,2,3,4,7,8-HxCDF	8.00E-07	0.00E+00	4.15E-10	6.89E-09	2.16E-10	0.00E+00	7.52E-10	0.00E+00	4.84E-11	7.52E-10				
1,2,3,6,7,8-HxCDF	7.60E-07	0.00E+00	3.94E-10	6.49E-09	2.05E-10	0.00E+00	7.09E-10	0.00E+00	4.60E-11	7.09E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	9.20E-07	0.00E+00	6.56E-10	8.13E-09	2.49E-10	0.00E+00	9.03E-10	0.00E+00	5.56E-11	9.03E-10				
1,2,3,4,6,7,8-HpCDF	2.03E-06	0.00E+00	7.89E-10	2.07E-08	5.48E-10	0.00E+00	2.21E-10	0.00E+00	1.23E-11	2.21E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	7.38E-06	0.00E+00	1.58E-09	9.52E-08	1.99E-09	0.00E+00	2.96E-11	0.00E+00	1.34E-12	2.96E-11				
Total Dioxins/Furans						0.00E+00	3.43E-08	0.00E+00	1.77E-09	3.61E-08	5.62E-07	<1	3.76E-06	<1

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H6-8
Screening-Level Exposure Evaluation - Long-tailed Weasel
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E+00	0.00E+00	1.26E+00	No TRV	--	No TRV	--
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.96E-04	0.00E+00	3.96E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	1.42E+01	4.40E-03	0.00E+00	0.00E+00	3.55E-03	3.55E-03	2.26E-04	1.17E-02	1.55E-02	1.04E+00	<1	4.55E+00	<1
Barium	4.93E+02	2.71E+00	0.00E+00	0.00E+00	1.73E-02	1.73E-02	1.39E-01	4.06E-01	5.62E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.72E-05	0.00E+00	7.72E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-04	0.00E+00	1.54E-04	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	1.40E-03	--	1.40E-03	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.98E-04	0.00E+00	7.98E-04	7.33E+00	<1	1.89E+01	<1
Copper	2.90E+01	1.83E-01	0.00E+00	0.00E+00	6.45E-01	6.45E-01	9.42E-03	2.39E-02	6.78E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.98E+01	3.52E-02	0.00E+00	0.00E+00	2.08E-01	2.08E-01	1.81E-03	1.63E-02	2.26E-01	4.70E+00	<1	1.86E+02	<1
Manganese	7.45E+02	3.75E+00	0.00E+00	0.00E+00	7.85E-01	7.85E-01	1.93E-01	6.13E-01	1.59E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	1.34E-05	--	1.34E-05	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.88E-03	0.00E+00	2.88E-03	1.70E+00	<1	1.48E+01	<1
Selenium	1.05E+00	2.00E-03	0.00E+00	0.00E+00	3.46E-02	3.46E-02	1.03E-04	8.65E-04	3.56E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E-05	0.00E+00	1.70E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	2.00E+01	2.48E-02	0.00E+00	0.00E+00	1.26E-02	1.26E-02	1.28E-03	1.64E-02	3.03E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.65E+02	5.37E-01	0.00E+00	0.00E+00	5.79E+00	5.79E+00	2.76E-02	1.35E-01	5.96E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	5.82E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.95E-02	4.79E-04	1.99E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	1.15E+00	--	1.15E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	3.19E-05	--	3.19E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	4.79E-04	--	4.79E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	4.48E-05	--	4.48E-05				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	4.48E-05	--	4.48E-05				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	7.72E-05	--	7.72E-05				
Total LMW PAHs						0.00E+00	6.77E-04	0.00E+00	6.77E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	1.54E-04	--	1.54E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	5.15E-04	--	5.15E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	2.01E-04	--	2.01E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	2.37E-05	--	2.37E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	3.91E-04	--	3.91E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	5.04E-06	--	5.04E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	1.60E-04	--	1.60E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	3.60E-04	--	3.60E-04				
Total HMW PAHs						0.00E+00	1.81E-03	0.00E+00	1.81E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.45E-01	2.20E-02	0.00E+00	0.00E+00	9.82E-03	9.82E-03	1.13E-03	2.02E-04	1.12E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H6-8
Screening-Level Exposure Evaluation - Long-tailed Weasel
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.39E-06	0.00E+00	0.00E+00	0.00E+00	4.22E-08	4.22E-08	0.00E+00	1.14E-09	4.33E-08				
1,2,3,7,8-PeCDD	1.60E-07	0.00E+00	0.00E+00	0.00E+00	3.92E-09	3.92E-09	0.00E+00	1.32E-10	4.05E-09				
1,2,3,4,7,8-HxCDD	1.07E-06	0.00E+00	0.00E+00	0.00E+00	3.16E-08	3.16E-09	0.00E+00	8.81E-11	3.25E-09				
1,2,3,6,7,8-HxCDD	2.90E-07	0.00E+00	0.00E+00	0.00E+00	7.53E-09	7.53E-10	0.00E+00	2.39E-11	7.77E-10				
1,2,3,7,8,9-HxCDD	6.00E-07	0.00E+00	0.00E+00	0.00E+00	1.68E-08	1.68E-09	0.00E+00	4.94E-11	1.72E-09				
1,2,3,4,6,7,8-HpCDD	2.59E-06	0.00E+00	0.00E+00	0.00E+00	8.36E-08	8.36E-10	0.00E+00	2.13E-11	8.58E-10				
OCDD	1.79E-05	0.00E+00	0.00E+00	0.00E+00	7.00E-07	2.10E-10	0.00E+00	4.42E-12	2.15E-10				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	1.53E-07	0.00E+00	0.00E+00	0.00E+00	9.85E-10	2.95E-10	0.00E+00	3.78E-11	3.33E-10				
1,2,3,4,7,8-HxCDF	2.35E-07	0.00E+00	0.00E+00	0.00E+00	1.51E-09	1.51E-10	0.00E+00	1.93E-11	1.71E-10				
1,2,3,6,7,8-HxCDF	3.63E-07	0.00E+00	0.00E+00	0.00E+00	2.34E-09	2.34E-10	0.00E+00	2.99E-11	2.64E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	2.64E-07	0.00E+00	0.00E+00	0.00E+00	1.70E-09	1.70E-10	0.00E+00	2.17E-11	1.92E-10				
1,2,3,4,6,7,8-HpCDF	7.25E-07	0.00E+00	0.00E+00	0.00E+00	4.67E-09	4.67E-11	0.00E+00	5.97E-12	5.26E-11				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	2.22E-06	0.00E+00	0.00E+00	0.00E+00	1.43E-08	4.29E-12	0.00E+00	5.48E-13	4.84E-12				
Total Dioxins/Furans						5.37E-08	0.00E+00	1.58E-09	5.52E-08	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H6-9
Screening-Level Exposure Evaluation - Meadow Vole
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.68E+00	0.00E+00	3.68E+00	No TRV	--	No TRV	--
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.16E-03	0.00E+00	1.16E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	1.42E+01	4.40E-03	8.02E-02	0.00E+00	0.00E+00	8.02E-02	6.61E-04	2.78E-02	1.09E-01	1.04E+00	<1	4.55E+00	<1
Barium	4.93E+02	2.71E+00	1.15E+01	0.00E+00	0.00E+00	1.15E+01	4.07E-01	9.62E-01	1.29E+01	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.25E-04	0.00E+00	2.25E-04	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.51E-04	0.00E+00	4.51E-04	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	4.09E-03	--	4.09E-03	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.33E-03	0.00E+00	2.33E-03	7.33E+00	<1	1.89E+01	<1
Copper	2.90E+01	1.83E-01	1.10E+00	0.00E+00	0.00E+00	1.10E+00	2.75E-02	5.66E-02	1.19E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.98E+01	3.52E-02	2.12E-01	0.00E+00	0.00E+00	2.12E-01	5.29E-03	3.86E-02	2.56E-01	4.70E+00	<1	1.86E+02	<1
Manganese	7.45E+02	3.75E+00	8.84E+00	0.00E+00	0.00E+00	8.84E+00	5.63E-01	1.45E+00	1.09E+01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	3.91E-05	--	3.91E-05	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.40E-03	0.00E+00	8.40E-03	1.70E+00	<1	1.48E+01	<1
Selenium	1.05E+00	2.00E-03	8.06E-02	0.00E+00	0.00E+00	8.06E-02	3.00E-04	2.05E-03	8.29E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.96E-05	0.00E+00	4.96E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	2.00E+01	2.48E-02	1.45E-02	0.00E+00	0.00E+00	1.45E-02	3.73E-03	3.90E-02	5.72E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.65E+02	5.37E-01	1.23E+01	0.00E+00	0.00E+00	1.23E+01	8.07E-02	3.21E-01	1.27E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	5.82E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.68E-02	1.14E-03	5.79E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	3.37E+00	--	3.37E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	9.31E-05	--	9.31E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.40E-03	--	1.40E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.31E-04	--	1.31E-04				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	1.31E-04	--	1.31E-04				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	2.25E-04	--	2.25E-04				
Total LMW PAHs						0.00E+00	1.98E-03	0.00E+00	1.98E-03	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	4.51E-04	--	4.51E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.50E-03	--	1.50E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	5.86E-04	--	5.86E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	6.91E-05	--	6.91E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	1.14E-03	--	1.14E-03				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.47E-05	--	1.47E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	4.66E-04	--	4.66E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	1.05E-03	--	1.05E-03				
Total HMW PAHs						0.00E+00	5.28E-03	0.00E+00	5.28E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.45E-01	2.20E-02	8.76E-04	0.00E+00	0.00E+00	8.76E-04	3.31E-03	4.78E-04	4.66E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H6-9
Screening-Level Exposure Evaluation - Meadow Vole
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.39E-06	0.00E+00	1.96E-08	0.00E+00	0.00E+00	1.96E-08	0.00E+00	2.71E-09	2.24E-08				
1,2,3,7,8-PeCDD	1.60E-07	0.00E+00	1.24E-09	0.00E+00	0.00E+00	1.24E-09	0.00E+00	3.12E-10	1.56E-09				
1,2,3,4,7,8-HxCDD	1.07E-06	0.00E+00	4.53E-09	0.00E+00	0.00E+00	4.53E-10	0.00E+00	2.09E-10	6.62E-10				
1,2,3,6,7,8-HxCDD	2.90E-07	0.00E+00	1.23E-09	0.00E+00	0.00E+00	1.23E-10	0.00E+00	5.66E-11	1.79E-10				
1,2,3,7,8,9-HxCDD	6.00E-07	0.00E+00	2.54E-09	0.00E+00	0.00E+00	2.54E-10	0.00E+00	1.17E-10	3.71E-10				
1,2,3,4,6,7,8-HpCDD	2.59E-06	0.00E+00	6.03E-09	0.00E+00	0.00E+00	6.03E-11	0.00E+00	5.06E-11	1.11E-10				
OCDD	1.79E-05	0.00E+00	2.27E-08	0.00E+00	0.00E+00	6.82E-12	0.00E+00	1.05E-11	1.73E-11				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	1.53E-07	0.00E+00	2.12E-09	0.00E+00	0.00E+00	6.37E-10	0.00E+00	8.96E-11	7.26E-10				
1,2,3,4,7,8-HxCDF	2.35E-07	0.00E+00	1.31E-09	0.00E+00	0.00E+00	1.31E-10	0.00E+00	4.59E-11	1.76E-10				
1,2,3,6,7,8-HxCDF	3.63E-07	0.00E+00	2.02E-09	0.00E+00	0.00E+00	2.02E-10	0.00E+00	7.09E-11	2.73E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	2.64E-07	0.00E+00	2.01E-09	0.00E+00	0.00E+00	2.01E-10	0.00E+00	5.16E-11	2.53E-10				
1,2,3,4,6,7,8-HpCDF	7.25E-07	0.00E+00	3.01E-09	0.00E+00	0.00E+00	3.01E-11	0.00E+00	1.42E-11	4.43E-11				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	2.22E-06	0.00E+00	5.08E-09	0.00E+00	0.00E+00	1.52E-12	0.00E+00	1.30E-12	2.82E-12				
Total Dioxins/Furans						2.30E-08	0.00E+00	3.74E-09	2.67E-08	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H6-10
Screening-Level Exposure Evaluation - North American Wolverine
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.36E-01	0.00E+00	7.36E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.31E-04	0.00E+00	2.31E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	1.42E+01	4.40E-03	0.00E+00	0.00E+00	2.07E-03	2.07E-03	1.32E-04	1.20E-02	1.42E-02	1.04E+00	<1	4.55E+00	<1
Barium	4.93E+02	2.71E+00	0.00E+00	0.00E+00	1.01E-02	1.01E-02	8.14E-02	4.14E-01	5.06E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.51E-05	0.00E+00	4.51E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.01E-05	0.00E+00	9.01E-05	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	8.17E-04	--	8.17E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E-04	0.00E+00	4.66E-04	7.33E+00	<1	1.89E+01	<1
Copper	2.90E+01	1.83E-01	0.00E+00	0.00E+00	3.76E-01	3.76E-01	5.50E-03	2.44E-02	4.06E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.98E+01	3.52E-02	0.00E+00	0.00E+00	1.21E-01	1.21E-01	1.06E-03	1.66E-02	1.39E-01	4.70E+00	<1	1.86E+02	<1
Manganese	7.45E+02	3.75E+00	0.00E+00	0.00E+00	4.59E-01	4.59E-01	1.13E-01	6.26E-01	1.20E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	7.81E-06	--	7.81E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.68E-03	0.00E+00	1.68E-03	1.70E+00	<1	1.48E+01	<1
Selenium	1.05E+00	2.00E-03	0.00E+00	0.00E+00	2.02E-02	2.02E-02	6.01E-05	8.83E-04	2.11E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.92E-06	0.00E+00	9.92E-06	4.80E-01	<1	1.43E+00	<1
Vanadium	2.00E+01	2.48E-02	0.00E+00	0.00E+00	7.37E-03	7.37E-03	7.45E-04	1.68E-02	2.49E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.65E+02	5.37E-01	0.00E+00	0.00E+00	3.38E+00	3.38E+00	1.61E-02	1.38E-01	3.54E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	5.82E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-02	4.89E-04	1.18E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	6.73E-01	--	6.73E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	1.86E-05	--	1.86E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	2.79E-04	--	2.79E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	2.61E-05	--	2.61E-05				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	2.61E-05	--	2.61E-05				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	4.51E-05	--	4.51E-05				
Total LMW PAHs						0.00E+00	3.95E-04	0.00E+00	3.95E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	9.01E-05	--	9.01E-05				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	3.00E-04	--	3.00E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	1.17E-04	--	1.17E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	1.38E-05	--	1.38E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	2.28E-04	--	2.28E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	2.94E-06	--	2.94E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	9.31E-05	--	9.31E-05				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	2.10E-04	--	2.10E-04				
Total HMW PAHs						0.00E+00	1.06E-03	0.00E+00	1.06E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.45E-01	2.20E-02	0.00E+00	0.00E+00	5.73E-03	5.73E-03	6.61E-04	2.06E-04	6.60E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H6-10
Screening-Level Exposure Evaluation - North American Wolverine
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.39E-06	0.00E+00	0.00E+00	0.00E+00	2.46E-08	2.46E-08	0.00E+00	1.17E-09	2.58E-08				
1,2,3,7,8-PeCDD	1.60E-07	0.00E+00	0.00E+00	0.00E+00	2.29E-09	2.29E-09	0.00E+00	1.35E-10	2.42E-09				
1,2,3,4,7,8-HxCDD	1.07E-06	0.00E+00	0.00E+00	0.00E+00	1.85E-08	1.85E-09	0.00E+00	9.00E-11	1.94E-09				
1,2,3,6,7,8-HxCDD	2.90E-07	0.00E+00	0.00E+00	0.00E+00	4.40E-09	4.40E-10	0.00E+00	2.44E-11	4.64E-10				
1,2,3,7,8,9-HxCDD	6.00E-07	0.00E+00	0.00E+00	0.00E+00	9.78E-09	9.78E-10	0.00E+00	5.05E-11	1.03E-09				
1,2,3,4,6,7,8-HpCDD	2.59E-06	0.00E+00	0.00E+00	0.00E+00	4.88E-08	4.88E-10	0.00E+00	2.18E-11	5.10E-10				
OCDD	1.79E-05	0.00E+00	0.00E+00	0.00E+00	4.09E-07	1.23E-10	0.00E+00	4.52E-12	1.27E-10				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	1.53E-07	0.00E+00	0.00E+00	0.00E+00	5.75E-10	1.73E-10	0.00E+00	3.86E-11	2.11E-10				
1,2,3,4,7,8-HxCDF	2.35E-07	0.00E+00	0.00E+00	0.00E+00	8.83E-10	8.83E-11	0.00E+00	1.98E-11	1.08E-10				
1,2,3,6,7,8-HxCDF	3.63E-07	0.00E+00	0.00E+00	0.00E+00	1.36E-09	1.36E-10	0.00E+00	3.05E-11	1.67E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	2.64E-07	0.00E+00	0.00E+00	0.00E+00	9.92E-10	9.92E-11	0.00E+00	2.22E-11	1.21E-10				
1,2,3,4,6,7,8-HpCDF	7.25E-07	0.00E+00	0.00E+00	0.00E+00	2.73E-09	2.73E-11	0.00E+00	6.10E-12	3.33E-11				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	2.22E-06	0.00E+00	0.00E+00	0.00E+00	8.34E-09	2.50E-12	0.00E+00	5.60E-13	3.06E-12				
Total Dioxins/Furans						3.13E-08	0.00E+00	1.61E-09	3.29E-08	5.62E-07	<1	3.76E-06	<1

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H6-11
Screening-Level Exposure Evaluation - Short-tailed Shrew
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.28E+00	0.00E+00	3.28E+00	No TRV	--	No TRV	--
Antimony	0.00E+00	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-03	0.00E+00	1.03E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	1.42E+01	4.40E-03	0.00E+00	2.11E-01	0.00E+00	2.11E-01	5.90E-04	2.10E-02	2.32E-01	1.04E+00	<1	4.55E+00	<1
Barium	4.93E+02	2.71E+00	0.00E+00	6.01E+00	0.00E+00	6.01E+00	3.63E-01	7.26E-01	7.10E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E-04	0.00E+00	2.01E-04	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.02E-04	0.00E+00	4.02E-04	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	3.65E-03	--	3.65E-03	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.08E-03	0.00E+00	2.08E-03	7.33E+00	<1	1.89E+01	<1
Copper	2.90E+01	1.83E-01	0.00E+00	2.00E+00	0.00E+00	2.00E+00	2.45E-02	4.27E-02	2.07E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.98E+01	3.52E-02	0.00E+00	1.20E+00	0.00E+00	1.20E+00	4.72E-03	2.91E-02	1.23E+00	4.70E+00	<1	1.86E+02	<1
Manganese	7.45E+02	3.75E+00	0.00E+00	5.43E+00	0.00E+00	5.43E+00	5.03E-01	1.10E+00	7.03E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	3.48E-05	--	3.48E-05	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.49E-03	0.00E+00	7.49E-03	1.70E+00	<1	1.48E+01	<1
Selenium	1.05E+00	2.00E-03	0.00E+00	1.29E-01	0.00E+00	1.29E-01	2.68E-04	1.55E-03	1.31E-01	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.42E-05	0.00E+00	4.42E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	2.00E+01	2.48E-02	0.00E+00	1.12E-01	0.00E+00	1.12E-01	3.32E-03	2.94E-02	1.45E-01	4.16E+00	<1	9.44E+00	<1
Zinc	1.65E+02	5.37E-01	0.00E+00	6.11E+01	0.00E+00	6.11E+01	7.20E-02	2.42E-01	6.14E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	5.82E-01	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.07E-02	8.57E-04	5.15E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	3.00E+00	--	3.00E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	8.31E-05	--	8.31E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.25E-03	--	1.25E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.17E-04	--	1.17E-04				
Naphthalene	ND	8.70E-04	--	--	--	0.00E+00	1.17E-04	--	1.17E-04				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	2.01E-04	--	2.01E-04				
Total LMW PAHs						0.00E+00	1.76E-03	0.00E+00	1.76E-03	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	4.02E-04	--	4.02E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.34E-03	--	1.34E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	5.23E-04	--	5.23E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	6.16E-05	--	6.16E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	1.02E-03	--	1.02E-03				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.31E-05	--	1.31E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	4.15E-04	--	4.15E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	9.38E-04	--	9.38E-04				
Total HMW PAHs						0.00E+00	4.71E-03	0.00E+00	4.71E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.45E-01	2.20E-02	0.00E+00	1.79E+00	0.00E+00	1.79E+00	2.95E-03	3.61E-04	1.79E+00	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H6-11
Screening-Level Exposure Evaluation - Short-tailed Shrew
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.39E-06	0.00E+00	0.00E+00	5.48E-07	0.00E+00	5.48E-07	0.00E+00	2.05E-09	5.50E-07				
1,2,3,7,8-PeCDD	1.60E-07	0.00E+00	0.00E+00	4.25E-08	0.00E+00	4.25E-08	0.00E+00	2.36E-10	4.28E-08				
1,2,3,4,7,8-HxCDD	1.07E-06	0.00E+00	0.00E+00	4.02E-07	0.00E+00	4.02E-08	0.00E+00	1.58E-10	4.04E-08				
1,2,3,6,7,8-HxCDD	2.90E-07	0.00E+00	0.00E+00	8.59E-08	0.00E+00	8.59E-09	0.00E+00	4.28E-11	8.63E-09				
1,2,3,7,8,9-HxCDD	6.00E-07	0.00E+00	0.00E+00	2.03E-07	0.00E+00	2.03E-08	0.00E+00	8.84E-11	2.04E-08				
1,2,3,4,6,7,8-HpCDD	2.59E-06	0.00E+00	0.00E+00	1.14E-06	0.00E+00	1.14E-08	0.00E+00	3.82E-11	1.15E-08				
OCDD	1.79E-05	0.00E+00	0.00E+00	1.12E-05	0.00E+00	3.37E-09	0.00E+00	7.92E-12	3.38E-09				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	1.53E-07	0.00E+00	0.00E+00	4.03E-08	0.00E+00	1.21E-08	0.00E+00	6.77E-11	1.22E-08				
1,2,3,4,7,8-HxCDF	2.35E-07	0.00E+00	0.00E+00	6.70E-08	0.00E+00	6.70E-09	0.00E+00	3.46E-11	6.74E-09				
1,2,3,6,7,8-HxCDF	3.63E-07	0.00E+00	0.00E+00	1.12E-07	0.00E+00	1.12E-08	0.00E+00	5.35E-11	1.13E-08				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	2.64E-07	0.00E+00	0.00E+00	7.69E-08	0.00E+00	7.69E-09	0.00E+00	3.89E-11	7.73E-09				
1,2,3,4,6,7,8-HpCDF	7.25E-07	0.00E+00	0.00E+00	2.54E-07	0.00E+00	2.54E-09	0.00E+00	1.07E-11	2.55E-09				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	2.22E-06	0.00E+00	0.00E+00	9.53E-07	0.00E+00	2.86E-10	0.00E+00	9.82E-13	2.87E-10				
Total Dioxins/Furans						7.15E-07	0.00E+00	2.83E-09	7.17E-07	5.62E-07	1.28E+00	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H7-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Flathead River Riparian Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	2.45E+01	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	7.70E-03	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	4.40E-03	5.70E+00	3.75E-02	2.14E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	8.25E-01	Sample et al. (1999)	Regression[f]	3.26E-02	Sample et al. (1998b)
Barium	NA	2.71E+00	2.36E+02	1.56E-01	3.68E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	2.15E+01	Sample et al. (1998a)	6.83E-04	1.61E-01	Baes et al. (1984)[e]
Beryllium	NA	1.50E-03	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	3.00E-03	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	Regression[d]	0	Sample et al. (1999)	Regression[f]	0	Sample et al. (1998b)
Chromium	NA	2.72E-02	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	1.55E-02	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	1.83E-01	2.27E+01	Regression[a]	6.67E+00	Bechtel-Jacobs (1998a)	5.15E-01	1.17E+01	Sample et al. (1998a)	Regression[f]	1.21E+01	Sample et al. (1998b)
Lead	NA	3.52E-02	1.24E+01	Regression[a]	1.09E+00	Bechtel-Jacobs (1998a)	Regression[d]	6.13E+00	Sample et al. (1999)	Regression[f]	3.29E+00	Sample et al. (1998b)
Manganese	NA	3.75E+00	4.67E+02	7.90E-02	3.69E+01	Bechtel-Jacobs (1998a)[g]	Regression[d]	2.95E+01	Sample et al. (1999)	2.05E-02	9.57E+00	Sample et al. (1998b)[i]
Mercury	NA	2.60E-04	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	5.59E-02	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	7.78E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Selenium	NA	2.00E-03	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	Regression[d]	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	3.30E-04	ND	4.00E-03	0	Baes et al. (1984)	5.41E-02	0	USCHPPM (2004)	1.08E-01	0	Baes et al. (1984)[e]
Vanadium	NA	2.48E-02	0.00E+00	4.85E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	4.20E-02	0.00E+00	Sample et al. (1998a)	1.23E-02	0.00E+00	Sample et al. (1998b)[i]
Zinc	NA	5.37E-01	5.63E+01	Regression[a]	4.51E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.21E+02	Sample et al. (1998a)	Regression[f]	1.04E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	3.78E-01	1.90E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	2.24E+01	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polycholrinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	6.20E-04	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	9.30E-03	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	8.70E-04	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	8.70E-04	8.10E-01	1.22E+01	9.88E+00	USEPA (2007a)	4.40E+00	3.56E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Phenanthrene	4.55	1.50E-03	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]

Table H7-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Flathead River Riparian Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
LMW PAHs												
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	5.7	3.00E-03	ND	Regression[a]	0	USEPA (2007a)	1.59E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	1.00E-02	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	3.90E-03	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	4.60E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	7.60E-03	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	9.80E-05	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.10E-03	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	7.00E-03	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	2.20E-02	ND	2.38E-02	0	USEPA (2007a)	5.44E+01	0	USEPA (2007a)	7.79E-01	0	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	1.40E-02	8.14E-01	1.14E-02	USEPA (2007a)	1.03E+01	1.44E-01	USEPA (2007a)	4.49E-01	6.29E-03	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)

Table H7-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Flathead River Riparian Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	0.00E+00	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H7-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Flathead River Riparian Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([diet$_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H7-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Flathead River Riparian Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	2.45E+01	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	7.70E-03	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	4.40E-03	7.58E+00	3.75E-02	2.84E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.01E+00	Sample et al. (1999)	Regression[f]	4.12E-02	Sample et al. (1998b)
Barium	NA	2.71E+00	1.84E+02	1.56E-01	2.87E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	1.67E+01	Sample et al. (1998a)	6.83E-04	1.25E-01	Baes et al. (1984)[e]
Beryllium	NA	1.50E-03	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	3.00E-03	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	Regression[d]	0	Sample et al. (1999)	Regression[f]	0	Sample et al. (1998b)
Chromium	NA	2.72E-02	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	1.55E-02	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	1.83E-01	1.83E+01	Regression[a]	6.13E+00	Bechtel-Jacobs (1998a)	5.15E-01	9.44E+00	Sample et al. (1998a)	Regression[f]	1.17E+01	Sample et al. (1998b)
Lead	NA	3.52E-02	1.22E+01	Regression[a]	1.08E+00	Bechtel-Jacobs (1998a)	Regression[d]	6.05E+00	Sample et al. (1999)	Regression[f]	3.26E+00	Sample et al. (1998b)
Manganese	NA	3.75E+00	3.76E+02	7.90E-02	2.97E+01	Bechtel-Jacobs (1998a)[g]	Regression[d]	2.54E+01	Sample et al. (1999)	2.05E-02	7.71E+00	Sample et al. (1998b)[i]
Mercury	NA	2.60E-04	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	5.59E-02	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	7.78E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Selenium	NA	2.00E-03	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	Regression[d]	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	3.30E-04	ND	4.00E-03	0	Baes et al. (1984)	5.41E-02	0	USCHPPM (2004)	1.08E-01	0	Baes et al. (1984)[e]
Vanadium	NA	2.48E-02	0.00E+00	4.85E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	4.20E-02	0.00E+00	Sample et al. (1998a)	1.23E-02	0.00E+00	Sample et al. (1998b)[i]
Zinc	NA	5.37E-01	4.86E+01	Regression[a]	4.15E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.06E+02	Sample et al. (1998a)	Regression[f]	1.03E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	3.78E-01	3.25E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	2.24E+01	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polycholrinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	6.20E-04	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	9.30E-03	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	8.70E-04	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	8.70E-04	3.60E-01	1.22E+01	4.39E+00	USEPA (2007a)	4.40E+00	1.58E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Phenanthrene	4.55	1.50E-03	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]

Table H7-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Flathead River Riparian Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
LMW PAHs												
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	5.7	3.00E-03	ND	Regression[a]	0	USEPA (2007a)	1.59E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	1.00E-02	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	3.90E-03	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	4.60E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	7.60E-03	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	9.80E-05	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.10E-03	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	7.00E-03	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	2.20E-02	ND	2.38E-02	0	USEPA (2007a)	5.44E+01	0	USEPA (2007a)	7.79E-01	0	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	2.70E-02	8.14E-01	2.20E-02	USEPA (2007a)	1.03E+01	2.78E-01	USEPA (2007a)	4.49E-01	1.21E-02	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)

Table H7-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Flathead River Riparian Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	0.00E+00	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H7-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Flathead River Riparian Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H7-2
Screening-Level Exposure Evaluation - American Woodcock
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.88E+00	0.00E+00	2.88E+00	1.10E+02	<1	1.10E+03	<1
Antimony	ND	7.70E-03	--	--	--	0.00E+00	9.05E-04	--	9.05E-04	No TRV	--	No TRV	--
Arsenic	5.70E+00	4.40E-03	2.51E-03	8.72E-02	0.00E+00	8.98E-02	5.17E-04	5.02E-02	1.40E-01	2.24E+00	<1	4.51E+00	<1
Barium	2.36E+02	2.71E+00	4.33E-01	2.27E+00	0.00E+00	2.70E+00	3.18E-01	2.08E+00	5.10E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	1.76E-04	--	1.76E-04	No TRV	--	No TRV	--
Cadmium	ND	3.00E-03	--	--	--	0.00E+00	3.52E-04	--	3.52E-04	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	3.20E-03	--	3.20E-03	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.82E-03	0.00E+00	1.82E-03	7.61E+00	<1	2.02E+01	<1
Copper	2.27E+01	1.83E-01	7.84E-02	1.24E+00	0.00E+00	1.31E+00	2.15E-02	2.00E-01	1.54E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.24E+01	3.52E-02	1.28E-02	6.49E-01	0.00E+00	6.61E-01	4.14E-03	1.09E-01	7.75E-01	1.63E+00	<1	4.46E+01	<1
Manganese	4.67E+02	3.75E+00	4.33E-01	3.11E+00	0.00E+00	3.55E+00	4.41E-01	4.11E+00	8.10E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	3.05E-05	--	3.05E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.57E-03	0.00E+00	6.57E-03	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.35E-04	0.00E+00	2.35E-04	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	3.30E-04	--	--	--	0.00E+00	3.88E-05	--	3.88E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.91E-03	0.00E+00	2.91E-03	3.44E-01	<1	1.70E+00	<1
Zinc	5.63E+01	5.37E-01	5.29E-01	3.39E+01	0.00E+00	3.45E+01	6.31E-02	4.96E-01	3.50E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.90E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.44E-02	1.67E-02	6.11E-02	4.00E-02	1.53E+00	4.00E-01	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	2.63E+00	--	2.63E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	7.28E-05	--	7.28E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.09E-03	--	1.09E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.02E-04	--	1.02E-04				
Naphthalene	8.10E-01	8.70E-04	1.16E-01	3.77E-01	0.00E+00	4.93E-01	1.02E-04	7.14E-03	5.00E-01				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	1.76E-04	--	1.76E-04				
Total LMW PAHs						4.93E-01	1.55E-03	7.14E-03	5.02E-01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	3.52E-04	--	3.52E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.17E-03	--	1.17E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	4.58E-04	--	4.58E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	5.40E-05	--	5.40E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	8.93E-04	--	8.93E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.15E-05	--	1.15E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	3.64E-04	--	3.64E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	8.22E-04	--	8.22E-04				
Total HMW PAHs						0.00E+00	4.13E-03	0.00E+00	4.13E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	2.58E-03	--	2.58E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.40E-02	0.00E+00	1.34E-04	1.53E-02	0.00E+00	1.54E-02	0.00E+00	1.23E-04	1.55E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H7-2
Screening-Level Exposure Evaluation - American Woodcock
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H7-3
Screening-Level Exposure Evaluation - Mourning Dove
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.80E+00	0.00E+00	2.80E+00	1.10E+02	<1	1.10E+03	<1
Antimony	ND	7.70E-03	--	--	--	0.00E+00	8.79E-04	--	8.79E-04	No TRV	--	No TRV	--
Arsenic	5.70E+00	4.40E-03	2.44E-02	0.00E+00	0.00E+00	2.44E-02	5.02E-04	4.42E-02	6.92E-02	2.24E+00	<1	4.51E+00	<1
Barium	2.36E+02	2.71E+00	4.20E+00	0.00E+00	0.00E+00	4.20E+00	3.09E-01	1.83E+00	6.34E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	1.71E-04	--	1.71E-04	No TRV	--	No TRV	--
Cadmium	ND	3.00E-03	--	--	--	0.00E+00	3.42E-04	--	3.42E-04	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	3.10E-03	--	3.10E-03	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-03	0.00E+00	1.77E-03	7.61E+00	<1	2.02E+01	<1
Copper	2.27E+01	1.83E-01	7.62E-01	0.00E+00	0.00E+00	7.62E-01	2.09E-02	1.76E-01	9.59E-01	4.05E+00	<1	3.48E+01	<1
Lead	1.24E+01	3.52E-02	1.24E-01	0.00E+00	0.00E+00	1.24E-01	4.02E-03	9.62E-02	2.24E-01	1.63E+00	<1	4.46E+01	<1
Manganese	4.67E+02	3.75E+00	4.21E+00	0.00E+00	0.00E+00	4.21E+00	4.28E-01	3.62E+00	8.26E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	2.97E-05	--	2.97E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.38E-03	0.00E+00	6.38E-03	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.28E-04	0.00E+00	2.28E-04	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	3.30E-04	--	--	--	0.00E+00	3.77E-05	--	3.77E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.83E-03	0.00E+00	2.83E-03	3.44E-01	<1	1.70E+00	<1
Zinc	5.63E+01	5.37E-01	5.14E+00	0.00E+00	0.00E+00	5.14E+00	6.13E-02	4.37E-01	5.64E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.90E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.31E-02	1.47E-02	5.79E-02	4.00E-02	1.45E+00	4.00E-01	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	2.56E+00	--	2.56E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	7.08E-05	--	7.08E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.06E-03	--	1.06E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	9.93E-05	--	9.93E-05				
Naphthalene	8.10E-01	8.70E-04	1.13E+00	0.00E+00	0.00E+00	1.13E+00	9.93E-05	6.29E-03	1.13E+00				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	1.71E-04	--	1.71E-04				
Total LMW PAHs						1.13E+00	1.50E-03	6.29E-03	1.14E+00	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	3.42E-04	--	3.42E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.14E-03	--	1.14E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	4.45E-04	--	4.45E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	5.25E-05	--	5.25E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	8.67E-04	--	8.67E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.12E-05	--	1.12E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	3.54E-04	--	3.54E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	7.99E-04	--	7.99E-04				
Total HMW PAHs						0.00E+00	4.01E-03	0.00E+00	4.01E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	2.51E-03	--	2.51E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.40E-02	0.00E+00	1.30E-03	0.00E+00	0.00E+00	1.30E-03	0.00E+00	1.09E-04	1.41E-03	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H7-3
Screening-Level Exposure Evaluation - Mourning Dove
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H7-4
Screening-Level Exposure Evaluation - Red-tailed Hawk
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E+00	0.00E+00	2.01E+00	1.10E+02	<1	1.10E+03	<1
Antimony	ND	7.70E-03	--	--	--	0.00E+00	6.31E-04	--	6.31E-04	No TRV	--	No TRV	--
Arsenic	5.70E+00	4.40E-03	0.00E+00	0.00E+00	2.68E-03	2.68E-03	3.61E-04	1.22E-02	1.52E-02	2.24E+00	<1	4.51E+00	<1
Barium	2.36E+02	2.71E+00	0.00E+00	0.00E+00	1.32E-02	1.32E-02	2.22E-01	5.03E-01	7.39E-01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	1.23E-04	--	1.23E-04	No TRV	--	No TRV	--
Cadmium	ND	3.00E-03	--	--	--	0.00E+00	2.46E-04	--	2.46E-04	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	2.23E-03	--	2.23E-03	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-03	0.00E+00	1.27E-03	7.61E+00	<1	2.02E+01	<1
Copper	2.27E+01	1.83E-01	0.00E+00	0.00E+00	9.92E-01	9.92E-01	1.50E-02	4.84E-02	1.06E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.24E+01	3.52E-02	0.00E+00	0.00E+00	2.69E-01	2.69E-01	2.89E-03	2.64E-02	2.99E-01	1.63E+00	<1	4.46E+01	<1
Manganese	4.67E+02	3.75E+00	0.00E+00	0.00E+00	7.85E-01	7.85E-01	3.08E-01	9.96E-01	2.09E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	2.13E-05	--	2.13E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.58E-03	0.00E+00	4.58E-03	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.64E-04	0.00E+00	1.64E-04	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	3.30E-04	--	--	--	0.00E+00	2.71E-05	--	2.71E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.03E-03	0.00E+00	2.03E-03	3.44E-01	<1	1.70E+00	<1
Zinc	5.63E+01	5.37E-01	0.00E+00	0.00E+00	8.56E+00	8.56E+00	4.40E-02	1.20E-01	8.72E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.90E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.10E-02	4.05E-03	3.51E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	1.84E+00	--	1.84E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	5.08E-05	--	5.08E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	7.63E-04	--	7.63E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	7.13E-05	--	7.13E-05				
Naphthalene	8.10E-01	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.13E-05	1.73E-03	1.80E-03				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	1.23E-04	--	1.23E-04				
Total LMW PAHs						0.00E+00	1.08E-03	1.73E-03	2.81E-03	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	2.46E-04	--	2.46E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	8.20E-04	--	8.20E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	3.20E-04	--	3.20E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	3.77E-05	--	3.77E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	6.23E-04	--	6.23E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	8.04E-06	--	8.04E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	2.54E-04	--	2.54E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	5.74E-04	--	5.74E-04				
Total HMW PAHs						0.00E+00	2.88E-03	0.00E+00	2.88E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	1.80E-03	--	1.80E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.40E-02	0.00E+00	0.00E+00	0.00E+00	5.16E-04	5.16E-04	0.00E+00	2.99E-05	5.45E-04	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H7-4
Screening-Level Exposure Evaluation - Red-tailed Hawk
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H7-5
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.88E+00	0.00E+00	3.88E+00	1.10E+02	<1	1.10E+03	<1
Antimony	ND	7.70E-03	--	--	--	0.00E+00	1.22E-03	--	1.22E-03	No TRV	--	No TRV	--
Arsenic	5.70E+00	4.40E-03	0.00E+00	1.31E-01	0.00E+00	1.31E-01	6.97E-04	0.00E+00	1.31E-01	2.24E+00	<1	4.51E+00	<1
Barium	2.36E+02	2.71E+00	0.00E+00	3.40E+00	0.00E+00	3.40E+00	4.29E-01	0.00E+00	3.83E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	2.37E-04	--	2.37E-04	No TRV	--	No TRV	--
Cadmium	ND	3.00E-03	--	--	--	0.00E+00	4.75E-04	--	4.75E-04	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	4.31E-03	--	4.31E-03	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.45E-03	0.00E+00	2.45E-03	7.61E+00	<1	2.02E+01	<1
Copper	2.27E+01	1.83E-01	0.00E+00	1.85E+00	0.00E+00	1.85E+00	2.90E-02	0.00E+00	1.88E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.24E+01	3.52E-02	0.00E+00	9.71E-01	0.00E+00	9.71E-01	5.57E-03	0.00E+00	9.77E-01	1.63E+00	<1	4.46E+01	<1
Manganese	4.67E+02	3.75E+00	0.00E+00	4.66E+00	0.00E+00	4.66E+00	5.94E-01	0.00E+00	5.26E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	4.12E-05	--	4.12E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.85E-03	0.00E+00	8.85E-03	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.17E-04	0.00E+00	3.17E-04	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	3.30E-04	--	--	--	0.00E+00	5.22E-05	--	5.22E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.93E-03	0.00E+00	3.93E-03	3.44E-01	<1	1.70E+00	<1
Zinc	5.63E+01	5.37E-01	0.00E+00	5.08E+01	0.00E+00	5.08E+01	8.50E-02	0.00E+00	5.09E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.90E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.98E-02	0.00E+00	5.98E-02	4.00E-02	1.50E+00	4.00E-01	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	3.55E+00	--	3.55E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	9.82E-05	--	9.82E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.47E-03	--	1.47E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.38E-04	--	1.38E-04				
Naphthalene	8.10E-01	8.70E-04	0.00E+00	5.64E-01	0.00E+00	5.64E-01	1.38E-04	0.00E+00	5.64E-01				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	2.37E-04	--	2.37E-04				
Total LMW PAHs						5.64E-01	2.08E-03	0.00E+00	5.66E-01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	4.75E-04	--	4.75E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.58E-03	--	1.58E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	6.17E-04	--	6.17E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	7.28E-05	--	7.28E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	1.20E-03	--	1.20E-03				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.55E-05	--	1.55E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	4.91E-04	--	4.91E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	1.11E-03	--	1.11E-03				
Total HMW PAHs						0.00E+00	5.57E-03	0.00E+00	5.57E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	3.48E-03	--	3.48E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.40E-02	0.00E+00	0.00E+00	2.29E-02	0.00E+00	2.29E-02	0.00E+00	0.00E+00	2.29E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H7-5
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H7-6
Screening-Level Exposure Evaluation - Canada Lynx
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.65E-01	0.00E+00	7.65E-01	No TRV	--	No TRV	--
Antimony	ND	7.70E-03	--	--	--	0.00E+00	2.41E-04	--	2.41E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	5.70E+00	4.40E-03	0.00E+00	0.00E+00	1.02E-03	1.02E-03	1.37E-04	4.99E-03	6.14E-03	1.04E+00	<1	4.55E+00	<1
Barium	2.36E+02	2.71E+00	0.00E+00	0.00E+00	5.03E-03	5.03E-03	8.47E-02	2.06E-01	2.96E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	4.69E-05	--	4.69E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	ND	3.00E-03	--	--	--	0.00E+00	9.37E-05	--	9.37E-05	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	8.50E-04	--	8.50E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.84E-04	0.00E+00	4.84E-04	7.33E+00	<1	1.89E+01	<1
Copper	2.27E+01	1.83E-01	0.00E+00	0.00E+00	3.78E-01	3.78E-01	5.72E-03	1.99E-02	4.04E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.24E+01	3.52E-02	0.00E+00	0.00E+00	1.03E-01	1.03E-01	1.10E-03	1.08E-02	1.15E-01	4.70E+00	<1	1.86E+02	<1
Manganese	4.67E+02	3.75E+00	0.00E+00	0.00E+00	2.99E-01	2.99E-01	1.17E-01	4.09E-01	8.25E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	8.12E-06	--	8.12E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-03	0.00E+00	1.75E-03	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.25E-05	0.00E+00	6.25E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	3.30E-04	--	--	--	0.00E+00	1.03E-05	--	1.03E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.75E-04	0.00E+00	7.75E-04	4.16E+00	<1	9.44E+00	<1
Zinc	5.63E+01	5.37E-01	0.00E+00	0.00E+00	3.26E+00	3.26E+00	1.68E-02	4.93E-02	3.33E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.90E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-02	1.66E-03	1.35E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	7.00E-01	--	7.00E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	1.94E-05	--	1.94E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	2.91E-04	--	2.91E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	2.72E-05	--	2.72E-05				
Naphthalene	8.10E-01	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.72E-05	7.09E-04	7.36E-04				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	4.69E-05	--	4.69E-05				
Total LMW PAHs						0.00E+00	4.11E-04	7.09E-04	1.12E-03	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	9.37E-05	--	9.37E-05				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	3.12E-04	--	3.12E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	1.22E-04	--	1.22E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	1.44E-05	--	1.44E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	2.37E-04	--	2.37E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	3.06E-06	--	3.06E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	9.69E-05	--	9.69E-05				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	2.19E-04	--	2.19E-04				
Total HMW PAHs						0.00E+00	1.10E-03	0.00E+00	1.10E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	6.87E-04	--	6.87E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.40E-02	0.00E+00	0.00E+00	0.00E+00	1.96E-04	1.96E-04	0.00E+00	1.22E-05	2.09E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H7-6
Screening-Level Exposure Evaluation - Canada Lynx
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H7-7
Screening-Level Exposure Evaluation - Grizzly Bear
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate						
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.29E-01	0.00E+00	5.29E-01	No TRV	--	No TRV	--
Antimony	ND	7.70E-03	--	--	--	0.00E+00	0.00E+00	1.66E-04	--	1.66E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	5.70E+00	4.40E-03	3.00E-03	2.67E-03	7.05E-05	0.00E+00	5.75E-03	9.50E-05	3.45E-03	5.84E-03	1.04E+00	<1	4.55E+00	<1
Barium	2.36E+02	2.71E+00	5.17E-01	6.96E-02	3.48E-04	0.00E+00	5.87E-01	5.85E-02	1.43E-01	6.45E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	0.00E+00	3.24E-05	--	3.24E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	ND	3.00E-03	--	--	--	0.00E+00	0.00E+00	6.48E-05	--	6.48E-05	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	0.00E+00	5.87E-04	--	5.87E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-04	0.00E+00	3.35E-04	7.33E+00	<1	1.89E+01	<1
Copper	2.27E+01	1.83E-01	9.37E-02	3.79E-02	2.61E-02	0.00E+00	1.58E-01	3.95E-03	1.37E-02	1.62E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.24E+01	3.52E-02	1.53E-02	1.99E-02	7.09E-03	0.00E+00	4.22E-02	7.60E-04	7.50E-03	4.30E-02	4.70E+00	<1	1.86E+02	<1
Manganese	4.67E+02	3.75E+00	5.18E-01	9.54E-02	2.07E-02	0.00E+00	6.34E-01	8.10E-02	2.82E-01	7.15E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	0.00E+00	5.61E-06	--	5.61E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.21E-03	0.00E+00	1.21E-03	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.32E-05	0.00E+00	4.32E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	3.30E-04	--	--	--	0.00E+00	0.00E+00	7.13E-06	--	7.13E-06	4.80E-01	<1	1.43E+00	<1
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.36E-04	0.00E+00	5.36E-04	4.16E+00	<1	9.44E+00	<1
Zinc	5.63E+01	5.37E-01	6.33E-01	1.04E+00	2.25E-01	0.00E+00	1.90E+00	1.16E-02	3.40E-02	1.91E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	1.90E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.16E-03	1.15E-03	8.16E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	0.00E+00	4.84E-01	--	4.84E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	0.00E+00	1.34E-05	--	1.34E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	0.00E+00	2.01E-04	--	2.01E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	0.00E+00	1.88E-05	--	1.88E-05				
Naphthalene	8.10E-01	8.70E-04	1.39E-01	1.15E-02	0.00E+00	0.00E+00	1.50E-01	1.88E-05	4.90E-04	1.50E-01				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	0.00E+00	3.24E-05	--	3.24E-05				
Total LMW PAHs							1.50E-01	2.84E-04	4.90E-04	1.51E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	0.00E+00	6.48E-05	--	6.48E-05				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	0.00E+00	2.16E-04	--	2.16E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	0.00E+00	8.42E-05	--	8.42E-05				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	0.00E+00	9.93E-06	--	9.93E-06				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	0.00E+00	1.64E-04	--	1.64E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	0.00E+00	2.12E-06	--	2.12E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	0.00E+00	6.69E-05	--	6.69E-05				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	0.00E+00	1.51E-04	--	1.51E-04				
Total HMW PAHs							0.00E+00	7.59E-04	0.00E+00	7.59E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	0.00E+00	4.75E-04	--	4.75E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.40E-02	0.00E+00	1.60E-04	4.68E-04	1.36E-05	0.00E+00	6.41E-04	0.00E+00	8.47E-06	6.41E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H7-7
Screening-Level Exposure Evaluation - Grizzly Bear
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate						
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H7-8
Screening-Level Exposure Evaluation - Long-tailed Weasel
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E+00	0.00E+00	1.26E+00	No TRV	--	No TRV	--
Antimony	ND	7.70E-03	--	--	--	0.00E+00	3.96E-04	--	3.96E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	7.58E+00	4.40E-03	0.00E+00	0.00E+00	2.12E-03	2.12E-03	2.26E-04	6.24E-03	8.58E-03	1.04E+00	<1	4.55E+00	<1
Barium	1.84E+02	2.71E+00	0.00E+00	0.00E+00	6.45E-03	6.45E-03	1.39E-01	1.51E-01	2.97E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	7.72E-05	--	7.72E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	ND	3.00E-03	--	--	--	0.00E+00	1.54E-04	--	1.54E-04	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	1.40E-03	--	1.40E-03	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.98E-04	0.00E+00	7.98E-04	7.33E+00	<1	1.89E+01	<1
Copper	1.83E+01	1.83E-01	0.00E+00	0.00E+00	6.04E-01	6.04E-01	9.42E-03	1.51E-02	6.28E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.22E+01	3.52E-02	0.00E+00	0.00E+00	1.68E-01	1.68E-01	1.81E-03	1.00E-02	1.80E-01	4.70E+00	<1	1.86E+02	<1
Manganese	3.76E+02	3.75E+00	0.00E+00	0.00E+00	3.97E-01	3.97E-01	1.93E-01	3.10E-01	9.00E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	1.34E-05	--	1.34E-05	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.88E-03	0.00E+00	2.88E-03	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-04	0.00E+00	1.03E-04	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	3.30E-04	--	--	--	0.00E+00	1.70E-05	--	1.70E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-03	0.00E+00	1.28E-03	4.16E+00	<1	9.44E+00	<1
Zinc	4.86E+01	5.37E-01	0.00E+00	0.00E+00	5.31E+00	5.31E+00	2.76E-02	4.00E-02	5.38E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	3.25E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.95E-02	2.68E-03	2.21E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	1.15E+00	--	1.15E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	3.19E-05	--	3.19E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	4.79E-04	--	4.79E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	4.48E-05	--	4.48E-05				
Naphthalene	3.60E-01	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.48E-05	2.96E-04	3.41E-04				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	7.72E-05	--	7.72E-05				
Total LMW PAHs						0.00E+00	6.77E-04	2.96E-04	9.74E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	1.54E-04	--	1.54E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	5.15E-04	--	5.15E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	2.01E-04	--	2.01E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	2.37E-05	--	2.37E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	3.91E-04	--	3.91E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	5.04E-06	--	5.04E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	1.60E-04	--	1.60E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	3.60E-04	--	3.60E-04				
Total HMW PAHs						0.00E+00	1.81E-03	0.00E+00	1.81E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	1.13E-03	--	1.13E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	2.70E-02	0.00E+00	0.00E+00	0.00E+00	6.24E-04	6.24E-04	0.00E+00	2.22E-05	6.46E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H7-8
Screening-Level Exposure Evaluation - Long-tailed Weasel
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H7-9
Screening-Level Exposure Evaluation - Meadow Vole
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.68E+00	0.00E+00	3.68E+00	No TRV	--	No TRV	--
Antimony	ND	7.70E-03	--	--	--	0.00E+00	1.16E-03	--	1.16E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	7.58E+00	4.40E-03	4.27E-02	0.00E+00	0.00E+00	4.27E-02	6.61E-04	1.48E-02	5.82E-02	1.04E+00	<1	4.55E+00	<1
Barium	1.84E+02	2.71E+00	4.31E+00	0.00E+00	0.00E+00	4.31E+00	4.07E-01	3.59E-01	5.07E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	2.25E-04	--	2.25E-04	5.32E-01	<1	6.70E-01	<1
Cadmium	ND	3.00E-03	--	--	--	0.00E+00	4.51E-04	--	4.51E-04	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	4.09E-03	--	4.09E-03	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.33E-03	0.00E+00	2.33E-03	7.33E+00	<1	1.89E+01	<1
Copper	1.83E+01	1.83E-01	9.22E-01	0.00E+00	0.00E+00	9.22E-01	2.75E-02	3.58E-02	9.85E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.22E+01	3.52E-02	1.62E-01	0.00E+00	0.00E+00	1.62E-01	5.29E-03	2.38E-02	1.91E-01	4.70E+00	<1	1.86E+02	<1
Manganese	3.76E+02	3.75E+00	4.47E+00	0.00E+00	0.00E+00	4.47E+00	5.63E-01	7.35E-01	5.76E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	3.91E-05	--	3.91E-05	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.40E-03	0.00E+00	8.40E-03	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-04	0.00E+00	3.00E-04	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	3.30E-04	--	--	--	0.00E+00	4.96E-05	--	4.96E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.73E-03	0.00E+00	3.73E-03	4.16E+00	<1	9.44E+00	<1
Zinc	4.86E+01	5.37E-01	6.24E+00	0.00E+00	0.00E+00	6.24E+00	8.07E-02	9.49E-02	6.42E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	3.25E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.68E-02	6.35E-03	6.31E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	3.37E+00	--	3.37E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	9.31E-05	--	9.31E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.40E-03	--	1.40E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.31E-04	--	1.31E-04				
Naphthalene	3.60E-01	8.70E-04	6.60E-01	0.00E+00	0.00E+00	6.60E-01	1.31E-04	7.03E-04	6.61E-01				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	2.25E-04	--	2.25E-04				
Total LMW PAHs						6.60E-01	1.98E-03	7.03E-04	6.63E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	4.51E-04	--	4.51E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.50E-03	--	1.50E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	5.86E-04	--	5.86E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	6.91E-05	--	6.91E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	1.14E-03	--	1.14E-03				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.47E-05	--	1.47E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	4.66E-04	--	4.66E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	1.05E-03	--	1.05E-03				
Total HMW PAHs						0.00E+00	5.28E-03	0.00E+00	5.28E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	3.31E-03	--	3.31E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	2.70E-02	0.00E+00	3.30E-03	0.00E+00	0.00E+00	3.30E-03	0.00E+00	5.27E-05	3.36E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H7-9
Screening-Level Exposure Evaluation - Meadow Vole
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H7-10
Screening-Level Exposure Evaluation - North American Wolverine
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.36E-01	0.00E+00	7.36E-01	No TRV	--	No TRV	--
Antimony	ND	7.70E-03	--	--	--	0.00E+00	2.31E-04	--	2.31E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	7.58E+00	4.40E-03	0.00E+00	0.00E+00	1.24E-03	1.24E-03	1.32E-04	6.37E-03	7.74E-03	1.04E+00	<1	4.55E+00	<1
Barium	1.84E+02	2.71E+00	0.00E+00	0.00E+00	3.77E-03	3.77E-03	8.14E-02	1.55E-01	2.40E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	4.51E-05	--	4.51E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	ND	3.00E-03	--	--	--	0.00E+00	9.01E-05	--	9.01E-05	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	8.17E-04	--	8.17E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E-04	0.00E+00	4.66E-04	7.33E+00	<1	1.89E+01	<1
Copper	1.83E+01	1.83E-01	0.00E+00	0.00E+00	3.52E-01	3.52E-01	5.50E-03	1.54E-02	3.73E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.22E+01	3.52E-02	0.00E+00	0.00E+00	9.80E-02	9.80E-02	1.06E-03	1.03E-02	1.09E-01	4.70E+00	<1	1.86E+02	<1
Manganese	3.76E+02	3.75E+00	0.00E+00	0.00E+00	2.32E-01	2.32E-01	1.13E-01	3.17E-01	6.61E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	7.81E-06	--	7.81E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.68E-03	0.00E+00	1.68E-03	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.01E-05	0.00E+00	6.01E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	3.30E-04	--	--	--	0.00E+00	9.92E-06	--	9.92E-06	4.80E-01	<1	1.43E+00	<1
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.45E-04	0.00E+00	7.45E-04	4.16E+00	<1	9.44E+00	<1
Zinc	4.86E+01	5.37E-01	0.00E+00	0.00E+00	3.10E+00	3.10E+00	1.61E-02	4.09E-02	3.16E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	3.25E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-02	2.73E-03	1.41E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	6.73E-01	--	6.73E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	1.86E-05	--	1.86E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	2.79E-04	--	2.79E-04				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	2.61E-05	--	2.61E-05				
Naphthalene	3.60E-01	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.61E-05	3.03E-04	3.29E-04				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	4.51E-05	--	4.51E-05				
Total LMW PAHs						0.00E+00	3.95E-04	3.03E-04	6.98E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	9.01E-05	--	9.01E-05				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	3.00E-04	--	3.00E-04				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	1.17E-04	--	1.17E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	1.38E-05	--	1.38E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	2.28E-04	--	2.28E-04				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	2.94E-06	--	2.94E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	9.31E-05	--	9.31E-05				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	2.10E-04	--	2.10E-04				
Total HMW PAHs						0.00E+00	1.06E-03	0.00E+00	1.06E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	6.61E-04	--	6.61E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	2.70E-02	0.00E+00	0.00E+00	0.00E+00	3.64E-04	3.64E-04	0.00E+00	2.27E-05	3.87E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													

Table H7-10
Screening-Level Exposure Evaluation - North American Wolverine
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H7-11
Screening-Level Exposure Evaluation - Short-tailed Shrew
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.28E+00	0.00E+00	3.28E+00	No TRV	--	No TRV	--
Antimony	ND	7.70E-03	--	--	--	0.00E+00	1.03E-03	--	1.03E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	7.58E+00	4.40E-03	0.00E+00	1.35E-01	0.00E+00	1.35E-01	5.90E-04	1.12E-02	1.47E-01	1.04E+00	<1	4.55E+00	<1
Barium	1.84E+02	2.71E+00	0.00E+00	2.24E+00	0.00E+00	2.24E+00	3.63E-01	2.71E-01	2.87E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	1.50E-03	--	--	--	0.00E+00	2.01E-04	--	2.01E-04	5.32E-01	<1	6.70E-01	<1
Cadmium	ND	3.00E-03	--	--	--	0.00E+00	4.02E-04	--	4.02E-04	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.72E-02	--	--	--	0.00E+00	3.65E-03	--	3.65E-03	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.08E-03	0.00E+00	2.08E-03	7.33E+00	<1	1.89E+01	<1
Copper	1.83E+01	1.83E-01	0.00E+00	1.26E+00	0.00E+00	1.26E+00	2.45E-02	2.70E-02	1.32E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.22E+01	3.52E-02	0.00E+00	8.11E-01	0.00E+00	8.11E-01	4.72E-03	1.80E-02	8.34E-01	4.70E+00	<1	1.86E+02	<1
Manganese	3.76E+02	3.75E+00	0.00E+00	3.41E+00	0.00E+00	3.41E+00	5.03E-01	5.55E-01	4.46E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	2.60E-04	--	--	--	0.00E+00	3.48E-05	--	3.48E-05	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	5.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.49E-03	0.00E+00	7.49E-03	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.68E-04	0.00E+00	2.68E-04	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	3.30E-04	--	--	--	0.00E+00	4.42E-05	--	4.42E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.32E-03	0.00E+00	3.32E-03	4.16E+00	<1	9.44E+00	<1
Zinc	4.86E+01	5.37E-01	0.00E+00	4.10E+01	0.00E+00	4.10E+01	7.20E-02	7.16E-02	4.11E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	3.25E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.07E-02	4.79E-03	5.54E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	2.24E+01	--	--	--	0.00E+00	3.00E+00	--	3.00E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	6.20E-04	--	--	--	0.00E+00	8.31E-05	--	8.31E-05				
Fluoranthene	ND	9.30E-03	--	--	--	0.00E+00	1.25E-03	--	1.25E-03				
Fluorene	ND	8.70E-04	--	--	--	0.00E+00	1.17E-04	--	1.17E-04				
Naphthalene	3.60E-01	8.70E-04	0.00E+00	2.12E-01	0.00E+00	2.12E-01	1.17E-04	5.31E-04	2.13E-01				
Phenanthrene	ND	1.50E-03	--	--	--	0.00E+00	2.01E-04	--	2.01E-04				
Total LMW PAHs						2.12E-01	1.76E-03	5.31E-04	2.15E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	3.00E-03	--	--	--	0.00E+00	4.02E-04	--	4.02E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	1.00E-02	--	--	--	0.00E+00	1.34E-03	--	1.34E-03				
Benzo(g,h,i)perylene	ND	3.90E-03	--	--	--	0.00E+00	5.23E-04	--	5.23E-04				
Benzo(k)fluoranthene	ND	4.60E-04	--	--	--	0.00E+00	6.16E-05	--	6.16E-05				
Chrysene	ND	7.60E-03	--	--	--	0.00E+00	1.02E-03	--	1.02E-03				
Dibenz(A,H)Anthracene	ND	9.80E-05	--	--	--	0.00E+00	1.31E-05	--	1.31E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.10E-03	--	--	--	0.00E+00	4.15E-04	--	4.15E-04				
Pyrene	ND	7.00E-03	--	--	--	0.00E+00	9.38E-04	--	9.38E-04				
Total HMW PAHs						0.00E+00	4.71E-03	0.00E+00	4.71E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	2.20E-02	--	--	--	0.00E+00	2.95E-03	--	2.95E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	2.70E-02	0.00E+00	0.00E+00	3.73E-02	0.00E+00	3.73E-02	0.00E+00	3.98E-05	3.74E-02	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H7-11
Screening-Level Exposure Evaluation - Short-tailed Shrew
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H8-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North Percolation Pond (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	2.60E+00	Regression[a]	9.66E-02	USEPA (2007)	1.00E+00	2.60E+00	Assumption[c]	5.00E-02	1.30E-01	Baes et al. (1984)[e]
Arsenic	NA	2.64E+01	3.75E-02	9.91E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	2.44E+00	Sample et al. (1999)	Regression[f]	1.15E-01	Sample et al. (1998b)
Barium	NA	5.39E+02	1.56E-01	8.41E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	4.90E+01	Sample et al. (1998a)	6.83E-04	3.68E-01	Baes et al. (1984)[e]
Beryllium	NA	1.72E+01	Regression[a]	4.73E+00	USEPA (2007)	4.50E-02	7.74E-01	Sample et al. (1998a)	2.25E-03	3.87E-02	Baes et al. (1984)[e]
Cadmium	NA	8.30E+00	Regression[a]	1.97E+00	Bechtel-Jacobs (1998a)	Regression[d]	4.45E+01	Sample et al. (1999)	Regression[f]	7.73E-01	Sample et al. (1998b)
Chromium	NA	5.30E+01	4.10E-02	2.17E+00	Bechtel-Jacobs (1998a)[g]	3.06E-01	1.62E+01	Sample et al. (1998a)	Regression[f]	4.28E+00	Sample et al. (1998b)
Cobalt	NA	2.74E+01	7.50E-03	2.06E-01	Bechtel-Jacobs (1998a)[g]	1.22E-01	3.34E+00	Sample et al. (1998a)	Regression[f]	8.69E-01	Sample et al. (1998b)
Copper	NA	8.36E+01	Regression[a]	1.12E+01	Bechtel-Jacobs (1998a)	5.15E-01	4.31E+01	Sample et al. (1998a)	Regression[f]	1.46E+01	Sample et al. (1998b)
Lead	NA	2.38E+02	Regression[a]	5.71E+00	Bechtel-Jacobs (1998a)	Regression[d]	6.66E+01	Sample et al. (1999)	Regression[f]	1.21E+01	Sample et al. (1998b)
Manganese	NA	0.00E+00	7.90E-02	0.00E+00	Bechtel-Jacobs (1998a)[g]	Regression[d]	0.00E+00	Sample et al. (1999)	2.05E-02	0.00E+00	Sample et al. (1998b)[i]
Mercury	NA	1.20E-01	Regression[a]	1.17E-01	Bechtel-Jacobs (1998a)	3.93E+00	4.72E-01	Sample et al. (1998a)	3.81E-01	4.57E-02	LANL (2015)
Nickel	NA	1.25E+03	Regression[a]	2.24E+01	Bechtel-Jacobs (1998a)	7.78E-01	9.72E+02	Sample et al. (1998a)	Regression[f]	2.17E+01	Sample et al. (1998b)
Selenium	NA	3.40E+00	Regression[a]	1.96E+00	Bechtel-Jacobs (1998a)	Regression[d]	2.28E+00	Sample et al. (1998a)	Regression[f]	1.05E+00	Sample et al. (1998b)
Silver		ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	4.60E+00	4.00E-03	1.84E-02	Baes et al. (1984)	5.41E-02	2.49E-01	USCHPPM (2004)	1.08E-01	4.98E-01	Baes et al. (1984)[e]
Vanadium	NA	3.48E+02	4.85E-03	1.69E+00	Bechtel-Jacobs (1998a)[g]	4.20E-02	1.46E+01	Sample et al. (1998a)	1.23E-02	4.28E+00	Sample et al. (1998b)[i]
Zinc	NA	8.71E+02	Regression[a]	2.05E+02	Bechtel-Jacobs (1998a)	Regression[d]	7.88E+02	Sample et al. (1998a)	Regression[f]	1.27E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	1.37E+02	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	2.41E+02	6.00E-02	1.45E+01	Baes et al. (1984)	1.24E-01	2.99E+01	USCHPPM (2004)	1.60E-02	3.86E+00	LANL (2015)
Polycholrinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	1.90E+02	Regression[a]	4.31E-05	USEPA (2007a)	1.47E+00	2.79E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	2.50E+02	Regression[a]	2.74E+01	USEPA (2007a)	2.42E+00	6.05E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluoranthene	4.95	3.70E+03	5.00E-01	1.85E+03	USEPA (2007a)	3.04E+00	1.12E+04	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluorene	4.18	8.20E+01	Regression[a]	8.85E-05	USEPA (2007a)	9.57E+00	7.85E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Naphthalene	3.36	1.20E+01	1.22E+01	1.46E+02	USEPA (2007a)	4.40E+00	5.28E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]

Table H8-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North Percolation Pond (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Phenanthrene	4.55	1.30E+03	Regression[a]	7.23E+01	USEPA (2007a)	1.72E+00	2.24E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
LMW PAHs											
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	2.70E+03	Regression[a]	7.30E+00	USEPA (2007a)	1.59E+00	4.29E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	3.10E+03	Regression[a]	3.23E+02	USEPA (2007a)	1.33E+00	4.12E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	3.00E+03	3.10E-01	9.30E+02	USEPA (2007a)	2.60E+00	7.80E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	2.20E+03	Regression[a]	3.54E+03	USEPA (2007a)	2.94E+00	6.47E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	2.40E+03	Regression[a]	9.29E+01	USEPA (2007a)	2.60E+00	6.24E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Chrysene	5.7	2.80E+03	Regression[a]	7.46E+00	USEPA (2007a)	2.29E+00	6.41E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	7.40E+02	1.30E-01	9.62E+01	USEPA (2007a)	2.31E+00	1.71E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	2.00E+03	1.10E-01	2.20E+02	USEPA (2007a)	2.86E+00	5.72E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Pyrene	4.88	3.20E+03	7.20E-01	2.30E+03	USEPA (2007a)	1.75E+00	5.60E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
HMW PAHs											
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	1.80E-01	2.38E-02	4.28E-03	USEPA (2007a)	5.44E+01	9.79E+00	USEPA (2007a)	7.79E-01	1.40E-01	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	6.54E-01	0.00E+00	USEPA (2007a)	1.14E+01	0.00E+00	USEPA (2007a)	1.22E-01	0.00E+00	LANL (2015)
Dibenzofuran	3.71	2.80E+01	1.88E+00	5.26E+01	USEPA (2007a)	6.96E+00	1.95E+02	USEPA (2007a)	5.60E-02	1.57E+00	Calculated[j]
Di-n-butyl phthalate	4.61	ND	8.14E-01	0	USEPA (2007a)	1.03E+01	0	USEPA (2007a)	4.49E-01	0	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)

Table H8-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North Percolation Pond (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H8-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North Percolation Pond Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([diet$_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H8-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North Percolation Pond (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	2.45E+00	Regression[a]	9.14E-02	USEPA (2007)	1.00E+00	2.45E+00	Assumption[c]	5.00E-02	1.23E-01	Baes et al. (1984)[e]
Arsenic	NA	2.95E+01	3.75E-02	1.11E+00	Bechtel-Jacobs (1998a)[g]	Regression[d]	2.63E+00	Sample et al. (1999)	Regression[f]	1.25E-01	Sample et al. (1998b)
Barium	NA	1.23E+03	1.56E-01	1.93E+02	Bechtel-Jacobs (1998a)[g]	9.10E-02	1.12E+02	Sample et al. (1998a)	6.83E-04	8.43E-01	Baes et al. (1984)[e]
Beryllium	NA	1.29E+01	Regression[a]	3.82E+00	USEPA (2007)	4.50E-02	5.79E-01	Sample et al. (1998a)	2.25E-03	2.90E-02	Baes et al. (1984)[e]
Cadmium	NA	8.55E+00	Regression[a]	2.01E+00	Bechtel-Jacobs (1998a)	Regression[d]	4.56E+01	Sample et al. (1999)	Regression[f]	7.84E-01	Sample et al. (1998b)
Chromium	NA	4.73E+01	4.10E-02	1.94E+00	Bechtel-Jacobs (1998a)[g]	3.06E-01	1.45E+01	Sample et al. (1998a)	Regression[f]	3.94E+00	Sample et al. (1998b)
Cobalt	NA	1.58E+01	7.50E-03	1.19E-01	Bechtel-Jacobs (1998a)[g]	1.22E-01	1.93E+00	Sample et al. (1998a)	Regression[f]	4.24E-01	Sample et al. (1998b)
Copper	NA	3.93E+01	Regression[a]	8.28E+00	Bechtel-Jacobs (1998a)	5.15E-01	2.02E+01	Sample et al. (1998a)	Regression[f]	1.31E+01	Sample et al. (1998b)
Lead	NA	1.66E+02	Regression[a]	4.66E+00	Bechtel-Jacobs (1998a)	Regression[d]	4.97E+01	Sample et al. (1999)	Regression[f]	1.03E+01	Sample et al. (1998b)
Manganese	NA	0.00E+00	7.90E-02	0.00E+00	Bechtel-Jacobs (1998a)[g]	Regression[d]	0.00E+00	Sample et al. (1999)	2.05E-02	0.00E+00	Sample et al. (1998b)[i]
Mercury	NA	6.45E-02	Regression[a]	8.31E-02	Bechtel-Jacobs (1998a)	3.93E+00	2.53E-01	Sample et al. (1998a)	3.81E-01	2.46E-02	LANL (2015)
Nickel	NA	6.81E+02	Regression[a]	1.42E+01	Bechtel-Jacobs (1998a)	7.78E-01	5.29E+02	Sample et al. (1998a)	Regression[f]	1.63E+01	Sample et al. (1998b)
Selenium	NA	2.68E+00	Regression[a]	1.51E+00	Bechtel-Jacobs (1998a)	Regression[d]	1.91E+00	Sample et al. (1998a)	Regression[f]	9.56E-01	Sample et al. (1998b)
Silver		ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	3.57E+00	4.00E-03	1.43E-02	Baes et al. (1984)	5.41E-02	1.93E-01	USCHPPM (2004)	1.08E-01	3.86E-01	Baes et al. (1984)[e]
Vanadium	NA	1.81E+02	4.85E-03	8.79E-01	Bechtel-Jacobs (1998a)[g]	4.20E-02	7.61E+00	Sample et al. (1998a)	1.23E-02	2.23E+00	Sample et al. (1998b)[i]
Zinc	NA	5.89E+02	Regression[a]	1.65E+02	Bechtel-Jacobs (1998a)	Regression[d]	6.93E+02	Sample et al. (1998a)	Regression[f]	1.23E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	1.28E+02	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	2.73E+02	6.00E-02	1.64E+01	Baes et al. (1984)	1.24E-01	3.39E+01	USCHPPM (2004)	1.60E-02	4.37E+00	LANL (2015)
Polycholrinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	7.30E+01	Regression[a]	9.78E-05	USEPA (2007a)	1.47E+00	1.07E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	1.05E+02	Regression[a]	1.39E+01	USEPA (2007a)	2.42E+00	2.54E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluoranthene	4.95	1.45E+03	5.00E-01	7.25E+02	USEPA (2007a)	3.04E+00	4.41E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluorene	4.18	3.10E+01	Regression[a]	2.03E-04	USEPA (2007a)	9.57E+00	2.97E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Naphthalene	3.36	7.13E+00	1.22E+01	8.69E+01	USEPA (2007a)	4.40E+00	3.14E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]

Table H8-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North Percolation Pond (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Phenanthrene	4.55	4.98E+02	Regression[a]	3.99E+01	USEPA (2007a)	1.72E+00	8.56E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
LMW PAHs											
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	1.01E+03	Regression[a]	4.07E+00	USEPA (2007a)	1.59E+00	1.61E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	1.15E+03	Regression[a]	1.23E+02	USEPA (2007a)	1.33E+00	1.53E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	1.27E+03	3.10E-01	3.93E+02	USEPA (2007a)	2.60E+00	3.30E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	8.45E+02	Regression[a]	1.14E+03	USEPA (2007a)	2.94E+00	2.48E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	8.55E+02	Regression[a]	3.83E+01	USEPA (2007a)	2.60E+00	2.22E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Chrysene	5.7	1.00E+03	Regression[a]	4.05E+00	USEPA (2007a)	2.29E+00	2.30E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	2.95E+02	1.30E-01	3.84E+01	USEPA (2007a)	2.31E+00	6.81E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	7.75E+02	1.10E-01	8.53E+01	USEPA (2007a)	2.86E+00	2.22E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Pyrene	4.88	1.27E+03	7.20E-01	9.11E+02	USEPA (2007a)	1.75E+00	2.21E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
HMW PAHs											
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	4.58E+00	2.38E-02	1.09E-01	USEPA (2007a)	5.44E+01	2.49E+02	USEPA (2007a)	7.79E-01	3.56E+00	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	6.54E-01	0.00E+00	USEPA (2007a)	1.14E+01	0.00E+00	USEPA (2007a)	1.22E-01	0.00E+00	LANL (2015)
Dibenzofuran	3.71	1.39E+01	1.88E+00	2.61E+01	USEPA (2007a)	6.96E+00	9.67E+01	USEPA (2007a)	5.60E-02	7.79E-01	Calculated[j]
Di-n-butyl phthalate	4.61	ND	8.14E-01	0	USEPA (2007a)	1.03E+01	0	USEPA (2007a)	4.49E-01	0	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)

Table H8-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North Percolation Pond (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H8-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North Percolation Pond Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H8-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - North Percolation Pond
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Metals								
Aluminum	NA	8.63E+00	0.00E+00	NA	7.40E-02	---	0.00E+00	Stanley et al. (2010)
Antimony	NA	0.00E+00	2.60E+00	NA	5.75E-01	---	1.50E+00	Dovick et al. (2015)
Arsenic	NA	0.00E+00	2.64E+01	NA	3.73E-01	---	9.85E+00	Bechtel-Jacobs (1998b)[c]
Barium	NA	2.34E-01	5.39E+02	NA	2.82E+00	---	1.52E+03	Hamilton et al. (2002)
Beryllium	NA	7.10E-04	1.72E+01	NA	1.67E-01	---	2.87E+00	Hamilton et al. (2002)
Cadmium	NA	3.00E-03	8.30E+00	NA	4.59E-01	---	3.81E+00	Bechtel-Jacobs (1998b)[c]
Chromium	NA	0.00E+00	5.30E+01	NA	8.30E-02	---	4.40E+00	Bechtel-Jacobs (1998b)[c]
Cobalt		0.00E+00	0.00E+00					
Copper	NA	1.65E-02	8.36E+01	NA	6.61E-01	---	5.53E+01	Bechtel-Jacobs (1998b)[c]
Lead	NA	7.60E-03	2.38E+02	NA	8.00E-02	---	1.90E+01	Bechtel-Jacobs (1998b)[c]
Manganese		0.00E+00	0.00E+00					
Mercury	NA	0.00E+00	0.00E+00	NA	2.84E+00	---	0.00E+00	Bechtel-Jacobs (1998c)[c]
Nickel	NA	5.59E-02	1.25E+03	NA	1.34E-01	---	1.68E+02	Bechtel-Jacobs (1998b)[c]
Selenium	NA	0.00E+00	3.40E+00	NA	3.75E+00	---	1.28E+01	Hamilton et al. (2002)
Silver	NA	0.00E+00	1.00E+00	NA	1.80E-01	---	1.80E-01	Hirsch (1998)
Thallium	NA	0.00E+00	4.60E+00	NA	2.00E-02	---	9.20E-02	Turner et al. (2013)
Vanadium	NA	1.80E-02	3.48E+02	NA	2.50E-01	---	8.70E+01	Hamilton and Buhl (2002)
Zinc	NA	5.37E-01	8.71E+02	NA	8.40E-01	---	7.32E+02	Bechtel-Jacobs (1998b)[c]
Inorganics - Other Inorganics								
Cyanide	NA	7.60E-03	1.37E+02	NA	0.00E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	2.24E+01	0.00E+00	NA	---	Regression	1.37E+02	Derived based on Aguirre-Sierra et al. (2013)
Polycholrinated Biphenyls (PCBs)								
Aroclor 1248	6.34	0.00E+00	0.00E+00	5.74E-01	3.73E+00	---	0.00E+00	DiToro and McGrath (2000)
Aroclor 1254	6.98	0.00E+00	0.00E+00	5.43E-01	3.53E+00	---	0.00E+00	DiToro and McGrath (2000)
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)								
Low Molecular Weight (LMW) PAHs:								
Acenaphthene	4.01	0.00E+00	1.90E+02	7.04E-01	4.58E+00	---	8.70E+02	DiToro and McGrath (2000)
Acenaphthylene	3.22	0.00E+00	1.20E+00	7.54E-01	4.90E+00	---	5.88E+00	DiToro and McGrath (2000)
Anthracene	4.53	0.00E+00	2.50E+02	6.73E-01	4.37E+00	---	1.09E+03	DiToro and McGrath (2000)
Fluoranthene	5.08	0.00E+00	3.70E+03	6.41E-01	4.17E+00	---	1.54E+04	DiToro and McGrath (2000)
Fluorene	4.21	0.00E+00	8.20E+01	6.92E-01	4.50E+00	---	3.69E+02	DiToro and McGrath (2000)

Table H8-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - North Percolation Pond
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Naphthalene	3.36	0.00E+00	1.20E+01	7.45E-01	4.84E+00	---	5.81E+01	DiToro and McGrath (2000)
Phenanthrene	4.57	0.00E+00	1.30E+03	6.70E-01	4.36E+00	---	5.66E+03	DiToro and McGrath (2000)
Total LMW PAHs							2.35E+04	
High Molecular Weight (HMW) PAHs:								
Benzo(a)anthracene	6.71	3.00E-03	2.70E+03	5.56E-01	3.61E+00	---	9.76E+03	DiToro and McGrath (2000)
Benzo[A]Pyrene	6.11	3.90E-03	3.10E+03	5.86E-01	3.81E+00	---	1.18E+04	DiToro and McGrath (2000)
Benzo(b)fluoranthene	6.27	1.00E-02	3.00E+03	5.78E-01	3.76E+00	---	1.13E+04	DiToro and McGrath (2000)
Benzo(g,h,i)perylene	6.51	3.90E-03	2.20E+03	5.66E-01	3.68E+00	---	8.09E+03	DiToro and McGrath (2000)
Benzo(k)fluoranthene	6.29	0.00E+00	2.40E+03	5.77E-01	3.75E+00	---	9.00E+03	DiToro and McGrath (2000)
Chrysene	5.71	7.60E-03	2.80E+03	6.07E-01	3.94E+00	---	1.10E+04	DiToro and McGrath (2000)
Dibenz(A,H)Anthracene	6.71	0.00E+00	7.40E+02	5.56E-01	3.61E+00	---	2.67E+03	DiToro and McGrath (2000)
Indeno (1,2,3-CD) Pyrene	6.72	3.10E-03	2.00E+03	5.55E-01	3.61E+00	---	7.22E+03	DiToro and McGrath (2000)
Pyrene	4.92	7.00E-03	3.20E+03	6.50E-01	4.23E+00	---	1.35E+04	DiToro and McGrath (2000)
Total HMW PAHs							8.44E+04	
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs								
1,2,4,5-Tetrachlorobenzene		0.00E+00	0.00E+00					
2,3,4,6-Tetrachlorophenol	4.09	0.00E+00	0.00E+00	6.99E-01	4.54E+00	---	0.00E+00	DiToro and McGrath (2000)
2-Chloronaphthalene	3.81	0.00E+00	0.00E+00	7.16E-01	4.66E+00	---	0.00E+00	DiToro and McGrath (2000)
Biphenyl (Diphenyl)	3.76	0.00E+00	0.00E+00	7.20E-01	4.68E+00	---	0.00E+00	DiToro and McGrath (2000)
Bis(2-ethylhexyl)phthalate	8.39	0.00E+00	0.00E+00	4.80E-01	3.12E+00	---	0.00E+00	DiToro and McGrath (2000)
Butylbenzylphthalate		0.00E+00	0.00E+00					
Dibenzofuran	3.71	0.00E+00	0.00E+00	7.23E-01	4.70E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	6.68E-01	4.34E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-octyl phthalate	8.54	0.00E+00	0.00E+00	4.74E-01	3.08E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobenzene	5.86	0.00E+00	0.00E+00	5.99E-01	3.89E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobutadiene	4.72	0.00E+00	0.00E+00	6.62E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachloroethane		0.00E+00	0.00E+00					
Pentachlorophenol	4.74	0.00E+00	0.00E+00	6.61E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)
Volatile Organic Compounds (VOCs)								
Methylcyclohexane		0.00E+00	0.00E+00					
Dioxin/Furans								
2,3,7,8-TCDD		0.00E+00	0.00E+00					

Table H8-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - North Percolation Pond
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
1,2,3,7,8-PeCDD		0.00E+00	0.00E+00					
1,2,3,4,7,8-HxCDD		0.00E+00	0.00E+00					
1,2,3,6,7,8-HxCDD		0.00E+00	0.00E+00					
1,2,3,7,8,9-HxCDD		0.00E+00	0.00E+00					
1,2,3,4,6,7,8-HpCDD		0.00E+00	0.00E+00					
OCDD		0.00E+00	0.00E+00					
2,3,7,8-TCDF		0.00E+00	0.00E+00					
1,2,3,7,8-PeCDF		0.00E+00	0.00E+00					
2,3,4,7,8-PeCDF		0.00E+00	0.00E+00					
1,2,3,4,7,8-HxCDF		0.00E+00	0.00E+00					
1,2,3,6,7,8-HxCDF		0.00E+00	0.00E+00					
2,3,4,6,7,8-HxCDF		0.00E+00	0.00E+00					
1,2,3,7,8,9-HxCDF		0.00E+00	0.00E+00					
1,2,3,4,6,7,8-HpCDF		0.00E+00	0.00E+00					
1,2,3,4,7,8,9-HpCDF		0.00E+00	0.00E+00					
OCDF		0.00E+00	0.00E+00					

Notes:
NA, Normalized BSAF was not applicable for metals
a, Normalized BSAF (kg OC / kg lipid) calculated based on K_{ow}, where BSAF = $K_{ow}^{-0.038}$ (DiToro and McGrath 2000)
b, For non-ionic organic constituents, dry weight BSAF calculated from sediment organic carbon and lipid normalized BSAF as follows:

$$BSAF_{dry\ weight} = BSAF_{norm} \times f_{lip;id} \times \frac{1}{f_{oc}}$$

where: $BSAF_{norm}$ = Normalized BSAF (kg OC/kg lipid)
f_{lipid} = Fraction of lipids in prey item expressed on a dry weight basis (0.065, invertebrates; 0.08, fish)
f_{oc} = Fraction of sediment organic carbon expressed on a dry weight basis (0.01 or 1%)
c, Median BSAF for non-depurated invertebrates determined by Bechtel-Jacobs (1998b)

Table H8-3
Screening-Level Exposure Evaluation - American Dipper
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals												
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	1.43E+00	0.00E+00	1.43E+00	1.10E+02	<1	1.10E+03	<1
Antimony	2.60E+00	0.00E+00	2.48E-01	0.00E+00	2.48E-01	0.00E+00	8.63E-03	2.57E-01	No TRV	--	No TRV	--
Arsenic	2.64E+01	0.00E+00	1.63E+00	0.00E+00	1.63E+00	0.00E+00	8.76E-02	1.72E+00	2.24E+00	<1	4.51E+00	<1
Barium	5.39E+02	2.34E-01	2.52E+02	0.00E+00	2.52E+02	3.88E-02	1.79E+00	2.54E+02	7.35E+01	3.46E+00	1.31E+02	1.94E+00
Beryllium	1.72E+01	7.10E-04	4.77E-01	0.00E+00	4.77E-01	1.18E-04	5.71E-02	5.34E-01	No TRV	--	No TRV	--
Cadmium	8.30E+00	3.00E-03	6.32E-01	0.00E+00	6.32E-01	4.98E-04	2.75E-02	6.60E-01	1.47E+00	<1	6.35E+00	<1
Chromium	5.30E+01	0.00E+00	7.30E-01	0.00E+00	7.30E-01	0.00E+00	1.76E-01	9.06E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	8.36E+01	1.65E-02	9.17E+00	0.00E+00	9.17E+00	2.74E-03	2.77E-01	9.45E+00	4.05E+00	2.33E+00	3.48E+01	<1
Lead	2.38E+02	7.60E-03	3.16E+00	0.00E+00	3.16E+00	1.26E-03	7.90E-01	3.95E+00	1.63E+00	2.42E+00	4.46E+01	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E+02	--	3.77E+02	--
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	1.25E+03	5.59E-02	2.78E+01	0.00E+00	2.78E+01	9.28E-03	4.15E+00	3.20E+01	6.71E+00	4.76E+00	1.86E+01	1.72E+00
Selenium	3.40E+00	0.00E+00	2.12E+00	0.00E+00	2.12E+00	0.00E+00	1.13E-02	2.13E+00	2.90E-01	7.33E+00	8.20E-01	2.59E+00
Silver	1.00E+00	0.00E+00	2.99E-02	0.00E+00	2.99E-02	0.00E+00	3.32E-03	3.32E-02	2.02E+00	<1	6.05E+01	<1
Thallium	4.60E+00	0.00E+00	1.53E-02	0.00E+00	1.53E-02	0.00E+00	1.53E-02	3.05E-02	3.50E-01	<1	3.50E+00	<1
Vanadium	3.48E+02	1.80E-02	1.44E+01	0.00E+00	1.44E+01	2.99E-03	1.15E+00	1.56E+01	3.44E-01	4.53E+01	1.70E+00	9.17E+00
Zinc	8.71E+02	5.37E-01	1.21E+02	0.00E+00	1.21E+02	8.91E-02	2.89E+00	1.24E+02	6.61E+01	1.88E+00	1.71E+02	<1
Inorganics - Other Inorganics												
Cyanide	1.37E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	1.26E-03	4.55E-01	4.56E-01	4.00E-02	1.14E+01	4.00E-01	1.14E+00
Fluoride	0.00E+00	2.24E+01	2.27E+01	0.00E+00	2.27E+01	3.72E+00	0.00E+00	2.65E+01	1.22E+01	2.17E+00	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	1.90E+02	0.00E+00	1.44E+02	0.00E+00	1.44E+02	0.00E+00	6.31E-01	1.45E+02				
Acenaphthylene	1.20E+00	0.00E+00	9.76E-01	0.00E+00	9.76E-01	0.00E+00	3.98E-03	9.80E-01				
Anthracene	2.50E+02	0.00E+00	1.81E+02	0.00E+00	1.81E+02	0.00E+00	8.30E-01	1.82E+02				
Fluoranthene	3.70E+03	0.00E+00	2.56E+03	0.00E+00	2.56E+03	0.00E+00	1.23E+01	2.57E+03				
Fluorene	8.20E+01	0.00E+00	6.12E+01	0.00E+00	6.12E+01	0.00E+00	2.72E-01	6.15E+01				
Naphthalene	1.20E+01	0.00E+00	9.65E+00	0.00E+00	9.65E+00	0.00E+00	3.98E-02	9.69E+00				
Phenanthrene	1.30E+03	0.00E+00	9.40E+02	0.00E+00	9.40E+02	0.00E+00	4.31E+00	9.44E+02				
Total LMW PAHs					3.90E+03	0.00E+00	1.84E+01	3.91E+03	1.61E+01	2.43E+02	1.61E+02	2.43E+01
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	2.70E+03	3.00E-03	1.62E+03	0.00E+00	1.62E+03	4.98E-04	8.96E+00	1.63E+03				
Benzo[A]Pyrene	3.10E+03	3.90E-03	1.96E+03	0.00E+00	1.96E+03	6.47E-04	1.03E+01	1.97E+03				
Benzo(b)fluoranthene	3.00E+03	1.00E-02	1.87E+03	0.00E+00	1.87E+03	1.66E-03	9.96E+00	1.88E+03				
Benzo(g,h,i)perylene	2.20E+03	3.90E-03	1.34E+03	0.00E+00	1.34E+03	6.47E-04	7.30E+00	1.35E+03				
Benzo(k)fluoranthene	2.40E+03	0.00E+00	1.49E+03	0.00E+00	1.49E+03	0.00E+00	7.96E+00	1.50E+03				
Chrysene	2.80E+03	7.60E-03	1.83E+03	0.00E+00	1.83E+03	1.26E-03	9.29E+00	1.84E+03				
Dibenz(A,H)Anthracene	7.40E+02	0.00E+00	4.44E+02	0.00E+00	4.44E+02	0.00E+00	2.46E+00	4.46E+02				
Indeno (1,2,3-CD) Pyrene	2.00E+03	3.10E-03	1.20E+03	0.00E+00	1.20E+03	5.14E-04	6.64E+00	1.20E+03				
Pyrene	3.20E+03	7.00E-03	2.24E+03	0.00E+00	2.24E+03	1.16E-03	1.06E+01	2.25E+03				
Total HMW PAHs					1.40E+04	6.39E-03	7.35E+01	1.41E+04	2.00E+00	7.04E+03	2.00E+01	7.04E+02
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H8-3
Screening-Level Exposure Evaluation - American Dipper
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H8-4
Screening-Level Exposure Evaluation - American Woodcock
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E+00	0.00E+00	1.01E+00	1.10E+02	<1	1.10E+03	<1
Antimony	2.60E+00	0.00E+00	1.14E-03	2.75E-01	0.00E+00	2.76E-01	0.00E+00	2.29E-02	2.99E-01	No TRV	--	No TRV	--
Arsenic	2.64E+01	0.00E+00	1.16E-02	2.57E-01	0.00E+00	2.69E-01	0.00E+00	2.33E-01	5.02E-01	2.24E+00	<1	4.51E+00	<1
Barium	5.39E+02	2.34E-01	9.88E-01	5.19E+00	0.00E+00	6.17E+00	2.75E-02	4.75E+00	1.10E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	1.72E+01	7.10E-04	5.55E-02	8.18E-02	0.00E+00	1.37E-01	8.34E-05	1.52E-01	2.89E-01	No TRV	--	No TRV	--
Cadmium	8.30E+00	3.00E-03	2.32E-02	4.71E+00	0.00E+00	4.73E+00	3.52E-04	7.31E-02	4.81E+00	1.47E+00	3.27E+00	6.35E+00	<1
Chromium	5.30E+01	0.00E+00	2.55E-02	1.71E+00	0.00E+00	1.74E+00	0.00E+00	4.67E-01	2.21E+00	2.66E+00	<1	1.56E+01	<1
Cobalt	2.74E+01	0.00E+00	2.41E-03	3.53E-01	0.00E+00	3.56E-01	0.00E+00	2.41E-01	5.97E-01	7.61E+00	<1	2.02E+01	<1
Copper	8.36E+01	1.65E-02	1.31E-01	4.55E+00	0.00E+00	4.68E+00	1.94E-03	7.37E-01	5.42E+00	4.05E+00	1.34E+00	3.48E+01	<1
Lead	2.38E+02	7.60E-03	6.71E-02	7.04E+00	0.00E+00	7.10E+00	8.93E-04	2.10E+00	9.20E+00	1.63E+00	5.65E+00	4.46E+01	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E+02	--	3.77E+02	--
Mercury	1.20E-01	0.00E+00	1.37E-03	4.99E-02	0.00E+00	5.12E-02	0.00E+00	1.06E-03	5.23E-02	4.50E-01	<1	9.10E-01	<1
Nickel	1.25E+03	5.59E-02	2.64E-01	1.03E+02	0.00E+00	1.03E+02	6.57E-03	1.10E+01	1.14E+02	6.71E+00	1.70E+01	1.86E+01	6.13E+00
Selenium	3.40E+00	0.00E+00	2.31E-02	2.41E-01	0.00E+00	2.64E-01	0.00E+00	3.00E-02	2.94E-01	2.90E-01	1.01E+00	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	4.60E+00	0.00E+00	2.16E-04	2.63E-02	0.00E+00	2.65E-02	0.00E+00	4.05E-02	6.71E-02	3.50E-01	<1	3.50E+00	<1
Vanadium	3.48E+02	1.80E-02	1.98E-02	1.55E+00	0.00E+00	1.57E+00	2.11E-03	3.07E+00	4.63E+00	3.44E-01	1.35E+01	1.70E+00	2.73E+00
Zinc	8.71E+02	5.37E-01	2.41E+00	8.33E+01	0.00E+00	8.57E+01	6.31E-02	7.67E+00	9.35E+01	6.61E+01	1.41E+00	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.37E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.93E-04	1.21E+00	1.21E+00	4.00E-02	3.02E+01	4.00E-01	3.02E+00
Fluoride	2.41E+02	2.24E+01	1.70E-01	3.16E+00	0.00E+00	3.33E+00	2.63E+00	2.12E+00	8.08E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.90E+02	0.00E+00	5.07E-07	2.95E+01	0.00E+00	2.95E+01	0.00E+00	1.67E+00	3.12E+01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	2.50E+02	0.00E+00	3.21E-01	6.40E+01	0.00E+00	6.43E+01	0.00E+00	2.20E+00	6.65E+01				
Fluoranthene	3.70E+03	0.00E+00	2.17E+01	1.19E+03	0.00E+00	1.21E+03	0.00E+00	3.26E+01	1.24E+03				
Fluorene	8.20E+01	0.00E+00	1.04E-06	8.30E+01	0.00E+00	8.30E+01	0.00E+00	7.23E-01	8.37E+01				
Naphthalene	1.20E+01	0.00E+00	1.72E+00	5.58E+00	0.00E+00	7.30E+00	0.00E+00	1.06E-01	7.41E+00				
Phenanthrene	1.30E+03	0.00E+00	8.50E-01	2.36E+02	0.00E+00	2.37E+02	0.00E+00	1.15E+01	2.49E+02				
Total LMW PAHs						1.63E+03	0.00E+00	4.88E+01	1.68E+03	1.61E+01	1.04E+02	1.61E+02	1.04E+01
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	2.70E+03	3.00E-03	8.58E-02	4.54E+02	0.00E+00	4.54E+02	3.52E-04	2.38E+01	4.78E+02				
Benzo[A]Pyrene	3.10E+03	3.90E-03	3.79E+00	4.36E+02	0.00E+00	4.40E+02	4.58E-04	2.73E+01	4.67E+02				
Benzo(b)fluoranthene	3.00E+03	1.00E-02	1.09E+01	8.25E+02	0.00E+00	8.36E+02	1.17E-03	2.64E+01	8.62E+02				
Benzo(g,h,i)perylene	2.20E+03	3.90E-03	4.16E+01	6.84E+02	0.00E+00	7.25E+02	4.58E-04	1.94E+01	7.45E+02				
Benzo(k)fluoranthene	2.40E+03	0.00E+00	1.09E+00	6.60E+02	0.00E+00	6.61E+02	0.00E+00	2.11E+01	6.82E+02				
Chrysene	2.80E+03	7.60E-03	8.77E-02	6.78E+02	0.00E+00	6.78E+02	8.93E-04	2.47E+01	7.03E+02				
Dibenz(A,H)Anthracene	7.40E+02	0.00E+00	1.13E+00	1.81E+02	0.00E+00	1.82E+02	0.00E+00	6.52E+00	1.88E+02				
Indeno (1,2,3-CD) Pyrene	2.00E+03	3.10E-03	2.58E+00	6.05E+02	0.00E+00	6.07E+02	3.64E-04	1.76E+01	6.25E+02				
Pyrene	3.20E+03	7.00E-03	2.71E+01	5.92E+02	0.00E+00	6.19E+02	8.22E-04	2.82E+01	6.47E+02				
Total HMW PAHs						5.20E+03	4.52E-03	1.95E+02	5.40E+03	2.00E+00	2.70E+03	2.00E+01	2.70E+02
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.80E-01	0.00E+00	5.03E-05	1.04E+00	0.00E+00	1.04E+00	0.00E+00	1.59E-03	1.04E+00	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	2.80E+01	0.00E+00	6.18E-01	2.06E+01	0.00E+00	2.12E+01	0.00E+00	2.47E-01	2.15E+01	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H8-4
Screening-Level Exposure Evaluation - American Woodcock
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H8-5
Screening-Level Exposure Evaluation - Belted Kingfisher
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals												
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	1.36E+00	0.00E+00	1.36E+00	1.10E+02	<1	1.10E+03	<1
Antimony	2.60E+00	0.00E+00	2.36E-02	0.00E+00	2.36E-02	0.00E+00	0.00E+00	2.36E-02	No TRV	--	No TRV	--
Arsenic	2.64E+01	0.00E+00	1.55E-01	0.00E+00	1.55E-01	0.00E+00	0.00E+00	1.55E-01	2.24E+00	<1	4.51E+00	<1
Barium	5.39E+02	2.34E-01	2.40E+01	0.00E+00	2.40E+01	3.69E-02	0.00E+00	2.40E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	1.72E+01	7.10E-04	4.53E-02	0.00E+00	4.53E-02	1.12E-04	0.00E+00	4.54E-02	No TRV	--	No TRV	--
Cadmium	8.30E+00	3.00E-03	6.00E-02	0.00E+00	6.00E-02	4.73E-04	0.00E+00	6.05E-02	1.47E+00	<1	6.35E+00	<1
Chromium	5.30E+01	0.00E+00	6.93E-02	0.00E+00	6.93E-02	0.00E+00	0.00E+00	6.93E-02	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	8.36E+01	1.65E-02	8.71E-01	0.00E+00	8.71E-01	2.60E-03	0.00E+00	8.73E-01	4.05E+00	<1	3.48E+01	<1
Lead	2.38E+02	7.60E-03	3.00E-01	0.00E+00	3.00E-01	1.20E-03	0.00E+00	3.01E-01	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E+02	--	3.77E+02	--
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	1.25E+03	5.59E-02	2.64E+00	0.00E+00	2.64E+00	8.81E-03	0.00E+00	2.65E+00	6.71E+00	<1	1.86E+01	<1
Selenium	3.40E+00	0.00E+00	2.01E-01	0.00E+00	2.01E-01	0.00E+00	0.00E+00	2.01E-01	2.90E-01	<1	8.20E-01	<1
Silver	1.00E+00	0.00E+00	2.84E-03	0.00E+00	2.84E-03	0.00E+00	0.00E+00	2.84E-03	2.02E+00	<1	6.05E+01	<1
Thallium	4.60E+00	0.00E+00	1.45E-03	0.00E+00	1.45E-03	0.00E+00	0.00E+00	1.45E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	3.48E+02	1.80E-02	1.37E+00	0.00E+00	1.37E+00	2.84E-03	0.00E+00	1.37E+00	3.44E-01	3.99E+00	1.70E+00	<1
Zinc	8.71E+02	5.37E-01	1.15E+01	0.00E+00	1.15E+01	8.46E-02	0.00E+00	1.16E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics												
Cyanide	1.37E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	1.20E-03	0.00E+00	1.20E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	0.00E+00	2.24E+01	2.16E+00	0.00E+00	2.16E+00	3.53E+00	0.00E+00	5.69E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	1.90E+02	0.00E+00	1.37E+01	0.00E+00	1.37E+01	0.00E+00	0.00E+00	1.37E+01				
Acenaphthylene	1.20E+00	0.00E+00	9.27E-02	0.00E+00	9.27E-02	0.00E+00	0.00E+00	9.27E-02				
Anthracene	2.50E+02	0.00E+00	1.72E+01	0.00E+00	1.72E+01	0.00E+00	0.00E+00	1.72E+01				
Fluoranthene	3.70E+03	0.00E+00	2.43E+02	0.00E+00	2.43E+02	0.00E+00	0.00E+00	2.43E+02				
Fluorene	8.20E+01	0.00E+00	5.81E+00	0.00E+00	5.81E+00	0.00E+00	0.00E+00	5.81E+00				
Naphthalene	1.20E+01	0.00E+00	9.16E-01	0.00E+00	9.16E-01	0.00E+00	0.00E+00	9.16E-01				
Phenanthrene	1.30E+03	0.00E+00	8.93E+01	0.00E+00	8.93E+01	0.00E+00	0.00E+00	8.93E+01				
Total LMW PAHs					3.70E+02	0.00E+00	0.00E+00	3.70E+02	1.61E+01	2.30E+01	1.61E+02	2.30E+00
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	2.70E+03	3.00E-03	1.54E+02	0.00E+00	1.54E+02	4.73E-04	0.00E+00	1.54E+02				
Benzo[A]Pyrene	3.10E+03	3.90E-03	1.86E+02	0.00E+00	1.86E+02	6.15E-04	0.00E+00	1.86E+02				
Benzo(b)fluoranthene	3.00E+03	1.00E-02	1.78E+02	0.00E+00	1.78E+02	1.58E-03	0.00E+00	1.78E+02				
Benzo(g,h,i)perylene	2.20E+03	3.90E-03	1.27E+02	0.00E+00	1.27E+02	6.15E-04	0.00E+00	1.27E+02				
Benzo(k)fluoranthene	2.40E+03	0.00E+00	1.42E+02	0.00E+00	1.42E+02	0.00E+00	0.00E+00	1.42E+02				
Chrysene	2.80E+03	7.60E-03	1.74E+02	0.00E+00	1.74E+02	1.20E-03	0.00E+00	1.74E+02				
Dibenz(A,H)Anthracene	7.40E+02	0.00E+00	4.21E+01	0.00E+00	4.21E+01	0.00E+00	0.00E+00	4.21E+01				
Indeno (1,2,3-CD) Pyrene	2.00E+03	3.10E-03	1.14E+02	0.00E+00	1.14E+02	4.89E-04	0.00E+00	1.14E+02				
Pyrene	3.20E+03	7.00E-03	2.13E+02	0.00E+00	2.13E+02	1.10E-03	0.00E+00	2.13E+02				
Total HMW PAHs					1.33E+03	6.07E-03	0.00E+00	1.33E+03	2.00E+00	6.65E+02	2.00E+01	6.65E+01
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H8-5
Screening-Level Exposure Evaluation - Belted Kingfisher
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H8-6
Screening-Level Exposure Evaluation - Mourning Dove
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.85E-01	0.00E+00	9.85E-01	1.10E+02	<1	1.10E+03	<1
Antimony	2.60E+00	0.00E+00	1.10E-02	0.00E+00	0.00E+00	1.10E-02	0.00E+00	2.02E-02	3.12E-02	No TRV	--	No TRV	--
Arsenic	2.64E+01	0.00E+00	1.13E-01	0.00E+00	0.00E+00	1.13E-01	0.00E+00	2.05E-01	3.18E-01	2.24E+00	<1	4.51E+00	<1
Barium	5.39E+02	2.34E-01	9.60E+00	0.00E+00	0.00E+00	9.60E+00	2.67E-02	4.18E+00	1.38E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	1.72E+01	7.10E-04	5.40E-01	0.00E+00	0.00E+00	5.40E-01	8.10E-05	1.33E-01	6.73E-01	No TRV	--	No TRV	--
Cadmium	8.30E+00	3.00E-03	2.25E-01	0.00E+00	0.00E+00	2.25E-01	3.42E-04	6.44E-02	2.90E-01	1.47E+00	<1	6.35E+00	<1
Chromium	5.30E+01	0.00E+00	2.48E-01	0.00E+00	0.00E+00	2.48E-01	0.00E+00	4.11E-01	6.59E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	2.74E+01	0.00E+00	2.35E-02	0.00E+00	0.00E+00	2.35E-02	0.00E+00	2.13E-01	2.36E-01	7.61E+00	<1	2.02E+01	<1
Copper	8.36E+01	1.65E-02	1.27E+00	0.00E+00	0.00E+00	1.27E+00	1.88E-03	6.49E-01	1.92E+00	4.05E+00	<1	3.48E+01	<1
Lead	2.38E+02	7.60E-03	6.52E-01	0.00E+00	0.00E+00	6.52E-01	8.67E-04	1.85E+00	2.50E+00	1.63E+00	1.53E+00	4.46E+01	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E+02	--	3.77E+02	--
Mercury	1.20E-01	0.00E+00	1.33E-02	0.00E+00	0.00E+00	1.33E-02	0.00E+00	9.31E-04	1.42E-02	4.50E-01	<1	9.10E-01	<1
Nickel	1.25E+03	5.59E-02	2.56E+00	0.00E+00	0.00E+00	2.56E+00	6.38E-03	9.70E+00	1.23E+01	6.71E+00	1.83E+00	1.86E+01	<1
Selenium	3.40E+00	0.00E+00	2.24E-01	0.00E+00	0.00E+00	2.24E-01	0.00E+00	2.64E-02	2.50E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	4.60E+00	0.00E+00	2.10E-03	0.00E+00	0.00E+00	2.10E-03	0.00E+00	3.57E-02	3.78E-02	3.50E-01	<1	3.50E+00	<1
Vanadium	3.48E+02	1.80E-02	1.93E-01	0.00E+00	0.00E+00	1.93E-01	2.05E-03	2.70E+00	2.90E+00	3.44E-01	8.42E+00	1.70E+00	1.70E+00
Zinc	8.71E+02	5.37E-01	2.35E+01	0.00E+00	0.00E+00	2.35E+01	6.13E-02	6.76E+00	3.03E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.37E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.67E-04	1.06E+00	1.06E+00	4.00E-02	2.66E+01	4.00E-01	2.66E+00
Fluoride	2.41E+02	2.24E+01	1.65E+00	0.00E+00	0.00E+00	1.65E+00	2.56E+00	1.87E+00	6.08E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.90E+02	0.00E+00	4.92E-06	0.00E+00	0.00E+00	4.92E-06	0.00E+00	1.47E+00	1.47E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	2.50E+02	0.00E+00	3.12E+00	0.00E+00	0.00E+00	3.12E+00	0.00E+00	1.94E+00	5.06E+00				
Fluoranthene	3.70E+03	0.00E+00	2.11E+02	0.00E+00	0.00E+00	2.11E+02	0.00E+00	2.87E+01	2.40E+02				
Fluorene	8.20E+01	0.00E+00	1.01E-05	0.00E+00	0.00E+00	1.01E-05	0.00E+00	6.36E-01	6.36E-01				
Naphthalene	1.20E+01	0.00E+00	1.67E+01	0.00E+00	0.00E+00	1.67E+01	0.00E+00	9.31E-02	1.68E+01				
Phenanthrene	1.30E+03	0.00E+00	8.25E+00	0.00E+00	0.00E+00	8.25E+00	0.00E+00	1.01E+01	1.83E+01				
Total LMW PAHs						2.39E+02	0.00E+00	4.30E+01	2.82E+02	1.61E+01	1.75E+01	1.61E+02	1.75E+00
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	2.70E+03	3.00E-03	8.34E-01	0.00E+00	0.00E+00	8.34E-01	3.42E-04	2.10E+01	2.18E+01				
Benzo[A]Pyrene	3.10E+03	3.90E-03	3.68E+01	0.00E+00	0.00E+00	3.68E+01	4.45E-04	2.41E+01	6.09E+01				
Benzo(b)fluoranthene	3.00E+03	1.00E-02	1.06E+02	0.00E+00	0.00E+00	1.06E+02	1.14E-03	2.33E+01	1.29E+02				
Benzo(g,h,i)perylene	2.20E+03	3.90E-03	4.04E+02	0.00E+00	0.00E+00	4.04E+02	4.45E-04	1.71E+01	4.21E+02				
Benzo(k)fluoranthene	2.40E+03	0.00E+00	1.06E+01	0.00E+00	0.00E+00	1.06E+01	0.00E+00	1.86E+01	2.92E+01				
Chrysene	2.80E+03	7.60E-03	8.52E-01	0.00E+00	0.00E+00	8.52E-01	8.67E-04	2.17E+01	2.26E+01				
Dibenz(A,H)Anthracene	7.40E+02	0.00E+00	1.10E+01	0.00E+00	0.00E+00	1.10E+01	0.00E+00	5.74E+00	1.67E+01				
Indeno (1,2,3-CD) Pyrene	2.00E+03	3.10E-03	2.51E+01	0.00E+00	0.00E+00	2.51E+01	3.54E-04	1.55E+01	4.06E+01				
Pyrene	3.20E+03	7.00E-03	2.63E+02	0.00E+00	0.00E+00	2.63E+02	7.99E-04	2.48E+01	2.88E+02				
Total HMW PAHs						8.59E+02	4.39E-03	1.72E+02	1.03E+03	2.00E+00	5.15E+02	2.00E+01	5.15E+01
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.80E-01	0.00E+00	4.89E-04	0.00E+00	0.00E+00	4.89E-04	0.00E+00	1.40E-03	1.89E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	2.80E+01	0.00E+00	6.01E+00	0.00E+00	0.00E+00	6.01E+00	0.00E+00	2.17E-01	6.22E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H8-6
Screening-Level Exposure Evaluation - Mourning Dove
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H8-7
Screening-Level Exposure Evaluation - Red-tailed Hawk
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.08E-01	0.00E+00	7.08E-01	1.10E+02	<1	1.10E+03	<1
Antimony	2.60E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-02	1.07E-02	0.00E+00	5.54E-03	1.62E-02	No TRV	--	No TRV	--
Arsenic	2.64E+01	0.00E+00	0.00E+00	0.00E+00	9.39E-03	9.39E-03	0.00E+00	5.63E-02	6.57E-02	2.24E+00	<1	4.51E+00	<1
Barium	5.39E+02	2.34E-01	0.00E+00	0.00E+00	3.02E-02	3.02E-02	1.92E-02	1.15E+00	1.20E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	1.72E+01	7.10E-04	0.00E+00	0.00E+00	3.17E-03	3.17E-03	5.82E-05	3.67E-02	3.99E-02	No TRV	--	No TRV	--
Cadmium	8.30E+00	3.00E-03	0.00E+00	0.00E+00	6.34E-02	6.34E-02	2.46E-04	1.77E-02	8.13E-02	1.47E+00	<1	6.35E+00	<1
Chromium	5.30E+01	0.00E+00	0.00E+00	0.00E+00	3.51E-01	3.51E-01	0.00E+00	1.13E-01	4.64E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	2.74E+01	0.00E+00	0.00E+00	0.00E+00	7.13E-02	7.13E-02	0.00E+00	5.84E-02	1.30E-01	7.61E+00	<1	2.02E+01	<1
Copper	8.36E+01	1.65E-02	0.00E+00	0.00E+00	1.20E+00	1.20E+00	1.35E-03	1.78E-01	1.38E+00	4.05E+00	<1	3.48E+01	<1
Lead	2.38E+02	7.60E-03	0.00E+00	0.00E+00	9.95E-01	9.95E-01	6.23E-04	5.07E-01	1.50E+00	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E+02	--	3.77E+02	--
Mercury	1.20E-01	0.00E+00	0.00E+00	0.00E+00	3.75E-03	3.75E-03	0.00E+00	2.56E-04	4.01E-03	4.50E-01	<1	9.10E-01	<1
Nickel	1.25E+03	5.59E-02	0.00E+00	0.00E+00	1.78E+00	1.78E+00	4.58E-03	2.67E+00	4.45E+00	6.71E+00	<1	1.86E+01	<1
Selenium	3.40E+00	0.00E+00	0.00E+00	0.00E+00	8.58E-02	8.58E-02	0.00E+00	7.25E-03	9.30E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	4.60E+00	0.00E+00	0.00E+00	0.00E+00	4.08E-02	4.08E-02	0.00E+00	9.81E-03	5.06E-02	3.50E-01	<1	3.50E+00	<1
Vanadium	3.48E+02	1.80E-02	0.00E+00	0.00E+00	3.51E-01	3.51E-01	1.48E-03	7.42E-01	1.09E+00	3.44E-01	3.18E+00	1.70E+00	<1
Zinc	8.71E+02	5.37E-01	0.00E+00	0.00E+00	1.04E+01	1.04E+01	4.40E-02	1.86E+00	1.23E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.37E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.23E-04	2.92E-01	2.93E-01	4.00E-02	7.32E+00	4.00E-01	<1
Fluoride	2.41E+02	2.24E+01	0.00E+00	0.00E+00	3.16E-01	3.16E-01	1.84E+00	5.14E-01	2.67E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.90E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.05E-01	4.05E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	2.50E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.33E-01	5.33E-01				
Fluoranthene	3.70E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.89E+00	7.89E+00				
Fluorene	8.20E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-01	1.75E-01				
Naphthalene	1.20E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.56E-02	2.56E-02				
Phenanthrene	1.30E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.77E+00	2.77E+00				
Total LMW PAHs						0.00E+00	0.00E+00	1.18E+01	1.18E+01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	2.70E+03	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.46E-04	5.76E+00	5.76E+00				
Benzo[A]Pyrene	3.10E+03	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.20E-04	6.61E+00	6.61E+00				
Benzo(b)fluoranthene	3.00E+03	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.20E-04	6.40E+00	6.40E+00				
Benzo(g,h,i)perylene	2.20E+03	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.20E-04	4.69E+00	4.69E+00				
Benzo(k)fluoranthene	2.40E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.12E+00	5.12E+00				
Chrysene	2.80E+03	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.23E-04	5.97E+00	5.97E+00				
Dibenz(A,H)Anthracene	7.40E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.58E+00	1.58E+00				
Indeno (1,2,3-CD) Pyrene	2.00E+03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.54E-04	4.26E+00	4.26E+00				
Pyrene	3.20E+03	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.74E-04	6.82E+00	6.82E+00				
Total HMW PAHs						0.00E+00	3.16E-03	4.72E+01	4.72E+01	2.00E+00	2.36E+01	2.00E+01	2.36E+00
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.80E-01	0.00E+00	0.00E+00	0.00E+00	1.15E-02	1.15E-02	0.00E+00	3.84E-04	1.19E-02	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	2.80E+01	0.00E+00	0.00E+00	0.00E+00	1.29E-01	1.29E-01	0.00E+00	5.97E-02	1.88E-01	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H8-7
Screening-Level Exposure Evaluation - Red-tailed Hawk
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H8-8
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E+00	0.00E+00	1.37E+00	1.10E+02	<1	1.10E+03	<1
Antimony	2.60E+00	0.00E+00	0.00E+00	4.12E-01	0.00E+00	4.12E-01	0.00E+00	0.00E+00	4.12E-01	No TRV	--	No TRV	--
Arsenic	2.64E+01	0.00E+00	0.00E+00	3.86E-01	0.00E+00	3.86E-01	0.00E+00	0.00E+00	3.86E-01	2.24E+00	<1	4.51E+00	<1
Barium	5.39E+02	2.34E-01	0.00E+00	7.77E+00	0.00E+00	7.77E+00	3.70E-02	0.00E+00	7.80E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	1.72E+01	7.10E-04	0.00E+00	1.23E-01	0.00E+00	1.23E-01	1.12E-04	0.00E+00	1.23E-01	No TRV	--	No TRV	--
Cadmium	8.30E+00	3.00E-03	0.00E+00	7.05E+00	0.00E+00	7.05E+00	4.75E-04	0.00E+00	7.05E+00	1.47E+00	4.80E+00	6.35E+00	1.11E+00
Chromium	5.30E+01	0.00E+00	0.00E+00	2.57E+00	0.00E+00	2.57E+00	0.00E+00	0.00E+00	2.57E+00	2.66E+00	<1	1.56E+01	<1
Cobalt	2.74E+01	0.00E+00	0.00E+00	5.29E-01	0.00E+00	5.29E-01	0.00E+00	0.00E+00	5.29E-01	7.61E+00	<1	2.02E+01	<1
Copper	8.36E+01	1.65E-02	0.00E+00	6.82E+00	0.00E+00	6.82E+00	2.61E-03	0.00E+00	6.82E+00	4.05E+00	1.68E+00	3.48E+01	<1
Lead	2.38E+02	7.60E-03	0.00E+00	1.05E+01	0.00E+00	1.05E+01	1.20E-03	0.00E+00	1.05E+01	1.63E+00	6.47E+00	4.46E+01	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E+02	--	3.77E+02	--
Mercury	1.20E-01	0.00E+00	0.00E+00	7.47E-02	0.00E+00	7.47E-02	0.00E+00	0.00E+00	7.47E-02	4.50E-01	<1	9.10E-01	<1
Nickel	1.25E+03	5.59E-02	0.00E+00	1.54E+02	0.00E+00	1.54E+02	8.85E-03	0.00E+00	1.54E+02	6.71E+00	2.29E+01	1.86E+01	8.28E+00
Selenium	3.40E+00	0.00E+00	0.00E+00	3.60E-01	0.00E+00	3.60E-01	0.00E+00	0.00E+00	3.60E-01	2.90E-01	1.24E+00	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	4.60E+00	0.00E+00	0.00E+00	3.94E-02	0.00E+00	3.94E-02	0.00E+00	0.00E+00	3.94E-02	3.50E-01	<1	3.50E+00	<1
Vanadium	3.48E+02	1.80E-02	0.00E+00	2.31E+00	0.00E+00	2.31E+00	2.85E-03	0.00E+00	2.32E+00	3.44E-01	6.74E+00	1.70E+00	1.36E+00
Zinc	8.71E+02	5.37E-01	0.00E+00	1.25E+02	0.00E+00	1.25E+02	8.50E-02	0.00E+00	1.25E+02	6.61E+01	1.89E+00	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.37E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-03	0.00E+00	1.20E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	2.41E+02	2.24E+01	0.00E+00	4.73E+00	0.00E+00	4.73E+00	3.55E+00	0.00E+00	8.28E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.90E+02	0.00E+00	0.00E+00	4.42E+01	0.00E+00	4.42E+01	0.00E+00	0.00E+00	4.42E+01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	2.50E+02	0.00E+00	0.00E+00	9.58E+01	0.00E+00	9.58E+01	0.00E+00	0.00E+00	9.58E+01				
Fluoranthene	3.70E+03	0.00E+00	0.00E+00	1.78E+03	0.00E+00	1.78E+03	0.00E+00	0.00E+00	1.78E+03				
Fluorene	8.20E+01	0.00E+00	0.00E+00	1.24E+02	0.00E+00	1.24E+02	0.00E+00	0.00E+00	1.24E+02				
Naphthalene	1.20E+01	0.00E+00	0.00E+00	8.36E+00	0.00E+00	8.36E+00	0.00E+00	0.00E+00	8.36E+00				
Phenanthrene	1.30E+03	0.00E+00	0.00E+00	3.54E+02	0.00E+00	3.54E+02	0.00E+00	0.00E+00	3.54E+02				
Total LMW PAHs						2.41E+03	0.00E+00	0.00E+00	2.41E+03	1.61E+01	1.50E+02	1.61E+02	1.50E+01
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	2.70E+03	3.00E-03	0.00E+00	6.80E+02	0.00E+00	6.80E+02	4.75E-04	0.00E+00	6.80E+02				
Benzo[A]Pyrene	3.10E+03	3.90E-03	0.00E+00	6.53E+02	0.00E+00	6.53E+02	6.17E-04	0.00E+00	6.53E+02				
Benzo(b)fluoranthene	3.00E+03	1.00E-02	0.00E+00	1.23E+03	0.00E+00	1.23E+03	1.58E-03	0.00E+00	1.23E+03				
Benzo(g,h,i)perylene	2.20E+03	3.90E-03	0.00E+00	1.02E+03	0.00E+00	1.02E+03	6.17E-04	0.00E+00	1.02E+03				
Benzo(k)fluoranthene	2.40E+03	0.00E+00	0.00E+00	9.88E+02	0.00E+00	9.88E+02	0.00E+00	0.00E+00	9.88E+02				
Chrysene	2.80E+03	7.60E-03	0.00E+00	1.02E+03	0.00E+00	1.02E+03	1.20E-03	0.00E+00	1.02E+03				
Dibenz(A,H)Anthracene	7.40E+02	0.00E+00	0.00E+00	2.71E+02	0.00E+00	2.71E+02	0.00E+00	0.00E+00	2.71E+02				
Indeno (1,2,3-CD) Pyrene	2.00E+03	3.10E-03	0.00E+00	9.06E+02	0.00E+00	9.06E+02	4.91E-04	0.00E+00	9.06E+02				
Pyrene	3.20E+03	7.00E-03	0.00E+00	8.87E+02	0.00E+00	8.87E+02	1.11E-03	0.00E+00	8.87E+02				
Total HMW PAHs						7.66E+03	6.10E-03	0.00E+00	7.66E+03	2.00E+00	3.83E+03	2.00E+01	3.83E+02
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.80E-01	0.00E+00	0.00E+00	1.55E+00	0.00E+00	1.55E+00	0.00E+00	0.00E+00	1.55E+00	1.10E+00	1.41E+00	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	2.80E+01	0.00E+00	0.00E+00	3.08E+01	0.00E+00	3.08E+01	0.00E+00	0.00E+00	3.08E+01	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H8-8
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H8-9
Screening-Level Exposure Evaluation - Canada Lynx
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.70E-01	0.00E+00	2.70E-01	No TRV	--	No TRV	--
Antimony	2.60E+00	0.00E+00	0.00E+00	0.00E+00	4.06E-03	4.06E-03	0.00E+00	2.27E-03	6.34E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	2.64E+01	0.00E+00	0.00E+00	0.00E+00	3.58E-03	3.58E-03	0.00E+00	2.31E-02	2.67E-02	1.04E+00	<1	4.55E+00	<1
Barium	5.39E+02	2.34E-01	0.00E+00	0.00E+00	1.15E-02	1.15E-02	7.31E-03	4.72E-01	4.90E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	1.72E+01	7.10E-04	0.00E+00	0.00E+00	1.21E-03	1.21E-03	2.22E-05	1.50E-02	1.63E-02	5.32E-01	<1	6.70E-01	<1
Cadmium	8.30E+00	3.00E-03	0.00E+00	0.00E+00	2.41E-02	2.41E-02	9.37E-05	7.26E-03	3.15E-02	7.70E-01	<1	6.87E+00	<1
Chromium	5.30E+01	0.00E+00	0.00E+00	0.00E+00	1.34E-01	1.34E-01	0.00E+00	4.64E-02	1.80E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	2.74E+01	0.00E+00	0.00E+00	0.00E+00	2.72E-02	2.72E-02	0.00E+00	2.40E-02	5.11E-02	7.33E+00	<1	1.89E+01	<1
Copper	8.36E+01	1.65E-02	0.00E+00	0.00E+00	4.56E-01	4.56E-01	5.16E-04	7.31E-02	5.30E-01	5.60E+00	<1	8.27E+01	<1
Lead	2.38E+02	7.60E-03	0.00E+00	0.00E+00	3.79E-01	3.79E-01	2.37E-04	2.08E-01	5.88E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E+01	--	1.46E+02	--
Mercury	1.20E-01	0.00E+00	0.00E+00	0.00E+00	1.43E-03	1.43E-03	0.00E+00	1.05E-04	1.53E-03	1.41E+00	<1	1.41E+01	<1
Nickel	1.25E+03	5.59E-02	0.00E+00	0.00E+00	6.77E-01	6.77E-01	1.75E-03	1.09E+00	1.77E+00	1.70E+00	1.04E+00	1.48E+01	<1
Selenium	3.40E+00	0.00E+00	0.00E+00	0.00E+00	3.27E-02	3.27E-02	0.00E+00	2.97E-03	3.57E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	4.60E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-02	1.56E-02	0.00E+00	4.02E-03	1.96E-02	4.80E-01	<1	1.43E+00	<1
Vanadium	3.48E+02	1.80E-02	0.00E+00	0.00E+00	1.34E-01	1.34E-01	5.62E-04	3.04E-01	4.39E-01	4.16E+00	<1	9.44E+00	<1
Zinc	8.71E+02	5.37E-01	0.00E+00	0.00E+00	3.96E+00	3.96E+00	1.68E-02	7.62E-01	4.73E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.37E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.37E-04	1.20E-01	1.20E-01	6.87E+01	<1	6.87E+02	<1
Fluoride	2.41E+02	2.24E+01	0.00E+00	0.00E+00	1.20E-01	1.20E-01	7.00E-01	2.11E-01	1.03E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.90E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E-01	1.66E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	2.50E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-01	2.19E-01				
Fluoranthene	3.70E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.24E+00	3.24E+00				
Fluorene	8.20E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.17E-02	7.17E-02				
Naphthalene	1.20E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-02	1.05E-02				
Phenanthrene	1.30E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E+00	1.14E+00				
Total LMW PAHs						0.00E+00	0.00E+00	4.84E+00	4.84E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	2.70E+03	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.37E-05	2.36E+00	2.36E+00				
Benzo[A]Pyrene	3.10E+03	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-04	2.71E+00	2.71E+00				
Benzo(b)fluoranthene	3.00E+03	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.12E-04	2.62E+00	2.62E+00				
Benzo(g,h,i)perylene	2.20E+03	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-04	1.92E+00	1.92E+00				
Benzo(k)fluoranthene	2.40E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E+00	2.10E+00				
Chrysene	2.80E+03	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.37E-04	2.45E+00	2.45E+00				
Dibenz(A,H)Anthracene	7.40E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.47E-01	6.47E-01				
Indeno (1,2,3-CD) Pyrene	2.00E+03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.69E-05	1.75E+00	1.75E+00				
Pyrene	3.20E+03	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-04	2.80E+00	2.80E+00				
Total HMW PAHs						0.00E+00	1.20E-03	1.94E+01	1.94E+01	6.15E-01	3.15E+01	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.80E-01	0.00E+00	0.00E+00	0.00E+00	4.38E-03	4.38E-03	0.00E+00	1.57E-04	4.54E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	2.80E+01	0.00E+00	0.00E+00	0.00E+00	4.90E-02	4.90E-02	0.00E+00	2.45E-02	7.35E-02	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H8-9
Screening-Level Exposure Evaluation - Canada Lynx
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H8-10
Screening-Level Exposure Evaluation - Grizzly Bear
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)										
			Diet					Water	Substrate				
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.86E-01	0.00E+00	1.86E-01	No TRV	--	No TRV	--
Antimony	2.60E+00	0.00E+00	1.36E-03	8.42E-03	2.81E-04	0.00E+00	1.01E-02	0.00E+00	1.57E-03	1.01E-02	5.90E-02	<1	2.76E+00	<1
Arsenic	2.64E+01	0.00E+00	1.39E-02	7.89E-03	2.47E-04	0.00E+00	2.20E-02	0.00E+00	1.60E-02	2.20E-02	1.04E+00	<1	4.55E+00	<1
Barium	5.39E+02	2.34E-01	1.18E+00	1.59E-01	7.94E-04	0.00E+00	1.34E+00	5.05E-03	3.26E-01	1.35E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	1.72E+01	7.10E-04	6.64E-02	2.51E-03	8.36E-05	0.00E+00	6.90E-02	1.53E-05	1.04E-02	6.90E-02	5.32E-01	<1	6.70E-01	<1
Cadmium	8.30E+00	3.00E-03	2.77E-02	1.44E-01	1.67E-03	0.00E+00	1.74E-01	6.48E-05	5.02E-03	1.74E-01	7.70E-01	<1	6.87E+00	<1
Chromium	5.30E+01	0.00E+00	3.05E-02	5.25E-02	9.24E-03	0.00E+00	9.23E-02	0.00E+00	3.20E-02	9.23E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	2.74E+01	0.00E+00	2.88E-03	1.08E-02	1.88E-03	0.00E+00	1.56E-02	0.00E+00	1.66E-02	1.56E-02	7.33E+00	<1	1.89E+01	<1
Copper	8.36E+01	1.65E-02	1.57E-01	1.39E-01	3.15E-02	0.00E+00	3.28E-01	3.56E-04	5.06E-02	3.28E-01	5.60E+00	<1	8.27E+01	<1
Lead	2.38E+02	7.60E-03	8.01E-02	2.16E-01	2.62E-02	0.00E+00	3.22E-01	1.64E-04	1.44E-01	3.22E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E+01	--	1.46E+02	--
Mercury	1.20E-01	0.00E+00	1.64E-03	1.53E-03	9.87E-05	0.00E+00	3.26E-03	0.00E+00	7.26E-05	3.26E-03	1.41E+00	<1	1.41E+01	<1
Nickel	1.25E+03	5.59E-02	3.15E-01	3.15E+00	4.68E-02	0.00E+00	3.51E+00	1.21E-03	7.56E-01	3.51E+00	1.70E+00	2.07E+00	1.48E+01	<1
Selenium	3.40E+00	0.00E+00	2.75E-02	7.37E-03	2.26E-03	0.00E+00	3.72E-02	0.00E+00	2.06E-03	3.72E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	4.60E+00	0.00E+00	2.58E-04	8.06E-04	1.07E-03	0.00E+00	2.14E-03	0.00E+00	2.78E-03	2.14E-03	4.80E-01	<1	1.43E+00	<1
Vanadium	3.48E+02	1.80E-02	2.37E-02	4.73E-02	9.24E-03	0.00E+00	8.03E-02	3.89E-04	2.10E-01	8.07E-02	4.16E+00	<1	9.44E+00	<1
Zinc	8.71E+02	5.37E-01	2.88E+00	2.55E+00	2.73E-01	0.00E+00	5.71E+00	1.16E-02	5.27E-01	5.72E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	1.37E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.64E-04	8.28E-02	1.64E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	2.41E+02	2.24E+01	2.03E-01	9.68E-02	8.33E-03	0.00E+00	3.08E-01	4.84E-01	1.46E-01	7.92E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	1.90E+02	0.00E+00	6.05E-07	9.05E-01	0.00E+00	0.00E+00	9.05E-01	0.00E+00	1.15E-01	9.05E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	2.50E+02	0.00E+00	3.84E-01	1.96E+00	0.00E+00	0.00E+00	2.34E+00	0.00E+00	1.51E-01	2.34E+00				
Fluoranthene	3.70E+03	0.00E+00	2.60E+01	3.64E+01	0.00E+00	0.00E+00	6.24E+01	0.00E+00	2.24E+00	6.24E+01				
Fluorene	8.20E+01	0.00E+00	1.24E-06	2.54E+00	0.00E+00	0.00E+00	2.54E+00	0.00E+00	4.96E-02	2.54E+00				
Naphthalene	1.20E+01	0.00E+00	2.06E+00	1.71E-01	0.00E+00	0.00E+00	2.23E+00	0.00E+00	7.26E-03	2.23E+00				
Phenanthrene	1.30E+03	0.00E+00	1.02E+00	7.24E+00	0.00E+00	0.00E+00	8.26E+00	0.00E+00	7.86E-01	8.26E+00				
Total LMW PAHs							7.87E+01	0.00E+00	3.35E+00	8.20E+01	6.56E+01	1.25E+00	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	2.70E+03	3.00E-03	1.03E-01	1.39E+01	0.00E+00	0.00E+00	1.40E+01	6.48E-05	1.63E+00	1.40E+01				
Benzo[A]Pyrene	3.10E+03	3.90E-03	4.53E+00	1.34E+01	0.00E+00	0.00E+00	1.79E+01	8.42E-05	1.87E+00	1.79E+01				
Benzo(b)fluoranthene	3.00E+03	1.00E-02	1.31E+01	2.53E+01	0.00E+00	0.00E+00	3.83E+01	2.16E-04	1.81E+00	3.83E+01				
Benzo(g,h,i)perylene	2.20E+03	3.90E-03	4.97E+01	2.10E+01	0.00E+00	0.00E+00	7.07E+01	8.42E-05	1.33E+00	7.07E+01				
Benzo(k)fluoranthene	2.40E+03	0.00E+00	1.30E+00	2.02E+01	0.00E+00	0.00E+00	2.15E+01	0.00E+00	1.45E+00	2.15E+01				
Chrysene	2.80E+03	7.60E-03	1.05E-01	2.08E+01	0.00E+00	0.00E+00	2.09E+01	1.64E-04	1.69E+00	2.09E+01				
Dibenz(A,H)Anthracene	7.40E+02	0.00E+00	1.35E+00	5.54E+00	0.00E+00	0.00E+00	6.89E+00	0.00E+00	4.47E-01	6.89E+00				
Indeno (1,2,3-CD) Pyrene	2.00E+03	3.10E-03	3.09E+00	1.85E+01	0.00E+00	0.00E+00	2.16E+01	6.69E-05	1.21E+00	2.16E+01				
Pyrene	3.20E+03	7.00E-03	3.23E+01	1.81E+01	0.00E+00	0.00E+00	5.05E+01	1.51E-04	1.93E+00	5.05E+01				
Total HMW PAHs							2.62E+02	8.31E-04	1.34E+01	2.76E+02	6.15E-01	4.48E+02	3.84E+01	7.18E+00
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.80E-01	0.00E+00	6.01E-05	3.17E-02	3.03E-04	0.00E+00	3.21E-02	0.00E+00	1.09E-04	3.21E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	2.80E+01	0.00E+00	7.39E-01	6.31E-01	3.39E-03	0.00E+00	1.37E+00	0.00E+00	1.69E-02	1.37E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H8-10
Screening-Level Exposure Evaluation - Grizzly Bear
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)										
			Diet					Water	Substrate				
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H8-11
Screening-Level Exposure Evaluation - Long-tailed Weasel
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.44E-01	0.00E+00	4.44E-01	No TRV	--	No TRV	--
Antimony	2.45E+00	0.00E+00	0.00E+00	0.00E+00	6.30E-03	6.30E-03	0.00E+00	2.02E-03	8.32E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	2.95E+01	0.00E+00	0.00E+00	0.00E+00	6.46E-03	6.46E-03	0.00E+00	2.43E-02	3.07E-02	1.04E+00	<1	4.55E+00	<1
Barium	1.23E+03	2.34E-01	0.00E+00	0.00E+00	4.34E-02	4.34E-02	1.20E-02	1.02E+00	1.07E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	1.29E+01	7.10E-04	0.00E+00	0.00E+00	1.49E-03	1.49E-03	3.65E-05	1.06E-02	1.21E-02	5.32E-01	<1	6.70E-01	<1
Cadmium	8.55E+00	3.00E-03	0.00E+00	0.00E+00	4.03E-02	4.03E-02	1.54E-04	7.04E-03	4.75E-02	7.70E-01	<1	6.87E+00	<1
Chromium	4.73E+01	0.00E+00	0.00E+00	0.00E+00	2.03E-01	2.03E-01	0.00E+00	3.90E-02	2.42E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	1.58E+01	0.00E+00	0.00E+00	0.00E+00	2.18E-02	2.18E-02	0.00E+00	1.30E-02	3.49E-02	7.33E+00	<1	1.89E+01	<1
Copper	3.93E+01	1.65E-02	0.00E+00	0.00E+00	6.74E-01	6.74E-01	8.49E-04	3.23E-02	7.07E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.66E+02	7.60E-03	0.00E+00	0.00E+00	5.32E-01	5.32E-01	3.91E-04	1.36E-01	6.69E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E+01	--	1.46E+02	--
Mercury	6.45E-02	0.00E+00	0.00E+00	0.00E+00	1.26E-03	1.26E-03	0.00E+00	5.31E-05	1.32E-03	1.41E+00	<1	1.41E+01	<1
Nickel	6.81E+02	5.59E-02	0.00E+00	0.00E+00	8.40E-01	8.40E-01	2.88E-03	5.61E-01	1.40E+00	1.70E+00	<1	1.48E+01	<1
Selenium	2.68E+00	0.00E+00	0.00E+00	0.00E+00	4.92E-02	4.92E-02	0.00E+00	2.20E-03	5.14E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	3.57E+00	0.00E+00	0.00E+00	0.00E+00	1.99E-02	1.99E-02	0.00E+00	2.94E-03	2.28E-02	4.80E-01	<1	1.43E+00	<1
Vanadium	1.81E+02	1.80E-02	0.00E+00	0.00E+00	1.15E-01	1.15E-01	9.26E-04	1.49E-01	2.65E-01	4.16E+00	<1	9.44E+00	<1
Zinc	5.89E+02	5.37E-01	0.00E+00	0.00E+00	6.34E+00	6.34E+00	2.76E-02	4.85E-01	6.85E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.28E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.91E-04	1.05E-01	1.06E-01	6.87E+01	<1	6.87E+02	<1
Fluoride	2.73E+02	2.24E+01	0.00E+00	0.00E+00	2.25E-01	2.25E-01	1.15E+00	2.25E-01	1.60E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	7.30E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.01E-02	6.01E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	1.05E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.65E-02	8.65E-02				
Fluoranthene	1.45E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.19E+00	1.19E+00				
Fluorene	3.10E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.55E-02	2.55E-02				
Naphthalene	7.13E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.87E-03	5.87E-03				
Phenanthrene	4.98E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.10E-01	4.10E-01				
Total LMW PAHs						0.00E+00	0.00E+00	1.78E+00	1.78E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.01E+03	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-04	8.32E-01	8.32E-01				
Benzo[A]Pyrene	1.15E+03	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E-04	9.47E-01	9.47E-01				
Benzo(b)fluoranthene	1.27E+03	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E-04	1.04E+00	1.04E+00				
Benzo(g,h,i)perylene	8.45E+02	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E-04	6.96E-01	6.96E-01				
Benzo(k)fluoranthene	8.55E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.04E-01	7.04E-01				
Chrysene	1.00E+03	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.91E-04	8.25E-01	8.26E-01				
Dibenz(A,H)Anthracene	2.95E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.43E-01	2.43E-01				
Indeno (1,2,3-CD) Pyrene	7.75E+02	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.60E-04	6.38E-01	6.38E-01				
Pyrene	1.27E+03	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-04	1.04E+00	1.04E+00				
Total HMW PAHs						0.00E+00	1.98E-03	6.97E+00	6.97E+00	6.15E-01	1.13E+01	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.58E+00	0.00E+00	0.00E+00	0.00E+00	1.83E-01	1.83E-01	0.00E+00	3.77E-03	1.87E-01	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	1.39E+01	0.00E+00	0.00E+00	0.00E+00	4.01E-02	4.01E-02	0.00E+00	1.14E-02	5.15E-02	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H8-11
Screening-Level Exposure Evaluation - Long-tailed Weasel
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H8-12
Screening-Level Exposure Evaluation - Meadow Vole
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E+00	0.00E+00	1.30E+00	No TRV	--	No TRV	--
Antimony	2.45E+00	0.00E+00	1.37E-02	0.00E+00	0.00E+00	1.37E-02	0.00E+00	4.78E-03	1.85E-02	5.90E-02	<1	2.76E+00	<1
Arsenic	2.95E+01	0.00E+00	1.66E-01	0.00E+00	0.00E+00	1.66E-01	0.00E+00	5.76E-02	2.24E-01	1.04E+00	<1	4.55E+00	<1
Barium	1.23E+03	2.34E-01	2.89E+01	0.00E+00	0.00E+00	2.89E+01	3.52E-02	2.41E+00	3.14E+01	5.18E+01	<1	8.27E+01	<1
Beryllium	1.29E+01	7.10E-04	5.74E-01	0.00E+00	0.00E+00	5.74E-01	1.07E-04	2.51E-02	5.99E-01	5.32E-01	1.13E+00	6.70E-01	<1
Cadmium	8.55E+00	3.00E-03	3.02E-01	0.00E+00	0.00E+00	3.02E-01	4.51E-04	1.67E-02	3.19E-01	7.70E-01	<1	6.87E+00	<1
Chromium	4.73E+01	0.00E+00	2.92E-01	0.00E+00	0.00E+00	2.92E-01	0.00E+00	9.24E-02	3.84E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	1.58E+01	0.00E+00	1.78E-02	0.00E+00	0.00E+00	1.78E-02	0.00E+00	3.09E-02	4.87E-02	7.33E+00	<1	1.89E+01	<1
Copper	3.93E+01	1.65E-02	1.24E+00	0.00E+00	0.00E+00	1.24E+00	2.48E-03	7.67E-02	1.32E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.66E+02	7.60E-03	7.00E-01	0.00E+00	0.00E+00	7.00E-01	1.14E-03	3.24E-01	1.02E+00	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E+01	--	1.46E+02	--
Mercury	6.45E-02	0.00E+00	1.25E-02	0.00E+00	0.00E+00	1.25E-02	0.00E+00	1.26E-04	1.26E-02	1.41E+00	<1	1.41E+01	<1
Nickel	6.81E+02	5.59E-02	2.14E+00	0.00E+00	0.00E+00	2.14E+00	8.40E-03	1.33E+00	3.48E+00	1.70E+00	2.05E+00	1.48E+01	<1
Selenium	2.68E+00	0.00E+00	2.26E-01	0.00E+00	0.00E+00	2.26E-01	0.00E+00	5.22E-03	2.31E-01	1.43E-01	1.62E+00	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	3.57E+00	0.00E+00	2.15E-03	0.00E+00	0.00E+00	2.15E-03	0.00E+00	6.97E-03	9.12E-03	4.80E-01	<1	1.43E+00	<1
Vanadium	1.81E+02	1.80E-02	1.32E-01	0.00E+00	0.00E+00	1.32E-01	2.70E-03	3.54E-01	4.89E-01	4.16E+00	<1	9.44E+00	<1
Zinc	5.89E+02	5.37E-01	2.49E+01	0.00E+00	0.00E+00	2.49E+01	8.07E-02	1.15E+00	2.61E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.28E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-03	2.50E-01	2.51E-01	6.87E+01	<1	6.87E+02	<1
Fluoride	2.73E+02	2.24E+01	2.46E+00	0.00E+00	0.00E+00	2.46E+00	3.37E+00	5.33E-01	6.36E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	7.30E+01	0.00E+00	1.47E-05	0.00E+00	0.00E+00	1.47E-05	0.00E+00	1.43E-01	1.43E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	1.05E+02	0.00E+00	2.09E+00	0.00E+00	0.00E+00	2.09E+00	0.00E+00	2.05E-01	2.30E+00				
Fluoranthene	1.45E+03	0.00E+00	1.09E+02	0.00E+00	0.00E+00	1.09E+02	0.00E+00	2.83E+00	1.12E+02				
Fluorene	3.10E+01	0.00E+00	3.06E-05	0.00E+00	0.00E+00	3.06E-05	0.00E+00	6.05E-02	6.06E-02				
Naphthalene	7.13E+00	0.00E+00	1.31E+01	0.00E+00	0.00E+00	1.31E+01	0.00E+00	1.39E-02	1.31E+01				
Phenanthrene	4.98E+02	0.00E+00	5.99E+00	0.00E+00	0.00E+00	5.99E+00	0.00E+00	9.72E-01	6.96E+00				
Total LMW PAHs						1.30E+02	0.00E+00	4.23E+00	1.34E+02	6.56E+01	2.05E+00	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.01E+03	3.00E-03	6.12E-01	0.00E+00	0.00E+00	6.12E-01	4.51E-04	1.97E+00	2.58E+00				
Benzo[A]Pyrene	1.15E+03	3.90E-03	1.84E+01	0.00E+00	0.00E+00	1.84E+01	5.86E-04	2.25E+00	2.07E+01				
Benzo(b)fluoranthene	1.27E+03	1.00E-02	5.90E+01	0.00E+00	0.00E+00	5.90E+01	1.50E-03	2.48E+00	6.15E+01				
Benzo(g,h,i)perylene	8.45E+02	3.90E-03	1.72E+02	0.00E+00	0.00E+00	1.72E+02	5.86E-04	1.65E+00	1.73E+02				
Benzo(k)fluoranthene	8.55E+02	0.00E+00	5.75E+00	0.00E+00	0.00E+00	5.75E+00	0.00E+00	1.67E+00	7.42E+00				
Chrysene	1.00E+03	7.60E-03	6.09E-01	0.00E+00	0.00E+00	6.09E-01	1.14E-03	1.96E+00	2.57E+00				
Dibenz(A,H)Anthracene	2.95E+02	0.00E+00	5.76E+00	0.00E+00	0.00E+00	5.76E+00	0.00E+00	5.76E-01	6.34E+00				
Indeno (1,2,3-CD) Pyrene	7.75E+02	3.10E-03	1.28E+01	0.00E+00	0.00E+00	1.28E+01	4.66E-04	1.51E+00	1.43E+01				
Pyrene	1.27E+03	7.00E-03	1.37E+02	0.00E+00	0.00E+00	1.37E+02	1.05E-03	2.47E+00	1.39E+02				
Total HMW PAHs						4.11E+02	5.78E-03	1.65E+01	4.28E+02	6.15E-01	6.96E+02	3.84E+01	1.11E+01
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.58E+00	0.00E+00	1.64E-02	0.00E+00	0.00E+00	1.64E-02	0.00E+00	8.94E-03	2.53E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	1.39E+01	0.00E+00	3.92E+00	0.00E+00	0.00E+00	3.92E+00	0.00E+00	2.71E-02	3.95E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H8-12
Screening-Level Exposure Evaluation - Meadow Vole
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H8-13
Screening-Level Exposure Evaluation - Mink
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	3.73E-01	0.00E+00	3.73E-01	No TRV	--	No TRV	--
Antimony	2.60E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	2.64E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	5.39E+02	2.34E-01	0.00E+00	0.00E+00	0.00E+00	1.01E-02	0.00E+00	1.01E-02	5.18E+01	<1	8.27E+01	<1
Beryllium	1.72E+01	7.10E-04	0.00E+00	0.00E+00	0.00E+00	3.07E-05	0.00E+00	3.07E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	8.30E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	1.30E-04	0.00E+00	1.30E-04	7.70E-01	<1	6.87E+00	<1
Chromium	5.30E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	8.36E+01	1.65E-02	0.00E+00	0.00E+00	0.00E+00	7.14E-04	0.00E+00	7.14E-04	5.60E+00	<1	8.27E+01	<1
Lead	2.38E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	3.29E-04	0.00E+00	3.29E-04	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E+01	--	1.46E+02	--
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	1.25E+03	5.59E-02	0.00E+00	0.00E+00	0.00E+00	2.42E-03	0.00E+00	2.42E-03	1.70E+00	<1	1.48E+01	<1
Selenium	3.40E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-01	--	6.60E-01	--
Silver	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	4.60E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	3.48E+02	1.80E-02	0.00E+00	0.00E+00	0.00E+00	7.78E-04	0.00E+00	7.78E-04	4.16E+00	<1	9.44E+00	<1
Zinc	8.71E+02	5.37E-01	0.00E+00	0.00E+00	0.00E+00	2.32E-02	0.00E+00	2.32E-02	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics												
Cyanide	1.37E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	3.29E-04	0.00E+00	3.29E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	0.00E+00	2.24E+01	0.00E+00	0.00E+00	0.00E+00	9.69E-01	0.00E+00	9.69E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	1.90E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Acenaphthylene	1.20E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	2.50E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluoranthene	3.70E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluorene	8.20E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	1.20E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	1.30E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total LMW PAHs					0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	2.70E+03	3.00E-03	0.00E+00	0.00E+00	0.00E+00	1.30E-04	0.00E+00	1.30E-04				
Benzo[A]Pyrene	3.10E+03	3.90E-03	0.00E+00	0.00E+00	0.00E+00	1.69E-04	0.00E+00	1.69E-04				
Benzo(b)fluoranthene	3.00E+03	1.00E-02	0.00E+00	0.00E+00	0.00E+00	4.32E-04	0.00E+00	4.32E-04				
Benzo(g,h,i)perylene	2.20E+03	3.90E-03	0.00E+00	0.00E+00	0.00E+00	1.69E-04	0.00E+00	1.69E-04				
Benzo(k)fluoranthene	2.40E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Chrysene	2.80E+03	7.60E-03	0.00E+00	0.00E+00	0.00E+00	3.29E-04	0.00E+00	3.29E-04				
Dibenz(A,H)Anthracene	7.40E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Indeno (1,2,3-CD) Pyrene	2.00E+03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	1.34E-04	0.00E+00	1.34E-04				
Pyrene	3.20E+03	7.00E-03	0.00E+00	0.00E+00	0.00E+00	3.03E-04	0.00E+00	3.03E-04				
Total HMW PAHs					0.00E+00	1.66E-03	0.00E+00	1.66E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H8-13
Screening-Level Exposure Evaluation - Mink
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H8-14
Screening-Level Exposure Evaluation - North American Wolverine
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.59E-01	0.00E+00	2.59E-01	No TRV	--	No TRV	--
Antimony	2.45E+00	0.00E+00	0.00E+00	0.00E+00	3.68E-03	3.68E-03	0.00E+00	2.06E-03	5.74E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	2.95E+01	0.00E+00	0.00E+00	0.00E+00	3.77E-03	3.77E-03	0.00E+00	2.48E-02	2.86E-02	1.04E+00	<1	4.55E+00	<1
Barium	1.23E+03	2.34E-01	0.00E+00	0.00E+00	2.53E-02	2.53E-02	7.03E-03	1.04E+00	1.07E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	1.29E+01	7.10E-04	0.00E+00	0.00E+00	8.70E-04	8.70E-04	2.13E-05	1.08E-02	1.17E-02	5.32E-01	<1	6.70E-01	<1
Cadmium	8.55E+00	3.00E-03	0.00E+00	0.00E+00	2.36E-02	2.36E-02	9.01E-05	7.19E-03	3.08E-02	7.70E-01	<1	6.87E+00	<1
Chromium	4.73E+01	0.00E+00	0.00E+00	0.00E+00	1.18E-01	1.18E-01	0.00E+00	3.98E-02	1.58E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	1.58E+01	0.00E+00	0.00E+00	0.00E+00	1.27E-02	1.27E-02	0.00E+00	1.33E-02	2.61E-02	7.33E+00	<1	1.89E+01	<1
Copper	3.93E+01	1.65E-02	0.00E+00	0.00E+00	3.93E-01	3.93E-01	4.96E-04	3.30E-02	4.27E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.66E+02	7.60E-03	0.00E+00	0.00E+00	3.11E-01	3.11E-01	2.28E-04	1.39E-01	4.50E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E+01	--	1.46E+02	--
Mercury	6.45E-02	0.00E+00	0.00E+00	0.00E+00	7.38E-04	7.38E-04	0.00E+00	5.43E-05	7.93E-04	1.41E+00	<1	1.41E+01	<1
Nickel	6.81E+02	5.59E-02	0.00E+00	0.00E+00	4.90E-01	4.90E-01	1.68E-03	5.73E-01	1.06E+00	1.70E+00	<1	1.48E+01	<1
Selenium	2.68E+00	0.00E+00	0.00E+00	0.00E+00	2.87E-02	2.87E-02	0.00E+00	2.25E-03	3.10E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	3.57E+00	0.00E+00	0.00E+00	0.00E+00	1.16E-02	1.16E-02	0.00E+00	3.00E-03	1.46E-02	4.80E-01	<1	1.43E+00	<1
Vanadium	1.81E+02	1.80E-02	0.00E+00	0.00E+00	6.70E-02	6.70E-02	5.41E-04	1.52E-01	2.20E-01	4.16E+00	<1	9.44E+00	<1
Zinc	5.89E+02	5.37E-01	0.00E+00	0.00E+00	3.70E+00	3.70E+00	1.61E-02	4.96E-01	4.21E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.28E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.28E-04	1.08E-01	1.08E-01	6.87E+01	<1	6.87E+02	<1
Fluoride	2.73E+02	2.24E+01	0.00E+00	0.00E+00	1.31E-01	1.31E-01	6.73E-01	2.30E-01	1.03E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	7.30E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.14E-02	6.14E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	1.05E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.83E-02	8.83E-02				
Fluoranthene	1.45E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+00	1.22E+00				
Fluorene	3.10E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.61E-02	2.61E-02				
Naphthalene	7.13E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.99E-03	5.99E-03				
Phenanthrene	4.98E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.19E-01	4.19E-01				
Total LMW PAHs						0.00E+00	0.00E+00	1.82E+00	1.82E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.01E+03	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.01E-05	8.50E-01	8.50E-01				
Benzo[A]Pyrene	1.15E+03	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-04	9.67E-01	9.68E-01				
Benzo(b)fluoranthene	1.27E+03	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-04	1.07E+00	1.07E+00				
Benzo(g,h,i)perylene	8.45E+02	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-04	7.11E-01	7.11E-01				
Benzo(k)fluoranthene	8.55E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.19E-01	7.19E-01				
Chrysene	1.00E+03	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.28E-04	8.43E-01	8.44E-01				
Dibenz(A,H)Anthracene	2.95E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.48E-01	2.48E-01				
Indeno (1,2,3-CD) Pyrene	7.75E+02	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.31E-05	6.52E-01	6.52E-01				
Pyrene	1.27E+03	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-04	1.06E+00	1.06E+00				
Total HMW PAHs						0.00E+00	1.16E-03	7.12E+00	7.12E+00	6.15E-01	1.16E+01	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.58E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-01	1.07E-01	0.00E+00	3.85E-03	1.11E-01	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	1.39E+01	0.00E+00	0.00E+00	0.00E+00	2.34E-02	2.34E-02	0.00E+00	1.17E-02	3.51E-02	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H8-14
Screening-Level Exposure Evaluation - North American Wolverine
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H8-15
Screening-Level Exposure Evaluation - Short-tailed Shrew
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.16E+00	0.00E+00	1.16E+00	No TRV	--	No TRV	--
Antimony	2.45E+00	0.00E+00	0.00E+00	3.28E-01	0.00E+00	3.28E-01	0.00E+00	3.61E-03	3.32E-01	5.90E-02	5.63E+00	2.76E+00	<1
Arsenic	2.95E+01	0.00E+00	0.00E+00	3.53E-01	0.00E+00	3.53E-01	0.00E+00	4.35E-02	3.96E-01	1.04E+00	<1	4.55E+00	<1
Barium	1.23E+03	2.34E-01	0.00E+00	1.51E+01	0.00E+00	1.51E+01	3.14E-02	1.82E+00	1.69E+01	5.18E+01	<1	8.27E+01	<1
Beryllium	1.29E+01	7.10E-04	0.00E+00	7.76E-02	0.00E+00	7.76E-02	9.51E-05	1.90E-02	9.67E-02	5.32E-01	<1	6.70E-01	<1
Cadmium	8.55E+00	3.00E-03	0.00E+00	6.11E+00	0.00E+00	6.11E+00	4.02E-04	1.26E-02	6.12E+00	7.70E-01	7.95E+00	6.87E+00	<1
Chromium	4.73E+01	0.00E+00	0.00E+00	1.94E+00	0.00E+00	1.94E+00	0.00E+00	6.98E-02	2.01E+00	2.40E+00	<1	5.82E+01	<1
Cobalt	1.58E+01	0.00E+00	0.00E+00	2.59E-01	0.00E+00	2.59E-01	0.00E+00	2.33E-02	2.82E-01	7.33E+00	<1	1.89E+01	<1
Copper	3.93E+01	1.65E-02	0.00E+00	2.71E+00	0.00E+00	2.71E+00	2.21E-03	5.79E-02	2.77E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.66E+02	7.60E-03	0.00E+00	6.66E+00	0.00E+00	6.66E+00	1.02E-03	2.44E-01	6.90E+00	4.70E+00	1.47E+00	1.86E+02	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E+01	--	1.46E+02	--
Mercury	6.45E-02	0.00E+00	0.00E+00	3.40E-02	0.00E+00	3.40E-02	0.00E+00	9.51E-05	3.41E-02	1.41E+00	<1	1.41E+01	<1
Nickel	6.81E+02	5.59E-02	0.00E+00	7.10E+01	0.00E+00	7.10E+01	7.49E-03	1.00E+00	7.20E+01	1.70E+00	4.23E+01	1.48E+01	4.86E+00
Selenium	2.68E+00	0.00E+00	0.00E+00	2.56E-01	0.00E+00	2.56E-01	0.00E+00	3.94E-03	2.60E-01	1.43E-01	1.82E+00	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	3.57E+00	0.00E+00	0.00E+00	2.59E-02	0.00E+00	2.59E-02	0.00E+00	5.26E-03	3.11E-02	4.80E-01	<1	1.43E+00	<1
Vanadium	1.81E+02	1.80E-02	0.00E+00	1.02E+00	0.00E+00	1.02E+00	2.41E-03	2.67E-01	1.29E+00	4.16E+00	<1	9.44E+00	<1
Zinc	5.89E+02	5.37E-01	0.00E+00	9.29E+01	0.00E+00	9.29E+01	7.20E-02	8.68E-01	9.38E+01	7.54E+01	1.24E+00	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.28E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-03	1.89E-01	1.90E-01	6.87E+01	<1	6.87E+02	<1
Fluoride	2.73E+02	2.24E+01	0.00E+00	4.54E+00	0.00E+00	4.54E+00	3.00E+00	4.02E-01	7.94E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	7.30E+01	0.00E+00	0.00E+00	1.44E+01	0.00E+00	1.44E+01	0.00E+00	1.08E-01	1.45E+01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	1.05E+02	0.00E+00	0.00E+00	3.41E+01	0.00E+00	3.41E+01	0.00E+00	1.55E-01	3.42E+01				
Fluoranthene	1.45E+03	0.00E+00	0.00E+00	5.91E+02	0.00E+00	5.91E+02	0.00E+00	2.14E+00	5.93E+02				
Fluorene	3.10E+01	0.00E+00	0.00E+00	3.98E+01	0.00E+00	3.98E+01	0.00E+00	4.57E-02	3.98E+01				
Naphthalene	7.13E+00	0.00E+00	0.00E+00	4.20E+00	0.00E+00	4.20E+00	0.00E+00	1.05E-02	4.21E+00				
Phenanthrene	4.98E+02	0.00E+00	0.00E+00	1.15E+02	0.00E+00	1.15E+02	0.00E+00	7.33E-01	1.15E+02				
Total LMW PAHs						7.98E+02	0.00E+00	3.19E+00	8.01E+02	6.56E+01	1.22E+01	3.56E+02	2.25E+00
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.01E+03	3.00E-03	0.00E+00	2.15E+02	0.00E+00	2.15E+02	4.02E-04	1.49E+00	2.17E+02				
Benzo[A]Pyrene	1.15E+03	3.90E-03	0.00E+00	2.05E+02	0.00E+00	2.05E+02	5.23E-04	1.70E+00	2.07E+02				
Benzo(b)fluoranthene	1.27E+03	1.00E-02	0.00E+00	4.42E+02	0.00E+00	4.42E+02	1.34E-03	1.87E+00	4.44E+02				
Benzo(g,h,i)perylene	8.45E+02	3.90E-03	0.00E+00	3.33E+02	0.00E+00	3.33E+02	5.23E-04	1.25E+00	3.34E+02				
Benzo(k)fluoranthene	8.55E+02	0.00E+00	0.00E+00	2.98E+02	0.00E+00	2.98E+02	0.00E+00	1.26E+00	2.99E+02				
Chrysene	1.00E+03	7.60E-03	0.00E+00	3.08E+02	0.00E+00	3.08E+02	1.02E-03	1.48E+00	3.09E+02				
Dibenz(A,H)Anthracene	2.95E+02	0.00E+00	0.00E+00	9.13E+01	0.00E+00	9.13E+01	0.00E+00	4.35E-01	9.18E+01				
Indeno (1,2,3-CD) Pyrene	7.75E+02	3.10E-03	0.00E+00	2.97E+02	0.00E+00	2.97E+02	4.15E-04	1.14E+00	2.98E+02				
Pyrene	1.27E+03	7.00E-03	0.00E+00	2.97E+02	0.00E+00	2.97E+02	9.38E-04	1.86E+00	2.99E+02				
Total HMW PAHs						2.49E+03	5.16E-03	1.25E+01	2.50E+03	6.15E-01	4.06E+03	3.84E+01	6.50E+01
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.58E+00	0.00E+00	0.00E+00	3.34E+01	0.00E+00	3.34E+01	0.00E+00	6.74E-03	3.34E+01	1.83E+01	1.82E+00	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	1.39E+01	0.00E+00	0.00E+00	1.30E+01	0.00E+00	1.30E+01	0.00E+00	2.05E-02	1.30E+01	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H8-15
Screening-Level Exposure Evaluation - Short-tailed Shrew
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H9-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - South Percolation Pond Area (0 - 0.5' Interval)
Baselie Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	1.00E+00	0.00E+00	Assumption[c]	5.00E-02	0.00E+00	Baes et al. (1984)[e]
Arsenic	NA	ND	3.75E-02	0	Bechtel-Jacobs (1998a)[g]	Regression[d]	0	Sample et al. (1999)	Regression[f]	0	Sample et al. (1998b)
Barium	NA	9.72E+02	1.56E-01	1.52E+02	Bechtel-Jacobs (1998a)[g]	9.10E-02	8.85E+01	Sample et al. (1998a)	6.83E-04	6.63E-01	Baes et al. (1984)[e]
Beryllium	NA	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	2.50E+00	Regression[a]	1.03E+00	Bechtel-Jacobs (1998a)	Regression[d]	1.72E+01	Sample et al. (1999)	Regression[f]	4.39E-01	Sample et al. (1998b)
Chromium	NA	3.28E+01	4.10E-02	1.34E+00	Bechtel-Jacobs (1998a)[g]	3.06E-01	1.00E+01	Sample et al. (1998a)	Regression[f]	3.01E+00	Sample et al. (1998b)
Cobalt	NA	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	6.94E+02	Regression[a]	2.57E+01	Bechtel-Jacobs (1998a)	5.15E-01	3.57E+02	Sample et al. (1998a)	Regression[f]	1.98E+01	Sample et al. (1998b)
Lead	NA	1.16E+02	Regression[a]	3.81E+00	Bechtel-Jacobs (1998a)	Regression[d]	3.73E+01	Sample et al. (1999)	Regression[f]	8.83E+00	Sample et al. (1998b)
Manganese	NA	0.00E+00	7.90E-02	0.00E+00	Bechtel-Jacobs (1998a)[g]	Regression[d]	0.00E+00	Sample et al. (1999)	2.05E-02	0.00E+00	Sample et al. (1998b)[i]
Mercury	NA	1.40E+00	Regression[a]	4.44E-01	Bechtel-Jacobs (1998a)	3.93E+00	5.50E+00	Sample et al. (1998a)	3.81E-01	5.33E-01	LANL (2015)
Nickel	NA	5.39E+01	Regression[a]	2.14E+00	Bechtel-Jacobs (1998a)	7.78E-01	4.19E+01	Sample et al. (1998a)	Regression[f]	5.01E+00	Sample et al. (1998b)
Selenium	NA	1.30E+00	Regression[a]	6.79E-01	Bechtel-Jacobs (1998a)	Regression[d]	1.12E+00	Sample et al. (1998a)	Regression[f]	7.28E-01	Sample et al. (1998b)
Silver		2.35E+01	1.40E-02	1.66E+01	Bechtel-Jacobs (1998a)m	2.05E+00	9.38E+00	Sample et al. (1998a)	4.00E-03	2.17E+00	Sample et al. (1998b)
Thallium	NA	0.00E+00	4.00E-03	0.00E+00	Baes et al. (1984)	5.41E-02	0.00E+00	USCHPPM (2004)	1.08E-01	0.00E+00	Baes et al. (1984)[e]
Vanadium	NA	0.00E+00	4.85E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	4.20E-02	0.00E+00	Sample et al. (1998a)	1.23E-02	0.00E+00	Sample et al. (1998b)[i]
Zinc	NA	3.51E+02	Regression[a]	1.24E+02	Bechtel-Jacobs (1998a)	Regression[d]	5.85E+02	Sample et al. (1998a)	Regression[f]	1.19E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	1.64E+01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polycholrinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]

Table H9-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - South Percolation Pond Area (0 - 0.5' Interval)
Baselie Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Phenanthrene	4.55	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs											
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	7.50E-01	Regression[a]	5.62E-02	USEPA (2007a)	1.59E+00	1.19E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	4.00E+00	Regression[a]	4.92E-01	USEPA (2007a)	1.33E+00	5.32E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs											
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	2.20E+00	2.38E-02	5.23E-02	USEPA (2007a)	5.44E+01	1.20E+02	USEPA (2007a)	7.79E-01	1.71E+00	LANL (2015)
Butylbenzylphthalate	4.84	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	5.80E-02	8.14E-01	4.72E-02	USEPA (2007a)	1.03E+01	5.98E-01	USEPA (2007a)	4.49E-01	2.60E-02	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)

Table H9-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - South Percolation Pond Area (0 - 0.5' Interval)
Baselie Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H9-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - South Percolation Pond Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H9-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - South Percolation Pond Area (0 - 2' Interval)
Baselie Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	1.00E+00	0.00E+00	Assumption[c]	5.00E-02	0.00E+00	Baes et al. (1984)[e]
Arsenic	NA	ND	3.75E-02	0	Bechtel-Jacobs (1998a)[g]	Regression[d]	0	Sample et al. (1999)	Regression[f]	0	Sample et al. (1998b)
Barium	NA	5.80E+02	1.56E-01	9.04E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	5.27E+01	Sample et al. (1998a)	6.83E-04	3.96E-01	Baes et al. (1984)[e]
Beryllium	NA	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	1.75E+00	Regression[a]	8.44E-01	Bechtel-Jacobs (1998a)	Regression[d]	1.29E+01	Sample et al. (1999)	Regression[f]	3.71E-01	Sample et al. (1998b)
Chromium	NA	2.17E+01	4.10E-02	8.90E-01	Bechtel-Jacobs (1998a)[g]	3.06E-01	6.64E+00	Sample et al. (1998a)	Regression[f]	2.22E+00	Sample et al. (1998b)
Cobalt	NA	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	4.54E+02	Regression[a]	2.17E+01	Bechtel-Jacobs (1998a)	5.15E-01	2.34E+02	Sample et al. (1998a)	Regression[f]	1.86E+01	Sample et al. (1998b)
Lead	NA	8.56E+01	Regression[a]	3.22E+00	Bechtel-Jacobs (1998a)	Regression[d]	2.91E+01	Sample et al. (1999)	Regression[f]	7.72E+00	Sample et al. (1998b)
Manganese	NA	0.00E+00	7.90E-02	0.00E+00	Bechtel-Jacobs (1998a)[g]	Regression[d]	0.00E+00	Sample et al. (1999)	2.05E-02	0.00E+00	Sample et al. (1998b)[i]
Mercury	NA	1.03E+00	Regression[a]	3.74E-01	Bechtel-Jacobs (1998a)	3.93E+00	4.03E+00	Sample et al. (1998a)	3.81E-01	3.91E-01	LANL (2015)
Nickel	NA	3.34E+01	Regression[a]	1.49E+00	Bechtel-Jacobs (1998a)	7.78E-01	2.60E+01	Sample et al. (1998a)	Regression[f]	4.01E+00	Sample et al. (1998b)
Selenium	NA	7.83E-01	Regression[a]	3.88E-01	Bechtel-Jacobs (1998a)	Regression[d]	7.75E-01	Sample et al. (1998a)	Regression[f]	6.02E-01	Sample et al. (1998b)
Silver		9.03E+00	1.40E-02	5.76E+00	Bechtel-Jacobs (1998a)m	2.05E+00	4.65E+00	Sample et al. (1998a)	4.00E-03	1.51E+00	Sample et al. (1998b)
Thallium	NA	0.00E+00	4.00E-03	0.00E+00	Baes et al. (1984)	5.41E-02	0.00E+00	USCHPPM (2004)	1.08E-01	0.00E+00	Baes et al. (1984)[e]
Vanadium	NA	0.00E+00	4.85E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	4.20E-02	0.00E+00	Sample et al. (1998a)	1.23E-02	0.00E+00	Sample et al. (1998b)[i]
Zinc	NA	2.87E+02	Regression[a]	1.11E+02	Bechtel-Jacobs (1998a)	Regression[d]	5.48E+02	Sample et al. (1998a)	Regression[f]	1.17E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	4.63E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polycholrinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]

Table H9-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - South Percolation Pond Area (0 - 2' Interval)
Baselie Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Phenanthrene	4.55	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs											
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	6.25E-01	Regression[a]	5.04E-02	USEPA (2007a)	1.59E+00	9.94E-01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	3.70E+00	Regression[a]	4.56E-01	USEPA (2007a)	1.33E+00	4.92E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs											
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	1.68E+00	2.38E-02	3.99E-02	USEPA (2007a)	5.44E+01	9.13E+01	USEPA (2007a)	7.79E-01	1.31E+00	LANL (2015)
Butylbenzylphthalate	4.84	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	4.46E-02	8.14E-01	3.63E-02	USEPA (2007a)	1.03E+01	4.60E-01	USEPA (2007a)	4.49E-01	2.00E-02	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)

Table H9-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - South Percolation Pond Area (0 - 2' Interval)
Baselie Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H9-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - South Percolation Pond Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H9-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Metals								
Aluminum	NA	2.45E+01	0.00E+00	NA	7.40E-02	---	0.00E+00	Stanley et al. (2010)
Antimony	NA	0.00E+00	0.00E+00	NA	5.75E-01	---	0.00E+00	Dovick et al. (2015)
Arsenic	NA	0.00E+00	0.00E+00	NA	3.73E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Barium	NA	2.71E+00	9.72E+02	NA	2.82E+00	---	2.74E+03	Hamilton et al. (2002)
Beryllium	NA	0.00E+00	0.00E+00	NA	1.67E-01	---	0.00E+00	Hamilton et al. (2002)
Cadmium	NA	0.00E+00	2.50E+00	NA	4.59E-01	---	1.15E+00	Bechtel-Jacobs (1998b)[c]
Chromium	NA	0.00E+00	0.00E+00	NA	8.30E-02	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Cobalt		0.00E+00	0.00E+00					
Copper	NA	1.83E-01	6.94E+02	NA	6.61E-01	---	4.59E+02	Bechtel-Jacobs (1998b)[c]
Lead	NA	0.00E+00	1.16E+02	NA	8.00E-02	---	9.28E+00	Bechtel-Jacobs (1998b)[c]
Manganese		3.37E-01	0.00E+00					
Mercury	NA	0.00E+00	1.40E+00	NA	2.84E+00	---	3.97E+00	Bechtel-Jacobs (1998c)[c]
Nickel	NA	0.00E+00	5.39E+01	NA	1.34E-01	---	7.22E+00	Bechtel-Jacobs (1998b)[c]
Selenium	NA	0.00E+00	0.00E+00	NA	3.75E+00	---	0.00E+00	Hamilton et al. (2002)
Silver	NA	0.00E+00	2.35E+01	NA	1.80E-01	---	4.23E+00	Hirsch (1998)
Thallium	NA	0.00E+00	0.00E+00	NA	2.00E-02	---	0.00E+00	Turner et al. (2013)
Vanadium	NA	2.48E-02	2.62E+01	NA	2.50E-01	---	6.55E+00	Hamilton and Buhl (2002)
Zinc	NA	0.00E+00	3.51E+02	NA	8.40E-01	---	2.95E+02	Bechtel-Jacobs (1998b)[c]
Inorganics - Other Inorganics								
Cyanide	NA	1.39E-01	1.64E+01	NA	0.00E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	0.00E+00	0.00E+00	NA	---	Regression	0.00E+00	Derived based on Aguirre-Sierra et al. (2013)
Polycholrinated Biphenyls (PCBs)								
Aroclor 1248	6.34	0.00E+00	0.00E+00	5.74E-01	3.73E+00	---	0.00E+00	DiToro and McGrath (2000)
Aroclor 1254	6.98	0.00E+00	0.00E+00	5.43E-01	3.53E+00	---	0.00E+00	DiToro and McGrath (2000)
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)								
Low Molecular Weight (LMW) PAHs:								
Acenaphthene	4.01	0.00E+00	2.00E-02	7.04E-01	4.58E+00	---	9.15E-02	DiToro and McGrath (2000)
Acenaphthylene	3.22	0.00E+00	0.00E+00	7.54E-01	4.90E+00	---	0.00E+00	DiToro and McGrath (2000)
Anthracene	4.53	0.00E+00	9.60E-02	6.73E-01	4.37E+00	---	4.20E-01	DiToro and McGrath (2000)
Fluoranthene	5.08	0.00E+00	1.30E+00	6.41E-01	4.17E+00	---	5.42E+00	DiToro and McGrath (2000)
Fluorene	4.21	0.00E+00	2.00E-02	6.92E-01	4.50E+00	---	8.99E-02	DiToro and McGrath (2000)

Table H9-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Naphthalene	3.36	0.00E+00	0.00E+00	7.45E-01	4.84E+00	---	0.00E+00	DiToro and McGrath (2000)
Phenanthrene	4.57	0.00E+00	5.50E-01	6.70E-01	4.36E+00	---	2.40E+00	DiToro and McGrath (2000)
Total LMW PAHs							8.42E+00	
High Molecular Weight (HMW) PAHs:								
Benzo(a)anthracene	6.71	0.00E+00	5.70E-01	5.56E-01	3.61E+00	---	2.06E+00	DiToro and McGrath (2000)
Benzo[A]Pyrene	6.11	0.00E+00	2.80E+00	5.86E-01	3.81E+00	---	1.07E+01	DiToro and McGrath (2000)
Benzo(b)fluoranthene	6.27	0.00E+00	0.00E+00	5.78E-01	3.76E+00	---	0.00E+00	DiToro and McGrath (2000)
Benzo(g,h,i)perylene	6.51	0.00E+00	2.70E+00	5.66E-01	3.68E+00	---	9.93E+00	DiToro and McGrath (2000)
Benzo(k)fluoranthene	6.29	0.00E+00	6.40E-01	5.77E-01	3.75E+00	---	2.40E+00	DiToro and McGrath (2000)
Chrysene	5.71	0.00E+00	2.60E+00	6.07E-01	3.94E+00	---	1.03E+01	DiToro and McGrath (2000)
Dibenz(A,H)Anthracene	6.71	0.00E+00	2.80E-01	5.56E-01	3.61E+00	---	1.01E+00	DiToro and McGrath (2000)
Indeno (1,2,3-CD) Pyrene	6.72	2.80E-04	3.10E+00	5.55E-01	3.61E+00	---	1.12E+01	DiToro and McGrath (2000)
Pyrene	4.92	0.00E+00	1.30E+00	6.50E-01	4.23E+00	---	5.49E+00	DiToro and McGrath (2000)
Total HMW PAHs							5.30E+01	
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs								
1,2,4,5-Tetrachlorobenzene		0.00E+00	0.00E+00					
2,3,4,6-Tetrachlorophenol	4.09	0.00E+00	0.00E+00	6.99E-01	4.54E+00	---	0.00E+00	DiToro and McGrath (2000)
2-Chloronaphthalene	3.81	0.00E+00	0.00E+00	7.16E-01	4.66E+00	---	0.00E+00	DiToro and McGrath (2000)
Biphenyl (Diphenyl)	3.76	0.00E+00	0.00E+00	7.20E-01	4.68E+00	---	0.00E+00	DiToro and McGrath (2000)
Bis(2-ethylhexyl)phthalate	8.39	0.00E+00	0.00E+00	4.80E-01	3.12E+00	---	0.00E+00	DiToro and McGrath (2000)
Butylbenzylphthalate		0.00E+00	0.00E+00					
Dibenzofuran	3.71	0.00E+00	0.00E+00	7.23E-01	4.70E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	6.68E-01	4.34E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-octyl phthalate	8.54	0.00E+00	0.00E+00	4.74E-01	3.08E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobenzene	5.86	0.00E+00	0.00E+00	5.99E-01	3.89E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobutadiene	4.72	0.00E+00	0.00E+00	6.62E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachloroethane		0.00E+00	0.00E+00					
Pentachlorophenol	4.74	0.00E+00	0.00E+00	6.61E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)
Volatile Organic Compounds (VOCs)								
Methylcyclohexane		0.00E+00	0.00E+00					
Dioxin/Furans								
2,3,7,8-TCDD		0.00E+00	0.00E+00					

Table H9-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
1,2,3,7,8-PeCDD		0.00E+00	0.00E+00					
1,2,3,4,7,8-HxCDD		0.00E+00	0.00E+00					
1,2,3,6,7,8-HxCDD		0.00E+00	0.00E+00					
1,2,3,7,8,9-HxCDD		0.00E+00	0.00E+00					
1,2,3,4,6,7,8-HpCDD		0.00E+00	0.00E+00					
OCDD		0.00E+00	0.00E+00					
2,3,7,8-TCDF		0.00E+00	0.00E+00					
1,2,3,7,8-PeCDF		0.00E+00	0.00E+00					
2,3,4,7,8-PeCDF		0.00E+00	0.00E+00					
1,2,3,4,7,8-HxCDF		0.00E+00	0.00E+00					
1,2,3,6,7,8-HxCDF		0.00E+00	0.00E+00					
2,3,4,6,7,8-HxCDF		0.00E+00	0.00E+00					
1,2,3,7,8,9-HxCDF		0.00E+00	0.00E+00					
1,2,3,4,6,7,8-HpCDF		0.00E+00	0.00E+00					
1,2,3,4,7,8,9-HpCDF		0.00E+00	0.00E+00					
OCDF		0.00E+00	0.00E+00					

Notes:
NA, Normalized BSAF was not applicable for metals
a, Normalized BSAF (kg OC / kg lipid) calculated based on K_{ow}, where BSAF = $K_{ow}^{-0.038}$ (DiToro and McGrath 2000)
b, For non-ionic organic constituents, dry weight BSAF calculated from sediment organic carbon and lipid normalized BSAF as follows:

$$BSAF_{dry\ weight} = BSAF_{norm} \times f_{lip;id} \times \frac{1}{f_{oc}}$$

where: $BSAF_{norm}$ = Normalized BSAF (kg OC/kg lipid)
f_{lipid} = Fraction of lipids in prey item expressed on a dry weight basis (0.065, invertebrates; 0.08, fish)
f_{oc} = Fraction of sediment organic carbon expressed on a dry weight basis (0.01 or 1%)
c, Median BSAF for non-depurated invertebrates determined by Bechtel-Jacobs (1998b)

Table H9-3
Screening-Level Exposure Evaluation - American Dipper
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	4.07E+00	0.00E+00	4.07E+00	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	9.72E+02	2.71E+00	4.55E+02	0.00E+00	4.55E+02	4.50E-01	3.23E+00	4.58E+02	7.35E+01	6.24E+00	1.31E+02	3.50E+00
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Cadmium	2.50E+00	0.00E+00	1.90E-01	0.00E+00	1.90E-01	0.00E+00	8.30E-03	1.99E-01	1.47E+00	<1	6.35E+00	<1
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	6.94E+02	1.83E-01	7.61E+01	0.00E+00	7.61E+01	3.04E-02	2.30E+00	7.85E+01	4.05E+00	1.94E+01	3.48E+01	2.25E+00
Lead	1.16E+02	0.00E+00	1.54E+00	0.00E+00	1.54E+00	0.00E+00	3.85E-01	1.92E+00	1.63E+00	1.18E+00	4.46E+01	<1
Manganese	0.00E+00	3.37E-01	0.00E+00	0.00E+00	0.00E+00	5.59E-02	0.00E+00	5.59E-02	1.79E+02	<1	3.77E+02	<1
Mercury	1.40E+00	0.00E+00	6.59E-01	0.00E+00	6.59E-01	0.00E+00	4.65E-03	6.64E-01	4.50E-01	1.47E+00	9.10E-01	<1
Nickel	5.39E+01	0.00E+00	1.20E+00	0.00E+00	1.20E+00	0.00E+00	1.79E-01	1.38E+00	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-01	--	8.20E-01	--
Silver	2.35E+01	0.00E+00	7.02E-01	0.00E+00	7.02E-01	0.00E+00	7.80E-02	7.80E-01	2.02E+00	<1	6.05E+01	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	2.62E+01	2.48E-02	1.09E+00	0.00E+00	1.09E+00	4.12E-03	8.69E-02	1.18E+00	3.44E-01	3.42E+00	1.70E+00	<1
Zinc	3.51E+02	0.00E+00	4.89E+01	0.00E+00	4.89E+01	0.00E+00	1.16E+00	5.01E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics												
Cyanide	1.64E+01	1.39E-01	0.00E+00	0.00E+00	0.00E+00	2.31E-02	5.44E-02	7.75E-02	4.00E-02	1.94E+00	4.00E-01	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	2.00E-02	0.00E+00	1.52E-02	0.00E+00	1.52E-02	0.00E+00	6.64E-05	1.53E-02				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	9.60E-02	0.00E+00	6.97E-02	0.00E+00	6.97E-02	0.00E+00	3.19E-04	7.00E-02				
Fluoranthene	1.30E+00	0.00E+00	8.99E-01	0.00E+00	8.99E-01	0.00E+00	4.31E-03	9.03E-01				
Fluorene	2.00E-02	0.00E+00	1.49E-02	0.00E+00	1.49E-02	0.00E+00	6.64E-05	1.50E-02				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	5.50E-01	0.00E+00	3.98E-01	0.00E+00	3.98E-01	0.00E+00	1.83E-03	4.00E-01				
Total LMW PAHs					1.40E+00	0.00E+00	6.59E-03	1.40E+00	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	5.70E-01	0.00E+00	3.42E-01	0.00E+00	3.42E-01	0.00E+00	1.89E-03	3.44E-01				
Benzo[A]Pyrene	2.80E+00	0.00E+00	1.77E+00	0.00E+00	1.77E+00	0.00E+00	9.29E-03	1.78E+00				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	2.70E+00	0.00E+00	1.65E+00	0.00E+00	1.65E+00	0.00E+00	8.96E-03	1.66E+00				
Benzo(k)fluoranthene	6.40E-01	0.00E+00	3.98E-01	0.00E+00	3.98E-01	0.00E+00	2.12E-03	4.00E-01				
Chrysene	2.60E+00	0.00E+00	1.70E+00	0.00E+00	1.70E+00	0.00E+00	8.63E-03	1.71E+00				
Dibenz(A,H)Anthracene	2.80E-01	0.00E+00	1.68E-01	0.00E+00	1.68E-01	0.00E+00	9.29E-04	1.69E-01				
Indeno (1,2,3-CD) Pyrene	3.10E+00	2.80E-04	1.86E+00	0.00E+00	1.86E+00	4.65E-05	1.03E-02	1.87E+00				
Pyrene	1.30E+00	0.00E+00	9.12E-01	0.00E+00	9.12E-01	0.00E+00	4.31E-03	9.16E-01				
Total HMW PAHs					8.79E+00	4.65E-05	4.64E-02	8.84E+00	2.00E+00	4.42E+00	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H9-3
Screening-Level Exposure Evaluation - American Dipper
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H9-4
Screening-Level Exposure Evaluation - American Woodcock
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.88E+00	0.00E+00	2.88E+00	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	9.72E+02	2.71E+00	1.78E+00	9.35E+00	0.00E+00	1.11E+01	3.18E-01	8.56E+00	2.00E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Cadmium	2.50E+00	0.00E+00	1.20E-02	1.81E+00	0.00E+00	1.83E+00	0.00E+00	2.20E-02	1.85E+00	1.47E+00	1.26E+00	6.35E+00	<1
Chromium	3.28E+01	0.00E+00	1.58E-02	1.06E+00	0.00E+00	1.08E+00	0.00E+00	2.89E-01	1.37E+00	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	6.94E+02	1.83E-01	3.02E-01	3.78E+01	0.00E+00	3.81E+01	2.15E-02	6.11E+00	4.42E+01	4.05E+00	1.09E+01	3.48E+01	1.27E+00
Lead	1.16E+02	0.00E+00	4.48E-02	3.94E+00	0.00E+00	3.99E+00	0.00E+00	1.02E+00	5.01E+00	1.63E+00	3.07E+00	4.46E+01	<1
Manganese	0.00E+00	3.37E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.96E-02	0.00E+00	3.96E-02	1.79E+02	<1	3.77E+02	<1
Mercury	1.40E+00	0.00E+00	5.21E-03	5.82E-01	0.00E+00	5.87E-01	0.00E+00	1.23E-02	5.99E-01	4.50E-01	1.33E+00	9.10E-01	<1
Nickel	5.39E+01	0.00E+00	2.51E-02	4.43E+00	0.00E+00	4.46E+00	0.00E+00	4.75E-01	4.93E+00	6.71E+00	<1	1.86E+01	<1
Selenium	1.30E+00	0.00E+00	7.98E-03	1.19E-01	0.00E+00	1.27E-01	0.00E+00	1.15E-02	1.38E-01	2.90E-01	<1	8.20E-01	<1
Silver	2.35E+01	0.00E+00	1.95E-01	9.92E-01	0.00E+00	1.19E+00	0.00E+00	2.07E-01	1.39E+00	2.02E+00	<1	6.05E+01	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.91E-03	0.00E+00	2.91E-03	3.44E-01	<1	1.70E+00	<1
Zinc	3.51E+02	0.00E+00	1.46E+00	6.18E+01	0.00E+00	6.33E+01	0.00E+00	3.09E+00	6.64E+01	6.61E+01	1.00E+00	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.64E+01	1.39E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E-02	1.45E-01	1.61E-01	4.00E-02	4.02E+00	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	7.50E-01	0.00E+00	6.60E-04	1.26E-01	0.00E+00	1.27E-01	0.00E+00	6.61E-03	1.33E-01				
Benzo[A]Pyrene	4.00E+00	0.00E+00	5.78E-03	5.62E-01	0.00E+00	5.68E-01	0.00E+00	3.52E-02	6.04E-01				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	3.29E-05	--	3.29E-05				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						6.95E-01	3.29E-05	4.19E-02	7.37E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.20E+00	0.00E+00	6.15E-04	1.27E+01	0.00E+00	1.27E+01	0.00E+00	1.94E-02	1.27E+01	1.10E+00	1.15E+01	1.10E+01	1.15E+00
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.80E-02	0.00E+00	5.55E-04	6.32E-02	0.00E+00	6.38E-02	0.00E+00	5.11E-04	6.43E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H9-4
Screening-Level Exposure Evaluation - American Woodcock
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H9-5
Screening-Level Exposure Evaluation - Belted Kingfisher
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals												
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	3.86E+00	0.00E+00	3.86E+00	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	9.72E+02	2.71E+00	4.32E+01	0.00E+00	4.32E+01	4.27E-01	0.00E+00	4.36E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Cadmium	2.50E+00	0.00E+00	1.81E-02	0.00E+00	1.81E-02	0.00E+00	0.00E+00	1.81E-02	1.47E+00	<1	6.35E+00	<1
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	6.94E+02	1.83E-01	7.23E+00	0.00E+00	7.23E+00	2.88E-02	0.00E+00	7.26E+00	4.05E+00	1.79E+00	3.48E+01	<1
Lead	1.16E+02	0.00E+00	1.46E-01	0.00E+00	1.46E-01	0.00E+00	0.00E+00	1.46E-01	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	3.37E-01	0.00E+00	0.00E+00	0.00E+00	5.31E-02	0.00E+00	5.31E-02	1.79E+02	<1	3.77E+02	<1
Mercury	1.40E+00	0.00E+00	6.26E-02	0.00E+00	6.26E-02	0.00E+00	0.00E+00	6.26E-02	4.50E-01	<1	9.10E-01	<1
Nickel	5.39E+01	0.00E+00	1.14E-01	0.00E+00	1.14E-01	0.00E+00	0.00E+00	1.14E-01	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-01	--	8.20E-01	--
Silver	2.35E+01	0.00E+00	6.67E-02	0.00E+00	6.67E-02	0.00E+00	0.00E+00	6.67E-02	2.02E+00	<1	6.05E+01	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	2.62E+01	2.48E-02	1.03E-01	0.00E+00	1.03E-01	3.91E-03	0.00E+00	1.07E-01	3.44E-01	<1	1.70E+00	<1
Zinc	3.51E+02	0.00E+00	4.65E+00	0.00E+00	4.65E+00	0.00E+00	0.00E+00	4.65E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics												
Cyanide	1.64E+01	1.39E-01	0.00E+00	0.00E+00	0.00E+00	2.19E-02	0.00E+00	2.19E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	2.00E-02	0.00E+00	1.44E-03	0.00E+00	1.44E-03	0.00E+00	0.00E+00	1.44E-03				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	9.60E-02	0.00E+00	6.62E-03	0.00E+00	6.62E-03	0.00E+00	0.00E+00	6.62E-03				
Fluoranthene	1.30E+00	0.00E+00	8.54E-02	0.00E+00	8.54E-02	0.00E+00	0.00E+00	8.54E-02				
Fluorene	2.00E-02	0.00E+00	1.42E-03	0.00E+00	1.42E-03	0.00E+00	0.00E+00	1.42E-03				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	5.50E-01	0.00E+00	3.78E-02	0.00E+00	3.78E-02	0.00E+00	0.00E+00	3.78E-02				
Total LMW PAHs					1.33E-01	0.00E+00	0.00E+00	1.33E-01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	5.70E-01	0.00E+00	3.25E-02	0.00E+00	3.25E-02	0.00E+00	0.00E+00	3.25E-02				
Benzo[A]Pyrene	2.80E+00	0.00E+00	1.68E-01	0.00E+00	1.68E-01	0.00E+00	0.00E+00	1.68E-01				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	2.70E+00	0.00E+00	1.56E-01	0.00E+00	1.56E-01	0.00E+00	0.00E+00	1.56E-01				
Benzo(k)fluoranthene	6.40E-01	0.00E+00	3.78E-02	0.00E+00	3.78E-02	0.00E+00	0.00E+00	3.78E-02				
Chrysene	2.60E+00	0.00E+00	1.62E-01	0.00E+00	1.62E-01	0.00E+00	0.00E+00	1.62E-01				
Dibenz(A,H)Anthracene	2.80E-01	0.00E+00	1.59E-02	0.00E+00	1.59E-02	0.00E+00	0.00E+00	1.59E-02				
Indeno (1,2,3-CD) Pyrene	3.10E+00	2.80E-04	1.76E-01	0.00E+00	1.76E-01	4.41E-05	0.00E+00	1.76E-01				
Pyrene	1.30E+00	0.00E+00	8.66E-02	0.00E+00	8.66E-02	0.00E+00	0.00E+00	8.66E-02				
Total HMW PAHs					8.35E-01	4.41E-05	0.00E+00	8.35E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H9-5
Screening-Level Exposure Evaluation - Belted Kingfisher
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H9-6
Screening-Level Exposure Evaluation - Mourning Dove
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.80E+00	0.00E+00	2.80E+00	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	9.72E+02	2.71E+00	1.73E+01	0.00E+00	0.00E+00	1.73E+01	3.09E-01	7.54E+00	2.52E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Cadmium	2.50E+00	0.00E+00	1.17E-01	0.00E+00	0.00E+00	1.17E-01	0.00E+00	1.94E-02	1.36E-01	1.47E+00	<1	6.35E+00	<1
Chromium	3.28E+01	0.00E+00	1.53E-01	0.00E+00	0.00E+00	1.53E-01	0.00E+00	2.55E-01	4.08E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	6.94E+02	1.83E-01	2.93E+00	0.00E+00	0.00E+00	2.93E+00	2.09E-02	5.39E+00	8.34E+00	4.05E+00	2.06E+00	3.48E+01	<1
Lead	1.16E+02	0.00E+00	4.35E-01	0.00E+00	0.00E+00	4.35E-01	0.00E+00	9.00E-01	1.34E+00	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	3.37E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.85E-02	0.00E+00	3.85E-02	1.79E+02	<1	3.77E+02	<1
Mercury	1.40E+00	0.00E+00	5.06E-02	0.00E+00	0.00E+00	5.06E-02	0.00E+00	1.09E-02	6.15E-02	4.50E-01	<1	9.10E-01	<1
Nickel	5.39E+01	0.00E+00	2.44E-01	0.00E+00	0.00E+00	2.44E-01	0.00E+00	4.18E-01	6.62E-01	6.71E+00	<1	1.86E+01	<1
Selenium	1.30E+00	0.00E+00	7.75E-02	0.00E+00	0.00E+00	7.75E-02	0.00E+00	1.01E-02	8.76E-02	2.90E-01	<1	8.20E-01	<1
Silver	2.35E+01	0.00E+00	1.89E+00	0.00E+00	0.00E+00	1.89E+00	0.00E+00	1.82E-01	2.08E+00	2.02E+00	1.03E+00	6.05E+01	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.83E-03	0.00E+00	2.83E-03	3.44E-01	<1	1.70E+00	<1
Zinc	3.51E+02	0.00E+00	1.42E+01	0.00E+00	0.00E+00	1.42E+01	0.00E+00	2.72E+00	1.69E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.64E+01	1.39E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-02	1.27E-01	1.43E-01	4.00E-02	3.58E+00	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	7.50E-01	0.00E+00	6.41E-03	0.00E+00	0.00E+00	6.41E-03	0.00E+00	5.82E-03	1.22E-02				
Benzo[A]Pyrene	4.00E+00	0.00E+00	5.61E-02	0.00E+00	0.00E+00	5.61E-02	0.00E+00	3.10E-02	8.72E-02				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	3.20E-05	--	3.20E-05				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						6.25E-02	3.20E-05	3.69E-02	9.94E-02	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.20E+00	0.00E+00	5.97E-03	0.00E+00	0.00E+00	5.97E-03	0.00E+00	1.71E-02	2.30E-02	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.80E-02	0.00E+00	5.39E-03	0.00E+00	0.00E+00	5.39E-03	0.00E+00	4.50E-04	5.84E-03	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H9-6
Screening-Level Exposure Evaluation - Mourning Dove
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H9-7
Screening-Level Exposure Evaluation - Red-tailed Hawk
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E+00	0.00E+00	2.01E+00	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	9.72E+02	2.71E+00	0.00E+00	0.00E+00	5.44E-02	5.44E-02	2.22E-01	2.07E+00	2.35E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Cadmium	2.50E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-02	3.60E-02	0.00E+00	5.33E-03	4.13E-02	1.47E+00	<1	6.35E+00	<1
Chromium	3.28E+01	0.00E+00	0.00E+00	0.00E+00	2.47E-01	2.47E-01	0.00E+00	6.99E-02	3.17E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	6.94E+02	1.83E-01	0.00E+00	0.00E+00	1.63E+00	1.63E+00	1.50E-02	1.48E+00	3.12E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.16E+02	0.00E+00	0.00E+00	0.00E+00	7.24E-01	7.24E-01	0.00E+00	2.47E-01	9.71E-01	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	3.37E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.76E-02	0.00E+00	2.76E-02	1.79E+02	<1	3.77E+02	<1
Mercury	1.40E+00	0.00E+00	0.00E+00	0.00E+00	4.37E-02	4.37E-02	0.00E+00	2.99E-03	4.67E-02	4.50E-01	<1	9.10E-01	<1
Nickel	5.39E+01	0.00E+00	0.00E+00	0.00E+00	4.11E-01	4.11E-01	0.00E+00	1.15E-01	5.26E-01	6.71E+00	<1	1.86E+01	<1
Selenium	1.30E+00	0.00E+00	0.00E+00	0.00E+00	5.97E-02	5.97E-02	0.00E+00	2.77E-03	6.25E-02	2.90E-01	<1	8.20E-01	<1
Silver	2.35E+01	0.00E+00	0.00E+00	0.00E+00	1.78E-01	1.78E-01	0.00E+00	5.01E-02	2.28E-01	2.02E+00	<1	6.05E+01	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.03E-03	0.00E+00	2.03E-03	3.44E-01	<1	1.70E+00	<1
Zinc	3.51E+02	0.00E+00	0.00E+00	0.00E+00	9.74E+00	9.74E+00	0.00E+00	7.48E-01	1.05E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.64E+01	1.39E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-02	3.50E-02	4.64E-02	4.00E-02	1.16E+00	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	7.50E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.60E-03	1.60E-03				
Benzo[A]Pyrene	4.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.53E-03	8.53E-03				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	2.30E-05	--	2.30E-05				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	2.30E-05	1.01E-02	1.02E-02	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.20E+00	0.00E+00	0.00E+00	0.00E+00	1.41E-01	1.41E-01	0.00E+00	4.69E-03	1.45E-01	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.80E-02	0.00E+00	0.00E+00	0.00E+00	2.14E-03	2.14E-03	0.00E+00	1.24E-04	2.26E-03	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H9-7
Screening-Level Exposure Evaluation - Red-tailed Hawk
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H9-8
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.88E+00	0.00E+00	3.88E+00	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	9.72E+02	2.71E+00	0.00E+00	1.40E+01	0.00E+00	1.40E+01	4.29E-01	0.00E+00	1.44E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Cadmium	2.50E+00	0.00E+00	0.00E+00	2.72E+00	0.00E+00	2.72E+00	0.00E+00	0.00E+00	2.72E+00	1.47E+00	1.85E+00	6.35E+00	<1
Chromium	3.28E+01	0.00E+00	0.00E+00	1.59E+00	0.00E+00	1.59E+00	0.00E+00	0.00E+00	1.59E+00	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	6.94E+02	1.83E-01	0.00E+00	5.66E+01	0.00E+00	5.66E+01	2.90E-02	0.00E+00	5.66E+01	4.05E+00	1.40E+01	3.48E+01	1.63E+00
Lead	1.16E+02	0.00E+00	0.00E+00	5.90E+00	0.00E+00	5.90E+00	0.00E+00	0.00E+00	5.90E+00	1.63E+00	3.62E+00	4.46E+01	<1
Manganese	0.00E+00	3.37E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.34E-02	0.00E+00	5.34E-02	1.79E+02	<1	3.77E+02	<1
Mercury	1.40E+00	0.00E+00	0.00E+00	8.71E-01	0.00E+00	8.71E-01	0.00E+00	0.00E+00	8.71E-01	4.50E-01	1.94E+00	9.10E-01	<1
Nickel	5.39E+01	0.00E+00	0.00E+00	6.64E+00	0.00E+00	6.64E+00	0.00E+00	0.00E+00	6.64E+00	6.71E+00	<1	1.86E+01	<1
Selenium	1.30E+00	0.00E+00	0.00E+00	1.78E-01	0.00E+00	1.78E-01	0.00E+00	0.00E+00	1.78E-01	2.90E-01	<1	8.20E-01	<1
Silver	2.35E+01	0.00E+00	0.00E+00	1.49E+00	0.00E+00	1.49E+00	0.00E+00	0.00E+00	1.49E+00	2.02E+00	<1	6.05E+01	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.93E-03	0.00E+00	3.93E-03	3.44E-01	<1	1.70E+00	<1
Zinc	3.51E+02	0.00E+00	0.00E+00	9.26E+01	0.00E+00	9.26E+01	0.00E+00	0.00E+00	9.26E+01	6.61E+01	1.40E+00	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.64E+01	1.39E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.20E-02	0.00E+00	2.20E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	7.50E-01	0.00E+00	0.00E+00	1.89E-01	0.00E+00	1.89E-01	0.00E+00	0.00E+00	1.89E-01				
Benzo[A]Pyrene	4.00E+00	0.00E+00	0.00E+00	8.42E-01	0.00E+00	8.42E-01	0.00E+00	0.00E+00	8.42E-01				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	4.43E-05	--	4.43E-05				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						1.03E+00	4.43E-05	0.00E+00	1.03E+00	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.20E+00	0.00E+00	0.00E+00	1.90E+01	0.00E+00	1.90E+01	0.00E+00	0.00E+00	1.90E+01	1.10E+00	1.72E+01	1.10E+01	1.72E+00
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.80E-02	0.00E+00	0.00E+00	9.47E-02	0.00E+00	9.47E-02	0.00E+00	0.00E+00	9.47E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H9-8
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H9-9
Screening-Level Exposure Evaluation - Canada Lynx
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.65E-01	0.00E+00	7.65E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	9.72E+02	2.71E+00	0.00E+00	0.00E+00	2.07E-02	2.07E-02	8.47E-02	8.50E-01	9.56E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	2.50E+00	0.00E+00	0.00E+00	0.00E+00	1.37E-02	1.37E-02	0.00E+00	2.19E-03	1.59E-02	7.70E-01	<1	6.87E+00	<1
Chromium	3.28E+01	0.00E+00	0.00E+00	0.00E+00	9.40E-02	9.40E-02	0.00E+00	2.87E-02	1.23E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	6.94E+02	1.83E-01	0.00E+00	0.00E+00	6.19E-01	6.19E-01	5.72E-03	6.07E-01	1.23E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.16E+02	0.00E+00	0.00E+00	0.00E+00	2.76E-01	2.76E-01	0.00E+00	1.01E-01	3.77E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	3.37E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-02	0.00E+00	1.05E-02	5.15E+01	<1	1.46E+02	<1
Mercury	1.40E+00	0.00E+00	0.00E+00	0.00E+00	1.67E-02	1.67E-02	0.00E+00	1.22E-03	1.79E-02	1.41E+00	<1	1.41E+01	<1
Nickel	5.39E+01	0.00E+00	0.00E+00	0.00E+00	1.56E-01	1.56E-01	0.00E+00	4.72E-02	2.04E-01	1.70E+00	<1	1.48E+01	<1
Selenium	1.30E+00	0.00E+00	0.00E+00	0.00E+00	2.28E-02	2.28E-02	0.00E+00	1.14E-03	2.39E-02	1.43E-01	<1	6.60E-01	<1
Silver	2.35E+01	0.00E+00	0.00E+00	0.00E+00	6.76E-02	6.76E-02	0.00E+00	2.06E-02	8.82E-02	6.02E+00	<1	1.19E+02	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.75E-04	0.00E+00	7.75E-04	4.16E+00	<1	9.44E+00	<1
Zinc	3.51E+02	0.00E+00	0.00E+00	0.00E+00	3.71E+00	3.71E+00	0.00E+00	3.07E-01	4.02E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.64E+01	1.39E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.34E-03	1.43E-02	1.87E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	7.50E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E-04	6.56E-04				
Benzo[A]Pyrene	4.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-03	3.50E-03				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	8.75E-06	--	8.75E-06				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	8.75E-06	4.16E-03	4.16E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.20E+00	0.00E+00	0.00E+00	0.00E+00	5.35E-02	5.35E-02	0.00E+00	1.92E-03	5.55E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.80E-02	0.00E+00	0.00E+00	0.00E+00	8.14E-04	8.14E-04	0.00E+00	5.07E-05	8.64E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H9-9
Screening-Level Exposure Evaluation - Canada Lynx
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H9-10
Screening-Level Exposure Evaluation - Grizzly Bear
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)										
			Diet					Water	Substrate				
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.29E-01	0.00E+00	5.29E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	9.72E+02	2.71E+00	2.13E+00	2.87E-01	1.43E-03	0.00E+00	2.42E+00	5.85E-02	5.88E-01	2.47E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	2.50E+00	0.00E+00	1.44E-02	5.56E-02	9.47E-04	0.00E+00	7.09E-02	0.00E+00	1.51E-03	7.09E-02	7.70E-01	<1	6.87E+00	<1
Chromium	3.28E+01	0.00E+00	1.89E-02	3.25E-02	6.50E-03	0.00E+00	5.79E-02	0.00E+00	1.98E-02	5.79E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	6.94E+02	1.83E-01	3.60E-01	1.16E+00	4.28E-02	0.00E+00	1.56E+00	3.95E-03	4.20E-01	1.57E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.16E+02	0.00E+00	5.35E-02	1.21E-01	1.91E-02	0.00E+00	1.93E-01	0.00E+00	7.01E-02	1.93E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	3.37E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.28E-03	0.00E+00	7.28E-03	5.15E+01	<1	1.46E+02	<1
Mercury	1.40E+00	0.00E+00	6.23E-03	1.78E-02	1.15E-03	0.00E+00	2.52E-02	0.00E+00	8.47E-04	2.52E-02	1.41E+00	<1	1.41E+01	<1
Nickel	5.39E+01	0.00E+00	3.00E-02	1.36E-01	1.08E-02	0.00E+00	1.77E-01	0.00E+00	3.26E-02	1.77E-01	1.70E+00	<1	1.48E+01	<1
Selenium	1.30E+00	0.00E+00	9.53E-03	3.64E-03	1.57E-03	0.00E+00	1.47E-02	0.00E+00	7.86E-04	1.47E-02	1.43E-01	<1	6.60E-01	<1
Silver	2.35E+01	0.00E+00	2.33E-01	3.04E-02	4.68E-03	0.00E+00	2.68E-01	0.00E+00	1.42E-02	2.68E-01	6.02E+00	<1	1.19E+02	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.36E-04	0.00E+00	5.36E-04	4.16E+00	<1	9.44E+00	<1
Zinc	3.51E+02	0.00E+00	1.74E+00	1.89E+00	2.56E-01	0.00E+00	3.89E+00	0.00E+00	2.12E-01	3.89E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	1.64E+01	1.39E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-03	9.92E-03	3.00E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs							0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	7.50E-01	0.00E+00	7.89E-04	3.86E-03	0.00E+00	0.00E+00	4.65E-03	0.00E+00	4.54E-04	4.65E-03				
Benzo[A]Pyrene	4.00E+00	0.00E+00	6.90E-03	1.72E-02	0.00E+00	0.00E+00	2.41E-02	0.00E+00	2.42E-03	2.41E-02				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	0.00E+00	6.05E-06	--	6.05E-06				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs							2.88E-02	6.05E-06	2.87E-03	3.17E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.20E+00	0.00E+00	7.35E-04	3.88E-01	3.70E-03	0.00E+00	3.92E-01	0.00E+00	1.33E-03	3.92E-01	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.80E-02	0.00E+00	6.63E-04	1.94E-03	5.62E-05	0.00E+00	2.66E-03	0.00E+00	3.51E-05	2.66E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H9-10
Screening-Level Exposure Evaluation - Grizzly Bear
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)										
			Diet					Water	Substrate				
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H9-11
Screening-Level Exposure Evaluation - Long-tailed Weasel
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E+00	0.00E+00	1.26E+00	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	5.80E+02	2.71E+00	0.00E+00	0.00E+00	2.04E-02	2.04E-02	1.39E-01	4.77E-01	6.37E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	1.75E+00	0.00E+00	0.00E+00	0.00E+00	1.91E-02	1.91E-02	0.00E+00	1.44E-03	2.05E-02	7.70E-01	<1	6.87E+00	<1
Chromium	2.17E+01	0.00E+00	0.00E+00	0.00E+00	1.14E-01	1.14E-01	0.00E+00	1.79E-02	1.32E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	4.54E+02	1.83E-01	0.00E+00	0.00E+00	9.59E-01	9.59E-01	9.42E-03	3.74E-01	1.34E+00	5.60E+00	<1	8.27E+01	<1
Lead	8.56E+01	0.00E+00	0.00E+00	0.00E+00	3.97E-01	3.97E-01	0.00E+00	7.04E-02	4.68E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	3.37E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.73E-02	0.00E+00	1.73E-02	5.15E+01	<1	1.46E+02	<1
Mercury	1.03E+00	0.00E+00	0.00E+00	0.00E+00	2.01E-02	2.01E-02	0.00E+00	8.44E-04	2.09E-02	1.41E+00	<1	1.41E+01	<1
Nickel	3.34E+01	0.00E+00	0.00E+00	0.00E+00	2.06E-01	2.06E-01	0.00E+00	2.75E-02	2.34E-01	1.70E+00	<1	1.48E+01	<1
Selenium	7.83E-01	0.00E+00	0.00E+00	0.00E+00	3.10E-02	3.10E-02	0.00E+00	6.44E-04	3.16E-02	1.43E-01	<1	6.60E-01	<1
Silver	9.03E+00	0.00E+00	0.00E+00	0.00E+00	7.77E-02	7.77E-02	0.00E+00	7.43E-03	8.52E-02	6.02E+00	<1	1.19E+02	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-03	0.00E+00	1.28E-03	4.16E+00	<1	9.44E+00	<1
Zinc	2.87E+02	0.00E+00	0.00E+00	0.00E+00	6.02E+00	6.02E+00	0.00E+00	2.37E-01	6.26E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.63E+00	1.39E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.15E-03	3.81E-03	1.10E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	6.25E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E-04	5.15E-04				
Benzo[A]Pyrene	3.70E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.05E-03	3.05E-03				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	1.44E-05	--	1.44E-05				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	1.44E-05	3.56E-03	3.58E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.68E+00	0.00E+00	0.00E+00	0.00E+00	6.73E-02	6.73E-02	0.00E+00	1.38E-03	6.87E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	4.46E-02	0.00E+00	0.00E+00	0.00E+00	1.03E-03	1.03E-03	0.00E+00	3.67E-05	1.07E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H9-11
Screening-Level Exposure Evaluation - Long-tailed Weasel
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H9-12
Screening-Level Exposure Evaluation - Meadow Vole
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.68E+00	0.00E+00	3.68E+00	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	5.80E+02	2.71E+00	1.36E+01	0.00E+00	0.00E+00	1.36E+01	4.07E-01	1.13E+00	1.51E+01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	1.75E+00	0.00E+00	1.27E-01	0.00E+00	0.00E+00	1.27E-01	0.00E+00	3.42E-03	1.30E-01	7.70E-01	<1	6.87E+00	<1
Chromium	2.17E+01	0.00E+00	1.34E-01	0.00E+00	0.00E+00	1.34E-01	0.00E+00	4.24E-02	1.76E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	4.54E+02	1.83E-01	3.26E+00	0.00E+00	0.00E+00	3.26E+00	2.75E-02	8.87E-01	4.18E+00	5.60E+00	<1	8.27E+01	<1
Lead	8.56E+01	0.00E+00	4.83E-01	0.00E+00	0.00E+00	4.83E-01	0.00E+00	1.67E-01	6.50E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	3.37E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.06E-02	0.00E+00	5.06E-02	5.15E+01	<1	1.46E+02	<1
Mercury	1.03E+00	0.00E+00	5.62E-02	0.00E+00	0.00E+00	5.62E-02	0.00E+00	2.00E-03	5.82E-02	1.41E+00	<1	1.41E+01	<1
Nickel	3.34E+01	0.00E+00	2.25E-01	0.00E+00	0.00E+00	2.25E-01	0.00E+00	6.53E-02	2.90E-01	1.70E+00	<1	1.48E+01	<1
Selenium	7.83E-01	0.00E+00	5.82E-02	0.00E+00	0.00E+00	5.82E-02	0.00E+00	1.53E-03	5.98E-02	1.43E-01	<1	6.60E-01	<1
Silver	9.03E+00	0.00E+00	8.66E-01	0.00E+00	0.00E+00	8.66E-01	0.00E+00	1.76E-02	8.84E-01	6.02E+00	<1	1.19E+02	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.73E-03	0.00E+00	3.73E-03	4.16E+00	<1	9.44E+00	<1
Zinc	2.87E+02	0.00E+00	1.67E+01	0.00E+00	0.00E+00	1.67E+01	0.00E+00	5.61E-01	1.73E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.63E+00	1.39E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.09E-02	9.05E-03	2.99E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	6.25E-01	0.00E+00	7.58E-03	0.00E+00	0.00E+00	7.58E-03	0.00E+00	1.22E-03	8.80E-03				
Benzo[A]Pyrene	3.70E+00	0.00E+00	6.85E-02	0.00E+00	0.00E+00	6.85E-02	0.00E+00	7.23E-03	7.57E-02				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	4.21E-05	--	4.21E-05				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						7.60E-02	4.21E-05	8.45E-03	8.45E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.68E+00	0.00E+00	6.00E-03	0.00E+00	0.00E+00	6.00E-03	0.00E+00	3.28E-03	9.28E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	4.46E-02	0.00E+00	5.46E-03	0.00E+00	0.00E+00	5.46E-03	0.00E+00	8.72E-05	5.55E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H9-12
Screening-Level Exposure Evaluation - Meadow Vole
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H9-13
Screening-Level Exposure Evaluation - Mink
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	1.06E+00	0.00E+00	1.06E+00	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	9.72E+02	2.71E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-01	0.00E+00	1.17E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	2.50E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	6.94E+02	1.83E-01	0.00E+00	0.00E+00	0.00E+00	7.91E-03	0.00E+00	7.91E-03	5.60E+00	<1	8.27E+01	<1
Lead	1.16E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.70E+00	--	1.86E+02	--
Manganese	0.00E+00	3.37E-01	0.00E+00	0.00E+00	0.00E+00	1.46E-02	0.00E+00	1.46E-02	5.15E+01	<1	1.46E+02	<1
Mercury	1.40E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	5.39E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-01	--	6.60E-01	--
Silver	2.35E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	2.62E+01	2.48E-02	0.00E+00	0.00E+00	0.00E+00	1.07E-03	0.00E+00	1.07E-03	4.16E+00	<1	9.44E+00	<1
Zinc	3.51E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.54E+01	--	2.98E+02	--
Inorganics - Other Inorganics												
Cyanide	1.64E+01	1.39E-01	0.00E+00	0.00E+00	0.00E+00	6.01E-03	0.00E+00	6.01E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	2.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	9.60E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluoranthene	1.30E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluorene	2.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	5.50E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total LMW PAHs					0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	5.70E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo[A]Pyrene	2.80E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	2.70E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(k)fluoranthene	6.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Chrysene	2.60E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Dibenz(A,H)Anthracene	2.80E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Indeno (1,2,3-CD) Pyrene	3.10E+00	2.80E-04	0.00E+00	0.00E+00	0.00E+00	1.21E-05	0.00E+00	1.21E-05				
Pyrene	1.30E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total HMW PAHs					0.00E+00	1.21E-05	0.00E+00	1.21E-05	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H9-13
Screening-Level Exposure Evaluation - Mink
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H9-14
Screening-Level Exposure Evaluation - North American Wolverine
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.36E-01	0.00E+00	7.36E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	5.80E+02	2.71E+00	0.00E+00	0.00E+00	1.19E-02	1.19E-02	8.14E-02	4.88E-01	5.81E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	1.75E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-02	1.11E-02	0.00E+00	1.47E-03	1.26E-02	7.70E-01	<1	6.87E+00	<1
Chromium	2.17E+01	0.00E+00	0.00E+00	0.00E+00	6.67E-02	6.67E-02	0.00E+00	1.83E-02	8.50E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	4.54E+02	1.83E-01	0.00E+00	0.00E+00	5.60E-01	5.60E-01	5.50E-03	3.82E-01	9.48E-01	5.60E+00	<1	8.27E+01	<1
Lead	8.56E+01	0.00E+00	0.00E+00	0.00E+00	2.32E-01	2.32E-01	0.00E+00	7.20E-02	3.04E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	3.37E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-02	0.00E+00	1.01E-02	5.15E+01	<1	1.46E+02	<1
Mercury	1.03E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-02	1.17E-02	0.00E+00	8.62E-04	1.26E-02	1.41E+00	<1	1.41E+01	<1
Nickel	3.34E+01	0.00E+00	0.00E+00	0.00E+00	1.20E-01	1.20E-01	0.00E+00	2.81E-02	1.49E-01	1.70E+00	<1	1.48E+01	<1
Selenium	7.83E-01	0.00E+00	0.00E+00	0.00E+00	1.81E-02	1.81E-02	0.00E+00	6.58E-04	1.87E-02	1.43E-01	<1	6.60E-01	<1
Silver	9.03E+00	0.00E+00	0.00E+00	0.00E+00	4.54E-02	4.54E-02	0.00E+00	7.59E-03	5.30E-02	6.02E+00	<1	1.19E+02	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.45E-04	0.00E+00	7.45E-04	4.16E+00	<1	9.44E+00	<1
Zinc	2.87E+02	0.00E+00	0.00E+00	0.00E+00	3.52E+00	3.52E+00	0.00E+00	2.42E-01	3.76E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.63E+00	1.39E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.18E-03	3.90E-03	8.07E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	6.25E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.26E-04	5.26E-04				
Benzo[A]Pyrene	3.70E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.11E-03	3.11E-03				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	8.41E-06	--	8.41E-06				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	8.41E-06	3.64E-03	3.65E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.68E+00	0.00E+00	0.00E+00	0.00E+00	3.93E-02	3.93E-02	0.00E+00	1.41E-03	4.07E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	4.46E-02	0.00E+00	0.00E+00	0.00E+00	6.02E-04	6.02E-04	0.00E+00	3.75E-05	6.40E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H9-14
Screening-Level Exposure Evaluation - North American Wolverine
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H9-15
Screening-Level Exposure Evaluation - Short-tailed Shrew
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.28E+00	0.00E+00	3.28E+00	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	5.80E+02	2.71E+00	0.00E+00	7.07E+00	0.00E+00	7.07E+00	3.63E-01	8.54E-01	8.28E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	1.75E+00	0.00E+00	0.00E+00	1.73E+00	0.00E+00	1.73E+00	0.00E+00	2.58E-03	1.73E+00	7.70E-01	2.25E+00	6.87E+00	<1
Chromium	2.17E+01	0.00E+00	0.00E+00	8.90E-01	0.00E+00	8.90E-01	0.00E+00	3.20E-02	9.22E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	4.54E+02	1.83E-01	0.00E+00	3.13E+01	0.00E+00	3.13E+01	2.45E-02	6.69E-01	3.20E+01	5.60E+00	5.72E+00	8.27E+01	<1
Lead	8.56E+01	0.00E+00	0.00E+00	3.91E+00	0.00E+00	3.91E+00	0.00E+00	1.26E-01	4.03E+00	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	3.37E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.52E-02	0.00E+00	4.52E-02	5.15E+01	<1	1.46E+02	<1
Mercury	1.03E+00	0.00E+00	0.00E+00	5.40E-01	0.00E+00	5.40E-01	0.00E+00	1.51E-03	5.41E-01	1.41E+00	<1	1.41E+01	<1
Nickel	3.34E+01	0.00E+00	0.00E+00	3.48E+00	0.00E+00	3.48E+00	0.00E+00	4.93E-02	3.53E+00	1.70E+00	2.08E+00	1.48E+01	<1
Selenium	7.83E-01	0.00E+00	0.00E+00	1.04E-01	0.00E+00	1.04E-01	0.00E+00	1.15E-03	1.05E-01	1.43E-01	<1	6.60E-01	<1
Silver	9.03E+00	0.00E+00	0.00E+00	6.24E-01	0.00E+00	6.24E-01	0.00E+00	1.33E-02	6.37E-01	6.02E+00	<1	1.19E+02	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	0.00E+00	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.32E-03	0.00E+00	3.32E-03	4.16E+00	<1	9.44E+00	<1
Zinc	2.87E+02	0.00E+00	0.00E+00	7.34E+01	0.00E+00	7.34E+01	0.00E+00	4.23E-01	7.38E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.63E+00	1.39E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.86E-02	6.83E-03	2.55E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	6.25E-01	0.00E+00	0.00E+00	1.33E-01	0.00E+00	1.33E-01	0.00E+00	9.21E-04	1.34E-01				
Benzo[A]Pyrene	3.70E+00	0.00E+00	0.00E+00	6.59E-01	0.00E+00	6.59E-01	0.00E+00	5.45E-03	6.65E-01				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	3.75E-05	--	3.75E-05				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						7.93E-01	3.75E-05	6.38E-03	7.99E-01	6.15E-01	1.30E+00	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.68E+00	0.00E+00	0.00E+00	1.22E+01	0.00E+00	1.22E+01	0.00E+00	2.47E-03	1.22E+01	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	4.46E-02	0.00E+00	0.00E+00	6.17E-02	0.00E+00	6.17E-02	0.00E+00	6.58E-05	6.17E-02	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H9-15
Screening-Level Exposure Evaluation - Short-tailed Shrew
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H10-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Cedar Creek Reservoir Overflow Ditch (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	7.80E+00	3.75E-02	2.93E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.03E+00	Sample et al. (1999)	Regression[f]	4.22E-02	Sample et al. (1998b)
Barium	NA	2.95E+02	1.56E-01	4.60E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	2.68E+01	Sample et al. (1998a)	6.83E-04	2.01E-01	Baes et al. (1984)[e]
Beryllium	NA	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	Regression[d]	0	Sample et al. (1999)	Regression[f]	0	Sample et al. (1998b)
Chromium	NA	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	2.78E+01	Regression[a]	7.23E+00	Bechtel-Jacobs (1998a)	5.15E-01	1.43E+01	Sample et al. (1998a)	Regression[f]	1.25E+01	Sample et al. (1998b)
Lead	NA	1.85E+01	Regression[a]	1.36E+00	Bechtel-Jacobs (1998a)	Regression[d]	8.47E+00	Sample et al. (1999)	Regression[f]	3.92E+00	Sample et al. (1998b)
Manganese	NA	1.64E+03	7.90E-02	1.30E+02	Bechtel-Jacobs (1998a)[g]	Regression[d]	6.94E+01	Sample et al. (1999)	2.05E-02	3.36E+01	Sample et al. (1998b)[i]
Mercury	NA	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	4.38E+01	Regression[a]	1.83E+00	Bechtel-Jacobs (1998a)	7.78E-01	3.41E+01	Sample et al. (1998a)	Regression[f]	4.55E+00	Sample et al. (1998b)
Selenium	NA	1.40E+00	Regression[a]	7.37E-01	Bechtel-Jacobs (1998a)	Regression[d]	1.19E+00	Sample et al. (1998a)	Regression[f]	7.49E-01	Sample et al. (1998b)
Silver		ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	ND	4.00E-03	0	Baes et al. (1984)	5.41E-02	0	USCHPPM (2004)	1.08E-01	0	Baes et al. (1984)[e]
Vanadium	NA	1.80E+01	4.85E-03	8.73E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	7.56E-01	Sample et al. (1998a)	1.23E-02	2.21E-01	Sample et al. (1998b)[i]
Zinc	NA	1.29E+02	Regression[a]	7.13E+01	Bechtel-Jacobs (1998a)	Regression[d]	4.21E+02	Sample et al. (1998a)	Regression[f]	1.11E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	1.50E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]

Table H10-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Cedar Creek Reservoir Overflow Ditch (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Phenanthrene	4.55	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs											
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	1.00E+00	Regression[a]	6.67E-02	USEPA (2007a)	1.59E+00	1.59E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs											
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	4.50E-02	2.38E-02	1.07E-03	USEPA (2007a)	5.44E+01	2.45E+00	USEPA (2007a)	7.79E-01	3.51E-02	LANL (2015)
Butylbenzylphthalate	4.84	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	3.90E-02	8.14E-01	3.18E-02	USEPA (2007a)	1.03E+01	4.02E-01	USEPA (2007a)	4.49E-01	1.75E-02	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)

Table H10-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Cedar Creek Reservoir Overflow Ditch (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H10-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Cedar Creek Reservoir Overflow Ditch (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:
BAF, Bioaccumulation Factor
HMW, High Molecular Weight
LMW, Low Molecular Weight
mg/kg, milligrams per kilogram
USEPA, Untied States Environmental Protection Agency

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([diet$_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H10-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors Cedar Creek Reservoir Overflow Ditch (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	7.80E+00	3.75E-02	2.93E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.03E+00	Sample et al. (1999)	Regression[f]	4.22E-02	Sample et al. (1998b)
Barium	NA	2.95E+02	1.56E-01	4.60E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	2.68E+01	Sample et al. (1998a)	6.83E-04	2.01E-01	Baes et al. (1984)[e]
Beryllium	NA	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	Regression[d]	0	Sample et al. (1999)	Regression[f]	0	Sample et al. (1998b)
Chromium	NA	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	2.78E+01	Regression[a]	7.23E+00	Bechtel-Jacobs (1998a)	5.15E-01	1.43E+01	Sample et al. (1998a)	Regression[f]	1.25E+01	Sample et al. (1998b)
Lead	NA	1.85E+01	Regression[a]	1.36E+00	Bechtel-Jacobs (1998a)	Regression[d]	8.47E+00	Sample et al. (1999)	Regression[f]	3.92E+00	Sample et al. (1998b)
Manganese	NA	1.64E+03	7.90E-02	1.30E+02	Bechtel-Jacobs (1998a)[g]	Regression[d]	6.94E+01	Sample et al. (1999)	2.05E-02	3.36E+01	Sample et al. (1998b)[i]
Mercury	NA	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	4.38E+01	Regression[a]	1.83E+00	Bechtel-Jacobs (1998a)	7.78E-01	3.41E+01	Sample et al. (1998a)	Regression[f]	4.55E+00	Sample et al. (1998b)
Selenium	NA	1.40E+00	Regression[a]	7.37E-01	Bechtel-Jacobs (1998a)	Regression[d]	1.19E+00	Sample et al. (1998a)	Regression[f]	7.49E-01	Sample et al. (1998b)
Silver		ND	1.40E-02	0	Bechtel-Jacobs (1998a)[m]	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	ND	4.00E-03	0	Baes et al. (1984)	5.41E-02	0	USCHPPM (2004)	1.08E-01	0	Baes et al. (1984)[e]
Vanadium	NA	1.80E+01	4.85E-03	8.73E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	7.56E-01	Sample et al. (1998a)	1.23E-02	2.21E-01	Sample et al. (1998b)[i]
Zinc	NA	1.29E+02	Regression[a]	7.13E+01	Bechtel-Jacobs (1998a)	Regression[d]	4.21E+02	Sample et al. (1998a)	Regression[f]	1.11E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	1.50E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polycholrinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Phenanthrene	4.55	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]

Table H10-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors Cedar Creek Reservoir Overflow Ditch (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
LMW PAHs											
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	1.00E+00	Regression[a]	6.67E-02	USEPA (2007a)	1.59E+00	1.59E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs											
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	4.50E-02	2.38E-02	1.07E-03	USEPA (2007a)	5.44E+01	2.45E+00	USEPA (2007a)	7.79E-01	3.51E-02	LANL (2015)
Butylbenzylphthalate	4.84	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	3.90E-02	8.14E-01	3.18E-02	USEPA (2007a)	1.03E+01	4.02E-01	USEPA (2007a)	4.49E-01	1.75E-02	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)

Table H10-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors Cedar Creek Reservoir Overflow Ditch (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H10-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Cedar Creek Reservoir Overflow Ditch (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H10-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Metals								
Aluminum	NA	1.61E+00	0.00E+00	NA	7.40E-02	---	0.00E+00	Stanley et al. (2010)
Antimony	NA	0.00E+00	0.00E+00	NA	5.75E-01	---	0.00E+00	Dovick et al. (2015)
Arsenic	NA	0.00E+00	0.00E+00	NA	3.73E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Barium	NA	2.09E-01	2.95E+02	NA	2.82E+00	---	8.32E+02	Hamilton et al. (2002)
Beryllium	NA	0.00E+00	1.00E+00	NA	1.67E-01	---	1.67E-01	Hamilton et al. (2002)
Cadmium	NA	0.00E+00	0.00E+00	NA	4.59E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Chromium	NA	0.00E+00	0.00E+00	NA	8.30E-02	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Cobalt		0.00E+00	0.00E+00					
Copper	NA	0.00E+00	0.00E+00	NA	6.61E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Lead	NA	0.00E+00	0.00E+00	NA	8.00E-02	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Manganese		3.75E+00	1.64E+03					
Mercury	NA	0.00E+00	0.00E+00	NA	2.84E+00	---	0.00E+00	Bechtel-Jacobs (1998c)[c]
Nickel	NA	0.00E+00	4.38E+01	NA	1.34E-01	---	5.87E+00	Bechtel-Jacobs (1998b)[c]
Selenium	NA	0.00E+00	0.00E+00	NA	3.75E+00	---	0.00E+00	Hamilton et al. (2002)
Silver	NA	0.00E+00	0.00E+00	NA	1.80E-01	---	0.00E+00	Hirsch (1998)
Thallium	NA	0.00E+00	0.00E+00	NA	2.00E-02	---	0.00E+00	Turner et al. (2013)
Vanadium	NA	2.20E-03	1.80E+01	NA	2.50E-01	---	4.50E+00	Hamilton and Buhl (2002)
Zinc	NA	0.00E+00	1.29E+02	NA	8.40E-01	---	1.08E+02	Bechtel-Jacobs (1998b)[c]
Inorganics - Other Inorganics								
Cyanide	NA	0.00E+00	1.50E+00	NA	0.00E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	0.00E+00	0.00E+00	NA	---	Regression	0.00E+00	Derived based on Aguirre-Sierra et al. (2013)
Polycholrinated Biphenyls (PCBs)								
Aroclor 1248	6.34	0.00E+00	0.00E+00	5.74E-01	3.73E+00	---	0.00E+00	DiToro and McGrath (2000)
Aroclor 1254	6.98	0.00E+00	0.00E+00	5.43E-01	3.53E+00	---	0.00E+00	DiToro and McGrath (2000)
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)								
Low Molecular Weight (LMW) PAHs:								
Acenaphthene	4.01	0.00E+00	7.50E-02	7.04E-01	4.58E+00	---	3.43E-01	DiToro and McGrath (2000)
Acenaphthylene	3.22	0.00E+00	0.00E+00	7.54E-01	4.90E+00	---	0.00E+00	DiToro and McGrath (2000)
Anthracene	4.53	0.00E+00	1.40E-01	6.73E-01	4.37E+00	---	6.12E-01	DiToro and McGrath (2000)

Table H10-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Fluoranthene	5.08	0.00E+00	1.80E+00	6.41E-01	4.17E+00	---	7.50E+00	DiToro and McGrath (2000)
Fluorene	4.21	0.00E+00	5.30E-02	6.92E-01	4.50E+00	---	2.38E-01	DiToro and McGrath (2000)
Naphthalene	3.36	0.00E+00	4.50E-02	7.45E-01	4.84E+00	---	2.18E-01	DiToro and McGrath (2000)
Phenanthrene	4.57	0.00E+00	8.10E-01	6.70E-01	4.36E+00	---	3.53E+00	DiToro and McGrath (2000)
Total LMW PAHs							1.24E+01	
High Molecular Weight (HMW) PAHs:								
Benzo(a)anthracene	6.71	0.00E+00	1.00E+00	5.56E-01	3.61E+00	---	3.61E+00	DiToro and McGrath (2000)
Benzo[A]Pyrene	6.11	0.00E+00	1.40E+00	5.86E-01	3.81E+00	---	5.33E+00	DiToro and McGrath (2000)
Benzo(b)fluoranthene	6.27	0.00E+00	0.00E+00	5.78E-01	3.76E+00	---	0.00E+00	DiToro and McGrath (2000)
Benzo(g,h,i)perylene	6.51	0.00E+00	1.30E+00	5.66E-01	3.68E+00	---	4.78E+00	DiToro and McGrath (2000)
Benzo(k)fluoranthene	6.29	0.00E+00	7.50E-01	5.77E-01	3.75E+00	---	2.81E+00	DiToro and McGrath (2000)
Chrysene	5.71	0.00E+00	1.40E+00	6.07E-01	3.94E+00	---	5.52E+00	DiToro and McGrath (2000)
Dibenz(A,H)Anthracene	6.71	0.00E+00	2.80E-01	5.56E-01	3.61E+00	---	1.01E+00	DiToro and McGrath (2000)
Indeno (1,2,3-CD) Pyrene	6.72	0.00E+00	1.30E+00	5.55E-01	3.61E+00	---	4.69E+00	DiToro and McGrath (2000)
Pyrene	4.92	0.00E+00	1.50E+00	6.50E-01	4.23E+00	---	6.34E+00	DiToro and McGrath (2000)
Total HMW PAHs							3.41E+01	
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs								
1,2,4,5-Tetrachlorobenzene		0.00E+00	0.00E+00					
2,3,4,6-Tetrachlorophenol	4.09	0.00E+00	0.00E+00	6.99E-01	4.54E+00	---	0.00E+00	DiToro and McGrath (2000)
2-Chloronaphthalene	3.81	0.00E+00	0.00E+00	7.16E-01	4.66E+00	---	0.00E+00	DiToro and McGrath (2000)
Biphenyl (Diphenyl)	3.76	0.00E+00	0.00E+00	7.20E-01	4.68E+00	---	0.00E+00	DiToro and McGrath (2000)
Bis(2-ethylhexyl)phthalate	8.39	0.00E+00	0.00E+00	4.80E-01	3.12E+00	---	0.00E+00	DiToro and McGrath (2000)
Butylbenzylphthalate		0.00E+00	0.00E+00					
Dibenzofuran	3.71	0.00E+00	0.00E+00	7.23E-01	4.70E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	6.68E-01	4.34E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-octyl phthalate	8.54	0.00E+00	0.00E+00	4.74E-01	3.08E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobenzene	5.86	0.00E+00	0.00E+00	5.99E-01	3.89E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobutadiene	4.72	0.00E+00	0.00E+00	6.62E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachloroethane		0.00E+00	0.00E+00					
Pentachlorophenol	4.74	0.00E+00	0.00E+00	6.61E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)

Table H10-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Volatile Organic Compounds (VOCs)								
Methylcyclohexane		0.00E+00	0.00E+00					
Dioxin/Furans								
2,3,7,8-TCDD		0.00E+00	0.00E+00					
1,2,3,7,8-PeCDD		0.00E+00	0.00E+00					
1,2,3,4,7,8-HxCDD		0.00E+00	0.00E+00					
1,2,3,6,7,8-HxCDD		0.00E+00	0.00E+00					
1,2,3,7,8,9-HxCDD		0.00E+00	0.00E+00					
1,2,3,4,6,7,8-HpCDD		0.00E+00	0.00E+00					
OCDD		0.00E+00	0.00E+00					
2,3,7,8-TCDF		0.00E+00	0.00E+00					
1,2,3,7,8-PeCDF		0.00E+00	0.00E+00					
2,3,4,7,8-PeCDF		0.00E+00	0.00E+00					
1,2,3,4,7,8-HxCDF		0.00E+00	0.00E+00					
1,2,3,6,7,8-HxCDF		0.00E+00	0.00E+00					
2,3,4,6,7,8-HxCDF		0.00E+00	0.00E+00					
1,2,3,7,8,9-HxCDF		0.00E+00	0.00E+00					
1,2,3,4,6,7,8-HpCDF		0.00E+00	0.00E+00					
1,2,3,4,7,8,9-HpCDF		0.00E+00	0.00E+00					
OCDF		0.00E+00	0.00E+00					

Notes:
NA, Normalized BSAF was not applicable for metals
a, Normalized BSAF (kg OC / kg lipid) calculated based on K_{ow}, where BSAF = $K_{ow}^{-0.038}$ (DiToro and McGrath 2000)
b, For non-ionic organic constituents, dry weight BSAF calculated from sediment organic carbon and lipid normalized BSAF as follows:

$$BSAF_{dry\ weight} = BSAF_{norm} \times f_{lip;id} \times \frac{1}{f_{oc}}$$

where: $BSAF_{norm}$ = Normalized BSAF (kg OC/kg lipid)
f_{lipid} = Fraction of lipids in prey item expressed on a dry weight basis (0.065, invertebrates; 0.08, fish)
f_{oc} = Fraction of sediment organic carbon expressed on a dry weight basis (0.01 or 1%)
c, Median BSAF for non-depurated invertebrates determined by Bechtel-Jacobs (1998b)

Table H10-3
Screening-Level Exposure Evaluation - American Dipper
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals												
Aluminum	0.00E+00	1.61E+00	0.00E+00	0.00E+00	0.00E+00	2.67E-01	0.00E+00	2.67E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	2.95E+02	2.09E-01	1.38E+02	0.00E+00	1.38E+02	3.47E-02	9.79E-01	1.39E+02	7.35E+01	1.89E+00	1.31E+02	1.06E+00
Beryllium	1.00E+00	0.00E+00	2.77E-02	0.00E+00	2.77E-02	0.00E+00	3.32E-03	3.10E-02	No TRV	--	No TRV	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.05E+00	--	3.48E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+00	--	4.46E+01	--
Manganese	1.64E+03	3.75E+00	0.00E+00	0.00E+00	0.00E+00	6.22E-01	5.44E+00	6.06E+00	1.79E+02	<1	3.77E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	4.38E+01	0.00E+00	9.74E-01	0.00E+00	9.74E-01	0.00E+00	1.45E-01	1.12E+00	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-01	--	8.20E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.80E+01	2.20E-03	7.47E-01	0.00E+00	7.47E-01	3.65E-04	5.97E-02	8.07E-01	3.44E-01	2.35E+00	1.70E+00	<1
Zinc	1.29E+02	0.00E+00	1.80E+01	0.00E+00	1.80E+01	0.00E+00	4.28E-01	1.84E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics												
Cyanide	1.50E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.98E-03	4.98E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	7.50E-02	0.00E+00	5.70E-02	0.00E+00	5.70E-02	0.00E+00	2.49E-04	5.72E-02				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	1.40E-01	0.00E+00	1.02E-01	0.00E+00	1.02E-01	0.00E+00	4.65E-04	1.02E-01				
Fluoranthene	1.80E+00	0.00E+00	1.24E+00	0.00E+00	1.24E+00	0.00E+00	5.97E-03	1.25E+00				
Fluorene	5.30E-02	0.00E+00	3.95E-02	0.00E+00	3.95E-02	0.00E+00	1.76E-04	3.97E-02				
Naphthalene	4.50E-02	0.00E+00	3.62E-02	0.00E+00	3.62E-02	0.00E+00	1.49E-04	3.63E-02				
Phenanthrene	8.10E-01	0.00E+00	5.86E-01	0.00E+00	5.86E-01	0.00E+00	2.69E-03	5.88E-01				
Total LMW PAHs					2.06E+00	0.00E+00	9.70E-03	2.07E+00	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	1.00E+00	0.00E+00	6.00E-01	0.00E+00	6.00E-01	0.00E+00	3.32E-03	6.03E-01				
Benzo[A]Pyrene	1.40E+00	0.00E+00	8.85E-01	0.00E+00	8.85E-01	0.00E+00	4.65E-03	8.89E-01				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	1.30E+00	0.00E+00	7.93E-01	0.00E+00	7.93E-01	0.00E+00	4.31E-03	7.98E-01				
Benzo(k)fluoranthene	7.50E-01	0.00E+00	4.67E-01	0.00E+00	4.67E-01	0.00E+00	2.49E-03	4.69E-01				
Chrysene	1.40E+00	0.00E+00	9.16E-01	0.00E+00	9.16E-01	0.00E+00	4.65E-03	9.21E-01				
Dibenz(A,H)Anthracene	2.80E-01	0.00E+00	1.68E-01	0.00E+00	1.68E-01	0.00E+00	9.29E-04	1.69E-01				
Indeno (1,2,3-CD) Pyrene	1.30E+00	0.00E+00	7.79E-01	0.00E+00	7.79E-01	0.00E+00	4.31E-03	7.83E-01				
Pyrene	1.50E+00	0.00E+00	1.05E+00	0.00E+00	1.05E+00	0.00E+00	4.98E-03	1.06E+00				
Total HMW PAHs					5.66E+00	0.00E+00	2.96E-02	5.69E+00	2.00E+00	2.84E+00	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H10-3
Screening-Level Exposure Evaluation - American Dipper
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:
a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H10-4
Screening-Level Exposure Evaluation - American Woodcock
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.61E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.89E-01	0.00E+00	1.89E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Arsenic	7.80E+00	0.00E+00	3.44E-03	1.09E-01	0.00E+00	1.12E-01	0.00E+00	6.87E-02	1.81E-01	2.24E+00	<1	4.51E+00	<1
Barium	2.95E+02	2.09E-01	5.41E-01	2.84E+00	0.00E+00	3.38E+00	2.46E-02	2.60E+00	6.00E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.78E+01	0.00E+00	8.49E-02	1.51E+00	0.00E+00	1.60E+00	0.00E+00	2.45E-01	1.84E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.85E+01	0.00E+00	1.60E-02	8.96E-01	0.00E+00	9.12E-01	0.00E+00	1.63E-01	1.07E+00	1.63E+00	<1	4.46E+01	<1
Manganese	1.64E+03	3.75E+00	1.52E+00	7.33E+00	0.00E+00	8.86E+00	4.41E-01	1.45E+01	2.37E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	4.38E+01	0.00E+00	2.15E-02	3.60E+00	0.00E+00	3.62E+00	0.00E+00	3.86E-01	4.01E+00	6.71E+00	<1	1.86E+01	<1
Selenium	1.40E+00	0.00E+00	8.66E-03	1.26E-01	0.00E+00	1.34E-01	0.00E+00	1.23E-02	1.47E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.80E+01	2.20E-03	1.03E-03	7.99E-02	0.00E+00	8.10E-02	2.58E-04	1.59E-01	2.40E-01	3.44E-01	<1	1.70E+00	<1
Zinc	1.29E+02	0.00E+00	8.38E-01	4.45E+01	0.00E+00	4.54E+01	0.00E+00	1.14E+00	4.65E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.50E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.32E-02	1.32E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.00E+00	0.00E+00	7.83E-04	1.68E-01	0.00E+00	1.69E-01	0.00E+00	8.81E-03	1.78E-01				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						1.69E-01	0.00E+00	8.81E-03	1.78E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	1.26E-05	2.59E-01	0.00E+00	2.59E-01	0.00E+00	3.96E-04	2.59E-01	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	3.73E-04	4.25E-02	0.00E+00	4.29E-02	0.00E+00	3.44E-04	4.32E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H10-4
Screening-Level Exposure Evaluation - American Woodcock
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H10-5
Screening-Level Exposure Evaluation - Belted Kingfisher
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	1.61E+00	0.00E+00	0.00E+00	0.00E+00	2.54E-01	0.00E+00	2.54E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	2.95E+02	2.09E-01	1.31E+01	0.00E+00	1.31E+01	3.29E-02	0.00E+00	1.31E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	1.00E+00	0.00E+00	2.63E-03	0.00E+00	2.63E-03	0.00E+00	0.00E+00	2.63E-03	No TRV	--	No TRV	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.05E+00	--	3.48E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+00	--	4.46E+01	--
Manganese	1.64E+03	3.75E+00	0.00E+00	0.00E+00	0.00E+00	5.91E-01	0.00E+00	5.91E-01	1.79E+02	<1	3.77E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	4.38E+01	0.00E+00	9.25E-02	0.00E+00	9.25E-02	0.00E+00	0.00E+00	9.25E-02	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-01	--	8.20E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.80E+01	2.20E-03	7.09E-02	0.00E+00	7.09E-02	3.47E-04	0.00E+00	7.13E-02	3.44E-01	<1	1.70E+00	<1
Zinc	1.29E+02	0.00E+00	1.71E+00	0.00E+00	1.71E+00	0.00E+00	0.00E+00	1.71E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics												
Cyanide	1.50E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.00E-02	--	4.00E-01	--
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	7.50E-02	0.00E+00	5.41E-03	0.00E+00	5.41E-03	0.00E+00	0.00E+00	5.41E-03				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	1.40E-01	0.00E+00	9.65E-03	0.00E+00	9.65E-03	0.00E+00	0.00E+00	9.65E-03				
Fluoranthene	1.80E+00	0.00E+00	1.18E-01	0.00E+00	1.18E-01	0.00E+00	0.00E+00	1.18E-01				
Fluorene	5.30E-02	0.00E+00	3.76E-03	0.00E+00	3.76E-03	0.00E+00	0.00E+00	3.76E-03				
Naphthalene	4.50E-02	0.00E+00	3.44E-03	0.00E+00	3.44E-03	0.00E+00	0.00E+00	3.44E-03				
Phenanthrene	8.10E-01	0.00E+00	5.56E-02	0.00E+00	5.56E-02	0.00E+00	0.00E+00	5.56E-02				
Total LMW PAHs					1.96E-01	0.00E+00	0.00E+00	1.96E-01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	1.00E+00	0.00E+00	5.69E-02	0.00E+00	5.69E-02	0.00E+00	0.00E+00	5.69E-02				
Benzo[A]Pyrene	1.40E+00	0.00E+00	8.40E-02	0.00E+00	8.40E-02	0.00E+00	0.00E+00	8.40E-02				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	1.30E+00	0.00E+00	7.53E-02	0.00E+00	7.53E-02	0.00E+00	0.00E+00	7.53E-02				
Benzo(k)fluoranthene	7.50E-01	0.00E+00	4.43E-02	0.00E+00	4.43E-02	0.00E+00	0.00E+00	4.43E-02				
Chrysene	1.40E+00	0.00E+00	8.70E-02	0.00E+00	8.70E-02	0.00E+00	0.00E+00	8.70E-02				
Dibenz(A,H)Anthracene	2.80E-01	0.00E+00	1.59E-02	0.00E+00	1.59E-02	0.00E+00	0.00E+00	1.59E-02				
Indeno (1,2,3-CD) Pyrene	1.30E+00	0.00E+00	7.40E-02	0.00E+00	7.40E-02	0.00E+00	0.00E+00	7.40E-02				
Pyrene	1.50E+00	0.00E+00	9.99E-02	0.00E+00	9.99E-02	0.00E+00	0.00E+00	9.99E-02				
Total HMW PAHs					5.37E-01	0.00E+00	0.00E+00	5.37E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H10-5
Screening-Level Exposure Evaluation - Belted Kingfisher
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H10-6
Screening-Level Exposure Evaluation - Mourning Dove
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.61E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.84E-01	0.00E+00	1.84E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Arsenic	7.80E+00	0.00E+00	3.34E-02	0.00E+00	0.00E+00	3.34E-02	0.00E+00	6.05E-02	9.39E-02	2.24E+00	<1	4.51E+00	<1
Barium	2.95E+02	2.09E-01	5.25E+00	0.00E+00	0.00E+00	5.25E+00	2.39E-02	2.29E+00	7.57E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.78E+01	0.00E+00	8.25E-01	0.00E+00	0.00E+00	8.25E-01	0.00E+00	2.16E-01	1.04E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.85E+01	0.00E+00	1.55E-01	0.00E+00	0.00E+00	1.55E-01	0.00E+00	1.44E-01	2.99E-01	1.63E+00	<1	4.46E+01	<1
Manganese	1.64E+03	3.75E+00	1.48E+01	0.00E+00	0.00E+00	1.48E+01	4.28E-01	1.27E+01	2.79E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	4.38E+01	0.00E+00	2.09E-01	0.00E+00	0.00E+00	2.09E-01	0.00E+00	3.40E-01	5.49E-01	6.71E+00	<1	1.86E+01	<1
Selenium	1.40E+00	0.00E+00	8.41E-02	0.00E+00	0.00E+00	8.41E-02	0.00E+00	1.09E-02	9.50E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.80E+01	2.20E-03	9.96E-03	0.00E+00	0.00E+00	9.96E-03	2.51E-04	1.40E-01	1.50E-01	3.44E-01	<1	1.70E+00	<1
Zinc	1.29E+02	0.00E+00	8.14E+00	0.00E+00	0.00E+00	8.14E+00	0.00E+00	1.00E+00	9.14E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.50E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.16E-02	1.16E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.00E+00	0.00E+00	7.61E-03	0.00E+00	0.00E+00	7.61E-03	0.00E+00	7.76E-03	1.54E-02				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						7.61E-03	0.00E+00	7.76E-03	1.54E-02	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	1.22E-04	0.00E+00	0.00E+00	1.22E-04	0.00E+00	3.49E-04	4.71E-04	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	3.62E-03	0.00E+00	0.00E+00	3.62E-03	0.00E+00	3.03E-04	3.93E-03	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H10-6
Screening-Level Exposure Evaluation - Mourning Dove
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H10-7
Screening-Level Exposure Evaluation - Red-tailed Hawk
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.61E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.32E-01	0.00E+00	1.32E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Arsenic	7.80E+00	0.00E+00	0.00E+00	0.00E+00	3.46E-03	3.46E-03	0.00E+00	1.66E-02	2.01E-02	2.24E+00	<1	4.51E+00	<1
Barium	2.95E+02	2.09E-01	0.00E+00	0.00E+00	1.65E-02	1.65E-02	1.71E-02	6.29E-01	6.63E-01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.78E+01	0.00E+00	0.00E+00	0.00E+00	1.02E+00	1.02E+00	0.00E+00	5.93E-02	1.08E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.85E+01	0.00E+00	0.00E+00	0.00E+00	3.22E-01	3.22E-01	0.00E+00	3.94E-02	3.61E-01	1.63E+00	<1	4.46E+01	<1
Manganese	1.64E+03	3.75E+00	0.00E+00	0.00E+00	2.76E+00	2.76E+00	3.08E-01	3.50E+00	6.56E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	4.38E+01	0.00E+00	0.00E+00	0.00E+00	3.73E-01	3.73E-01	0.00E+00	9.34E-02	4.66E-01	6.71E+00	<1	1.86E+01	<1
Selenium	1.40E+00	0.00E+00	0.00E+00	0.00E+00	6.14E-02	6.14E-02	0.00E+00	2.99E-03	6.44E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.80E+01	2.20E-03	0.00E+00	0.00E+00	1.82E-02	1.82E-02	1.80E-04	3.84E-02	5.67E-02	3.44E-01	<1	1.70E+00	<1
Zinc	1.29E+02	0.00E+00	0.00E+00	0.00E+00	9.07E+00	9.07E+00	0.00E+00	2.75E-01	9.35E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.50E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.20E-03	3.20E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.13E-03	2.13E-03				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	2.13E-03	2.13E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	0.00E+00	0.00E+00	2.87E-03	2.87E-03	0.00E+00	9.60E-05	2.97E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	0.00E+00	0.00E+00	1.44E-03	1.44E-03	0.00E+00	8.32E-05	1.52E-03	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H10-7
Screening-Level Exposure Evaluation - Red-tailed Hawk
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H10-8
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.61E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.55E-01	0.00E+00	2.55E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Arsenic	7.80E+00	0.00E+00	0.00E+00	1.63E-01	0.00E+00	1.63E-01	0.00E+00	0.00E+00	1.63E-01	2.24E+00	<1	4.51E+00	<1
Barium	2.95E+02	2.09E-01	0.00E+00	4.25E+00	0.00E+00	4.25E+00	3.31E-02	0.00E+00	4.28E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.78E+01	0.00E+00	0.00E+00	2.27E+00	0.00E+00	2.27E+00	0.00E+00	0.00E+00	2.27E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.85E+01	0.00E+00	0.00E+00	1.34E+00	0.00E+00	1.34E+00	0.00E+00	0.00E+00	1.34E+00	1.63E+00	<1	4.46E+01	<1
Manganese	1.64E+03	3.75E+00	0.00E+00	1.10E+01	0.00E+00	1.10E+01	5.94E-01	0.00E+00	1.16E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	4.38E+01	0.00E+00	0.00E+00	5.39E+00	0.00E+00	5.39E+00	0.00E+00	0.00E+00	5.39E+00	6.71E+00	<1	1.86E+01	<1
Selenium	1.40E+00	0.00E+00	0.00E+00	1.88E-01	0.00E+00	1.88E-01	0.00E+00	0.00E+00	1.88E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.80E+01	2.20E-03	0.00E+00	1.20E-01	0.00E+00	1.20E-01	3.48E-04	0.00E+00	1.20E-01	3.44E-01	<1	1.70E+00	<1
Zinc	1.29E+02	0.00E+00	0.00E+00	6.67E+01	0.00E+00	6.67E+01	0.00E+00	0.00E+00	6.67E+01	6.61E+01	1.01E+00	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.50E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.00E-02	--	4.00E-01	--
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.00E+00	0.00E+00	0.00E+00	2.52E-01	0.00E+00	2.52E-01	0.00E+00	0.00E+00	2.52E-01				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						2.52E-01	0.00E+00	0.00E+00	2.52E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	0.00E+00	3.88E-01	0.00E+00	3.88E-01	0.00E+00	0.00E+00	3.88E-01	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	0.00E+00	6.37E-02	0.00E+00	6.37E-02	0.00E+00	0.00E+00	6.37E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H10-8
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

special status species, decisions are made solely on the NOAEL-based HQs.

TRV, toxicity reference value

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H10-9
Screening-Level Exposure Evaluation - Canada Lynx
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	1.61E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.03E-02	0.00E+00	5.03E-02	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	7.80E+00	0.00E+00	0.00E+00	0.00E+00	1.32E-03	1.32E-03	0.00E+00	6.82E-03	8.14E-03	1.04E+00	<1	4.55E+00	<1
Barium	2.95E+02	2.09E-01	0.00E+00	0.00E+00	6.29E-03	6.29E-03	6.53E-03	2.58E-01	2.71E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.78E+01	0.00E+00	0.00E+00	0.00E+00	3.89E-01	3.89E-01	0.00E+00	2.43E-02	4.13E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.85E+01	0.00E+00	0.00E+00	0.00E+00	1.23E-01	1.23E-01	0.00E+00	1.62E-02	1.39E-01	4.70E+00	<1	1.86E+02	<1
Manganese	1.64E+03	3.75E+00	0.00E+00	0.00E+00	1.05E+00	1.05E+00	1.17E-01	1.43E+00	2.60E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	4.38E+01	0.00E+00	0.00E+00	0.00E+00	1.42E-01	1.42E-01	0.00E+00	3.83E-02	1.80E-01	1.70E+00	<1	1.48E+01	<1
Selenium	1.40E+00	0.00E+00	0.00E+00	0.00E+00	2.34E-02	2.34E-02	0.00E+00	1.22E-03	2.46E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.80E+01	2.20E-03	0.00E+00	0.00E+00	6.92E-03	6.92E-03	6.87E-05	1.57E-02	2.27E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.29E+02	0.00E+00	0.00E+00	0.00E+00	3.46E+00	3.46E+00	0.00E+00	1.13E-01	3.57E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.50E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.31E-03	1.31E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.75E-04	8.75E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	8.75E-04	8.75E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	0.00E+00	0.00E+00	1.10E-03	1.10E-03	0.00E+00	3.94E-05	1.13E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	0.00E+00	0.00E+00	5.47E-04	5.47E-04	0.00E+00	3.41E-05	5.81E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H10-9
Screening-Level Exposure Evaluation - Canada Lynx
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

[redacted] special status species, decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H10-10
Screening-Level Exposure Evaluation - Grizzly Bear
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)										
			Diet					Water	Substrate				
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	1.61E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.48E-02	0.00E+00	3.48E-02	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	7.80E+00	0.00E+00	4.11E-03	3.34E-03	9.11E-05	0.00E+00	7.53E-03	0.00E+00	4.72E-03	7.53E-03	1.04E+00	<1	4.55E+00	<1
Barium	2.95E+02	2.09E-01	6.46E-01	8.70E-02	4.35E-04	0.00E+00	7.33E-01	4.51E-03	1.78E-01	7.38E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.78E+01	0.00E+00	1.01E-01	4.64E-02	2.69E-02	0.00E+00	1.75E-01	0.00E+00	1.68E-02	1.75E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.85E+01	0.00E+00	1.91E-02	2.74E-02	8.47E-03	0.00E+00	5.50E-02	0.00E+00	1.12E-02	5.50E-02	4.70E+00	<1	1.86E+02	<1
Manganese	1.64E+03	3.75E+00	1.82E+00	2.25E-01	7.26E-02	0.00E+00	2.12E+00	8.10E-02	9.92E-01	2.20E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	4.38E+01	0.00E+00	2.57E-02	1.10E-01	9.82E-03	0.00E+00	1.46E-01	0.00E+00	2.65E-02	1.46E-01	1.70E+00	<1	1.48E+01	<1
Selenium	1.40E+00	0.00E+00	1.03E-02	3.85E-03	1.62E-03	0.00E+00	1.58E-02	0.00E+00	8.47E-04	1.58E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.80E+01	2.20E-03	1.23E-03	2.45E-03	4.78E-04	0.00E+00	4.15E-03	4.75E-05	1.09E-02	4.20E-03	4.16E+00	<1	9.44E+00	<1
Zinc	1.29E+02	0.00E+00	1.00E+00	1.36E+00	2.39E-01	0.00E+00	2.60E+00	0.00E+00	7.80E-02	2.60E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	1.50E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.07E-04	0.00E+00	6.87E+01	--	6.87E+02	--
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:												--		
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs							0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:												--		
Benzo(a)anthracene	1.00E+00	0.00E+00	9.36E-04	5.15E-03	0.00E+00	0.00E+00	6.09E-03	0.00E+00	6.05E-04	6.09E-03				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs							6.09E-03	0.00E+00	6.05E-04	6.69E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	1.50E-05	7.93E-03	7.57E-05	0.00E+00	8.02E-03	0.00E+00	2.72E-05	8.02E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	4.46E-04	1.30E-03	3.78E-05	0.00E+00	1.79E-03	0.00E+00	2.36E-05	1.79E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H10-10
Screening-Level Exposure Evaluation - Grizzly Bear
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)										
			Diet					Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

special status species, decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H10-11
Screening-Level Exposure Evaluation - Long-tailed Weasel
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.61E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.29E-02	0.00E+00	8.29E-02	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	7.80E+00	0.00E+00	0.00E+00	0.00E+00	2.17E-03	2.17E-03	0.00E+00	6.42E-03	8.59E-03	1.04E+00	<1	4.55E+00	<1
Barium	2.95E+02	2.09E-01	0.00E+00	0.00E+00	1.04E-02	1.04E-02	1.08E-02	2.43E-01	2.64E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.78E+01	0.00E+00	0.00E+00	0.00E+00	6.41E-01	6.41E-01	0.00E+00	2.29E-02	6.64E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.85E+01	0.00E+00	0.00E+00	0.00E+00	2.02E-01	2.02E-01	0.00E+00	1.52E-02	2.17E-01	4.70E+00	<1	1.86E+02	<1
Manganese	1.64E+03	3.75E+00	0.00E+00	0.00E+00	1.73E+00	1.73E+00	1.93E-01	1.35E+00	3.27E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	4.38E+01	0.00E+00	0.00E+00	0.00E+00	2.34E-01	2.34E-01	0.00E+00	3.61E-02	2.70E-01	1.70E+00	<1	1.48E+01	<1
Selenium	1.40E+00	0.00E+00	0.00E+00	0.00E+00	3.85E-02	3.85E-02	0.00E+00	1.15E-03	3.97E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.80E+01	2.20E-03	0.00E+00	0.00E+00	1.14E-02	1.14E-02	1.13E-04	1.48E-02	2.63E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.29E+02	0.00E+00	0.00E+00	0.00E+00	5.69E+00	5.69E+00	0.00E+00	1.06E-01	5.80E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.50E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.24E-03	1.24E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.23E-04	8.23E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	8.23E-04	8.23E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	0.00E+00	0.00E+00	1.80E-03	1.80E-03	0.00E+00	3.71E-05	1.84E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	0.00E+00	0.00E+00	9.01E-04	9.01E-04	0.00E+00	3.21E-05	9.33E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H10-11
Screening-Level Exposure Evaluation - Long-tailed Weasel
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H10-12
Screening-Level Exposure Evaluation - Meadow Vole
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.61E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.42E-01	0.00E+00	2.42E-01	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	7.80E+00	0.00E+00	4.40E-02	0.00E+00	0.00E+00	4.40E-02	0.00E+00	1.52E-02	5.92E-02	1.04E+00	<1	4.55E+00	<1
Barium	2.95E+02	2.09E-01	6.91E+00	0.00E+00	0.00E+00	6.91E+00	3.14E-02	5.76E-01	7.52E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.78E+01	0.00E+00	1.09E+00	0.00E+00	0.00E+00	1.09E+00	0.00E+00	5.43E-02	1.14E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.85E+01	0.00E+00	2.05E-01	0.00E+00	0.00E+00	2.05E-01	0.00E+00	3.61E-02	2.41E-01	4.70E+00	<1	1.86E+02	<1
Manganese	1.64E+03	3.75E+00	1.95E+01	0.00E+00	0.00E+00	1.95E+01	5.63E-01	3.20E+00	2.32E+01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	4.38E+01	0.00E+00	2.75E-01	0.00E+00	0.00E+00	2.75E-01	0.00E+00	8.55E-02	3.60E-01	1.70E+00	<1	1.48E+01	<1
Selenium	1.40E+00	0.00E+00	1.11E-01	0.00E+00	0.00E+00	1.11E-01	0.00E+00	2.73E-03	1.13E-01	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.80E+01	2.20E-03	1.31E-02	0.00E+00	0.00E+00	1.31E-02	3.31E-04	3.52E-02	4.86E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.29E+02	0.00E+00	1.07E+01	0.00E+00	0.00E+00	1.07E+01	0.00E+00	2.52E-01	1.10E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.50E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.93E-03	2.93E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.00E+00	0.00E+00	1.00E-02	0.00E+00	0.00E+00	1.00E-02	0.00E+00	1.95E-03	1.20E-02				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						1.00E-02	0.00E+00	1.95E-03	1.20E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	1.61E-04	0.00E+00	0.00E+00	1.61E-04	0.00E+00	8.79E-05	2.49E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	4.77E-03	0.00E+00	0.00E+00	4.77E-03	0.00E+00	7.62E-05	4.85E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H10-12
Screening-Level Exposure Evaluation - Meadow Vole
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H10-13
Screening-Level Exposure Evaluation - Mink
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	1.61E+00	0.00E+00	0.00E+00	0.00E+00	6.96E-02	0.00E+00	6.96E-02	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	2.95E+02	2.09E-01	0.00E+00	0.00E+00	0.00E+00	9.04E-03	0.00E+00	9.04E-03	5.18E+01	<1	8.27E+01	<1
Beryllium	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.60E+00	--	8.27E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.70E+00	--	1.86E+02	--
Manganese	1.64E+03	3.75E+00	0.00E+00	0.00E+00	0.00E+00	1.62E-01	0.00E+00	1.62E-01	5.15E+01	<1	1.46E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	4.38E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-01	--	6.60E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.80E+01	2.20E-03	0.00E+00	0.00E+00	0.00E+00	9.51E-05	0.00E+00	9.51E-05	4.16E+00	<1	9.44E+00	<1
Zinc	1.29E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.54E+01	--	2.98E+02	--
Inorganics - Other Inorganics												
Cyanide	1.50E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.87E+01	--	6.87E+02	--
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	7.50E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	1.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluoranthene	1.80E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluorene	5.30E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	4.50E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	8.10E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total LMW PAHs					0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo[A]Pyrene	1.40E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	1.30E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(k)fluoranthene	7.50E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Chrysene	1.40E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Dibenz(A,H)Anthracene	2.80E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Indeno (1,2,3-CD) Pyrene	1.30E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Pyrene	1.50E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total HMW PAHs					0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-01	--	3.84E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H10-13
Screening-Level Exposure Evaluation - Mink
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H10-14
Screening-Level Exposure Evaluation - North American Wolverine
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.61E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.84E-02	0.00E+00	4.84E-02	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	7.80E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-03	1.27E-03	0.00E+00	6.56E-03	7.83E-03	1.04E+00	<1	4.55E+00	<1
Barium	2.95E+02	2.09E-01	0.00E+00	0.00E+00	6.05E-03	6.05E-03	6.28E-03	2.48E-01	2.61E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.78E+01	0.00E+00	0.00E+00	0.00E+00	3.74E-01	3.74E-01	0.00E+00	2.34E-02	3.98E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.85E+01	0.00E+00	0.00E+00	0.00E+00	1.18E-01	1.18E-01	0.00E+00	1.56E-02	1.33E-01	4.70E+00	<1	1.86E+02	<1
Manganese	1.64E+03	3.75E+00	0.00E+00	0.00E+00	1.01E+00	1.01E+00	1.13E-01	1.38E+00	2.50E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	4.38E+01	0.00E+00	0.00E+00	0.00E+00	1.37E-01	1.37E-01	0.00E+00	3.68E-02	1.73E-01	1.70E+00	<1	1.48E+01	<1
Selenium	1.40E+00	0.00E+00	0.00E+00	0.00E+00	2.25E-02	2.25E-02	0.00E+00	1.18E-03	2.37E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.80E+01	2.20E-03	0.00E+00	0.00E+00	6.65E-03	6.65E-03	6.61E-05	1.51E-02	2.19E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.29E+02	0.00E+00	0.00E+00	0.00E+00	3.32E+00	3.32E+00	0.00E+00	1.09E-01	3.43E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.50E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E-03	1.26E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.41E-04	8.41E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	8.41E-04	8.41E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	0.00E+00	0.00E+00	1.05E-03	1.05E-03	0.00E+00	3.79E-05	1.09E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	0.00E+00	0.00E+00	5.26E-04	5.26E-04	0.00E+00	3.28E-05	5.59E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H10-14
Screening-Level Exposure Evaluation - North American Wolverine
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

[redacted] special status species, decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H10-15
Screening-Level Exposure Evaluation - Short-tailed Shrew
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.61E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.16E-01	0.00E+00	2.16E-01	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	7.80E+00	0.00E+00	0.00E+00	1.38E-01	0.00E+00	1.38E-01	0.00E+00	1.15E-02	1.49E-01	1.04E+00	<1	4.55E+00	<1
Barium	2.95E+02	2.09E-01	0.00E+00	3.60E+00	0.00E+00	3.60E+00	2.80E-02	4.35E-01	4.06E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.78E+01	0.00E+00	0.00E+00	1.92E+00	0.00E+00	1.92E+00	0.00E+00	4.10E-02	1.96E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.85E+01	0.00E+00	0.00E+00	1.14E+00	0.00E+00	1.14E+00	0.00E+00	2.73E-02	1.16E+00	4.70E+00	<1	1.86E+02	<1
Manganese	1.64E+03	3.75E+00	0.00E+00	9.30E+00	0.00E+00	9.30E+00	5.03E-01	2.42E+00	1.22E+01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	4.38E+01	0.00E+00	0.00E+00	4.57E+00	0.00E+00	4.57E+00	0.00E+00	6.46E-02	4.63E+00	1.70E+00	2.72E+00	1.48E+01	<1
Selenium	1.40E+00	0.00E+00	0.00E+00	1.59E-01	0.00E+00	1.59E-01	0.00E+00	2.06E-03	1.61E-01	1.43E-01	1.13E+00	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.80E+01	2.20E-03	0.00E+00	1.01E-01	0.00E+00	1.01E-01	2.95E-04	2.65E-02	1.28E-01	4.16E+00	<1	9.44E+00	<1
Zinc	1.29E+02	0.00E+00	0.00E+00	5.64E+01	0.00E+00	5.64E+01	0.00E+00	1.90E-01	5.66E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.50E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.21E-03	2.21E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.00E+00	0.00E+00	0.00E+00	2.13E-01	0.00E+00	2.13E-01	0.00E+00	1.47E-03	2.15E-01				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						2.13E-01	0.00E+00	1.47E-03	2.15E-01	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	0.00E+00	3.28E-01	0.00E+00	3.28E-01	0.00E+00	6.63E-05	3.28E-01	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	0.00E+00	5.39E-02	0.00E+00	5.39E-02	0.00E+00	5.75E-05	5.40E-02	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H10-15
Screening-Level Exposure Evaluation - Short-tailed Shrew
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:
a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H11-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Northern Surface Water Feature (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	1.45E+01	3.75E-02	5.44E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.60E+00	Sample et al. (1999)	Regression[f]	7.01E-02	Sample et al. (1998b)
Barium	NA	9.05E+02	1.56E-01	1.41E+02	Bechtel-Jacobs (1998a)[g]	9.10E-02	8.24E+01	Sample et al. (1998a)	6.83E-04	6.18E-01	Baes et al. (1984)[e]
Beryllium	NA	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	4.50E-02	0.00E+00	Sample et al. (1998a)	2.25E-03	0.00E+00	Baes et al. (1984)[e]
Cadmium	NA	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	Regression[d]	0	Sample et al. (1999)	Regression[f]	0	Sample et al. (1998b)
Chromium	NA	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	4.25E+01	Regression[a]	8.54E+00	Bechtel-Jacobs (1998a)	5.15E-01	2.19E+01	Sample et al. (1998a)	Regression[f]	1.32E+01	Sample et al. (1998b)
Lead	NA	1.76E+01	Regression[a]	1.32E+00	Bechtel-Jacobs (1998a)	Regression[d]	8.14E+00	Sample et al. (1999)	Regression[f]	3.84E+00	Sample et al. (1998b)
Manganese	NA	9.88E+02	7.90E-02	7.81E+01	Bechtel-Jacobs (1998a)[g]	Regression[d]	4.91E+01	Sample et al. (1999)	2.05E-02	2.03E+01	Sample et al. (1998b)[i]
Mercury	NA	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	7.78E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Selenium	NA	4.40E+00	Regression[a]	2.61E+00	Bechtel-Jacobs (1998a)	Regression[d]	2.75E+00	Sample et al. (1998a)	Regression[f]	1.15E+00	Sample et al. (1998b)
Silver		ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	ND	4.00E-03	0	Baes et al. (1984)	5.41E-02	0	USCHPPM (2004)	1.08E-01	0	Baes et al. (1984)[e]
Vanadium	NA	1.72E+01	4.85E-03	8.34E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	7.22E-01	Sample et al. (1998a)	1.23E-02	2.12E-01	Sample et al. (1998b)[i]
Zinc	NA	6.53E+01	Regression[a]	4.89E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.37E+02	Sample et al. (1998a)	Regression[f]	1.05E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	8.40E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]

Table H11-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Northern Surface Water Feature (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Phenanthrene	4.55	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs											
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	ND	Regression[a]	0	USEPA (2007a)	1.59E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs											

Table H11-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Northern Surface Water Feature (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	ND	2.38E-02	0	USEPA (2007a)	5.44E+01	0	USEPA (2007a)	7.79E-01	0	LANL (2015)
Butylbenzylphthalate	4.84	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	ND	8.14E-01	0	USEPA (2007a)	1.03E+01	0	USEPA (2007a)	4.49E-01	0	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H11-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Northern Surface Water Feature (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H11-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Northern Surface Water Feature (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	1.45E+01	3.75E-02	5.44E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.60E+00	Sample et al. (1999)	Regression[f]	7.01E-02	Sample et al. (1998b)
Barium	NA	9.05E+02	1.56E-01	1.41E+02	Bechtel-Jacobs (1998a)[g]	9.10E-02	8.24E+01	Sample et al. (1998a)	6.83E-04	6.18E-01	Baes et al. (1984)[e]
Beryllium	NA	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	4.50E-02	0.00E+00	Sample et al. (1998a)	2.25E-03	0.00E+00	Baes et al. (1984)[e]
Cadmium	NA	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	Regression[d]	0	Sample et al. (1999)	Regression[f]	0	Sample et al. (1998b)
Chromium	NA	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	4.25E+01	Regression[a]	8.54E+00	Bechtel-Jacobs (1998a)	5.15E-01	2.19E+01	Sample et al. (1998a)	Regression[f]	1.32E+01	Sample et al. (1998b)
Lead	NA	1.76E+01	Regression[a]	1.32E+00	Bechtel-Jacobs (1998a)	Regression[d]	8.14E+00	Sample et al. (1999)	Regression[f]	3.84E+00	Sample et al. (1998b)
Manganese	NA	9.88E+02	7.90E-02	7.81E+01	Bechtel-Jacobs (1998a)[g]	Regression[d]	4.91E+01	Sample et al. (1999)	2.05E-02	2.03E+01	Sample et al. (1998b)[i]
Mercury	NA	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	7.78E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Selenium	NA	4.40E+00	Regression[a]	2.61E+00	Bechtel-Jacobs (1998a)	Regression[d]	2.75E+00	Sample et al. (1998a)	Regression[f]	1.15E+00	Sample et al. (1998b)
Silver		ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	ND	4.00E-03	0	Baes et al. (1984)	5.41E-02	0	USCHPPM (2004)	1.08E-01	0	Baes et al. (1984)[e]
Vanadium	NA	1.72E+01	4.85E-03	8.34E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	7.22E-01	Sample et al. (1998a)	1.23E-02	2.12E-01	Sample et al. (1998b)[i]
Zinc	NA	6.53E+01	Regression[a]	4.89E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.37E+02	Sample et al. (1998a)	Regression[f]	1.05E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	8.40E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polycholrinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]

Table H11-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Northern Surface Water Feature (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Phenanthrene	4.55	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs											
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	ND	Regression[a]	0	USEPA (2007a)	1.59E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs											
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	ND	2.38E-02	0	USEPA (2007a)	5.44E+01	0	USEPA (2007a)	7.79E-01	0	LANL (2015)
Butylbenzylphthalate	4.84	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	ND	8.14E-01	0	USEPA (2007a)	1.03E+01	0	USEPA (2007a)	4.49E-01	0	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)

Table H11-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Northern Surface Water Feature (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H11-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Northern Surface Water Feature (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assummed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H11-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Metals								
Aluminum	NA	5.75E+00	0.00E+00	NA	7.40E-02	---	0.00E+00	Stanley et al. (2010)
Antimony	NA	0.00E+00	0.00E+00	NA	5.75E-01	---	0.00E+00	Dovick et al. (2015)
Arsenic	NA	0.00E+00	1.45E+01	NA	3.73E-01	---	5.41E+00	Bechtel-Jacobs (1998b)[c]
Barium	NA	2.45E-01	9.05E+02	NA	2.82E+00	---	2.55E+03	Hamilton et al. (2002)
Beryllium	NA	0.00E+00	1.10E+00	NA	1.67E-01	---	1.84E-01	Hamilton et al. (2002)
Cadmium	NA	0.00E+00	0.00E+00	NA	4.59E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Chromium	NA	0.00E+00	0.00E+00	NA	8.30E-02	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Cobalt		0.00E+00	0.00E+00					
Copper	NA	0.00E+00	4.25E+01	NA	6.61E-01	---	2.81E+01	Bechtel-Jacobs (1998b)[c]
Lead	NA	0.00E+00	0.00E+00	NA	8.00E-02	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Manganese		1.27E-01	9.88E+02					
Mercury	NA	0.00E+00	0.00E+00	NA	2.84E+00	---	0.00E+00	Bechtel-Jacobs (1998c)[c]
Nickel	NA	0.00E+00	0.00E+00	NA	1.34E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Selenium	NA	0.00E+00	4.40E+00	NA	3.75E+00	---	1.65E+01	Hamilton et al. (2002)
Silver	NA	0.00E+00	0.00E+00	NA	1.80E-01	---	0.00E+00	Hirsch (1998)
Thallium	NA	0.00E+00	0.00E+00	NA	2.00E-02	---	0.00E+00	Turner et al. (2013)
Vanadium	NA	3.90E-03	1.72E+01	NA	2.50E-01	---	4.30E+00	Hamilton and Buhl (2002)
Zinc	NA	0.00E+00	0.00E+00	NA	8.40E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Inorganics - Other Inorganics								
Cyanide	NA	0.00E+00	8.40E-01	NA	0.00E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	0.00E+00	0.00E+00	NA	---	Regression	0.00E+00	Derived based on Aguirre-Sierra et al. (2013)
Polycholrinated Biphenyls (PCBs)								
Aroclor 1248	6.34	0.00E+00	0.00E+00	5.74E-01	3.73E+00	---	0.00E+00	DiToro and McGrath (2000)
Aroclor 1254	6.98	0.00E+00	0.00E+00	5.43E-01	3.53E+00	---	0.00E+00	DiToro and McGrath (2000)
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)								
Low Molecular Weight (LMW) PAHs:								
Acenaphthene	4.01	0.00E+00	0.00E+00	7.04E-01	4.58E+00	---	0.00E+00	DiToro and McGrath (2000)
Acenaphthylene	3.22	0.00E+00	0.00E+00	7.54E-01	4.90E+00	---	0.00E+00	DiToro and McGrath (2000)
Anthracene	4.53	0.00E+00	1.30E-02	6.73E-01	4.37E+00	---	5.68E-02	DiToro and McGrath (2000)
Fluoranthene	5.08	0.00E+00	1.50E-01	6.41E-01	4.17E+00	---	6.25E-01	DiToro and McGrath (2000)

Table H11-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Fluorene	4.21	0.00E+00	0.00E+00	6.92E-01	4.50E+00	---	0.00E+00	DiToro and McGrath (2000)
Naphthalene	3.36	0.00E+00	0.00E+00	7.45E-01	4.84E+00	---	0.00E+00	DiToro and McGrath (2000)
Phenanthrene	4.57	0.00E+00	8.50E-02	6.70E-01	4.36E+00	---	3.70E-01	DiToro and McGrath (2000)
Total LMW PAHs							1.05E+00	
High Molecular Weight (HMW) PAHs:								
Benzo(a)anthracene	6.71	0.00E+00	7.40E-02	5.56E-01	3.61E+00	---	2.67E-01	DiToro and McGrath (2000)
Benzo[A]Pyrene	6.11	0.00E+00	9.10E-02	5.86E-01	3.81E+00	---	3.47E-01	DiToro and McGrath (2000)
Benzo(b)fluoranthene	6.27	0.00E+00	0.00E+00	5.78E-01	3.76E+00	---	0.00E+00	DiToro and McGrath (2000)
Benzo(g,h,i)perylene	6.51	0.00E+00	1.00E-01	5.66E-01	3.68E+00	---	3.68E-01	DiToro and McGrath (2000)
Benzo(k)fluoranthene	6.29	0.00E+00	0.00E+00	5.77E-01	3.75E+00	---	0.00E+00	DiToro and McGrath (2000)
Chrysene	5.71	0.00E+00	2.00E-01	6.07E-01	3.94E+00	---	7.89E-01	DiToro and McGrath (2000)
Dibenz(A,H)Anthracene	6.71	0.00E+00	2.10E-02	5.56E-01	3.61E+00	---	7.59E-02	DiToro and McGrath (2000)
Indeno (1,2,3-CD) Pyrene	6.72	0.00E+00	9.30E-02	5.55E-01	3.61E+00	---	3.36E-01	DiToro and McGrath (2000)
Pyrene	4.92	0.00E+00	1.20E-01	6.50E-01	4.23E+00	---	5.07E-01	DiToro and McGrath (2000)
Total HMW PAHs							2.69E+00	
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs								
1,2,4,5-Tetrachlorobenzene		0.00E+00	0.00E+00					
2,3,4,6-Tetrachlorophenol	4.09	0.00E+00	0.00E+00	6.99E-01	4.54E+00	---	0.00E+00	DiToro and McGrath (2000)
2-Chloronaphthalene	3.81	0.00E+00	0.00E+00	7.16E-01	4.66E+00	---	0.00E+00	DiToro and McGrath (2000)
Biphenyl (Diphenyl)	3.76	0.00E+00	0.00E+00	7.20E-01	4.68E+00	---	0.00E+00	DiToro and McGrath (2000)
Bis(2-ethylhexyl)phthalate	8.39	0.00E+00	0.00E+00	4.80E-01	3.12E+00	---	0.00E+00	DiToro and McGrath (2000)
Butylbenzylphthalate		0.00E+00	0.00E+00					
Dibenzofuran	3.71	0.00E+00	0.00E+00	7.23E-01	4.70E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	6.68E-01	4.34E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-octyl phthalate	8.54	0.00E+00	0.00E+00	4.74E-01	3.08E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobenzene	5.86	0.00E+00	0.00E+00	5.99E-01	3.89E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobutadiene	4.72	0.00E+00	0.00E+00	6.62E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachloroethane		0.00E+00	0.00E+00					
Pentachlorophenol	4.74	0.00E+00	0.00E+00	6.61E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)
Volatile Organic Compounds (VOCs)								
Methylcyclohexane		0.00E+00	0.00E+00					

Table H11-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Dioxin/Furans								
2,3,7,8-TCDD		0.00E+00	0.00E+00					
1,2,3,7,8-PeCDD		0.00E+00	0.00E+00					
1,2,3,4,7,8-HxCDD		0.00E+00	0.00E+00					
1,2,3,6,7,8-HxCDD		0.00E+00	0.00E+00					
1,2,3,7,8,9-HxCDD		0.00E+00	0.00E+00					
1,2,3,4,6,7,8-HpCDD		0.00E+00	0.00E+00					
OCDD		0.00E+00	0.00E+00					
2,3,7,8-TCDF		0.00E+00	0.00E+00					
1,2,3,7,8-PeCDF		0.00E+00	0.00E+00					
2,3,4,7,8-PeCDF		0.00E+00	0.00E+00					
1,2,3,4,7,8-HxCDF		0.00E+00	0.00E+00					
1,2,3,6,7,8-HxCDF		0.00E+00	0.00E+00					
2,3,4,6,7,8-HxCDF		0.00E+00	0.00E+00					
1,2,3,7,8,9-HxCDF		0.00E+00	0.00E+00					
1,2,3,4,6,7,8-HpCDF		0.00E+00	0.00E+00					
1,2,3,4,7,8,9-HpCDF		0.00E+00	0.00E+00					
OCDF		0.00E+00	0.00E+00					

Notes:
NA, Normalized BSAF was not applicable for metals
a, Normalized BSAF (kg OC / kg lipid) calculated based on K_{ow}, where BSAF = $K_{ow}^{-0.038}$ (DiToro and McGrath 2000)
b, For non-ionic organic constituents, dry weight BSAF calculated from sediment organic carbon and lipid normalized BSAF as follows:

$$BSAF_{dry\ weight} = BSAF_{norm} \times f_{lip;id} \times \frac{1}{f_{oc}}$$

where: $BSAF_{norm}$ = Normalized BSAF (kg OC/kg lipid)
f_{lipid} = Fraction of lipids in prey item expressed on a dry weight basis (0.065, invertebrates; 0.08, fish)
f_{oc} = Fraction of sediment organic carbon expressed on a dry weight basis (0.01 or 1%)
c, Median BSAF for non-depurated invertebrates determined by Bechtel-Jacobs (1998b)

Table H11-3
Screening-Level Exposure Evaluation - American Dipper
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	5.75E+00	0.00E+00	0.00E+00	0.00E+00	9.54E-01	0.00E+00	9.54E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	1.45E+01	0.00E+00	8.97E-01	0.00E+00	8.97E-01	0.00E+00	4.81E-02	9.46E-01	2.24E+00	<1	4.51E+00	<1
Barium	9.05E+02	2.45E-01	4.23E+02	0.00E+00	4.23E+02	4.07E-02	3.00E+00	4.27E+02	7.35E+01	5.80E+00	1.31E+02	3.26E+00
Beryllium	1.10E+00	0.00E+00	3.05E-02	0.00E+00	3.05E-02	0.00E+00	3.65E-03	3.41E-02	No TRV	--	No TRV	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	4.25E+01	0.00E+00	4.66E+00	0.00E+00	4.66E+00	0.00E+00	1.41E-01	4.80E+00	4.05E+00	1.19E+00	3.48E+01	<1
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+00	--	4.46E+01	--
Manganese	9.88E+02	1.27E-01	0.00E+00	0.00E+00	0.00E+00	2.11E-02	3.28E+00	3.30E+00	1.79E+02	<1	3.77E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	4.40E+00	0.00E+00	2.74E+00	0.00E+00	2.74E+00	0.00E+00	1.46E-02	2.75E+00	2.90E-01	9.49E+00	8.20E-01	3.36E+00
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.72E+01	3.90E-03	7.13E-01	0.00E+00	7.13E-01	6.47E-04	5.71E-02	7.71E-01	3.44E-01	2.24E+00	1.70E+00	<1
Zinc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.61E+01	--	1.71E+02	--
Inorganics - Other Inorganics												
Cyanide	8.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.79E-03	2.79E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	1.30E-02	0.00E+00	9.43E-03	0.00E+00	9.43E-03	0.00E+00	4.31E-05	9.48E-03				
Fluoranthene	1.50E-01	0.00E+00	1.04E-01	0.00E+00	1.04E-01	0.00E+00	4.98E-04	1.04E-01				
Fluorene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	8.50E-02	0.00E+00	6.15E-02	0.00E+00	6.15E-02	0.00E+00	2.82E-04	6.17E-02				
Total LMW PAHs					1.75E-01	0.00E+00	8.23E-04	1.75E-01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	7.40E-02	0.00E+00	4.44E-02	0.00E+00	4.44E-02	0.00E+00	2.46E-04	4.46E-02				
Benzo[A]Pyrene	9.10E-02	0.00E+00	5.75E-02	0.00E+00	5.75E-02	0.00E+00	3.02E-04	5.78E-02				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	1.00E-01	0.00E+00	6.10E-02	0.00E+00	6.10E-02	0.00E+00	3.32E-04	6.13E-02				
Benzo(k)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Chrysene	2.00E-01	0.00E+00	1.31E-01	0.00E+00	1.31E-01	0.00E+00	6.64E-04	1.32E-01				
Dibenz(A,H)Anthracene	2.10E-02	0.00E+00	1.26E-02	0.00E+00	1.26E-02	0.00E+00	6.97E-05	1.27E-02				
Indeno (1,2,3-CD) Pyrene	9.30E-02	0.00E+00	5.57E-02	0.00E+00	5.57E-02	0.00E+00	3.09E-04	5.60E-02				
Pyrene	1.20E-01	0.00E+00	8.42E-02	0.00E+00	8.42E-02	0.00E+00	3.98E-04	8.45E-02				
Total HMW PAHs					4.46E-01	0.00E+00	2.32E-03	4.49E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H11-3
Screening-Level Exposure Evaluation - American Dipper
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H11-4
Screening-Level Exposure Evaluation - American Woodcock
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	5.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.76E-01	0.00E+00	6.76E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Arsenic	1.45E+01	0.00E+00	6.39E-03	1.69E-01	0.00E+00	1.75E-01	0.00E+00	1.28E-01	3.03E-01	2.24E+00	<1	4.51E+00	<1
Barium	9.05E+02	2.45E-01	1.66E+00	8.71E+00	0.00E+00	1.04E+01	2.88E-02	7.97E+00	1.84E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	4.25E+01	0.00E+00	1.00E-01	2.31E+00	0.00E+00	2.41E+00	0.00E+00	3.74E-01	2.79E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.76E+01	0.00E+00	1.56E-02	8.60E-01	0.00E+00	8.76E-01	0.00E+00	1.55E-01	1.03E+00	1.63E+00	<1	4.46E+01	<1
Manganese	9.88E+02	1.27E-01	9.17E-01	5.19E+00	0.00E+00	6.11E+00	1.49E-02	8.71E+00	1.48E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	4.40E+00	0.00E+00	3.06E-02	2.91E-01	0.00E+00	3.21E-01	0.00E+00	3.88E-02	3.60E-01	2.90E-01	1.24E+00	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.72E+01	3.90E-03	9.80E-04	7.64E-02	0.00E+00	7.74E-02	4.58E-04	1.52E-01	2.29E-01	3.44E-01	<1	1.70E+00	<1
Zinc	6.53E+01	0.00E+00	5.75E-01	3.56E+01	0.00E+00	3.62E+01	0.00E+00	5.75E-01	3.68E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.40E-03	7.40E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+00	--	2.00E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H11-4
Screening-Level Exposure Evaluation - American Woodcock
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H11-5
Screening-Level Exposure Evaluation - Belted Kingfisher
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	5.75E+00	0.00E+00	0.00E+00	0.00E+00	9.06E-01	0.00E+00	9.06E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	1.45E+01	0.00E+00	8.52E-02	0.00E+00	8.52E-02	0.00E+00	0.00E+00	8.52E-02	2.24E+00	<1	4.51E+00	<1
Barium	9.05E+02	2.45E-01	4.02E+01	0.00E+00	4.02E+01	3.86E-02	0.00E+00	4.03E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	1.10E+00	0.00E+00	2.89E-03	0.00E+00	2.89E-03	0.00E+00	0.00E+00	2.89E-03	No TRV	--	No TRV	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	4.25E+01	0.00E+00	4.43E-01	0.00E+00	4.43E-01	0.00E+00	0.00E+00	4.43E-01	4.05E+00	<1	3.48E+01	<1
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+00	--	4.46E+01	--
Manganese	9.88E+02	1.27E-01	0.00E+00	0.00E+00	0.00E+00	2.00E-02	0.00E+00	2.00E-02	1.79E+02	<1	3.77E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	4.40E+00	0.00E+00	2.60E-01	0.00E+00	2.60E-01	0.00E+00	0.00E+00	2.60E-01	2.90E-01	<1	8.20E-01	<1
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.72E+01	3.90E-03	6.78E-02	0.00E+00	6.78E-02	6.15E-04	0.00E+00	6.84E-02	3.44E-01	<1	1.70E+00	<1
Zinc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.61E+01	--	1.71E+02	--
Inorganics - Other Inorganics												
Cyanide	8.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.00E-02	--	4.00E-01	--
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	1.30E-02	0.00E+00	8.96E-04	0.00E+00	8.96E-04	0.00E+00	0.00E+00	8.96E-04				
Fluoranthene	1.50E-01	0.00E+00	9.85E-03	0.00E+00	9.85E-03	0.00E+00	0.00E+00	9.85E-03				
Fluorene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	8.50E-02	0.00E+00	5.84E-03	0.00E+00	5.84E-03	0.00E+00	0.00E+00	5.84E-03				
Total LMW PAHs					1.66E-02	0.00E+00	0.00E+00	1.66E-02	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	7.40E-02	0.00E+00	4.21E-03	0.00E+00	4.21E-03	0.00E+00	0.00E+00	4.21E-03				
Benzo[A]Pyrene	9.10E-02	0.00E+00	5.46E-03	0.00E+00	5.46E-03	0.00E+00	0.00E+00	5.46E-03				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	1.00E-01	0.00E+00	5.80E-03	0.00E+00	5.80E-03	0.00E+00	0.00E+00	5.80E-03				
Benzo(k)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Chrysene	2.00E-01	0.00E+00	1.24E-02	0.00E+00	1.24E-02	0.00E+00	0.00E+00	1.24E-02				
Dibenz(A,H)Anthracene	2.10E-02	0.00E+00	1.20E-03	0.00E+00	1.20E-03	0.00E+00	0.00E+00	1.20E-03				
Indeno (1,2,3-CD) Pyrene	9.30E-02	0.00E+00	5.29E-03	0.00E+00	5.29E-03	0.00E+00	0.00E+00	5.29E-03				
Pyrene	1.20E-01	0.00E+00	7.99E-03	0.00E+00	7.99E-03	0.00E+00	0.00E+00	7.99E-03				
Total HMW PAHs					4.24E-02	0.00E+00	0.00E+00	4.24E-02	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H11-5
Screening-Level Exposure Evaluation - Belted Kingfisher
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

where:

ADD_{diet} = Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet} = Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF = Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$ = COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i = Dietary fraction of food item i (proportion of food type in the diet)
AUF = Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW = Body weight of the receptor, wet weight (kg)

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

where:

$ADD_{substrate}$ = Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s = Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$ = COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

Table H11-6
Screening-Level Exposure Evaluation - Mourning Dove
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	5.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E-01	0.00E+00	6.56E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Arsenic	1.45E+01	0.00E+00	6.21E-02	0.00E+00	0.00E+00	6.21E-02	0.00E+00	1.13E-01	1.75E-01	2.24E+00	<1	4.51E+00	<1
Barium	9.05E+02	2.45E-01	1.61E+01	0.00E+00	0.00E+00	1.61E+01	2.80E-02	7.02E+00	2.32E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	4.25E+01	0.00E+00	9.75E-01	0.00E+00	0.00E+00	9.75E-01	0.00E+00	3.30E-01	1.31E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.76E+01	0.00E+00	1.51E-01	0.00E+00	0.00E+00	1.51E-01	0.00E+00	1.37E-01	2.88E-01	1.63E+00	<1	4.46E+01	<1
Manganese	9.88E+02	1.27E-01	8.91E+00	0.00E+00	0.00E+00	8.91E+00	1.45E-02	7.67E+00	1.66E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	4.40E+00	0.00E+00	2.98E-01	0.00E+00	0.00E+00	2.98E-01	0.00E+00	3.42E-02	3.32E-01	2.90E-01	1.14E+00	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.72E+01	3.90E-03	9.52E-03	0.00E+00	0.00E+00	9.52E-03	4.45E-04	1.33E-01	1.43E-01	3.44E-01	<1	1.70E+00	<1
Zinc	6.53E+01	0.00E+00	5.58E+00	0.00E+00	0.00E+00	5.58E+00	0.00E+00	5.07E-01	6.09E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.52E-03	6.52E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+00	--	2.00E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H11-6
Screening-Level Exposure Evaluation - Mourning Dove
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H11-7
Screening-Level Exposure Evaluation - Red-tailed Hawk
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	5.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.72E-01	0.00E+00	4.72E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Arsenic	1.45E+01	0.00E+00	0.00E+00	0.00E+00	5.75E-03	5.75E-03	0.00E+00	3.09E-02	3.67E-02	2.24E+00	<1	4.51E+00	<1
Barium	9.05E+02	2.45E-01	0.00E+00	0.00E+00	5.07E-02	5.07E-02	2.01E-02	1.93E+00	2.00E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	4.25E+01	0.00E+00	0.00E+00	0.00E+00	1.09E+00	1.09E+00	0.00E+00	9.06E-02	1.18E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.76E+01	0.00E+00	0.00E+00	0.00E+00	3.15E-01	3.15E-01	0.00E+00	3.75E-02	3.52E-01	1.63E+00	<1	4.46E+01	<1
Manganese	9.88E+02	1.27E-01	0.00E+00	0.00E+00	1.66E+00	1.66E+00	1.04E-02	2.11E+00	3.78E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	4.40E+00	0.00E+00	0.00E+00	0.00E+00	9.45E-02	9.45E-02	0.00E+00	9.38E-03	1.04E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.72E+01	3.90E-03	0.00E+00	0.00E+00	1.74E-02	1.74E-02	3.20E-04	3.67E-02	5.43E-02	3.44E-01	<1	1.70E+00	<1
Zinc	6.53E+01	0.00E+00	0.00E+00	0.00E+00	8.65E+00	8.65E+00	0.00E+00	1.39E-01	8.79E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E-03	1.79E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+00	--	2.00E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H11-7
Screening-Level Exposure Evaluation - Red-tailed Hawk
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H11-8
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	5.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.10E-01	0.00E+00	9.10E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Arsenic	1.45E+01	0.00E+00	0.00E+00	2.53E-01	0.00E+00	2.53E-01	0.00E+00	0.00E+00	2.53E-01	2.24E+00	<1	4.51E+00	<1
Barium	9.05E+02	2.45E-01	0.00E+00	1.30E+01	0.00E+00	1.30E+01	3.88E-02	0.00E+00	1.31E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	4.25E+01	0.00E+00	0.00E+00	3.47E+00	0.00E+00	3.47E+00	0.00E+00	0.00E+00	3.47E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.76E+01	0.00E+00	0.00E+00	1.29E+00	0.00E+00	1.29E+00	0.00E+00	0.00E+00	1.29E+00	1.63E+00	<1	4.46E+01	<1
Manganese	9.88E+02	1.27E-01	0.00E+00	7.77E+00	0.00E+00	7.77E+00	2.01E-02	0.00E+00	7.79E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	4.40E+00	0.00E+00	0.00E+00	4.35E-01	0.00E+00	4.35E-01	0.00E+00	0.00E+00	4.35E-01	2.90E-01	1.50E+00	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.72E+01	3.90E-03	0.00E+00	1.14E-01	0.00E+00	1.14E-01	6.17E-04	0.00E+00	1.15E-01	3.44E-01	<1	1.70E+00	<1
Zinc	6.53E+01	0.00E+00	0.00E+00	5.33E+01	0.00E+00	5.33E+01	0.00E+00	0.00E+00	5.33E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.00E-02	--	4.00E-01	--
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+00	--	2.00E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H11-8
Screening-Level Exposure Evaluation - Yellow-billed Cuckoo
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H11-9
Screening-Level Exposure Evaluation - Canada Lynx
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	5.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	0.00E+00	1.80E-01	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	1.45E+01	0.00E+00	0.00E+00	0.00E+00	2.19E-03	2.19E-03	0.00E+00	1.27E-02	1.49E-02	1.04E+00	<1	4.55E+00	<1
Barium	9.05E+02	2.45E-01	0.00E+00	0.00E+00	1.93E-02	1.93E-02	7.65E-03	7.92E-01	8.19E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	4.25E+01	0.00E+00	0.00E+00	0.00E+00	4.14E-01	4.14E-01	0.00E+00	3.72E-02	4.51E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.76E+01	0.00E+00	0.00E+00	0.00E+00	1.20E-01	1.20E-01	0.00E+00	1.54E-02	1.35E-01	4.70E+00	<1	1.86E+02	<1
Manganese	9.88E+02	1.27E-01	0.00E+00	0.00E+00	6.33E-01	6.33E-01	3.97E-03	8.64E-01	1.50E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	4.40E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-02	3.60E-02	0.00E+00	3.85E-03	3.99E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.72E+01	3.90E-03	0.00E+00	0.00E+00	6.61E-03	6.61E-03	1.22E-04	1.50E-02	2.18E-02	4.16E+00	<1	9.44E+00	<1
Zinc	6.53E+01	0.00E+00	0.00E+00	0.00E+00	3.29E+00	3.29E+00	0.00E+00	5.71E-02	3.35E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.35E-04	7.35E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-01	--	3.84E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H11-9
Screening-Level Exposure Evaluation - Canada Lynx
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H11-10
Screening-Level Exposure Evaluation - Grizzly Bear
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate						
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	5.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.24E-01	0.00E+00	1.24E-01	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	1.45E+01	0.00E+00	7.64E-03	5.17E-03	1.51E-04	0.00E+00	1.30E-02	0.00E+00	8.77E-03	1.30E-02	1.04E+00	<1	4.55E+00	<1
Barium	9.05E+02	2.45E-01	1.98E+00	2.67E-01	1.33E-03	0.00E+00	2.25E+00	5.29E-03	5.47E-01	2.26E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	4.25E+01	0.00E+00	1.20E-01	7.09E-02	2.86E-02	0.00E+00	2.19E-01	0.00E+00	2.57E-02	2.19E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.76E+01	0.00E+00	1.86E-02	2.64E-02	8.28E-03	0.00E+00	5.32E-02	0.00E+00	1.06E-02	5.32E-02	4.70E+00	<1	1.86E+02	<1
Manganese	9.88E+02	1.27E-01	1.10E+00	1.59E-01	4.37E-02	0.00E+00	1.30E+00	2.74E-03	5.97E-01	1.30E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	4.40E+00	0.00E+00	3.66E-02	8.90E-03	2.49E-03	0.00E+00	4.80E-02	0.00E+00	2.66E-03	4.80E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.72E+01	3.90E-03	1.17E-03	2.34E-03	4.57E-04	0.00E+00	3.97E-03	8.42E-05	1.04E-02	4.05E-03	4.16E+00	<1	9.44E+00	<1
Zinc	6.53E+01	0.00E+00	6.87E-01	1.09E+00	2.28E-01	0.00E+00	2.01E+00	0.00E+00	3.95E-02	2.01E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	8.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.08E-04	0.00E+00	6.87E+01	--	6.87E+02	--
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs							0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs							0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-01	--	3.84E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H11-10
Screening-Level Exposure Evaluation - Grizzly Bear
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)										
			Diet					Water	Substrate				
	Maximum Shallow Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H11-11
Screening-Level Exposure Evaluation - Long-tailed Weasel
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	5.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.96E-01	0.00E+00	2.96E-01	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	1.45E+01	0.00E+00	0.00E+00	0.00E+00	3.61E-03	3.61E-03	0.00E+00	1.19E-02	1.55E-02	1.04E+00	<1	4.55E+00	<1
Barium	9.05E+02	2.45E-01	0.00E+00	0.00E+00	3.18E-02	3.18E-02	1.26E-02	7.45E-01	7.90E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	4.25E+01	0.00E+00	0.00E+00	0.00E+00	6.81E-01	6.81E-01	0.00E+00	3.50E-02	7.16E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.76E+01	0.00E+00	0.00E+00	0.00E+00	1.97E-01	1.97E-01	0.00E+00	1.45E-02	2.12E-01	4.70E+00	<1	1.86E+02	<1
Manganese	9.88E+02	1.27E-01	0.00E+00	0.00E+00	1.04E+00	1.04E+00	6.54E-03	8.14E-01	1.86E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	4.40E+00	0.00E+00	0.00E+00	0.00E+00	5.93E-02	5.93E-02	0.00E+00	3.62E-03	6.29E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.72E+01	3.90E-03	0.00E+00	0.00E+00	1.09E-02	1.09E-02	2.01E-04	1.42E-02	2.53E-02	4.16E+00	<1	9.44E+00	<1
Zinc	6.53E+01	0.00E+00	0.00E+00	0.00E+00	5.43E+00	5.43E+00	0.00E+00	5.38E-02	5.48E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.92E-04	6.92E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-01	--	3.84E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H11-11
Screening-Level Exposure Evaluation - Long-tailed Weasel
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

where:

ADD_{diet} = Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet} = Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF = Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$ = COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i = Dietary fraction of food item i (proportion of food type in the diet)
AUF = Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW = Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$ = Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s = Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$ = COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

Table H11-12
Screening-Level Exposure Evaluation - Meadow Vole
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	5.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.64E-01	0.00E+00	8.64E-01	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	1.45E+01	0.00E+00	8.17E-02	0.00E+00	0.00E+00	8.17E-02	0.00E+00	2.83E-02	1.10E-01	1.04E+00	<1	4.55E+00	<1
Barium	9.05E+02	2.45E-01	2.12E+01	0.00E+00	0.00E+00	2.12E+01	3.68E-02	1.77E+00	2.30E+01	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	4.25E+01	0.00E+00	1.28E+00	0.00E+00	0.00E+00	1.28E+00	0.00E+00	8.30E-02	1.37E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.76E+01	0.00E+00	1.99E-01	0.00E+00	0.00E+00	1.99E-01	0.00E+00	3.44E-02	2.33E-01	4.70E+00	<1	1.86E+02	<1
Manganese	9.88E+02	1.27E-01	1.17E+01	0.00E+00	0.00E+00	1.17E+01	1.91E-02	1.93E+00	1.37E+01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	4.40E+00	0.00E+00	3.92E-01	0.00E+00	0.00E+00	3.92E-01	0.00E+00	8.59E-03	4.00E-01	1.43E-01	2.80E+00	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.72E+01	3.90E-03	1.25E-02	0.00E+00	0.00E+00	1.25E-02	5.86E-04	3.36E-02	4.67E-02	4.16E+00	<1	9.44E+00	<1
Zinc	6.53E+01	0.00E+00	7.35E+00	0.00E+00	0.00E+00	7.35E+00	0.00E+00	1.28E-01	7.48E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.64E-03	1.64E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-01	--	3.84E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H11-12
Screening-Level Exposure Evaluation - Meadow Vole
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H11-13
Screening-Level Exposure Evaluation - Mink
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	5.75E+00	0.00E+00	0.00E+00	0.00E+00	2.49E-01	0.00E+00	2.49E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	1.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	9.05E+02	2.45E-01	0.00E+00	0.00E+00	0.00E+00	1.06E-02	0.00E+00	1.06E-02	5.18E+01	<1	8.27E+01	<1
Beryllium	1.10E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	4.25E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.60E+00	--	8.27E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.70E+00	--	1.86E+02	--
Manganese	9.88E+02	1.27E-01	0.00E+00	0.00E+00	0.00E+00	5.49E-03	0.00E+00	5.49E-03	5.15E+01	<1	1.46E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	4.40E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-01	--	6.60E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.72E+01	3.90E-03	0.00E+00	0.00E+00	0.00E+00	1.69E-04	0.00E+00	1.69E-04	4.16E+00	<1	9.44E+00	<1
Zinc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.54E+01	--	2.98E+02	--
Inorganics - Other Inorganics												
Cyanide	8.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.87E+01	--	6.87E+02	--
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	1.30E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluoranthene	1.50E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluorene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	8.50E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total LMW PAHs					0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	7.40E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo[A]Pyrene	9.10E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	1.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(k)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Chrysene	2.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Dibenz(A,H)Anthracene	2.10E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Indeno (1,2,3-CD) Pyrene	9.30E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Pyrene	1.20E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total HMW PAHs					0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-01	--	3.84E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H11-13
Screening-Level Exposure Evaluation - Mink
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H11-14
Screening-Level Exposure Evaluation - North American Wolverine
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	5.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.73E-01	0.00E+00	1.73E-01	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	1.45E+01	0.00E+00	0.00E+00	0.00E+00	2.11E-03	2.11E-03	0.00E+00	1.22E-02	1.43E-02	1.04E+00	<1	4.55E+00	<1
Barium	9.05E+02	2.45E-01	0.00E+00	0.00E+00	1.86E-02	1.86E-02	7.36E-03	7.61E-01	7.87E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	4.25E+01	0.00E+00	0.00E+00	0.00E+00	3.98E-01	3.98E-01	0.00E+00	3.58E-02	4.34E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.76E+01	0.00E+00	0.00E+00	0.00E+00	1.15E-01	1.15E-01	0.00E+00	1.48E-02	1.30E-01	4.70E+00	<1	1.86E+02	<1
Manganese	9.88E+02	1.27E-01	0.00E+00	0.00E+00	6.09E-01	6.09E-01	3.82E-03	8.31E-01	1.44E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	4.40E+00	0.00E+00	0.00E+00	0.00E+00	3.46E-02	3.46E-02	0.00E+00	3.70E-03	3.83E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.72E+01	3.90E-03	0.00E+00	0.00E+00	6.36E-03	6.36E-03	1.17E-04	1.45E-02	2.09E-02	4.16E+00	<1	9.44E+00	<1
Zinc	6.53E+01	0.00E+00	0.00E+00	0.00E+00	3.17E+00	3.17E+00	0.00E+00	5.49E-02	3.22E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.07E-04	7.07E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-01	--	3.84E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H11-14
Screening-Level Exposure Evaluation - North American Wolverine
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

signifies special status species, and decisions are made solely on the NOAEL-based HQs.

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H11-15
Screening-Level Exposure Evaluation - Short-tailed Shrew
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	5.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E-01	0.00E+00	7.71E-01	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	1.45E+01	0.00E+00	0.00E+00	2.14E-01	0.00E+00	2.14E-01	0.00E+00	2.14E-02	2.35E-01	1.04E+00	<1	4.55E+00	<1
Barium	9.05E+02	2.45E-01	0.00E+00	1.10E+01	0.00E+00	1.10E+01	3.28E-02	1.33E+00	1.24E+01	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	4.25E+01	0.00E+00	0.00E+00	2.93E+00	0.00E+00	2.93E+00	0.00E+00	6.27E-02	3.00E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.76E+01	0.00E+00	0.00E+00	1.09E+00	0.00E+00	1.09E+00	0.00E+00	2.59E-02	1.12E+00	4.70E+00	<1	1.86E+02	<1
Manganese	9.88E+02	1.27E-01	0.00E+00	6.58E+00	0.00E+00	6.58E+00	1.70E-02	1.46E+00	8.05E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	4.40E+00	0.00E+00	0.00E+00	3.68E-01	0.00E+00	3.68E-01	0.00E+00	6.49E-03	3.75E-01	1.43E-01	2.62E+00	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.72E+01	3.90E-03	0.00E+00	9.68E-02	0.00E+00	9.68E-02	5.23E-04	2.54E-02	1.23E-01	4.16E+00	<1	9.44E+00	<1
Zinc	6.53E+01	0.00E+00	0.00E+00	4.51E+01	0.00E+00	4.51E+01	0.00E+00	9.63E-02	4.52E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.24E-03	1.24E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-01	--	3.84E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H11-15
Screening-Level Exposure Evaluation - Short-tailed Shrew
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H12-1
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)							
					Aquatic Life Stage Benthic Invertebrates				Fish			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference	BSAF	BCF	Estimated Concentration	BSAF/BCF Reference
Metals												
Cadmium	NA	0.00E+00	0.00E+00	NA	4.59E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	4.96E+04	0.00E+00	Sample et al. (1996)
Chromium	NA	0.00E+00	0.00E+00	NA	8.30E-02	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	1.20E+01	0.00E+00	Sample et al. (1996)
Cobalt		0.00E+00	0.00E+00									
Copper	NA	0.00E+00	0.00E+00	NA	6.61E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	1.16E+03	0.00E+00	Sample et al. (1996)
Lead	NA	0.00E+00	0.00E+00	NA	8.00E-02	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	1.80E+02	0.00E+00	Sample et al. (1996)
Manganese		2.12E-01	0.00E+00									
Mercury	NA	0.00E+00	0.00E+00	NA	2.84E+00	---	0.00E+00	Bechtel-Jacobs (1998c)[c]	---	1.92E+02	0.00E+00	DTSC (2000)
Nickel	NA	0.00E+00	0.00E+00	NA	1.34E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	4.24E+02	0.00E+00	Sample et al. (1996)
Selenium	NA	0.00E+00	0.00E+00	NA	3.75E+00	---	0.00E+00	Hamilton et al. (2002)	---	1.04E+04	0.00E+00	Sample et al. (1996)
Silver	NA	0.00E+00	0.00E+00	NA	1.80E-01	---	0.00E+00	Hirsch (1998)	---	4.24E+02	0.00E+00	Laplace et al. (1992)
Thallium	NA	0.00E+00	0.00E+00	NA	2.00E-02	---	0.00E+00	Turner et al. (2013)	---	1.36E+02	0.00E+00	Sample et al. (1996)
Vanadium	NA	1.90E-03	2.55E+01	NA	2.50E-01	---	6.38E+00	Hamilton and Buhl (2002)	---	2.52E+03	4.79E+00	CECBP (2008)
Zinc	NA	0.00E+00	0.00E+00	NA	8.40E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	3.86E+03	0.00E+00	Sample et al. (1996)
Inorganics - Other Inorganics												
Cyanide	NA	3.78E-01	8.30E+00	NA	0.00E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	0.00E+00	0.00E+00	NA	---	Regression	0.00E+00	Derived based on Aguirre-Sierra et al. (2013)	---	Regression	0.00E+00	Derived based on Shi et al. (2009)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	0.00E+00	5.74E-01	3.73E+00	---	0.00E+00	DiToro and McGrath (2000)	4.59E+00	---	0.00E+00	DiToro and McGrath (2000)
Aroclor 1254	6.98	0.00E+00	0.00E+00	5.43E-01	3.53E+00	---	0.00E+00	DiToro and McGrath (2000)	4.34E+00	---	0.00E+00	DiToro and McGrath (2000)
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	4.01	0.00E+00	3.30E-02	7.04E-01	4.58E+00	---	1.51E-01	DiToro and McGrath (2000)	5.63E+00	---	1.86E-01	DiToro and McGrath (2000)
Acenaphthylene	3.22	0.00E+00	0.00E+00	7.54E-01	4.90E+00	---	0.00E+00	DiToro and McGrath (2000)	6.04E+00	---	0.00E+00	DiToro and McGrath (2000)
Anthracene	4.53	0.00E+00	1.60E-01	6.73E-01	4.37E+00	---	7.00E-01	DiToro and McGrath (2000)	5.38E+00	---	8.61E-01	DiToro and McGrath (2000)
Fluoranthene	5.08	0.00E+00	6.50E+00	6.41E-01	4.17E+00	---	2.71E+01	DiToro and McGrath (2000)	5.13E+00	---	3.33E+01	DiToro and McGrath (2000)
Fluorene	4.21	0.00E+00	0.00E+00	6.92E-01	4.50E+00	---	0.00E+00	DiToro and McGrath (2000)	5.53E+00	---	0.00E+00	DiToro and McGrath (2000)
Naphthalene	3.36	0.00E+00	1.90E-02	7.45E-01	4.84E+00	---	9.20E-02	DiToro and McGrath (2000)	5.96E+00	---	1.13E-01	DiToro and McGrath (2000)
Phenanthrene	4.57	0.00E+00	1.00E+00	6.70E-01	4.36E+00	---	4.36E+00	DiToro and McGrath (2000)	5.36E+00	---	5.36E+00	DiToro and McGrath (2000)
Total LMW PAHs							3.24E+01				3.99E+01	

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Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)							
					Aquatic Life Stage Benthic Invertebrates				Fish			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference	BSAF	BCF	Estimated Concentration	BSAF/BCF Reference
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	6.71	0.00E+00	2.10E+00	5.56E-01	3.61E+00	---	7.59E+00	DiToro and McGrath (2000)	4.45E+00	---	9.34E+00	DiToro and McGrath (2000)
Benzo[A]Pyrene	6.11	0.00E+00	8.70E-01	5.86E-01	3.81E+00	---	3.31E+00	DiToro and McGrath (2000)	4.69E+00	---	4.08E+00	DiToro and McGrath (2000)
Benzo(b)fluoranthene	6.27	7.00E-04	0.00E+00	5.78E-01	3.76E+00	---	0.00E+00	DiToro and McGrath (2000)	4.62E+00	---	0.00E+00	DiToro and McGrath (2000)
Benzo(g,h,i)perylene	6.51	0.00E+00	1.20E+00	5.66E-01	3.68E+00	---	4.41E+00	DiToro and McGrath (2000)	4.53E+00	---	5.43E+00	DiToro and McGrath (2000)
Benzo(k)fluoranthene	6.29	0.00E+00	1.90E+00	5.77E-01	3.75E+00	---	7.12E+00	DiToro and McGrath (2000)	4.61E+00	---	8.77E+00	DiToro and McGrath (2000)
Chrysene	5.71	0.00E+00	4.90E+00	6.07E-01	3.94E+00	---	1.93E+01	DiToro and McGrath (2000)	4.85E+00	---	2.38E+01	DiToro and McGrath (2000)
Dibenz(A,H)Anthracene	6.71	0.00E+00	4.10E-01	5.56E-01	3.61E+00	---	1.48E+00	DiToro and McGrath (2000)	4.45E+00	---	1.82E+00	DiToro and McGrath (2000)
Indeno (1,2,3-CD) Pyrene	6.72	0.00E+00	1.50E+00	5.55E-01	3.61E+00	---	5.42E+00	DiToro and McGrath (2000)	4.44E+00	---	6.67E+00	DiToro and McGrath (2000)
Pyrene	4.92	1.60E-03	6.80E+00	6.50E-01	4.23E+00	---	2.87E+01	DiToro and McGrath (2000)	5.20E+00	---	3.54E+01	DiToro and McGrath (2000)
Total HMW PAHs							7.74E+01				9.53E+01	
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene		0.00E+00	0.00E+00									
2,3,4,6-Tetrachlorophenol	4.09	0.00E+00	0.00E+00	6.99E-01	4.54E+00	---	0.00E+00	DiToro and McGrath (2000)	5.59E+00	---	0.00E+00	DiToro and McGrath (2000)
2-Chloronaphthalene	3.81	0.00E+00	0.00E+00	7.16E-01	4.66E+00	---	0.00E+00	DiToro and McGrath (2000)	5.73E+00	---	0.00E+00	DiToro and McGrath (2000)
Biphenyl (Diphenyl)	3.76	0.00E+00	0.00E+00	7.20E-01	4.68E+00	---	0.00E+00	DiToro and McGrath (2000)	5.76E+00	---	0.00E+00	DiToro and McGrath (2000)
Bis(2-ethylhexyl)phthalate	8.39	2.20E-02	0.00E+00	4.80E-01	3.12E+00	---	0.00E+00	DiToro and McGrath (2000)	3.84E+00	---	0.00E+00	DiToro and McGrath (2000)
Butylbenzylphthalate		0.00E+00	0.00E+00									
Dibenzofuran	3.71	0.00E+00	0.00E+00	7.23E-01	4.70E+00	---	0.00E+00	DiToro and McGrath (2000)	5.78E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	6.68E-01	4.34E+00	---	0.00E+00	DiToro and McGrath (2000)	5.34E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-octyl phthalate	8.54	0.00E+00	0.00E+00	4.74E-01	3.08E+00	---	0.00E+00	DiToro and McGrath (2000)	3.79E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobenzene	5.86	0.00E+00	0.00E+00	5.99E-01	3.89E+00	---	0.00E+00	DiToro and McGrath (2000)	4.79E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobutadiene	4.72	0.00E+00	0.00E+00	6.62E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)	5.29E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachloroethane		0.00E+00	0.00E+00									
Pentachlorophenol	4.74	0.00E+00	0.00E+00	6.61E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)	5.29E+00	---	0.00E+00	DiToro and McGrath (2000)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane		0.00E+00	0.00E+00									
Dioxin/Furans												
2,3,7,8-TCDD		0.00E+00	0.00E+00									
1,2,3,7,8-PeCDD		0.00E+00	0.00E+00									

Table H12-1
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)							
					Aquatic Life Stage Benthic Invertebrates				Fish			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference	BSAF	BCF	Estimated Concentration	BSAF/BCF Reference
1,2,3,4,7,8-HxCDD		0.00E+00	0.00E+00									
1,2,3,6,7,8-HxCDD		0.00E+00	0.00E+00									
1,2,3,7,8,9-HxCDD		0.00E+00	0.00E+00									
1,2,3,4,6,7,8-HpCDD		0.00E+00	0.00E+00									
OCDD		0.00E+00	0.00E+00									
2,3,7,8-TCDF		0.00E+00	0.00E+00									
1,2,3,7,8-PeCDF		0.00E+00	0.00E+00									
2,3,4,7,8-PeCDF		0.00E+00	0.00E+00									
1,2,3,4,7,8-HxCDF		0.00E+00	0.00E+00									
1,2,3,6,7,8-HxCDF		0.00E+00	0.00E+00									
2,3,4,6,7,8-HxCDF		0.00E+00	0.00E+00									
1,2,3,7,8,9-HxCDF		0.00E+00	0.00E+00									
1,2,3,4,6,7,8-HpCDF		0.00E+00	0.00E+00									
1,2,3,4,7,8,9-HpCDF		0.00E+00	0.00E+00									
OCDF		0.00E+00	0.00E+00									

Notes:
NA, Normalized BSAF was not applicable for metals
a, Normalized BSAF (kg OC / kg lipid) calculated based on K_{ow}, where BSAF = $K_{ow}^{-0.038}$ (DiToro and McGrath 2000)
b, For non-ionic organic constituents, dry weight BSAF calculated from sediment organic carbon and lipid normalized BSAF as follows:

$$BSAF_{dry\ weight} = BSAF_{norm} \times f_{lip;id} \times \frac{1}{f_{oc}}$$

where: $BSAF_{norm}$ = Normalized BSAF (kg OC/kg lipid)
f_{lipid} = Fraction of lipids in prey item expressed on a dry weight basis (0.065, invertebrates; 0.08, fish)
f_{oc} = Fraction of sediment organic carbon expressed on a dry weight basis (0.01 or 1%)
c, Median BSAF for non-depurated invertebrates determined by Bechtel-Jacobs (1998b)

Table H12-2
Screening-Level Exposure Evaluation - American Dipper
Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	1.54E+00	0.00E+00	0.00E+00	0.00E+00	2.56E-01	0.00E+00	2.56E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	1.51E+02	2.16E-01	7.07E+01	0.00E+00	7.07E+01	3.58E-02	5.01E-01	7.12E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	5.70E-01	0.00E+00	1.58E-02	0.00E+00	1.58E-02	0.00E+00	1.89E-03	1.77E-02	No TRV	--	No TRV	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.05E+00	--	3.48E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+00	--	4.46E+01	--
Manganese	0.00E+00	2.12E-01	0.00E+00	0.00E+00	0.00E+00	3.52E-02	0.00E+00	3.52E-02	1.79E+02	<1	3.77E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-01	--	8.20E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	2.55E+01	1.90E-03	1.06E+00	0.00E+00	1.06E+00	3.15E-04	8.46E-02	1.14E+00	3.44E-01	3.32E+00	1.70E+00	<1
Zinc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.61E+01	--	1.71E+02	--
Inorganics - Other Inorganics												
Cyanide	8.30E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	6.27E-02	2.75E-02	9.03E-02	4.00E-02	2.26E+00	4.00E-01	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.30E-02	0.00E+00	2.51E-02	0.00E+00	2.51E-02	0.00E+00	1.10E-04	2.52E-02				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	1.60E-01	0.00E+00	1.16E-01	0.00E+00	1.16E-01	0.00E+00	5.31E-04	1.17E-01				
Fluoranthene	6.50E+00	0.00E+00	4.49E+00	0.00E+00	4.49E+00	0.00E+00	2.16E-02	4.52E+00				
Fluorene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	1.90E-02	0.00E+00	1.53E-02	0.00E+00	1.53E-02	0.00E+00	6.31E-05	1.53E-02				
Phenanthrene	1.00E+00	0.00E+00	7.23E-01	0.00E+00	7.23E-01	0.00E+00	3.32E-03	7.26E-01				
Total LMW PAHs					5.37E+00	0.00E+00	2.56E-02	5.40E+00	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	2.10E+00	0.00E+00	1.26E+00	0.00E+00	1.26E+00	0.00E+00	6.97E-03	1.27E+00				
Benzo[A]Pyrene	8.70E-01	0.00E+00	5.50E-01	0.00E+00	5.50E-01	0.00E+00	2.89E-03	5.53E-01				
Benzo(b)fluoranthene	0.00E+00	7.00E-04	0.00E+00	0.00E+00	0.00E+00	1.16E-04	0.00E+00	1.16E-04				
Benzo(g,h,i)perylene	1.20E+00	0.00E+00	7.32E-01	0.00E+00	7.32E-01	0.00E+00	3.98E-03	7.36E-01				
Benzo(k)fluoranthene	1.90E+00	0.00E+00	1.18E+00	0.00E+00	1.18E+00	0.00E+00	6.31E-03	1.19E+00				
Chrysene	4.90E+00	0.00E+00	3.21E+00	0.00E+00	3.21E+00	0.00E+00	1.63E-02	3.22E+00				
Dibenz(A,H)Anthracene	4.10E-01	0.00E+00	2.46E-01	0.00E+00	2.46E-01	0.00E+00	1.36E-03	2.47E-01				
Indeno (1,2,3-CD) Pyrene	1.50E+00	0.00E+00	8.99E-01	0.00E+00	8.99E-01	0.00E+00	4.98E-03	9.04E-01				
Pyrene	6.80E+00	1.60E-03	4.77E+00	0.00E+00	4.77E+00	2.65E-04	2.26E-02	4.79E+00				
Total HMW PAHs					1.28E+01	3.82E-04	6.53E-02	1.29E+01	2.00E+00	6.45E+00	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	2.20E-02	0.00E+00	0.00E+00	0.00E+00	3.65E-03	0.00E+00	3.65E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H12-2
Screening-Level Exposure Evaluation - American Dipper
Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H12-3
Screening-Level Exposure Evaluation - Belted Kingfisher
Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	1.54E+00	0.00E+00	2.02E+02	2.02E+02	2.43E-01	0.00E+00	2.02E+02	1.10E+02	1.84E+00	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	1.51E+02	2.16E-01	6.71E+00	9.12E+00	1.58E+01	3.40E-02	0.00E+00	1.59E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	5.70E-01	0.00E+00	1.50E-03	0.00E+00	1.50E-03	0.00E+00	0.00E+00	1.50E-03	No TRV	--	No TRV	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.05E+00	--	3.48E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+00	--	4.46E+01	--
Manganese	0.00E+00	2.12E-01	0.00E+00	0.00E+00	0.00E+00	3.34E-02	0.00E+00	3.34E-02	1.79E+02	<1	3.77E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-01	--	8.20E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	2.55E+01	1.90E-03	1.00E-01	6.79E-01	7.80E-01	2.99E-04	0.00E+00	7.80E-01	3.44E-01	2.27E+00	1.70E+00	<1
Zinc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.61E+01	--	1.71E+02	--
Inorganics - Other Inorganics												
Cyanide	8.30E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	5.96E-02	0.00E+00	5.96E-02	4.00E-02	1.49E+00	4.00E-01	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.30E-02	0.00E+00	2.38E-03	2.64E-02	2.87E-02	0.00E+00	0.00E+00	2.87E-02				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	1.60E-01	0.00E+00	1.10E-02	1.22E-01	1.33E-01	0.00E+00	0.00E+00	1.33E-01				
Fluoranthene	6.50E+00	0.00E+00	4.27E-01	4.73E+00	5.16E+00	0.00E+00	0.00E+00	5.16E+00				
Fluorene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	1.90E-02	0.00E+00	1.45E-03	1.61E-02	1.75E-02	0.00E+00	0.00E+00	1.75E-02				
Phenanthrene	1.00E+00	0.00E+00	6.87E-02	7.61E-01	8.29E-01	0.00E+00	0.00E+00	8.29E-01				
Total LMW PAHs					6.16E+00	0.00E+00	0.00E+00	6.16E+00	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	2.10E+00	0.00E+00	1.20E-01	1.32E+00	1.44E+00	0.00E+00	0.00E+00	1.44E+00				
Benzo[A]Pyrene	8.70E-01	0.00E+00	5.22E-02	5.78E-01	6.31E-01	0.00E+00	0.00E+00	6.31E-01				
Benzo(b)fluoranthene	0.00E+00	7.00E-04	0.00E+00	0.00E+00	0.00E+00	1.10E-04	0.00E+00	1.10E-04				
Benzo(g,h,i)perylene	1.20E+00	0.00E+00	6.95E-02	7.70E-01	8.40E-01	0.00E+00	0.00E+00	8.40E-01				
Benzo(k)fluoranthene	1.90E+00	0.00E+00	1.12E-01	1.24E+00	1.36E+00	0.00E+00	0.00E+00	1.36E+00				
Chrysene	4.90E+00	0.00E+00	3.05E-01	3.37E+00	3.68E+00	0.00E+00	0.00E+00	3.68E+00				
Dibenz(A,H)Anthracene	4.10E-01	0.00E+00	2.33E-02	2.59E-01	2.82E-01	0.00E+00	0.00E+00	2.82E-01				
Indeno (1,2,3-CD) Pyrene	1.50E+00	0.00E+00	8.53E-02	9.45E-01	1.03E+00	0.00E+00	0.00E+00	1.03E+00				
Pyrene	6.80E+00	1.60E-03	4.53E-01	5.02E+00	5.47E+00	2.52E-04	0.00E+00	5.47E+00				
Total HMW PAHs					1.47E+01	3.62E-04	0.00E+00	1.47E+01	2.00E+00	7.37E+00	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	2.20E-02	0.00E+00	0.00E+00	0.00E+00	3.47E-03	0.00E+00	3.47E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H12-3
Screening-Level Exposure Evaluation - Belted Kingfisher
Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H12-4
Screening-Level Exposure Evaluation - Mink
Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	1.54E+00	0.00E+00	6.15E+01	6.15E+01	6.66E-02	0.00E+00	6.16E+01	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	1.51E+02	2.16E-01	0.00E+00	2.78E+00	2.78E+00	9.34E-03	0.00E+00	2.79E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	5.70E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.60E+00	--	8.27E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.70E+00	--	1.86E+02	--
Manganese	0.00E+00	2.12E-01	0.00E+00	0.00E+00	0.00E+00	9.17E-03	0.00E+00	9.17E-03	5.15E+01	<1	1.46E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-01	--	6.60E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	2.55E+01	1.90E-03	0.00E+00	2.07E-01	2.07E-01	8.22E-05	0.00E+00	2.07E-01	4.16E+00	<1	9.44E+00	<1
Zinc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.54E+01	--	2.98E+02	--
Inorganics - Other Inorganics												
Cyanide	8.30E+00	3.78E-01	0.00E+00	0.00E+00	0.00E+00	1.63E-02	0.00E+00	1.63E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.30E-02	0.00E+00	0.00E+00	8.04E-03	8.04E-03	0.00E+00	0.00E+00	8.04E-03				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	1.60E-01	0.00E+00	0.00E+00	3.72E-02	3.72E-02	0.00E+00	0.00E+00	3.72E-02				
Fluoranthene	6.50E+00	0.00E+00	0.00E+00	1.44E+00	1.44E+00	0.00E+00	0.00E+00	1.44E+00				
Fluorene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	1.90E-02	0.00E+00	0.00E+00	4.90E-03	4.90E-03	0.00E+00	0.00E+00	4.90E-03				
Phenanthrene	1.00E+00	0.00E+00	0.00E+00	2.32E-01	2.32E-01	0.00E+00	0.00E+00	2.32E-01				
Total LMW PAHs					1.72E+00	0.00E+00	0.00E+00	1.72E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	2.10E+00	0.00E+00	0.00E+00	4.04E-01	4.04E-01	0.00E+00	0.00E+00	4.04E-01				
Benzo[A]Pyrene	8.70E-01	0.00E+00	0.00E+00	1.76E-01	1.76E-01	0.00E+00	0.00E+00	1.76E-01				
Benzo(b)fluoranthene	0.00E+00	7.00E-04	0.00E+00	0.00E+00	0.00E+00	3.03E-05	0.00E+00	3.03E-05				
Benzo(g,h,i)perylene	1.20E+00	0.00E+00	0.00E+00	2.35E-01	2.35E-01	0.00E+00	0.00E+00	2.35E-01				
Benzo(k)fluoranthene	1.90E+00	0.00E+00	0.00E+00	3.79E-01	3.79E-01	0.00E+00	0.00E+00	3.79E-01				
Chrysene	4.90E+00	0.00E+00	0.00E+00	1.03E+00	1.03E+00	0.00E+00	0.00E+00	1.03E+00				
Dibenz(A,H)Anthracene	4.10E-01	0.00E+00	0.00E+00	7.89E-02	7.89E-02	0.00E+00	0.00E+00	7.89E-02				
Indeno (1,2,3-CD) Pyrene	1.50E+00	0.00E+00	0.00E+00	2.88E-01	2.88E-01	0.00E+00	0.00E+00	2.88E-01				
Pyrene	6.80E+00	1.60E-03	0.00E+00	1.53E+00	1.53E+00	6.92E-05	0.00E+00	1.53E+00				
Total HMW PAHs					4.12E+00	9.95E-05	0.00E+00	4.12E+00	6.15E-01	6.70E+00	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	2.20E-02	0.00E+00	0.00E+00	0.00E+00	9.51E-04	0.00E+00	9.51E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H12-4
Screening-Level Exposure Evaluation - Mink
Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H13-1
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Cedar Creek
Baseline Ecological Screening Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)							
					Aquatic Life Stage Benthic Invertebrates				Fish			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference	BSAF	BCF	Estimated Concentration	BSAF/BCF Reference
Metals												
Aluminum	NA	0.00E+00	0.00E+00	NA	7.40E-02	---	0.00E+00	Stanley et al. (2010)	---	9.24E+02	0.00E+00	Sample et al. (1996)
Antimony	NA	0.00E+00	0.00E+00	NA	5.75E-01	---	0.00E+00	Dovick et al. (2015)	---	4.00E+00	0.00E+00	Sample et al. (1996)
Arsenic	NA	0.00E+00	0.00E+00	NA	3.73E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	6.80E+01	0.00E+00	Sample et al. (1996)
Barium	NA	1.30E-01	2.49E+02	NA	2.82E+00	---	7.02E+02	Hamilton et al. (2002)	---	2.98E+02	3.87E+01	Nakamoto and Hassler (1992)
Beryllium	NA	0.00E+00	0.00E+00	NA	1.67E-01	---	0.00E+00	Hamilton et al. (2002)	---	7.60E+01	0.00E+00	Sample et al. (1996)
Cadmium	NA	0.00E+00	0.00E+00	NA	4.59E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	4.96E+04	0.00E+00	Sample et al. (1996)
Chromium	NA	0.00E+00	0.00E+00	NA	8.30E-02	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	1.20E+01	0.00E+00	Sample et al. (1996)
Copper	NA	0.00E+00	0.00E+00	NA	6.61E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	1.16E+03	0.00E+00	Sample et al. (1996)
Lead	NA	0.00E+00	0.00E+00	NA	8.00E-02	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	1.80E+02	0.00E+00	Sample et al. (1996)
Mercury	NA	0.00E+00	0.00E+00	NA	2.84E+00	---	0.00E+00	Bechtel-Jacobs (1998c)[c]	---	1.92E+02	0.00E+00	DTSC (2000)
Nickel	NA	0.00E+00	0.00E+00	NA	1.34E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	4.24E+02	0.00E+00	Sample et al. (1996)
Selenium	NA	0.00E+00	0.00E+00	NA	3.75E+00	---	0.00E+00	Hamilton et al. (2002)	---	1.04E+04	0.00E+00	Sample et al. (1996)
Silver	NA	0.00E+00	0.00E+00	NA	1.80E-01	---	0.00E+00	Hirsch (1998)	---	4.24E+02	0.00E+00	Laplace et al. (1992)
Thallium	NA	0.00E+00	0.00E+00	NA	2.00E-02	---	0.00E+00	Turner et al. (2013)	---	1.36E+02	0.00E+00	Sample et al. (1996)
Vanadium	NA	0.00E+00	0.00E+00	NA	2.50E-01	---	0.00E+00	Hamilton and Buhl (2002)	---	2.52E+03	0.00E+00	CECBP (2008)
Zinc	NA	0.00E+00	0.00E+00	NA	8.40E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	3.86E+03	0.00E+00	Sample et al. (1996)
Inorganics - Other Inorganics												
Cyanide	NA	1.53E-02	2.40E-01	NA	0.00E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	0.00E+00	0.00E+00	NA	---	Regression	0.00E+00	Derived based on Aguirre-Sierra et al. (2013)	---	Regression	0.00E+00	Derived based on Shi et al. (2009)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	0.00E+00	5.74E-01	3.73E+00	---	0.00E+00	DiToro and McGrath (2000)	4.59E+00	---	0.00E+00	DiToro and McGrath (2000)
Aroclor 1254	6.98	0.00E+00	0.00E+00	5.43E-01	3.53E+00	---	0.00E+00	DiToro and McGrath (2000)	4.34E+00	---	0.00E+00	DiToro and McGrath (2000)
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	4.01	0.00E+00	1.10E-02	7.04E-01	4.58E+00	---	5.03E-02	DiToro and McGrath (2000)	5.63E+00	---	6.20E-02	DiToro and McGrath (2000)
Acenaphthylene	3.22	0.00E+00	3.30E-02	7.54E-01	4.90E+00	---	1.62E-01	DiToro and McGrath (2000)	6.04E+00	---	1.99E-01	DiToro and McGrath (2000)
Anthracene	4.53	0.00E+00	5.10E-02	6.73E-01	4.37E+00	---	2.23E-01	DiToro and McGrath (2000)	5.38E+00	---	2.74E-01	DiToro and McGrath (2000)
Fluoranthene	5.08	0.00E+00	1.90E-01	6.41E-01	4.17E+00	---	7.92E-01	DiToro and McGrath (2000)	5.13E+00	---	9.75E-01	DiToro and McGrath (2000)
Fluorene	4.21	0.00E+00	2.80E-02	6.92E-01	4.50E+00	---	1.26E-01	DiToro and McGrath (2000)	5.53E+00	---	1.55E-01	DiToro and McGrath (2000)
Naphthalene	3.36	0.00E+00	0.00E+00	7.45E-01	4.84E+00	---	0.00E+00	DiToro and McGrath (2000)	5.96E+00	---	0.00E+00	DiToro and McGrath (2000)

Table H13-1
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Cedar Creek
Baseline Ecological Screening Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)							
					Aquatic Life Stage Benthic Invertebrates				Fish			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference	BSAF	BCF	Estimated Concentration	BSAF/BCF Reference
Phenanthrene	4.57	0.00E+00	2.10E-01	6.70E-01	4.36E+00	---	9.15E-01	DiToro and McGrath (2000)	5.36E+00	---	1.13E+00	DiToro and McGrath (2000)
Total LMW PAHs							2.27E+00				2.79E+00	
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	6.71	0.00E+00	1.20E-01	5.56E-01	3.61E+00	---	4.34E-01	DiToro and McGrath (2000)	4.45E+00	---	5.34E-01	DiToro and McGrath (2000)
Benzo[A]Pyrene	6.11	0.00E+00	9.40E-02	5.86E-01	3.81E+00	---	3.58E-01	DiToro and McGrath (2000)	4.69E+00	---	4.41E-01	DiToro and McGrath (2000)
Benzo(b)fluoranthene	6.27	0.00E+00	0.00E+00	5.78E-01	3.76E+00	---	0.00E+00	DiToro and McGrath (2000)	4.62E+00	---	0.00E+00	DiToro and McGrath (2000)
Benzo(g,h,i)perylene	6.51	0.00E+00	8.10E-02	5.66E-01	3.68E+00	---	2.98E-01	DiToro and McGrath (2000)	4.53E+00	---	3.67E-01	DiToro and McGrath (2000)
Benzo(k)fluoranthene	6.29	0.00E+00	0.00E+00	5.77E-01	3.75E+00	---	0.00E+00	DiToro and McGrath (2000)	4.61E+00	---	0.00E+00	DiToro and McGrath (2000)
Chrysene	5.71	0.00E+00	1.30E-01	6.07E-01	3.94E+00	---	5.13E-01	DiToro and McGrath (2000)	4.85E+00	---	6.31E-01	DiToro and McGrath (2000)
Dibenz(A,H)Anthracene	6.71	0.00E+00	0.00E+00	5.56E-01	3.61E+00	---	0.00E+00	DiToro and McGrath (2000)	4.45E+00	---	0.00E+00	DiToro and McGrath (2000)
Indeno (1,2,3-CD) Pyrene	6.72	0.00E+00	8.70E-02	5.55E-01	3.61E+00	---	3.14E-01	DiToro and McGrath (2000)	4.44E+00	---	3.87E-01	DiToro and McGrath (2000)
Pyrene	4.92	0.00E+00	1.60E-01	6.50E-01	4.23E+00	---	6.76E-01	DiToro and McGrath (2000)	5.20E+00	---	8.32E-01	DiToro and McGrath (2000)
Total HMW PAHs							2.59E+00				3.19E+00	
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene		0.00E+00	0.00E+00									
2,3,4,6-Tetrachlorophenol	4.09	0.00E+00	0.00E+00	6.99E-01	4.54E+00	---	0.00E+00	DiToro and McGrath (2000)	5.59E+00	---	0.00E+00	DiToro and McGrath (2000)
2-Chloronaphthalene	3.81	0.00E+00	0.00E+00	7.16E-01	4.66E+00	---	0.00E+00	DiToro and McGrath (2000)	5.73E+00	---	0.00E+00	DiToro and McGrath (2000)
Biphenyl (Diphenyl)	3.76	0.00E+00	0.00E+00	7.20E-01	4.68E+00	---	0.00E+00	DiToro and McGrath (2000)	5.76E+00	---	0.00E+00	DiToro and McGrath (2000)
Bis(2-ethylhexyl)phthalate	8.39	0.00E+00	0.00E+00	4.80E-01	3.12E+00	---	0.00E+00	DiToro and McGrath (2000)	3.84E+00	---	0.00E+00	DiToro and McGrath (2000)
Butylbenzylphthalate		0.00E+00	0.00E+00									
Dibenzofuran	3.71	0.00E+00	0.00E+00	7.23E-01	4.70E+00	---	0.00E+00	DiToro and McGrath (2000)	5.78E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	6.68E-01	4.34E+00	---	0.00E+00	DiToro and McGrath (2000)	5.34E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-octyl phthalate	8.54	0.00E+00	0.00E+00	4.74E-01	3.08E+00	---	0.00E+00	DiToro and McGrath (2000)	3.79E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobenzene	5.86	0.00E+00	0.00E+00	5.99E-01	3.89E+00	---	0.00E+00	DiToro and McGrath (2000)	4.79E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobutadiene	4.72	0.00E+00	0.00E+00	6.62E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)	5.29E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachloroethane		0.00E+00	0.00E+00									
Pentachlorophenol	4.74	0.00E+00	0.00E+00	6.61E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)	5.29E+00	---	0.00E+00	DiToro and McGrath (2000)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane		0.00E+00	0.00E+00									
Dioxin/Furans												
2,3,7,8-TCDD		0.00E+00	0.00E+00									

Table H13-1
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Cedar Creek
Baseline Ecological Screening Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Maximum Surface Water Concentration (mg/L)	Maximum Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)							
					Aquatic Life Stage Benthic Invertebrates				Fish			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference	BSAF	BCF	Estimated Concentration	BSAF/BCF Reference
1,2,3,7,8-PeCDD		0.00E+00	0.00E+00									
1,2,3,4,7,8-HxCDD		0.00E+00	0.00E+00									
1,2,3,6,7,8-HxCDD		0.00E+00	0.00E+00									
1,2,3,7,8,9-HxCDD		0.00E+00	0.00E+00									
1,2,3,4,6,7,8-HpCDD		0.00E+00	0.00E+00									
OCDD		0.00E+00	0.00E+00									
2,3,7,8-TCDF		0.00E+00	0.00E+00									
1,2,3,7,8-PeCDF		0.00E+00	0.00E+00									
2,3,4,7,8-PeCDF		0.00E+00	0.00E+00									
1,2,3,4,7,8-HxCDF		0.00E+00	0.00E+00									
1,2,3,6,7,8-HxCDF		0.00E+00	0.00E+00									
2,3,4,6,7,8-HxCDF		0.00E+00	0.00E+00									
1,2,3,7,8,9-HxCDF		0.00E+00	0.00E+00									
1,2,3,4,6,7,8-HpCDF		0.00E+00	0.00E+00									
1,2,3,4,7,8,9-HpCDF		0.00E+00	0.00E+00									
OCDF		0.00E+00	0.00E+00									

Notes:
NA, Normalized BSAF was not applicable for metals
a, Normalized BSAF (kg OC / kg lipid) calculated based on K_{ow}, where BSAF = $K_{ow}^{-0.038}$ (DiToro and McGrath 2000)
b, For non-ionic organic constituents, dry weight BSAF calculated from sediment organic carbon and lipid normalized BSAF as follows:

$$BSAF_{dry\ weight} = BSAF_{norm} \times f_{lip;id} \times \frac{1}{f_{oc}}$$

where: $BSAF_{norm}$ = Normalized BSAF (kg OC/kg lipid)
f_{lipid} = Fraction of lipids in prey item expressed on a dry weight basis (0.065, invertebrates; 0.08, fish)
f_{oc} = Fraction of sediment organic carbon expressed on a dry weight basis (0.01 or 1%)
c, Median BSAF for non-depurated invertebrates determined by Bechtel-Jacobs (1998b)

Table H13-2
Screening-Level Exposure Evaluation - American Dipper
Cedar Creek
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals												
Aluminum	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+02	--	1.10E+03	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	2.49E+02	1.30E-01	1.17E+02	0.00E+00	1.17E+02	2.16E-02	8.26E-01	1.17E+02	7.35E+01	1.60E+00	1.31E+02	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.05E+00	--	3.48E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+00	--	4.46E+01	--
Manganese	5.71E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.89E+00	1.89E+00	1.79E+02	<1	3.77E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-01	--	8.20E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.44E-01	--	1.70E+00	--
Zinc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.61E+01	--	1.71E+02	--
Inorganics - Other Inorganics												
Cyanide	2.40E-01	1.53E-02	0.00E+00	0.00E+00	0.00E+00	2.54E-03	7.96E-04	3.34E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	1.10E-02	0.00E+00	8.35E-03	0.00E+00	8.35E-03	0.00E+00	3.65E-05	8.39E-03				
Acenaphthylene	3.30E-02	0.00E+00	2.69E-02	0.00E+00	2.69E-02	0.00E+00	1.10E-04	2.70E-02				
Anthracene	5.10E-02	0.00E+00	3.70E-02	0.00E+00	3.70E-02	0.00E+00	1.69E-04	3.72E-02				
Fluoranthene	1.90E-01	0.00E+00	1.31E-01	0.00E+00	1.31E-01	0.00E+00	6.31E-04	1.32E-01				
Fluorene	2.80E-02	0.00E+00	2.09E-02	0.00E+00	2.09E-02	0.00E+00	9.29E-05	2.10E-02				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	2.10E-01	0.00E+00	1.52E-01	0.00E+00	1.52E-01	0.00E+00	6.97E-04	1.53E-01				
Total LMW PAHs					3.76E-01	0.00E+00	1.74E-03	3.78E-01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	1.20E-01	0.00E+00	7.20E-02	0.00E+00	7.20E-02	0.00E+00	3.98E-04	7.23E-02				
Benzo[A]Pyrene	9.40E-02	0.00E+00	5.94E-02	0.00E+00	5.94E-02	0.00E+00	3.12E-04	5.97E-02				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	8.10E-02	0.00E+00	4.94E-02	0.00E+00	4.94E-02	0.00E+00	2.69E-04	4.97E-02				
Benzo(k)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Chrysene	1.30E-01	0.00E+00	8.51E-02	0.00E+00	8.51E-02	0.00E+00	4.31E-04	8.55E-02				
Dibenz(A,H)Anthracene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Indeno (1,2,3-CD) Pyrene	8.70E-02	0.00E+00	5.21E-02	0.00E+00	5.21E-02	0.00E+00	2.89E-04	5.24E-02				
Pyrene	1.60E-01	0.00E+00	1.12E-01	0.00E+00	1.12E-01	0.00E+00	5.31E-04	1.13E-01				
Total HMW PAHs					4.30E-01	0.00E+00	2.23E-03	4.32E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H13-2
Screening-Level Exposure Evaluation - American Dipper
Cedar Creek
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H13-3
Screening-Level Exposure Evaluation - Belted Kingfisher
Cedar Creek
Baseline Ecological Screening Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+02	--	1.10E+03	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	2.49E+02	1.30E-01	1.11E+01	5.49E+00	1.66E+01	2.05E-02	0.00E+00	1.66E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.05E+00	--	3.48E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+00	--	4.46E+01	--
Manganese	5.71E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E+02	--	3.77E+02	--
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-01	--	8.20E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.44E-01	--	1.70E+00	--
Zinc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.61E+01	--	1.71E+02	--
Inorganics - Other Inorganics												
Cyanide	2.40E-01	1.53E-02	0.00E+00	0.00E+00	0.00E+00	2.41E-03	0.00E+00	2.41E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	1.10E-02	0.00E+00	7.93E-04	8.79E-03	9.58E-03	0.00E+00	0.00E+00	9.58E-03				
Acenaphthylene	3.30E-02	0.00E+00	2.55E-03	2.82E-02	3.08E-02	0.00E+00	0.00E+00	3.08E-02				
Anthracene	5.10E-02	0.00E+00	3.51E-03	3.89E-02	4.24E-02	0.00E+00	0.00E+00	4.24E-02				
Fluoranthene	1.90E-01	0.00E+00	1.25E-02	1.38E-01	1.51E-01	0.00E+00	0.00E+00	1.51E-01				
Fluorene	2.80E-02	0.00E+00	1.98E-03	2.20E-02	2.40E-02	0.00E+00	0.00E+00	2.40E-02				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	2.10E-01	0.00E+00	1.44E-02	1.60E-01	1.74E-01	0.00E+00	0.00E+00	1.74E-01				
Total LMW PAHs					4.32E-01	0.00E+00	0.00E+00	4.32E-01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	1.20E-01	0.00E+00	6.83E-03	7.57E-02	8.25E-02	0.00E+00	0.00E+00	8.25E-02				
Benzo[A]Pyrene	9.40E-02	0.00E+00	5.64E-03	6.25E-02	6.81E-02	0.00E+00	0.00E+00	6.81E-02				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	8.10E-02	0.00E+00	4.69E-03	5.20E-02	5.67E-02	0.00E+00	0.00E+00	5.67E-02				
Benzo(k)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Chrysene	1.30E-01	0.00E+00	8.08E-03	8.95E-02	9.76E-02	0.00E+00	0.00E+00	9.76E-02				
Dibenz(A,H)Anthracene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Indeno (1,2,3-CD) Pyrene	8.70E-02	0.00E+00	4.95E-03	5.48E-02	5.98E-02	0.00E+00	0.00E+00	5.98E-02				
Pyrene	1.60E-01	0.00E+00	1.07E-02	1.18E-01	1.29E-01	0.00E+00	0.00E+00	1.29E-01				
Total HMW PAHs					4.93E-01	0.00E+00	0.00E+00	4.93E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H13-3
Screening-Level Exposure Evaluation - Belted Kingfisher
Cedar Creek
Baseline Ecological Screening Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H13-4
Screening-Level Exposure Evaluation - Mink
Cedar Creek
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	2.49E+02	1.30E-01	0.00E+00	1.67E+00	1.67E+00	5.62E-03	0.00E+00	1.68E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.60E+00	--	8.27E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.70E+00	--	1.86E+02	--
Manganese	5.71E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E+01	--	1.46E+02	--
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-01	--	6.60E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.16E+00	--	9.44E+00	--
Zinc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.54E+01	--	2.98E+02	--
Inorganics - Other Inorganics												
Cyanide	2.40E-01	1.53E-02	0.00E+00	0.00E+00	0.00E+00	6.62E-04	0.00E+00	6.62E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	1.10E-02	0.00E+00	0.00E+00	2.68E-03	2.68E-03	0.00E+00	0.00E+00	2.68E-03				
Acenaphthylene	3.30E-02	0.00E+00	0.00E+00	8.61E-03	8.61E-03	0.00E+00	0.00E+00	8.61E-03				
Anthracene	5.10E-02	0.00E+00	0.00E+00	1.19E-02	1.19E-02	0.00E+00	0.00E+00	1.19E-02				
Fluoranthene	1.90E-01	0.00E+00	0.00E+00	4.21E-02	4.21E-02	0.00E+00	0.00E+00	4.21E-02				
Fluorene	2.80E-02	0.00E+00	0.00E+00	6.70E-03	6.70E-03	0.00E+00	0.00E+00	6.70E-03				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	2.10E-01	0.00E+00	0.00E+00	4.87E-02	4.87E-02	0.00E+00	0.00E+00	4.87E-02				
Total LMW PAHs					1.21E-01	0.00E+00	0.00E+00	1.21E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	1.20E-01	0.00E+00	0.00E+00	2.31E-02	2.31E-02	0.00E+00	0.00E+00	2.31E-02				
Benzo[A]Pyrene	9.40E-02	0.00E+00	0.00E+00	1.91E-02	1.91E-02	0.00E+00	0.00E+00	1.91E-02				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	8.10E-02	0.00E+00	0.00E+00	1.59E-02	1.59E-02	0.00E+00	0.00E+00	1.59E-02				
Benzo(k)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Chrysene	1.30E-01	0.00E+00	0.00E+00	2.73E-02	2.73E-02	0.00E+00	0.00E+00	2.73E-02				
Dibenz(A,H)Anthracene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Indeno (1,2,3-CD) Pyrene	8.70E-02	0.00E+00	0.00E+00	1.67E-02	1.67E-02	0.00E+00	0.00E+00	1.67E-02				
Pyrene	1.60E-01	0.00E+00	0.00E+00	3.60E-02	3.60E-02	0.00E+00	0.00E+00	3.60E-02				
Total HMW PAHs					1.38E-01	0.00E+00	0.00E+00	1.38E-01	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H13-4
Screening-Level Exposure Evaluation - Mink
Cedar Creek
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Sediment Concentration (mg/kg, dw)	Maximum Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Appendix H2 Refined Food Chain Models

Table H14-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Main Plant Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	1.14E+00	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	9.28E-04	2.72E-01	Regression[a]	1.16E-02	USEPA (2007)	1.00E+00	2.72E-01	Assumption[c]	5.00E-02	1.36E-02	Baes et al. (1984)[e]
Arsenic	NA	9.37E-04	4.81E+00	3.75E-02	1.80E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	7.31E-01	Sample et al. (1999)	Regression[f]	2.84E-02	Sample et al. (1998b)
Barium	NA	1.73E-01	0.00E+00	1.56E-01	0.00E+00	Bechtel-Jacobs (1998a)[g]	9.10E-02	0.00E+00	Sample et al. (1998a)	6.83E-04	0.00E+00	Baes et al. (1984)[e]
Beryllium	NA	2.61E-04	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	6.80E-04	3.54E-01	Regression[a]	3.53E-01	Bechtel-Jacobs (1998a)	Regression[d]	3.63E+00	Sample et al. (1999)	Regression[f]	1.74E-01	Sample et al. (1998b)
Chromium	NA	2.97E-03	1.56E+01	4.10E-02	6.41E-01	Bechtel-Jacobs (1998a)[g]	3.06E-01	4.78E+00	Sample et al. (1998a)	Regression[f]	1.75E+00	Sample et al. (1998b)
Cobalt	NA	1.78E-03	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	9.09E-03	1.64E+01	Regression[a]	5.87E+00	Bechtel-Jacobs (1998a)	5.15E-01	8.46E+00	Sample et al. (1998a)	Regression[f]	1.15E+01	Sample et al. (1998b)
Lead	NA	1.75E-03	2.20E+01	Regression[a]	1.50E+00	Bechtel-Jacobs (1998a)	Regression[d]	9.76E+00	Sample et al. (1999)	Regression[f]	4.24E+00	Sample et al. (1998b)
Manganese	NA	1.34E-01	0.00E+00	7.90E-02	0.00E+00	Bechtel-Jacobs (1998a)[g]	Regression[d]	0.00E+00	Sample et al. (1999)	2.05E-02	0.00E+00	Sample et al. (1998b)[i]
Mercury	NA	1.46E-04	2.08E-02	Regression[a]	4.49E-02	Bechtel-Jacobs (1998a)	3.93E+00	8.17E-02	Sample et al. (1998a)	3.81E-01	7.92E-03	LANL (2015)
Nickel	NA	3.96E-03	3.17E+01	Regression[a]	1.44E+00	Bechtel-Jacobs (1998a)	7.78E-01	2.46E+01	Sample et al. (1998a)	Regression[f]	3.91E+00	Sample et al. (1998b)
Selenium	NA	7.23E-04	2.65E-01	Regression[a]	1.17E-01	Bechtel-Jacobs (1998a)	Regression[d]	3.50E-01	Sample et al. (1998a)	Regression[f]	4.00E-01	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	2.54E-04	0.00E+00	4.00E-03	0.00E+00	Baes et al. (1984)	5.41E-02	0.00E+00	USCHPPM (2004)	1.08E-01	0.00E+00	Baes et al. (1984)[e]
Vanadium	NA	2.33E-03	1.36E+01	4.85E-03	6.61E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	5.73E-01	Sample et al. (1998a)	1.23E-02	1.68E-01	Sample et al. (1998b)[i]
Zinc	NA	2.54E-02	5.88E+01	Regression[a]	4.62E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.25E+02	Sample et al. (1998a)	Regression[f]	1.05E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	4.08E-02	2.39E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	1.16E+00	1.19E+02	6.00E-02	7.13E+00	Baes et al. (1984)	1.24E-01	1.47E+01	USCHPPM (2004)	1.60E-02	1.90E+00	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	0.00E+00	8.90E-02	0.00E+00	USEPA (2007a)	2.92E+01	0.00E+00	USEPA (2007a)	2.53E-01	0.00E+00	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	1.48E+00	Regression[a]	2.75E-03	USEPA (2007a)	1.47E+00	2.17E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	4.12E-04	2.58E+00	Regression[a]	7.78E-01	USEPA (2007a)	2.42E+00	6.25E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluoranthene	4.95	1.76E-03	2.05E+01	5.00E-01	1.02E+01	USEPA (2007a)	3.04E+00	6.23E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluorene	4.18	0.00E+00	1.00E+00	Regression[a]	3.84E-03	USEPA (2007a)	9.57E+00	9.57E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Naphthalene	3.36	5.78E-04	5.24E-01	1.22E+01	6.40E+00	USEPA (2007a)	4.40E+00	2.31E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Phenanthrene	4.55	5.53E-04	1.32E+01	Regression[a]	4.19E+00	USEPA (2007a)	1.72E+00	2.26E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
LMW PAHs												
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	5.7	5.75E-04	1.28E+01	Regression[a]	3.04E-01	USEPA (2007a)	1.59E+00	2.04E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]

Table H14-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Main Plant Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Benzo[A]Pyrene	6.11	1.94E-03	1.49E+01	Regression[a]	1.77E+00	USEPA (2007a)	1.33E+00	1.98E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	5.09E-03	1.83E+01	3.10E-01	5.66E+00	USEPA (2007a)	2.60E+00	4.75E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	7.31E-04	1.29E+01	Regression[a]	8.08E+00	USEPA (2007a)	2.94E+00	3.78E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	1.53E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	3.69E-03	1.57E+01	Regression[a]	3.43E-01	USEPA (2007a)	2.29E+00	3.60E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	6.70E-05	3.29E+00	1.30E-01	4.27E-01	USEPA (2007a)	2.31E+00	7.59E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.28E-04	1.23E+01	1.10E-01	1.36E+00	USEPA (2007a)	2.86E+00	3.53E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Pyrene	4.88	1.33E-03	2.51E+01	7.20E-01	1.81E+01	USEPA (2007a)	1.75E+00	4.40E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	5.25E-03	5.32E-01	2.38E-02	1.27E-02	USEPA (2007a)	5.44E+01	2.90E+01	USEPA (2007a)	7.79E-01	4.14E-01	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	0.00E+00	6.54E-01	0.00E+00	USEPA (2007a)	1.14E+01	0.00E+00	USEPA (2007a)	1.22E-01	0.00E+00	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	1.85E-02	8.14E-01	1.51E-02	USEPA (2007a)	1.03E+01	1.91E-01	USEPA (2007a)	4.49E-01	8.32E-03	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	0.00E+00	2.53E-01	0.00E+00	USEPA (2007a)	1.79E+01	0.00E+00	USEPA (2007a)	2.65E+00	0.00E+00	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	0.00E+00	5.93E+00	0.00E+00	USEPA (2007a)	1.09E+01	0.00E+00	USEPA (2007a)	Regression[g]	0.00E+00	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	1.48E-07	9.41E-02	1.39E-08	USEPA (2007a)[b]	Regression[d]	2.89E-07	Sample et al. (1998a)	Regression[h]	6.99E-08	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	5.83E-07	5.17E-02	3.02E-08	USEPA (2007a)[b]	Regression[d]	1.46E-06	Sample et al. (1998a)	Regression[h]	3.15E-07	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	1.14E-06	2.82E-02	3.21E-08	USEPA (2007a)[b]	Regression[d]	3.23E-06	Sample et al. (1998a)	Regression[h]	6.59E-07	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	5.41E-06	2.82E-02	1.53E-07	USEPA (2007a)[b]	Regression[d]	2.04E-05	Sample et al. (1998a)	Regression[h]	3.65E-06	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	3.08E-06	2.82E-02	8.68E-08	USEPA (2007a)[b]	Regression[d]	1.05E-05	Sample et al. (1998a)	Regression[h]	1.97E-06	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	1.50E-04	1.55E-02	2.33E-06	USEPA (2007a)[b]	Regression[d]	1.03E-03	Sample et al. (1998a)	Regression[h]	1.41E-04	Sample et al. (1998b)
OCDD	9.50	0.00E+00	1.58E-03	8.45E-03	1.34E-05	USEPA (2007a)[b]	Regression[d]	1.67E-02	Sample et al. (1998a)	Regression[h]	1.88E-03	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	2.27E-06	1.69E-01	3.85E-07	USEPA (2007a)[b]	Regression[d]	7.30E-06	Sample et al. (1998a)	1.25E-01	2.84E-07	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	6.01E-07	9.24E-02	5.55E-08	USEPA (2007a)[b]	Regression[d]	1.52E-06	Sample et al. (1998a)	1.25E-01	7.52E-08	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	3.65E-06	9.24E-02	3.37E-07	USEPA (2007a)[b]	Regression[d]	1.28E-05	Sample et al. (1998a)	1.25E-01	4.57E-07	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	5.47E-06	3.70E-02	2.02E-07	USEPA (2007a)[b]	Regression[d]	2.06E-05	Sample et al. (1998a)	1.25E-01	6.84E-07	Sample et al. (1998b)[i]

Table H14-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Main Plant Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	1.03E-06	3.70E-02	3.81E-08	USEPA (2007a)[b]	Regression[d]	2.87E-06	Sample et al. (1998a)	1.25E-01	1.29E-07	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	0.00E+00	3.70E-02	0.00E+00	USEPA (2007a)[b]	Regression[d]	0.00E+00	Sample et al. (1998a)	1.25E-01	0.00E+00	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	2.58E-06	5.08E-02	1.31E-07	USEPA (2007a)[b]	Regression[d]	8.49E-06	Sample et al. (1998a)	1.25E-01	3.23E-07	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	1.56E-05	2.77E-02	4.32E-07	USEPA (2007a)[b]	Regression[d]	7.12E-05	Sample et al. (1998a)	1.25E-01	1.95E-06	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	7.12E-07	2.77E-02	1.97E-08	USEPA (2007a)[b]	Regression[d]	1.85E-06	Sample et al. (1998a)	1.25E-01	8.91E-08	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	4.24E-05	1.52E-02	6.45E-07	USEPA (2007a)[b]	Regression[d]	2.32E-04	Sample et al. (1998a)	1.25E-01	5.30E-06	Sample et al. (1998b)[i]

Table H14-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Main Plant Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([diet $_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H14-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Main Plant Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	1.14E+00	0.0	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	9.28E-04	0.1	Regression[a]	6.57E-03	USEPA (2007)	1.00E+00	1.48E-01	Assumption[c]	5.00E-02	7.40E-03	Baes et al. (1984)[e]
Arsenic	NA	9.37E-04	4.6	3.75E-02	1.71E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	7.04E-01	Sample et al. (1999)	Regression[f]	2.72E-02	Sample et al. (1998b)
Barium	NA	1.73E-01	0.0	1.56E-01	0.00E+00	Bechtel-Jacobs (1998a)[g]	9.10E-02	0.00E+00	Sample et al. (1998a)	6.83E-04	0.00E+00	Baes et al. (1984)[e]
Beryllium	NA	2.61E-04	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	6.80E-04	0.2	Regression[a]	2.50E-01	Bechtel-Jacobs (1998a)	Regression[d]	2.20E+00	Sample et al. (1999)	Regression[f]	1.30E-01	Sample et al. (1998b)
Chromium	NA	2.97E-03	12.1	4.10E-02	4.96E-01	Bechtel-Jacobs (1998a)[g]	3.06E-01	3.70E+00	Sample et al. (1998a)	Regression[f]	1.45E+00	Sample et al. (1998b)
Cobalt	NA	1.78E-03	0.0	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	9.09E-03	15.5	Regression[a]	5.75E+00	Bechtel-Jacobs (1998a)	5.15E-01	7.99E+00	Sample et al. (1998a)	Regression[f]	1.14E+01	Sample et al. (1998b)
Lead	NA	1.75E-03	13.7	Regression[a]	1.15E+00	Bechtel-Jacobs (1998a)	Regression[d]	6.66E+00	Sample et al. (1999)	Regression[f]	3.44E+00	Sample et al. (1998b)
Manganese	NA	1.34E-01	0.0	7.90E-02	0.00E+00	Bechtel-Jacobs (1998a)[g]	Regression[d]	0.00E+00	Sample et al. (1999)	2.05E-02	0.00E+00	Sample et al. (1998b)[j]
Mercury	NA	1.46E-04	0.0	Regression[a]	4.98E-02	Bechtel-Jacobs (1998a)	3.93E+00	9.87E-02	Sample et al. (1998a)	3.81E-01	9.57E-03	LANL (2015)
Nickel	NA	3.96E-03	18.4	Regression[a]	9.58E-01	Bechtel-Jacobs (1998a)	7.78E-01	1.43E+01	Sample et al. (1998a)	Regression[f]	3.04E+00	Sample et al. (1998b)
Selenium	NA	7.23E-04	0.2	Regression[a]	6.45E-02	Bechtel-Jacobs (1998a)	Regression[d]	2.36E-01	Sample et al. (1998a)	Regression[f]	3.26E-01	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	2.54E-04	0.0	4.00E-03	0.00E+00	Baes et al. (1984)	5.41E-02	0.00E+00	USCHPPM (2004)	1.08E-01	0.00E+00	Baes et al. (1984)[e]
Vanadium	NA	2.33E-03	11.6	4.85E-03	5.61E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	4.86E-01	Sample et al. (1998a)	1.23E-02	1.42E-01	Sample et al. (1998b)[j]
Zinc	NA	2.54E-02	53.1	Regression[a]	4.36E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.15E+02	Sample et al. (1998a)	Regression[f]	1.04E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	4.08E-02	2.76E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	1.16E+00	8.80E+01	6.00E-02	5.28E+00	Baes et al. (1984)	1.24E-01	1.09E+01	USCHPPM (2004)	1.60E-02	1.41E+00	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	0.00E+00	8.90E-02	0.00E+00	USEPA (2007a)	2.92E+01	0.00E+00	USEPA (2007a)	2.53E-01	0.00E+00	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	5.93E-01	Regression[a]	6.01E-03	USEPA (2007a)	1.47E+00	8.72E-01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	4.12E-04	1.12E+00	Regression[a]	4.07E-01	USEPA (2007a)	2.42E+00	2.71E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluoranthene	4.95	1.76E-03	9.95E+00	5.00E-01	4.98E+00	USEPA (2007a)	3.04E+00	3.02E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluorene	4.18	0.00E+00	4.10E-01	Regression[a]	8.24E-03	USEPA (2007a)	9.57E+00	3.92E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Naphthalene	3.36	5.78E-04	2.88E-01	1.22E+01	3.52E+00	USEPA (2007a)	4.40E+00	1.27E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Phenanthrene	4.55	5.53E-04	5.70E+00	Regression[a]	2.49E+00	USEPA (2007a)	1.72E+00	9.81E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
LMW PAHs												
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	5.7	5.75E-04	5.48E+00	Regression[a]	1.83E-01	USEPA (2007a)	1.59E+00	8.72E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	1.94E-03	5.98E+00	Regression[a]	7.28E-01	USEPA (2007a)	1.33E+00	7.95E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]

Table H14-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Main Plant Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Benzo(b)fluoranthene	6.2	5.09E-03	7.60E+00	3.10E-01	2.36E+00	USEPA (2007a)	2.60E+00	1.98E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	7.31E-04	5.37E+00	Regression[a]	2.88E+00	USEPA (2007a)	2.94E+00	1.58E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	1.53E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	3.69E-03	6.93E+00	Regression[a]	2.11E-01	USEPA (2007a)	2.29E+00	1.59E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	6.70E-05	1.28E+00	1.30E-01	1.67E-01	USEPA (2007a)	2.31E+00	2.97E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.28E-04	5.43E+00	1.10E-01	5.97E-01	USEPA (2007a)	2.86E+00	1.55E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Pyrene	4.88	1.33E-03	9.91E+00	7.20E-01	7.14E+00	USEPA (2007a)	1.75E+00	1.73E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	5.25E-03	1.52E-01	2.38E-02	3.62E-03	USEPA (2007a)	5.44E+01	8.27E+00	USEPA (2007a)	7.79E-01	1.18E-01	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	0.00E+00	6.54E-01	0.00E+00	USEPA (2007a)	1.14E+01	0.00E+00	USEPA (2007a)	1.22E-01	0.00E+00	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	1.92E-02	8.14E-01	1.56E-02	USEPA (2007a)	1.03E+01	1.98E-01	USEPA (2007a)	4.49E-01	8.62E-03	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	0.00E+00	2.53E-01	0.00E+00	USEPA (2007a)	1.79E+01	0.00E+00	USEPA (2007a)	2.65E+00	0.00E+00	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	0.00E+00	5.93E+00	0.00E+00	USEPA (2007a)	1.09E+01	0.00E+00	USEPA (2007a)	Regression[g]	0.00E+00	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	6.17E-08	9.41E-02	5.81E-09	USEPA (2007a)[b]	Regression[d]	1.03E-07	Sample et al. (1998a)	Regression[h]	2.67E-08	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	3.09E-07	5.17E-02	1.60E-08	USEPA (2007a)[b]	Regression[d]	6.91E-07	Sample et al. (1998a)	Regression[h]	1.57E-07	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	6.41E-07	2.82E-02	1.81E-08	USEPA (2007a)[b]	Regression[d]	1.64E-06	Sample et al. (1998a)	Regression[h]	3.50E-07	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	3.32E-06	2.82E-02	9.36E-08	USEPA (2007a)[b]	Regression[d]	1.14E-05	Sample et al. (1998a)	Regression[h]	2.14E-06	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	1.88E-06	2.82E-02	5.30E-08	USEPA (2007a)[b]	Regression[d]	5.84E-06	Sample et al. (1998a)	Regression[h]	1.14E-06	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	9.56E-05	1.55E-02	1.48E-06	USEPA (2007a)[b]	Regression[d]	6.07E-04	Sample et al. (1998a)	Regression[h]	8.58E-05	Sample et al. (1998b)
OCDD	9.50	0.00E+00	1.11E-03	8.45E-03	9.34E-06	USEPA (2007a)[b]	Regression[d]	1.10E-02	Sample et al. (1998a)	Regression[h]	1.27E-03	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	7.38E-07	1.69E-01	1.25E-07	USEPA (2007a)[b]	Regression[d]	1.93E-06	Sample et al. (1998a)	1.25E-01	9.23E-08	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	3.90E-07	9.24E-02	3.60E-08	USEPA (2007a)[b]	Regression[d]	9.10E-07	Sample et al. (1998a)	1.25E-01	4.88E-08	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	5.05E-07	9.24E-02	4.66E-08	USEPA (2007a)[b]	Regression[d]	1.23E-06	Sample et al. (1998a)	1.25E-01	6.32E-08	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	1.92E-06	3.70E-02	7.10E-08	USEPA (2007a)[b]	Regression[d]	5.99E-06	Sample et al. (1998a)	1.25E-01	2.40E-07	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	7.62E-07	3.70E-02	2.82E-08	USEPA (2007a)[b]	Regression[d]	2.01E-06	Sample et al. (1998a)	1.25E-01	9.53E-08	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	1.05E-07	3.70E-02	3.88E-09	USEPA (2007a)[b]	Regression[d]	1.93E-07	Sample et al. (1998a)	1.25E-01	1.31E-08	Sample et al. (1998b)[i]

Table H14-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Main Plant Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	8.42E-07	5.08E-02	4.28E-08	USEPA (2007a)[b]	Regression[d]	2.26E-06	Sample et al. (1998a)	1.25E-01	1.05E-07	Sample et al. (1998b)[j]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	1.50E-05	2.77E-02	4.15E-07	USEPA (2007a)[b]	Regression[d]	6.80E-05	Sample et al. (1998a)	1.25E-01	1.88E-06	Sample et al. (1998b)[j]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	3.35E-07	2.77E-02	9.27E-09	USEPA (2007a)[b]	Regression[d]	7.60E-07	Sample et al. (1998a)	1.25E-01	4.19E-08	Sample et al. (1998b)[j]
OCDF	8.87	0.00E+00	3.25E-05	1.52E-02	4.95E-07	USEPA (2007a)[b]	Regression[d]	1.70E-04	Sample et al. (1998a)	1.25E-01	4.07E-06	Sample et al. (1998b)[j]

Table H14-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Main Plant Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H14-2
Refined Exposure Evaluation - American Woodcock
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-01	0.00E+00	1.34E-01	1.10E+02	<1	1.10E+03	<1
Antimony	2.72E-01	9.28E-04	1.37E-04	2.87E-02	0.00E+00	2.89E-02	1.09E-04	2.39E-03	3.14E-02	No TRV	--	No TRV	--
Arsenic	4.81E+00	9.37E-04	2.12E-03	7.73E-02	0.00E+00	7.94E-02	1.10E-04	4.23E-02	1.22E-01	2.24E+00	<1	4.51E+00	<1
Barium	0.00E+00	1.73E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.03E-02	0.00E+00	2.03E-02	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	3.07E-05	--	3.07E-05	No TRV	--	No TRV	--
Cadmium	3.54E-01	6.80E-04	4.15E-03	3.84E-01	0.00E+00	3.88E-01	7.99E-05	3.12E-03	3.91E-01	1.47E+00	<1	6.35E+00	<1
Chromium	1.56E+01	2.97E-03	7.53E-03	5.06E-01	0.00E+00	5.13E-01	3.49E-04	1.38E-01	6.51E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.09E-04	0.00E+00	2.09E-04	7.61E+00	<1	2.02E+01	<1
Copper	1.64E+01	9.09E-03	6.90E-02	8.94E-01	0.00E+00	9.63E-01	1.07E-03	1.45E-01	1.11E+00	4.05E+00	<1	3.48E+01	<1
Lead	2.20E+01	1.75E-03	1.77E-02	1.03E+00	0.00E+00	1.05E+00	2.06E-04	1.94E-01	1.24E+00	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.58E-02	0.00E+00	1.58E-02	1.79E+02	<1	3.77E+02	<1
Mercury	2.08E-02	1.46E-04	5.27E-04	8.63E-03	0.00E+00	9.16E-03	1.72E-05	1.83E-04	9.36E-03	4.50E-01	<1	9.10E-01	<1
Nickel	3.17E+01	3.96E-03	1.69E-02	2.61E+00	0.00E+00	2.62E+00	4.65E-04	2.79E-01	2.90E+00	6.71E+00	<1	1.86E+01	<1
Selenium	2.65E-01	7.23E-04	1.38E-03	3.70E-02	0.00E+00	3.84E-02	8.49E-05	2.33E-03	4.08E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.98E-05	0.00E+00	2.98E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	1.36E+01	2.33E-03	7.77E-04	6.05E-02	0.00E+00	6.13E-02	2.74E-04	1.20E-01	1.82E-01	3.44E-01	<1	1.70E+00	<1
Zinc	5.88E+01	2.54E-02	5.42E-01	3.44E+01	0.00E+00	3.50E+01	2.98E-03	5.18E-01	3.55E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.39E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-03	2.10E-03	6.90E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	1.19E+02	1.16E+00	8.38E-02	1.56E+00	0.00E+00	1.64E+00	1.36E-01	1.05E+00	2.82E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.48E+00	0.00E+00	3.23E-05	2.30E-01	0.00E+00	2.30E-01	0.00E+00	1.30E-02	2.43E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	2.58E+00	4.12E-04	9.14E-03	6.60E-01	0.00E+00	6.70E-01	4.83E-05	2.27E-02	6.92E-01				
Fluoranthene	2.05E+01	1.76E-03	1.20E-01	6.59E+00	0.00E+00	6.71E+00	2.07E-04	1.81E-01	6.89E+00				
Fluorene	1.00E+00	0.00E+00	4.51E-05	1.01E+00	0.00E+00	1.01E+00	0.00E+00	8.81E-03	1.02E+00				
Naphthalene	5.24E-01	5.78E-04	7.52E-02	2.44E-01	0.00E+00	3.19E-01	6.79E-05	4.62E-03	3.24E-01				
Phenanthrene	1.32E+01	5.53E-04	4.92E-02	2.39E+00	0.00E+00	2.44E+00	6.50E-05	1.16E-01	2.56E+00				
Total LMW PAHs						1.14E+01	3.88E-04	3.46E-01	1.17E+01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.28E+01	5.75E-04	3.57E-03	2.16E+00	0.00E+00	2.16E+00	6.76E-05	1.13E-01	2.28E+00				
Benzo[A]Pyrene	1.49E+01	1.94E-03	2.08E-02	2.10E+00	0.00E+00	2.12E+00	2.28E-04	1.31E-01	2.25E+00				
Benzo(b)fluoranthene	1.83E+01	5.09E-03	6.65E-02	5.02E+00	0.00E+00	5.09E+00	5.98E-04	1.61E-01	5.25E+00				
Benzo(g,h,i)perylene	1.29E+01	7.31E-04	9.50E-02	4.00E+00	0.00E+00	4.09E+00	8.58E-05	1.13E-01	4.21E+00				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.80E-05	--	1.80E-05				
Chrysene	1.57E+01	3.69E-03	4.03E-03	3.81E+00	0.00E+00	3.81E+00	4.33E-04	1.39E-01	3.95E+00				
Dibenz(A,H)Anthracene	3.29E+00	6.70E-05	5.02E-03	8.03E-01	0.00E+00	8.08E-01	7.87E-06	2.90E-02	8.37E-01				
Indeno (1,2,3-CD) Pyrene	1.23E+01	3.28E-04	1.59E-02	3.73E+00	0.00E+00	3.74E+00	3.85E-05	1.09E-01	3.85E+00				
Pyrene	2.51E+01	1.33E-03	2.13E-01	4.65E+00	0.00E+00	4.86E+00	1.56E-04	2.21E-01	5.08E+00				
Total HMW PAHs						2.67E+01	1.63E-03	1.02E+00	2.77E+01	2.00E+00	1.39E+01	2.00E+01	1.39E+00
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	5.32E-01	5.25E-03	1.49E-04	3.06E+00	0.00E+00	3.06E+00	6.17E-04	4.69E-03	3.07E+00	1.10E+00	2.79E+00	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.85E-02	ND	1.77E-04	2.02E-02	0.00E+00	2.04E-02	--	1.63E-04	2.06E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H14-2
Refined Exposure Evaluation - American Woodcock
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.48E-07	0.00E+00	1.64E-10	3.06E-08	0.00E+00	3.08E-08	0.00E+00	1.30E-09	3.21E-08				
1,2,3,7,8-PeCDD	5.83E-07	0.00E+00	3.54E-10	1.55E-07	0.00E+00	1.55E-07	0.00E+00	5.14E-09	1.60E-07				
1,2,3,4,7,8-HxCDD	1.14E-06	0.00E+00	3.78E-10	3.42E-07	0.00E+00	1.71E-08	0.00E+00	5.02E-10	1.76E-08				
1,2,3,6,7,8-HxCDD	5.41E-06	0.00E+00	1.79E-09	2.15E-06	0.00E+00	2.16E-08	0.00E+00	4.77E-10	2.20E-08				
1,2,3,7,8,9-HxCDD	3.08E-06	0.00E+00	1.02E-09	1.11E-06	0.00E+00	1.11E-07	0.00E+00	2.71E-09	1.13E-07				
1,2,3,4,6,7,8-HpCDD	1.50E-04	0.00E+00	2.73E-08	1.09E-04	0.00E+00	1.09E-07	0.00E+00	1.32E-09	1.11E-07				
OCDD	1.58E-03	0.00E+00	1.57E-07	1.77E-03	0.00E+00	1.77E-07	0.00E+00	1.39E-09	1.78E-07				
2,3,7,8-TCDF	2.27E-06	0.00E+00	4.52E-09	7.72E-07	0.00E+00	7.76E-07	0.00E+00	2.00E-08	7.96E-07				
1,2,3,7,8-PeCDF	6.01E-07	0.00E+00	6.52E-10	1.60E-07	0.00E+00	1.61E-08	0.00E+00	5.30E-10	1.66E-08				
2,3,4,7,8-PeCDF	3.65E-06	0.00E+00	3.96E-09	1.35E-06	0.00E+00	1.36E-06	0.00E+00	3.22E-08	1.39E-06				
1,2,3,4,7,8-HxCDF	5.47E-06	0.00E+00	2.38E-09	2.18E-06	0.00E+00	2.18E-07	0.00E+00	4.82E-09	2.23E-07				
1,2,3,6,7,8-HxCDF	1.03E-06	0.00E+00	4.47E-10	3.03E-07	0.00E+00	3.04E-08	0.00E+00	9.08E-10	3.13E-08				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	2.58E-06	0.00E+00	1.54E-09	8.98E-07	0.00E+00	8.99E-08	0.00E+00	2.27E-09	9.22E-08				
1,2,3,4,6,7,8-HpCDF	1.56E-05	0.00E+00	5.07E-09	7.53E-06	0.00E+00	7.54E-08	0.00E+00	1.37E-09	7.67E-08				
1,2,3,4,7,8,9-HpCDF	7.12E-07	0.00E+00	2.31E-10	1.96E-07	0.00E+00	1.96E-09	0.00E+00	6.27E-11	2.02E-09				
OCDF	4.24E-05	0.00E+00	7.58E-09	2.46E-05	0.00E+00	2.46E-09	0.00E+00	3.74E-11	2.49E-09				
Total Dioxins/Furans						3.19E-06	0.00E+00	7.50E-08	3.19E-06	1.75E-06	1.82E+00	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H14-3
Refined Exposure Evaluation - Mourning Dove
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-01	0.00E+00	1.30E-01	1.10E+02	<1	1.10E+03	<1
Antimony	2.72E-01	9.28E-04	1.33E-03	0.00E+00	0.00E+00	1.33E-03	1.06E-04	2.11E-03	3.54E-03	No TRV	--	No TRV	--
Arsenic	4.81E+00	9.37E-04	2.06E-02	0.00E+00	0.00E+00	2.06E-02	1.07E-04	3.73E-02	5.80E-02	2.24E+00	<1	4.51E+00	<1
Barium	0.00E+00	1.73E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.97E-02	0.00E+00	1.97E-02	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	2.98E-05	--	2.98E-05	No TRV	--	No TRV	--
Cadmium	3.54E-01	6.80E-04	4.03E-02	0.00E+00	0.00E+00	4.03E-02	7.76E-05	2.75E-03	4.31E-02	1.47E+00	<1	6.35E+00	<1
Chromium	1.56E+01	2.97E-03	7.32E-02	0.00E+00	0.00E+00	7.32E-02	3.39E-04	1.21E-01	1.95E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.03E-04	0.00E+00	2.03E-04	7.61E+00	<1	2.02E+01	<1
Copper	1.64E+01	9.09E-03	6.70E-01	0.00E+00	0.00E+00	6.70E-01	1.04E-03	1.27E-01	7.99E-01	4.05E+00	<1	3.48E+01	<1
Lead	2.20E+01	1.75E-03	1.72E-01	0.00E+00	0.00E+00	1.72E-01	2.00E-04	1.71E-01	3.43E-01	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-02	0.00E+00	1.53E-02	1.79E+02	<1	3.77E+02	<1
Mercury	2.08E-02	1.46E-04	5.12E-03	0.00E+00	0.00E+00	5.12E-03	1.67E-05	1.61E-04	5.30E-03	4.50E-01	<1	9.10E-01	<1
Nickel	3.17E+01	3.96E-03	1.64E-01	0.00E+00	0.00E+00	1.64E-01	4.52E-04	2.46E-01	4.10E-01	6.71E+00	<1	1.86E+01	<1
Selenium	2.65E-01	7.23E-04	1.34E-02	0.00E+00	0.00E+00	1.34E-02	8.25E-05	2.05E-03	1.55E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-05	0.00E+00	2.90E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	1.36E+01	2.33E-03	7.55E-03	0.00E+00	0.00E+00	7.55E-03	2.66E-04	1.06E-01	1.14E-01	3.44E-01	<1	1.70E+00	<1
Zinc	5.88E+01	2.54E-02	5.27E+00	0.00E+00	0.00E+00	5.27E+00	2.89E-03	4.56E-01	5.73E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.39E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E-03	1.85E-03	6.51E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	1.19E+02	1.16E+00	8.14E-01	0.00E+00	0.00E+00	8.14E-01	1.32E-01	9.22E-01	1.87E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.48E+00	0.00E+00	3.14E-04	0.00E+00	0.00E+00	3.14E-04	0.00E+00	1.15E-02	1.18E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	2.58E+00	4.12E-04	8.88E-02	0.00E+00	0.00E+00	8.88E-02	4.70E-05	2.00E-02	1.09E-01				
Fluoranthene	2.05E+01	1.76E-03	1.17E+00	0.00E+00	0.00E+00	1.17E+00	2.01E-04	1.59E-01	1.33E+00				
Fluorene	1.00E+00	0.00E+00	4.39E-04	0.00E+00	0.00E+00	4.39E-04	0.00E+00	7.76E-03	8.20E-03				
Naphthalene	5.24E-01	5.78E-04	7.30E-01	0.00E+00	0.00E+00	7.30E-01	6.60E-05	4.07E-03	7.34E-01				
Phenanthrene	1.32E+01	5.53E-04	4.78E-01	0.00E+00	0.00E+00	4.78E-01	6.31E-05	1.02E-01	5.80E-01				
Total LMW PAHs						2.47E+00	3.77E-04	3.05E-01	2.77E+00	1.61E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.28E+01	5.75E-04	3.47E-02	0.00E+00	0.00E+00	3.47E-02	6.56E-05	9.97E-02	1.34E-01				
Benzo[A]Pyrene	1.49E+01	1.94E-03	2.02E-01	0.00E+00	0.00E+00	2.02E-01	2.21E-04	1.16E-01	3.18E-01				
Benzo(b)fluoranthene	1.83E+01	5.09E-03	6.47E-01	0.00E+00	0.00E+00	6.47E-01	5.81E-04	1.42E-01	7.89E-01				
Benzo(g,h,i)perylene	1.29E+01	7.31E-04	9.23E-01	0.00E+00	0.00E+00	9.23E-01	8.34E-05	9.98E-02	1.02E+00				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.75E-05	--	1.75E-05				
Chrysene	1.57E+01	3.69E-03	3.92E-02	0.00E+00	0.00E+00	3.92E-02	4.21E-04	1.22E-01	1.62E-01				
Dibenz(A,H)Anthracene	3.29E+00	6.70E-05	4.88E-02	0.00E+00	0.00E+00	4.88E-02	7.65E-06	2.55E-02	7.43E-02				
Indeno (1,2,3-CD) Pyrene	1.23E+01	3.28E-04	1.55E-01	0.00E+00	0.00E+00	1.55E-01	3.74E-05	9.57E-02	2.51E-01				
Pyrene	2.51E+01	1.33E-03	2.07E+00	0.00E+00	0.00E+00	2.07E+00	1.52E-04	1.95E-01	2.26E+00				
Total HMW PAHs						4.11E+00	1.59E-03	8.95E-01	5.01E+00	2.00E+00	2.51E+00	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	5.32E-01	5.25E-03	1.44E-03	0.00E+00	0.00E+00	1.44E-03	5.99E-04	4.13E-03	6.17E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.85E-02	0.00E+00	1.72E-03	0.00E+00	0.00E+00	1.72E-03	0.00E+00	1.44E-04	1.87E-03	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H14-3
Refined Exposure Evaluation - Mourning Dove
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.48E-07	0.00E+00	1.59E-09	0.00E+00	0.00E+00	1.59E-09	0.00E+00	1.15E-09	2.74E-09				
1,2,3,7,8-PeCDD	5.83E-07	0.00E+00	3.44E-09	0.00E+00	0.00E+00	3.44E-09	0.00E+00	4.52E-09	7.97E-09				
1,2,3,4,7,8-HxCDD	1.14E-06	0.00E+00	3.67E-09	0.00E+00	0.00E+00	1.83E-10	0.00E+00	4.42E-10	6.26E-10				
1,2,3,6,7,8-HxCDD	5.41E-06	0.00E+00	1.74E-08	0.00E+00	0.00E+00	1.74E-10	0.00E+00	4.20E-10	5.94E-10				
1,2,3,7,8,9-HxCDD	3.08E-06	0.00E+00	9.91E-09	0.00E+00	0.00E+00	9.91E-10	0.00E+00	2.39E-09	3.38E-09				
1,2,3,4,6,7,8-HpCDD	1.50E-04	0.00E+00	2.66E-07	0.00E+00	0.00E+00	2.66E-10	0.00E+00	1.16E-09	1.43E-09				
OCDD	1.58E-03	0.00E+00	1.53E-06	0.00E+00	0.00E+00	1.53E-10	0.00E+00	1.23E-09	1.38E-09				
2,3,7,8-TCDF	2.27E-06	0.00E+00	4.39E-08	0.00E+00	0.00E+00	4.39E-08	0.00E+00	1.76E-08	6.15E-08				
1,2,3,7,8-PeCDF	6.01E-07	0.00E+00	6.34E-09	0.00E+00	0.00E+00	6.34E-10	0.00E+00	4.66E-10	1.10E-09				
2,3,4,7,8-PeCDF	3.65E-06	0.00E+00	3.85E-08	0.00E+00	0.00E+00	3.85E-08	0.00E+00	2.83E-08	6.68E-08				
1,2,3,4,7,8-HxCDF	5.47E-06	0.00E+00	2.31E-08	0.00E+00	0.00E+00	2.31E-09	0.00E+00	4.25E-09	6.55E-09				
1,2,3,6,7,8-HxCDF	1.03E-06	0.00E+00	4.35E-09	0.00E+00	0.00E+00	4.35E-10	0.00E+00	7.99E-10	1.23E-09				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	2.58E-06	0.00E+00	1.50E-08	0.00E+00	0.00E+00	1.50E-09	0.00E+00	2.00E-09	3.50E-09				
1,2,3,4,6,7,8-HpCDF	1.56E-05	0.00E+00	4.93E-08	0.00E+00	0.00E+00	4.93E-10	0.00E+00	1.21E-09	1.70E-09				
1,2,3,4,7,8,9-HpCDF	7.12E-07	0.00E+00	2.25E-09	0.00E+00	0.00E+00	2.25E-11	0.00E+00	5.53E-11	7.78E-11				
OCDF	4.24E-05	0.00E+00	7.37E-08	0.00E+00	0.00E+00	7.37E-12	0.00E+00	3.29E-11	4.03E-11				
Total Dioxins/Furans						9.46E-08	0.00E+00	6.61E-08	1.61E-07	1.75E-06	<1	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H14-4
Refined Exposure Evaluation - Red-tailed Hawk
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.36E-02	0.00E+00	9.36E-02	1.10E+02	<1	1.10E+03	<1
Antimony	2.72E-01	9.28E-04	0.00E+00	0.00E+00	1.11E-03	1.11E-03	7.61E-05	5.79E-04	1.77E-03	No TRV	--	No TRV	--
Arsenic	4.81E+00	9.37E-04	0.00E+00	0.00E+00	2.33E-03	2.33E-03	7.68E-05	1.02E-02	1.27E-02	2.24E+00	<1	4.51E+00	<1
Barium	0.00E+00	1.73E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.42E-02	0.00E+00	1.42E-02	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	2.14E-05	--	2.14E-05	No TRV	--	No TRV	--
Cadmium	3.54E-01	6.80E-04	0.00E+00	0.00E+00	1.43E-02	1.43E-02	5.58E-05	7.55E-04	1.51E-02	1.47E+00	<1	6.35E+00	<1
Chromium	1.56E+01	2.97E-03	0.00E+00	0.00E+00	1.43E-01	1.43E-01	2.44E-04	3.33E-02	1.77E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-04	0.00E+00	1.46E-04	7.61E+00	<1	2.02E+01	<1
Copper	1.64E+01	9.09E-03	0.00E+00	0.00E+00	9.47E-01	9.47E-01	7.45E-04	3.50E-02	9.82E-01	4.05E+00	<1	3.48E+01	<1
Lead	2.20E+01	1.75E-03	0.00E+00	0.00E+00	3.48E-01	3.48E-01	1.44E-04	4.70E-02	3.95E-01	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-02	0.00E+00	1.10E-02	1.79E+02	<1	3.77E+02	<1
Mercury	2.08E-02	1.46E-04	0.00E+00	0.00E+00	6.49E-04	6.49E-04	1.20E-05	4.43E-05	7.06E-04	4.50E-01	<1	9.10E-01	<1
Nickel	3.17E+01	3.96E-03	0.00E+00	0.00E+00	3.21E-01	3.21E-01	3.25E-04	6.76E-02	3.89E-01	6.71E+00	<1	1.86E+01	<1
Selenium	2.65E-01	7.23E-04	0.00E+00	0.00E+00	3.28E-02	3.28E-02	5.93E-05	5.65E-04	3.34E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.08E-05	0.00E+00	2.08E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	1.36E+01	2.33E-03	0.00E+00	0.00E+00	1.38E-02	1.38E-02	1.91E-04	2.91E-02	4.30E-02	3.44E-01	<1	1.70E+00	<1
Zinc	5.88E+01	2.54E-02	0.00E+00	0.00E+00	8.58E+00	8.58E+00	2.08E-03	1.25E-01	8.71E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.39E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-03	5.09E-04	3.86E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	1.19E+02	1.16E+00	0.00E+00	0.00E+00	1.56E-01	1.56E-01	9.49E-02	2.53E-01	5.04E-01	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.48E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.15E-03	3.15E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	2.58E+00	4.12E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.37E-05	5.50E-03	5.54E-03				
Fluoranthene	2.05E+01	1.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.44E-04	4.37E-02	4.38E-02				
Fluorene	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.13E-03	2.13E-03				
Naphthalene	5.24E-01	5.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.74E-05	1.12E-03	1.17E-03				
Phenanthrene	1.32E+01	5.53E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.54E-05	2.81E-02	2.81E-02				
Total LMW PAHs						0.00E+00	2.71E-04	8.37E-02	8.39E-02	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.28E+01	5.75E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.72E-05	2.74E-02	2.74E-02				
Benzo[A]Pyrene	1.49E+01	1.94E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-04	3.18E-02	3.20E-02				
Benzo(b)fluoranthene	1.83E+01	5.09E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-04	3.90E-02	3.94E-02				
Benzo(g,h,i)perylene	1.29E+01	7.31E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.99E-05	2.74E-02	2.75E-02				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.26E-05	--	1.26E-05				
Chrysene	1.57E+01	3.69E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.02E-04	3.35E-02	3.39E-02				
Dibenz(A,H)Anthracene	3.29E+00	6.70E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.49E-06	7.01E-03	7.01E-03				
Indeno (1,2,3-CD) Pyrene	1.23E+01	3.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.69E-05	2.63E-02	2.63E-02				
Pyrene	2.51E+01	1.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.09E-04	5.36E-02	5.37E-02				
Total HMW PAHs						0.00E+00	1.14E-03	2.46E-01	2.47E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	5.32E-01	5.25E-03	0.00E+00	0.00E+00	3.40E-02	3.40E-02	4.31E-04	1.13E-03	3.56E-02	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.85E-02	0.00E+00	0.00E+00	0.00E+00	6.83E-04	6.83E-04	0.00E+00	3.95E-05	7.22E-04	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H14-4
Refined Exposure Evaluation - Red-tailed Hawk
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.48E-07	0.00E+00	0.00E+00	0.00E+00	5.73E-09	5.73E-09	0.00E+00	3.16E-10	6.05E-09				
1,2,3,7,8-PeCDD	5.83E-07	0.00E+00	0.00E+00	0.00E+00	2.59E-08	2.59E-08	0.00E+00	1.24E-09	2.71E-08				
1,2,3,4,7,8-HxCDD	1.14E-06	0.00E+00	0.00E+00	0.00E+00	5.41E-08	2.70E-09	0.00E+00	1.22E-10	2.83E-09				
1,2,3,6,7,8-HxCDD	5.41E-06	0.00E+00	0.00E+00	0.00E+00	3.00E-07	3.00E-09	0.00E+00	1.15E-10	3.11E-09				
1,2,3,7,8,9-HxCDD	3.08E-06	0.00E+00	0.00E+00	0.00E+00	1.61E-07	1.61E-08	0.00E+00	6.57E-10	1.68E-08				
1,2,3,4,6,7,8-HpCDD	1.50E-04	0.00E+00	0.00E+00	0.00E+00	1.16E-05	1.16E-08	0.00E+00	3.20E-10	1.19E-08				
OCDD	1.58E-03	0.00E+00	0.00E+00	0.00E+00	1.54E-04	1.54E-08	0.00E+00	3.37E-10	1.57E-08				
2,3,7,8-TCDF	2.27E-06	0.00E+00	0.00E+00	0.00E+00	2.33E-08	2.33E-08	0.00E+00	4.84E-09	2.81E-08				
1,2,3,7,8-PeCDF	6.01E-07	0.00E+00	0.00E+00	0.00E+00	6.17E-09	6.17E-10	0.00E+00	1.28E-10	7.45E-10				
2,3,4,7,8-PeCDF	3.65E-06	0.00E+00	0.00E+00	0.00E+00	3.74E-08	3.74E-08	0.00E+00	7.78E-09	4.52E-08				
1,2,3,4,7,8-HxCDF	5.47E-06	0.00E+00	0.00E+00	0.00E+00	5.61E-08	5.61E-09	0.00E+00	1.17E-09	6.78E-09				
1,2,3,6,7,8-HxCDF	1.03E-06	0.00E+00	0.00E+00	0.00E+00	1.06E-08	1.06E-09	0.00E+00	2.20E-10	1.28E-09				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	2.58E-06	0.00E+00	0.00E+00	0.00E+00	2.65E-08	2.65E-09	0.00E+00	5.50E-10	3.20E-09				
1,2,3,4,6,7,8-HpCDF	1.56E-05	0.00E+00	0.00E+00	0.00E+00	1.60E-07	1.60E-09	0.00E+00	3.33E-10	1.93E-09				
1,2,3,4,7,8,9-HpCDF	7.12E-07	0.00E+00	0.00E+00	0.00E+00	7.30E-09	7.30E-11	0.00E+00	1.52E-11	8.82E-11				
OCDF	4.24E-05	0.00E+00	0.00E+00	0.00E+00	4.35E-07	4.35E-11	0.00E+00	9.04E-12	5.25E-11				
Total Dioxins/Furans						1.53E-07	0.00E+00	1.82E-08	1.71E-07	1.75E-06	<1	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H14-5
Refined Exposure Evaluation - Yellow-billed Cuckoo
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.81E-01	0.00E+00	1.81E-01	1.10E+02	<1	1.10E+03	<1
Antimony	2.72E-01	9.28E-04	0.00E+00	4.30E-02	0.00E+00	4.30E-02	1.47E-04	0.00E+00	4.32E-02	No TRV	--	No TRV	--
Arsenic	4.81E+00	9.37E-04	0.00E+00	1.16E-01	0.00E+00	1.16E-01	1.48E-04	0.00E+00	1.16E-01	2.24E+00	<1	4.51E+00	<1
Barium	0.00E+00	1.73E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E-02	0.00E+00	2.74E-02	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	4.13E-05	--	4.13E-05	No TRV	--	No TRV	--
Cadmium	3.54E-01	6.80E-04	0.00E+00	5.75E-01	0.00E+00	5.75E-01	1.08E-04	0.00E+00	5.75E-01	1.47E+00	<1	6.35E+00	<1
Chromium	1.56E+01	2.97E-03	0.00E+00	7.57E-01	0.00E+00	7.57E-01	4.71E-04	0.00E+00	7.58E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.82E-04	0.00E+00	2.82E-04	7.61E+00	<1	2.02E+01	<1
Copper	1.64E+01	9.09E-03	0.00E+00	1.34E+00	0.00E+00	1.34E+00	1.44E-03	0.00E+00	1.34E+00	4.05E+00	<1	3.48E+01	<1
Lead	2.20E+01	1.75E-03	0.00E+00	1.55E+00	0.00E+00	1.55E+00	2.77E-04	0.00E+00	1.55E+00	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.13E-02	0.00E+00	2.13E-02	1.79E+02	<1	3.77E+02	<1
Mercury	2.08E-02	1.46E-04	0.00E+00	1.29E-02	0.00E+00	1.29E-02	2.31E-05	0.00E+00	1.30E-02	4.50E-01	<1	9.10E-01	<1
Nickel	3.17E+01	3.96E-03	0.00E+00	3.90E+00	0.00E+00	3.90E+00	6.27E-04	0.00E+00	3.90E+00	6.71E+00	<1	1.86E+01	<1
Selenium	2.65E-01	7.23E-04	0.00E+00	5.55E-02	0.00E+00	5.55E-02	1.14E-04	0.00E+00	5.56E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.02E-05	0.00E+00	4.02E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	1.36E+01	2.33E-03	0.00E+00	9.07E-02	0.00E+00	9.07E-02	3.70E-04	0.00E+00	9.10E-02	3.44E-01	<1	1.70E+00	<1
Zinc	5.88E+01	2.54E-02	0.00E+00	5.15E+01	0.00E+00	5.15E+01	4.01E-03	0.00E+00	5.15E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.39E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.46E-03	0.00E+00	6.46E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	1.19E+02	1.16E+00	0.00E+00	2.33E+00	0.00E+00	2.33E+00	1.83E-01	0.00E+00	2.52E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.48E+00	0.00E+00	0.00E+00	3.44E-01	0.00E+00	3.44E-01	0.00E+00	0.00E+00	3.44E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	2.58E+00	4.12E-04	0.00E+00	9.89E-01	0.00E+00	9.89E-01	6.52E-05	0.00E+00	9.89E-01				
Fluoranthene	2.05E+01	1.76E-03	0.00E+00	9.86E+00	0.00E+00	9.86E+00	2.79E-04	0.00E+00	9.86E+00				
Fluorene	1.00E+00	0.00E+00	0.00E+00	1.51E+00	0.00E+00	1.51E+00	0.00E+00	0.00E+00	1.51E+00				
Naphthalene	5.24E-01	5.78E-04	0.00E+00	3.65E-01	0.00E+00	3.65E-01	9.15E-05	0.00E+00	3.65E-01				
Phenanthrene	1.32E+01	5.53E-04	0.00E+00	3.58E+00	0.00E+00	3.58E+00	8.76E-05	0.00E+00	3.58E+00				
Total LMW PAHs						1.67E+01	5.23E-04	0.00E+00	1.67E+01	1.61E+01	1.03E+00	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.28E+01	5.75E-04	0.00E+00	3.23E+00	0.00E+00	3.23E+00	9.11E-05	0.00E+00	3.23E+00				
Benzo[A]Pyrene	1.49E+01	1.94E-03	0.00E+00	3.14E+00	0.00E+00	3.14E+00	3.07E-04	0.00E+00	3.14E+00				
Benzo(b)fluoranthene	1.83E+01	5.09E-03	0.00E+00	7.52E+00	0.00E+00	7.52E+00	8.06E-04	0.00E+00	7.52E+00				
Benzo(g,h,i)perylene	1.29E+01	7.31E-04	0.00E+00	5.99E+00	0.00E+00	5.99E+00	1.16E-04	0.00E+00	5.99E+00				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.43E-05	--	2.43E-05				
Chrysene	1.57E+01	3.69E-03	0.00E+00	5.70E+00	0.00E+00	5.70E+00	5.84E-04	0.00E+00	5.71E+00				
Dibenz(A,H)Anthracene	3.29E+00	6.70E-05	0.00E+00	1.20E+00	0.00E+00	1.20E+00	1.06E-05	0.00E+00	1.20E+00				
Indeno (1,2,3-CD) Pyrene	1.23E+01	3.28E-04	0.00E+00	5.58E+00	0.00E+00	5.58E+00	5.19E-05	0.00E+00	5.58E+00				
Pyrene	2.51E+01	1.33E-03	0.00E+00	6.96E+00	0.00E+00	6.96E+00	2.11E-04	0.00E+00	6.96E+00				
Total HMW PAHs						3.93E+01	2.20E-03	0.00E+00	3.93E+01	2.00E+00	1.97E+01	2.00E+01	1.97E+00
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	5.32E-01	5.25E-03	0.00E+00	4.58E+00	0.00E+00	4.58E+00	8.31E-04	0.00E+00	4.59E+00	1.10E+00	4.17E+00	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.85E-02	0.00E+00	0.00E+00	3.03E-02	0.00E+00	3.03E-02	0.00E+00	0.00E+00	3.03E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H14-5
Refined Exposure Evaluation - Yellow-billed Cuckoo
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.48E-07	0.00E+00	0.00E+00	4.58E-08	0.00E+00	4.58E-08	0.00E+00	0.00E+00	4.58E-08				
1,2,3,7,8-PeCDD	5.83E-07	0.00E+00	0.00E+00	2.32E-07	0.00E+00	2.32E-07	0.00E+00	0.00E+00	2.32E-07				
1,2,3,4,7,8-HxCDD	1.14E-06	0.00E+00	0.00E+00	5.12E-07	0.00E+00	2.56E-08	0.00E+00	0.00E+00	2.56E-08				
1,2,3,6,7,8-HxCDD	5.41E-06	0.00E+00	0.00E+00	3.23E-06	0.00E+00	3.23E-08	0.00E+00	0.00E+00	3.23E-08				
1,2,3,7,8,9-HxCDD	3.08E-06	0.00E+00	0.00E+00	1.66E-06	0.00E+00	1.66E-07	0.00E+00	0.00E+00	1.66E-07				
1,2,3,4,6,7,8-HpCDD	1.50E-04	0.00E+00	0.00E+00	1.64E-04	0.00E+00	1.64E-07	0.00E+00	0.00E+00	1.64E-07				
OCDD	1.58E-03	0.00E+00	0.00E+00	2.65E-03	0.00E+00	2.65E-07	0.00E+00	0.00E+00	2.65E-07				
2,3,7,8-TCDF	2.27E-06	0.00E+00	0.00E+00	1.16E-06	0.00E+00	1.16E-06	0.00E+00	0.00E+00	1.16E-06				
1,2,3,7,8-PeCDF	6.01E-07	0.00E+00	0.00E+00	2.40E-07	0.00E+00	2.40E-08	0.00E+00	0.00E+00	2.40E-08				
2,3,4,7,8-PeCDF	3.65E-06	0.00E+00	0.00E+00	2.03E-06	0.00E+00	2.03E-06	0.00E+00	0.00E+00	2.03E-06				
1,2,3,4,7,8-HxCDF	5.47E-06	0.00E+00	0.00E+00	3.27E-06	0.00E+00	3.27E-07	0.00E+00	0.00E+00	3.27E-07				
1,2,3,6,7,8-HxCDF	1.03E-06	0.00E+00	0.00E+00	4.54E-07	0.00E+00	4.54E-08	0.00E+00	0.00E+00	4.54E-08				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	2.58E-06	0.00E+00	0.00E+00	1.34E-06	0.00E+00	1.34E-07	0.00E+00	0.00E+00	1.34E-07				
1,2,3,4,6,7,8-HpCDF	1.56E-05	0.00E+00	0.00E+00	1.13E-05	0.00E+00	1.13E-07	0.00E+00	0.00E+00	1.13E-07				
1,2,3,4,7,8,9-HpCDF	7.12E-07	0.00E+00	0.00E+00	2.93E-07	0.00E+00	2.93E-09	0.00E+00	0.00E+00	2.93E-09				
OCDF	4.24E-05	0.00E+00	0.00E+00	3.68E-05	0.00E+00	3.68E-09	0.00E+00	0.00E+00	3.68E-09				
Total Dioxins/Furans						4.76E-06	0.00E+00	0.00E+00	4.76E-06	1.75E-06	2.72E+00	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H14-6
Refined Exposure Evaluation - Canada Lynx
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.57E-02	0.00E+00	3.57E-02	No TRV	--	No TRV	--
Antimony	2.72E-01	9.28E-04	0.00E+00	0.00E+00	4.25E-04	4.25E-04	2.90E-05	2.38E-04	6.91E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	4.81E+00	9.37E-04	0.00E+00	0.00E+00	8.87E-04	8.87E-04	2.93E-05	4.20E-03	5.12E-03	1.04E+00	<1	4.55E+00	<1
Barium	0.00E+00	1.73E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.40E-03	0.00E+00	5.40E-03	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	8.15E-06	--	8.15E-06	5.32E-01	<1	6.70E-01	<1
Cadmium	3.54E-01	6.80E-04	0.00E+00	0.00E+00	5.44E-03	5.44E-03	2.12E-05	3.10E-04	5.78E-03	7.70E-01	<1	6.87E+00	<1
Chromium	1.56E+01	2.97E-03	0.00E+00	0.00E+00	5.46E-02	5.46E-02	9.29E-05	1.37E-02	6.83E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.56E-05	0.00E+00	5.56E-05	7.33E+00	<1	1.89E+01	<1
Copper	1.64E+01	9.09E-03	0.00E+00	0.00E+00	3.61E-01	3.61E-01	2.84E-04	1.44E-02	3.75E-01	5.60E+00	<1	8.27E+01	<1
Lead	2.20E+01	1.75E-03	0.00E+00	0.00E+00	1.32E-01	1.32E-01	5.47E-05	1.93E-02	1.52E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.20E-03	0.00E+00	4.20E-03	5.15E+01	<1	1.46E+02	<1
Mercury	2.08E-02	1.46E-04	0.00E+00	0.00E+00	2.47E-04	2.47E-04	4.56E-06	1.82E-05	2.70E-04	1.41E+00	<1	1.41E+01	<1
Nickel	3.17E+01	3.96E-03	0.00E+00	0.00E+00	1.22E-01	1.22E-01	1.24E-04	2.77E-02	1.50E-01	1.70E+00	<1	1.48E+01	<1
Selenium	2.65E-01	7.23E-04	0.00E+00	0.00E+00	1.25E-02	1.25E-02	2.26E-05	2.32E-04	1.28E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.94E-06	0.00E+00	7.94E-06	4.80E-01	<1	1.43E+00	<1
Vanadium	1.36E+01	2.33E-03	0.00E+00	0.00E+00	5.24E-03	5.24E-03	7.29E-05	1.19E-02	1.72E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.88E+01	2.54E-02	0.00E+00	0.00E+00	3.27E+00	3.27E+00	7.92E-04	5.14E-02	3.32E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.39E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-03	2.09E-04	1.48E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	1.19E+02	1.16E+00	0.00E+00	0.00E+00	5.94E-02	5.94E-02	3.62E-02	1.04E-01	1.99E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.48E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E-03	1.29E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	2.58E+00	4.12E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E-05	2.26E-03	2.27E-03				
Fluoranthene	2.05E+01	1.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E-05	1.79E-02	1.80E-02				
Fluorene	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.75E-04	8.75E-04				
Naphthalene	5.24E-01	5.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.81E-05	4.59E-04	4.77E-04				
Phenanthrene	1.32E+01	5.53E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.73E-05	1.15E-02	1.15E-02				
Total LMW PAHs						0.00E+00	1.03E-04	3.43E-02	3.44E-02	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.28E+01	5.75E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-05	1.12E-02	1.13E-02				
Benzo[A]Pyrene	1.49E+01	1.94E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.06E-05	1.30E-02	1.31E-02				
Benzo(b)fluoranthene	1.83E+01	5.09E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-04	1.60E-02	1.61E-02				
Benzo(g,h,i)perylene	1.29E+01	7.31E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.28E-05	1.12E-02	1.13E-02				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	4.79E-06	--	4.79E-06				
Chrysene	1.57E+01	3.69E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-04	1.38E-02	1.39E-02				
Dibenz(A,H)Anthracene	3.29E+00	6.70E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.09E-06	2.87E-03	2.88E-03				
Indeno (1,2,3-CD) Pyrene	1.23E+01	3.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-05	1.08E-02	1.08E-02				
Pyrene	2.51E+01	1.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.16E-05	2.20E-02	2.20E-02				
Total HMW PAHs						0.00E+00	4.34E-04	1.01E-01	1.01E-01	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	5.32E-01	5.25E-03	0.00E+00	0.00E+00	1.30E-02	1.30E-02	1.64E-04	4.65E-04	1.36E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.85E-02	0.00E+00	0.00E+00	0.00E+00	2.60E-04	2.60E-04	0.00E+00	1.62E-05	2.76E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H14-6
Refined Exposure Evaluation - Canada Lynx
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.48E-07	0.00E+00	0.00E+00	0.00E+00	2.18E-09	2.18E-09	0.00E+00	1.29E-10	2.31E-09				
1,2,3,7,8-PeCDD	5.83E-07	0.00E+00	0.00E+00	0.00E+00	9.86E-09	9.86E-09	0.00E+00	5.10E-10	1.04E-08				
1,2,3,4,7,8-HxCDD	1.14E-06	0.00E+00	0.00E+00	0.00E+00	2.06E-08	2.06E-09	0.00E+00	9.97E-11	2.16E-09				
1,2,3,6,7,8-HxCDD	5.41E-06	0.00E+00	0.00E+00	0.00E+00	1.14E-07	1.14E-08	0.00E+00	4.73E-10	1.19E-08				
1,2,3,7,8,9-HxCDD	3.08E-06	0.00E+00	0.00E+00	0.00E+00	6.14E-08	6.14E-09	0.00E+00	2.69E-10	6.41E-09				
1,2,3,4,6,7,8-HpCDD	1.50E-04	0.00E+00	0.00E+00	0.00E+00	4.40E-06	4.40E-08	0.00E+00	1.31E-09	4.53E-08				
OCDD	1.58E-03	0.00E+00	0.00E+00	0.00E+00	5.86E-05	1.76E-08	0.00E+00	4.15E-10	1.80E-08				
2,3,7,8-TCDF	2.27E-06	0.00E+00	0.00E+00	0.00E+00	8.87E-09	8.87E-10	0.00E+00	1.99E-10	1.09E-09				
1,2,3,7,8-PeCDF	6.01E-07	0.00E+00	0.00E+00	0.00E+00	2.35E-09	7.05E-11	0.00E+00	1.58E-11	8.62E-11				
2,3,4,7,8-PeCDF	3.65E-06	0.00E+00	0.00E+00	0.00E+00	1.43E-08	4.28E-09	0.00E+00	9.58E-10	5.24E-09				
1,2,3,4,7,8-HxCDF	5.47E-06	0.00E+00	0.00E+00	0.00E+00	2.14E-08	2.14E-09	0.00E+00	4.79E-10	2.62E-09				
1,2,3,6,7,8-HxCDF	1.03E-06	0.00E+00	0.00E+00	0.00E+00	4.03E-09	4.03E-10	0.00E+00	9.01E-11	4.93E-10				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	2.58E-06	0.00E+00	0.00E+00	0.00E+00	1.01E-08	1.01E-09	0.00E+00	2.26E-10	1.23E-09				
1,2,3,4,6,7,8-HpCDF	1.56E-05	0.00E+00	0.00E+00	0.00E+00	6.10E-08	6.10E-10	0.00E+00	1.36E-10	7.46E-10				
1,2,3,4,7,8,9-HpCDF	7.12E-07	0.00E+00	0.00E+00	0.00E+00	2.78E-09	2.78E-11	0.00E+00	6.23E-12	3.41E-11				
OCDF	4.24E-05	0.00E+00	0.00E+00	0.00E+00	1.66E-07	4.97E-11	0.00E+00	1.11E-11	6.08E-11				
Total Dioxins/Furans						1.03E-07	0.00E+00	5.33E-09	1.08E-07	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H14-7
Refined Exposure Evaluation - Grizzly Bear
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate						
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals															
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.47E-02	0.00E+00	2.47E-02	No TRV	--	No TRV	--
Antimony	2.72E-01	9.28E-04	1.63E-04	8.80E-04	2.93E-05	0.00E+00	1.07E-03	2.00E-05	1.64E-04	1.26E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	4.81E+00	9.37E-04	2.53E-03	2.37E-03	6.13E-05	0.00E+00	4.96E-03	2.02E-05	2.91E-03	7.89E-03	1.04E+00	<1	4.55E+00	<1
Barium	0.00E+00	1.73E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.73E-03	0.00E+00	3.73E-03	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	0.00E+00	5.64E-06	--	5.64E-06	5.32E-01	<1	6.70E-01	<1
Cadmium	3.54E-01	6.80E-04	4.95E-03	1.18E-02	3.76E-04	0.00E+00	1.71E-02	1.47E-05	2.14E-04	1.73E-02	7.70E-01	<1	6.87E+00	<1
Chromium	1.56E+01	2.97E-03	9.00E-03	1.55E-02	3.77E-03	0.00E+00	2.83E-02	6.42E-05	9.45E-03	3.78E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.84E-05	0.00E+00	3.84E-05	7.33E+00	<1	1.89E+01	<1
Copper	1.64E+01	9.09E-03	8.25E-02	2.74E-02	2.49E-02	0.00E+00	1.35E-01	1.96E-04	9.93E-03	1.45E-01	5.60E+00	<1	8.27E+01	<1
Lead	2.20E+01	1.75E-03	2.11E-02	3.16E-02	9.15E-03	0.00E+00	6.19E-02	3.78E-05	1.33E-02	7.52E-02	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-03	0.00E+00	2.90E-03	5.15E+01	<1	1.46E+02	<1
Mercury	2.08E-02	1.46E-04	6.30E-04	2.65E-04	1.71E-05	0.00E+00	9.12E-04	3.15E-06	1.26E-05	9.28E-04	1.41E+00	<1	1.41E+01	<1
Nickel	3.17E+01	3.96E-03	2.02E-02	7.98E-02	8.44E-03	0.00E+00	1.08E-01	8.55E-05	1.92E-02	1.28E-01	1.70E+00	<1	1.48E+01	<1
Selenium	2.65E-01	7.23E-04	1.64E-03	1.13E-03	8.64E-04	0.00E+00	3.64E-03	1.56E-05	1.60E-04	3.82E-03	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.49E-06	0.00E+00	5.49E-06	4.80E-01	<1	1.43E+00	<1
Vanadium	1.36E+01	2.33E-03	9.28E-04	1.85E-03	3.62E-04	0.00E+00	3.15E-03	5.04E-05	8.24E-03	1.14E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.88E+01	2.54E-02	6.48E-01	1.05E+00	2.26E-01	0.00E+00	1.93E+00	5.48E-04	3.55E-02	1.96E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics															
Cyanide	2.39E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.82E-04	1.44E-04	1.03E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	1.19E+02	1.16E+00	1.00E-01	4.77E-02	4.11E-03	0.00E+00	1.52E-01	2.50E-02	7.18E-02	2.49E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)															
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)															
Low Molecular Weight (LMW) PAHs:															
Acenaphthene	1.48E+00	0.00E+00	3.86E-05	7.03E-03	0.00E+00	0.00E+00	7.07E-03	0.00E+00	8.93E-04	7.97E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	2.58E+00	4.12E-04	1.09E-02	2.02E-02	0.00E+00	0.00E+00	3.12E-02	8.89E-06	1.56E-03	3.27E-02				
Fluoranthene	2.05E+01	1.76E-03	1.44E-01	2.02E-01	0.00E+00	0.00E+00	3.46E-01	3.80E-05	1.24E-02	3.58E-01				
Fluorene	1.00E+00	0.00E+00	5.39E-05	3.10E-02	0.00E+00	0.00E+00	3.10E-02	0.00E+00	6.04E-04	3.16E-02				
Naphthalene	5.24E-01	5.78E-04	8.98E-02	7.48E-03	0.00E+00	0.00E+00	9.73E-02	1.25E-05	3.17E-04	9.76E-02				
Phenanthrene	1.32E+01	5.53E-04	5.88E-02	7.33E-02	0.00E+00	0.00E+00	1.32E-01	1.19E-05	7.96E-03	1.40E-01				
Total LMW PAHs							6.44E-01	7.13E-05	2.37E-02	6.68E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	1.28E+01	5.75E-04	4.27E-03	6.62E-02	0.00E+00	0.00E+00	7.04E-02	1.24E-05	7.77E-03	7.82E-02				
Benzo[A]Pyrene	1.49E+01	1.94E-03	2.49E-02	6.42E-02	0.00E+00	0.00E+00	8.91E-02	4.19E-05	9.02E-03	9.82E-02				
Benzo(b)fluoranthene	1.83E+01	5.09E-03	7.95E-02	1.54E-01	0.00E+00	0.00E+00	2.33E-01	1.10E-04	1.10E-02	2.45E-01				
Benzo(g,h,i)perylene	1.29E+01	7.31E-04	1.13E-01	1.22E-01	0.00E+00	0.00E+00	2.36E-01	1.58E-05	7.77E-03	2.44E-01				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	0.00E+00	3.31E-06	--	3.31E-06				
Chrysene	1.57E+01	3.69E-03	4.82E-03	1.17E-01	0.00E+00	0.00E+00	1.22E-01	7.96E-05	9.51E-03	1.31E-01				
Dibenz(A,H)Anthracene	3.29E+00	6.70E-05	6.00E-03	2.46E-02	0.00E+00	0.00E+00	3.06E-02	1.45E-06	1.99E-03	3.26E-02				
Indeno (1,2,3-CD) Pyrene	1.23E+01	3.28E-04	1.90E-02	1.14E-01	0.00E+00	0.00E+00	1.33E-01	7.08E-06	7.46E-03	1.41E-01				
Pyrene	2.51E+01	1.33E-03	2.54E-01	1.42E-01	0.00E+00	0.00E+00	3.96E-01	2.87E-05	1.52E-02	4.12E-01				
Total HMW PAHs							1.31E+00	3.00E-04	6.98E-02	1.38E+00	6.15E-01	2.25E+00	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs															
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	5.32E-01	5.25E-03	1.78E-04	9.38E-02	8.95E-04	0.00E+00	9.49E-02	1.13E-04	3.22E-04	9.53E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.85E-02	0.00E+00	2.12E-04	6.19E-04	1.80E-05	0.00E+00	8.49E-04	0.00E+00	1.12E-05	8.60E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+01	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H14-7
Refined Exposure Evaluation - Grizzly Bear
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate						
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)															
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans															
2,3,7,8-TCDD	1.48E-07	0.00E+00	1.95E-10	9.38E-10	1.51E-10	0.00E+00	1.28E-09	0.00E+00	8.95E-11	1.37E-09				
1,2,3,7,8-PeCDD	5.83E-07	0.00E+00	4.24E-10	4.74E-09	6.81E-10	0.00E+00	5.85E-09	0.00E+00	3.53E-10	6.20E-09				
1,2,3,4,7,8-HxCDD	1.14E-06	0.00E+00	4.51E-10	1.05E-08	1.42E-09	0.00E+00	1.23E-09	0.00E+00	6.89E-11	1.30E-09				
1,2,3,6,7,8-HxCDD	5.41E-06	0.00E+00	2.14E-09	6.60E-08	7.89E-09	0.00E+00	7.60E-09	0.00E+00	3.27E-10	7.93E-09				
1,2,3,7,8,9-HxCDD	3.08E-06	0.00E+00	1.22E-09	3.39E-08	4.25E-09	0.00E+00	3.94E-09	0.00E+00	1.86E-10	4.12E-09				
1,2,3,4,6,7,8-HpCDD	1.50E-04	0.00E+00	3.27E-08	3.35E-06	3.04E-07	0.00E+00	3.69E-08	0.00E+00	9.07E-10	3.78E-08				
OCDD	1.58E-03	0.00E+00	1.88E-07	5.42E-05	4.05E-06	0.00E+00	1.75E-08	0.00E+00	2.87E-10	1.78E-08				
2,3,7,8-TCDF	2.27E-06	0.00E+00	5.40E-09	2.36E-08	6.13E-10	0.00E+00	2.97E-09	0.00E+00	1.37E-10	3.10E-09				
1,2,3,7,8-PeCDF	6.01E-07	0.00E+00	7.79E-10	4.91E-09	1.62E-10	0.00E+00	1.76E-10	0.00E+00	1.09E-11	1.87E-10				
2,3,4,7,8-PeCDF	3.65E-06	0.00E+00	4.73E-09	4.14E-08	9.86E-10	0.00E+00	1.41E-08	0.00E+00	6.62E-10	1.48E-08				
1,2,3,4,7,8-HxCDF	5.47E-06	0.00E+00	2.84E-09	6.69E-08	1.48E-09	0.00E+00	7.12E-09	0.00E+00	3.31E-10	7.45E-09				
1,2,3,6,7,8-HxCDF	1.03E-06	0.00E+00	5.35E-10	9.29E-09	2.78E-10	0.00E+00	1.01E-09	0.00E+00	6.23E-11	1.07E-09				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	2.58E-06	0.00E+00	1.84E-09	2.75E-08	6.97E-10	0.00E+00	3.00E-09	0.00E+00	1.56E-10	3.16E-09				
1,2,3,4,6,7,8-HpCDF	1.56E-05	0.00E+00	6.06E-09	2.31E-07	4.21E-09	0.00E+00	2.41E-09	0.00E+00	9.43E-11	2.50E-09				
1,2,3,4,7,8,9-HpCDF	7.12E-07	0.00E+00	2.77E-10	6.00E-09	1.92E-10	0.00E+00	6.47E-11	0.00E+00	4.31E-12	6.90E-11				
OCDF	4.24E-05	0.00E+00	9.06E-09	7.52E-07	1.15E-08	0.00E+00	2.32E-10	0.00E+00	7.69E-12	2.40E-10				
Total Dioxins/Furans							1.05E-07	0.00E+00	3.68E-09	1.09E-07	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H14-8
Refined Exposure Evaluation - Long-tailed Weasel
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.87E-02	0.00E+00	5.87E-02	No TRV	--	No TRV	--
Antimony	1.48E-01	9.28E-04	0.00E+00	0.00E+00	3.81E-04	3.81E-04	4.78E-05	1.22E-04	5.51E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	4.56E+00	9.37E-04	0.00E+00	0.00E+00	1.40E-03	1.40E-03	4.82E-05	3.75E-03	5.20E-03	1.04E+00	<1	4.55E+00	<1
Barium	0.00E+00	1.73E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.90E-03	0.00E+00	8.90E-03	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	1.34E-05	--	1.34E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	1.89E-01	6.80E-04	0.00E+00	0.00E+00	6.67E-03	6.67E-03	3.50E-05	1.56E-04	6.86E-03	7.70E-01	<1	6.87E+00	<1
Chromium	1.21E+01	2.97E-03	0.00E+00	0.00E+00	7.45E-02	7.45E-02	1.53E-04	9.97E-03	8.46E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.15E-05	0.00E+00	9.15E-05	7.33E+00	<1	1.89E+01	<1
Copper	1.55E+01	9.09E-03	0.00E+00	0.00E+00	5.89E-01	5.89E-01	4.68E-04	1.28E-02	6.02E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.37E+01	1.75E-03	0.00E+00	0.00E+00	1.77E-01	1.77E-01	9.01E-05	1.13E-02	1.88E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.92E-03	0.00E+00	6.92E-03	5.15E+01	<1	1.46E+02	<1
Mercury	2.51E-02	1.46E-04	0.00E+00	0.00E+00	4.92E-04	4.92E-04	7.51E-06	2.07E-05	5.20E-04	1.41E+00	<1	1.41E+01	<1
Nickel	1.84E+01	3.96E-03	0.00E+00	0.00E+00	1.56E-01	1.56E-01	2.04E-04	1.52E-02	1.72E-01	1.70E+00	<1	1.48E+01	<1
Selenium	1.54E-01	7.23E-04	0.00E+00	0.00E+00	1.68E-02	1.68E-02	3.72E-05	1.27E-04	1.70E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.31E-05	0.00E+00	1.31E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	1.16E+01	2.33E-03	0.00E+00	0.00E+00	7.33E-03	7.33E-03	1.20E-04	9.53E-03	1.70E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.31E+01	2.54E-02	0.00E+00	0.00E+00	5.35E+00	5.35E+00	1.30E-03	4.37E-02	5.39E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.76E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-03	2.27E-04	2.33E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	8.80E+01	1.16E+00	0.00E+00	0.00E+00	7.25E-02	7.25E-02	5.96E-02	7.25E-02	2.05E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	5.93E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.88E-04	4.88E-04				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	1.12E+00	4.12E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.12E-05	9.23E-04	9.44E-04				
Fluoranthene	9.95E+00	1.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.06E-05	8.19E-03	8.28E-03				
Fluorene	4.10E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.38E-04	3.38E-04				
Naphthalene	2.88E-01	5.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.97E-05	2.37E-04	2.67E-04				
Phenanthrene	5.70E+00	5.53E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.85E-05	4.70E-03	4.72E-03				
Total LMW PAHs						0.00E+00	1.70E-04	1.49E-02	1.50E-02	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	5.48E+00	5.75E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.96E-05	4.51E-03	4.54E-03				
Benzo[A]Pyrene	5.98E+00	1.94E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.97E-05	4.92E-03	5.02E-03				
Benzo(b)fluoranthene	7.60E+00	5.09E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.62E-04	6.26E-03	6.52E-03				
Benzo(g,h,i)perylene	5.37E+00	7.31E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.76E-05	4.42E-03	4.46E-03				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	7.88E-06	--	7.88E-06				
Chrysene	6.93E+00	3.69E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.90E-04	5.71E-03	5.90E-03				
Dibenz(A,H)Anthracene	1.28E+00	6.70E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.45E-06	1.06E-03	1.06E-03				
Indeno (1,2,3-CD) Pyrene	5.43E+00	3.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.69E-05	4.47E-03	4.49E-03				
Pyrene	9.91E+00	1.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.84E-05	8.16E-03	8.23E-03				
Total HMW PAHs						0.00E+00	7.15E-04	3.95E-02	4.02E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.52E-01	5.25E-03	0.00E+00	0.00E+00	6.09E-03	6.09E-03	2.70E-04	1.25E-04	6.49E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.92E-02	0.00E+00	0.00E+00	0.00E+00	4.44E-04	4.44E-04	0.00E+00	1.58E-05	4.59E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H14-8
Refined Exposure Evaluation - Long-tailed Weasel
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	6.17E-08	0.00E+00	0.00E+00	0.00E+00	1.37E-09	1.37E-09	0.00E+00	5.08E-11	1.43E-09				
1,2,3,7,8-PeCDD	3.09E-07	0.00E+00	0.00E+00	0.00E+00	8.08E-09	8.08E-09	0.00E+00	2.54E-10	8.33E-09				
1,2,3,4,7,8-HxCDD	6.41E-07	0.00E+00	0.00E+00	0.00E+00	1.80E-08	1.80E-09	0.00E+00	5.28E-11	1.85E-09				
1,2,3,6,7,8-HxCDD	3.32E-06	0.00E+00	0.00E+00	0.00E+00	1.10E-07	1.10E-08	0.00E+00	2.73E-10	1.13E-08				
1,2,3,7,8,9-HxCDD	1.88E-06	0.00E+00	0.00E+00	0.00E+00	5.88E-08	5.88E-09	0.00E+00	1.55E-10	6.04E-09				
1,2,3,4,6,7,8-HpCDD	9.56E-05	0.00E+00	0.00E+00	0.00E+00	4.42E-06	4.42E-08	0.00E+00	7.87E-10	4.50E-08				
OCDD	1.11E-03	0.00E+00	0.00E+00	0.00E+00	6.51E-05	1.95E-08	0.00E+00	2.73E-10	1.98E-08				
2,3,7,8-TCDF	7.38E-07	0.00E+00	0.00E+00	0.00E+00	4.75E-09	4.75E-10	0.00E+00	6.08E-11	5.36E-10				
1,2,3,7,8-PeCDF	3.90E-07	0.00E+00	0.00E+00	0.00E+00	2.51E-09	7.53E-11	0.00E+00	9.63E-12	8.50E-11				
2,3,4,7,8-PeCDF	5.05E-07	0.00E+00	0.00E+00	0.00E+00	3.25E-09	9.75E-10	0.00E+00	1.25E-10	1.10E-09				
1,2,3,4,7,8-HxCDF	1.92E-06	0.00E+00	0.00E+00	0.00E+00	1.24E-08	1.24E-09	0.00E+00	1.58E-10	1.39E-09				
1,2,3,6,7,8-HxCDF	7.62E-07	0.00E+00	0.00E+00	0.00E+00	4.91E-09	4.91E-10	0.00E+00	6.27E-11	5.53E-10				
2,3,4,6,7,8-HxCDF	1.05E-07	0.00E+00	0.00E+00	0.00E+00	6.76E-10	6.76E-11	0.00E+00	8.65E-12	7.62E-11				
1,2,3,7,8,9-HxCDF	8.42E-07	0.00E+00	0.00E+00	0.00E+00	5.42E-09	5.42E-10	0.00E+00	6.93E-11	6.11E-10				
1,2,3,4,6,7,8-HpCDF	1.50E-05	0.00E+00	0.00E+00	0.00E+00	9.66E-08	9.66E-10	0.00E+00	1.24E-10	1.09E-09				
1,2,3,4,7,8,9-HpCDF	3.35E-07	0.00E+00	0.00E+00	0.00E+00	2.16E-09	2.16E-11	0.00E+00	2.76E-12	2.43E-11				
OCDF	3.25E-05	0.00E+00	0.00E+00	0.00E+00	2.09E-07	6.28E-11	0.00E+00	8.03E-12	7.08E-11				
Total Dioxins/Furans						9.68E-08	0.00E+00	2.47E-09	9.92E-08	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H14-9
Refined Exposure Evaluation - Meadow Vole
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E-01	0.00E+00	1.71E-01	No TRV	--	No TRV	--
Antimony	1.48E-01	9.28E-04	9.87E-04	0.00E+00	0.00E+00	9.87E-04	1.39E-04	2.89E-04	1.42E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	4.56E+00	9.37E-04	2.57E-02	0.00E+00	0.00E+00	2.57E-02	1.41E-04	8.90E-03	3.47E-02	1.04E+00	<1	4.55E+00	<1
Barium	0.00E+00	1.73E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.60E-02	0.00E+00	2.60E-02	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	3.92E-05	--	3.92E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	1.89E-01	6.80E-04	3.76E-02	0.00E+00	0.00E+00	3.76E-02	1.02E-04	3.69E-04	3.81E-02	7.70E-01	<1	6.87E+00	<1
Chromium	1.21E+01	2.97E-03	7.46E-02	0.00E+00	0.00E+00	7.46E-02	4.47E-04	2.36E-02	9.86E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.67E-04	0.00E+00	2.67E-04	7.33E+00	<1	1.89E+01	<1
Copper	1.55E+01	9.09E-03	8.63E-01	0.00E+00	0.00E+00	8.63E-01	1.37E-03	3.03E-02	8.95E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.37E+01	1.75E-03	1.73E-01	0.00E+00	0.00E+00	1.73E-01	2.63E-04	2.68E-02	2.00E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E-02	0.00E+00	2.02E-02	5.15E+01	<1	1.46E+02	<1
Mercury	2.51E-02	1.46E-04	7.48E-03	0.00E+00	0.00E+00	7.48E-03	2.19E-05	4.90E-05	7.55E-03	1.41E+00	<1	1.41E+01	<1
Nickel	1.84E+01	3.96E-03	1.44E-01	0.00E+00	0.00E+00	1.44E-01	5.95E-04	3.60E-02	1.81E-01	1.70E+00	<1	1.48E+01	<1
Selenium	1.54E-01	7.23E-04	9.69E-03	0.00E+00	0.00E+00	9.69E-03	1.09E-04	3.01E-04	1.01E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.82E-05	0.00E+00	3.82E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	1.16E+01	2.33E-03	8.44E-03	0.00E+00	0.00E+00	8.44E-03	3.51E-04	2.26E-02	3.14E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.31E+01	2.54E-02	6.56E+00	0.00E+00	0.00E+00	6.56E+00	3.81E-03	1.04E-01	6.66E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.76E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.13E-03	5.38E-04	6.67E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	8.80E+01	1.16E+00	7.94E-01	0.00E+00	0.00E+00	7.94E-01	1.74E-01	1.72E-01	1.14E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	5.93E-01	0.00E+00	9.02E-04	0.00E+00	0.00E+00	9.02E-04	0.00E+00	1.16E-03	2.06E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	1.12E+00	4.12E-04	6.11E-02	0.00E+00	0.00E+00	6.11E-02	6.18E-05	2.19E-03	6.34E-02				
Fluoranthene	9.95E+00	1.76E-03	7.47E-01	0.00E+00	0.00E+00	7.47E-01	2.64E-04	1.94E-02	7.67E-01				
Fluorene	4.10E-01	0.00E+00	1.24E-03	0.00E+00	0.00E+00	1.24E-03	0.00E+00	8.01E-04	2.04E-03				
Naphthalene	2.88E-01	5.78E-04	5.28E-01	0.00E+00	0.00E+00	5.28E-01	8.69E-05	5.63E-04	5.29E-01				
Phenanthrene	5.70E+00	5.53E-04	3.75E-01	0.00E+00	0.00E+00	3.75E-01	8.31E-05	1.11E-02	3.86E-01				
Total LMW PAHs						1.71E+00	4.96E-04	3.53E-02	1.75E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	5.48E+00	5.75E-04	2.75E-02	0.00E+00	0.00E+00	2.75E-02	8.64E-05	1.07E-02	3.83E-02				
Benzo[A]Pyrene	5.98E+00	1.94E-03	1.09E-01	0.00E+00	0.00E+00	1.09E-01	2.91E-04	1.17E-02	1.21E-01				
Benzo(b)fluoranthene	7.60E+00	5.09E-03	3.54E-01	0.00E+00	0.00E+00	3.54E-01	7.65E-04	1.48E-02	3.70E-01				
Benzo(g,h,i)perylene	5.37E+00	7.31E-04	4.33E-01	0.00E+00	0.00E+00	4.33E-01	1.10E-04	1.05E-02	4.43E-01				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.30E-05	--	2.30E-05				
Chrysene	6.93E+00	3.69E-03	3.17E-02	0.00E+00	0.00E+00	3.17E-02	5.54E-04	1.35E-02	4.58E-02				
Dibenz(A,H)Anthracene	1.28E+00	6.70E-05	2.51E-02	0.00E+00	0.00E+00	2.51E-02	1.01E-05	2.51E-03	2.76E-02				
Indeno (1,2,3-CD) Pyrene	5.43E+00	3.28E-04	8.97E-02	0.00E+00	0.00E+00	8.97E-02	4.92E-05	1.06E-02	1.00E-01				
Pyrene	9.91E+00	1.33E-03	1.07E+00	0.00E+00	0.00E+00	1.07E+00	2.00E-04	1.94E-02	1.09E+00				
Total HMW PAHs						2.14E+00	2.09E-03	9.37E-02	2.24E+00	6.15E-01	3.64E+00	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.52E-01	5.25E-03	5.43E-04	0.00E+00	0.00E+00	5.43E-04	7.89E-04	2.97E-04	1.63E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.92E-02	0.00E+00	2.35E-03	0.00E+00	0.00E+00	2.35E-03	0.00E+00	3.75E-05	2.39E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H14-9
Refined Exposure Evaluation - Meadow Vole
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	6.17E-08	0.00E+00	8.72E-10	0.00E+00	0.00E+00	8.72E-10	0.00E+00	1.21E-10	9.93E-10				
1,2,3,7,8-PeCDD	3.09E-07	0.00E+00	2.40E-09	0.00E+00	0.00E+00	2.40E-09	0.00E+00	6.03E-10	3.01E-09				
1,2,3,4,7,8-HxCDD	6.41E-07	0.00E+00	2.72E-09	0.00E+00	0.00E+00	2.72E-10	0.00E+00	1.25E-10	3.97E-10				
1,2,3,6,7,8-HxCDD	3.32E-06	0.00E+00	1.41E-08	0.00E+00	0.00E+00	1.41E-09	0.00E+00	6.48E-10	2.05E-09				
1,2,3,7,8,9-HxCDD	1.88E-06	0.00E+00	7.96E-09	0.00E+00	0.00E+00	7.96E-10	0.00E+00	3.67E-10	1.16E-09				
1,2,3,4,6,7,8-HpCDD	9.56E-05	0.00E+00	2.23E-07	0.00E+00	0.00E+00	2.23E-09	0.00E+00	1.87E-09	4.09E-09				
OCDD	1.11E-03	0.00E+00	1.40E-06	0.00E+00	0.00E+00	4.21E-10	0.00E+00	6.48E-10	1.07E-09				
2,3,7,8-TCDF	7.38E-07	0.00E+00	1.88E-08	0.00E+00	0.00E+00	1.88E-09	0.00E+00	1.44E-10	2.02E-09				
1,2,3,7,8-PeCDF	3.90E-07	0.00E+00	5.41E-09	0.00E+00	0.00E+00	1.62E-10	0.00E+00	2.29E-11	1.85E-10				
2,3,4,7,8-PeCDF	5.05E-07	0.00E+00	7.01E-09	0.00E+00	0.00E+00	2.10E-09	0.00E+00	2.96E-10	2.40E-09				
1,2,3,4,7,8-HxCDF	1.92E-06	0.00E+00	1.07E-08	0.00E+00	0.00E+00	1.07E-09	0.00E+00	3.75E-10	1.44E-09				
1,2,3,6,7,8-HxCDF	7.62E-07	0.00E+00	4.23E-09	0.00E+00	0.00E+00	4.23E-10	0.00E+00	1.49E-10	5.72E-10				
2,3,4,6,7,8-HxCDF	1.05E-07	0.00E+00	5.83E-10	0.00E+00	0.00E+00	5.83E-11	0.00E+00	2.05E-11	7.88E-11				
1,2,3,7,8,9-HxCDF	8.42E-07	0.00E+00	6.43E-09	0.00E+00	0.00E+00	6.43E-10	0.00E+00	1.64E-10	8.07E-10				
1,2,3,4,6,7,8-HpCDF	1.50E-05	0.00E+00	6.24E-08	0.00E+00	0.00E+00	6.24E-10	0.00E+00	2.93E-10	9.17E-10				
1,2,3,4,7,8,9-HpCDF	3.35E-07	0.00E+00	1.39E-09	0.00E+00	0.00E+00	1.39E-11	0.00E+00	6.54E-12	2.05E-11				
OCDF	3.25E-05	0.00E+00	7.43E-08	0.00E+00	0.00E+00	2.23E-11	0.00E+00	1.90E-11	4.13E-11				
Total Dioxins/Furans						1.54E-08	0.00E+00	5.87E-09	2.13E-08	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H14-10
Refined Exposure Evaluation - North American Wolverine
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E-02	0.00E+00	3.43E-02	No TRV	--	No TRV	--
Antimony	1.48E-01	9.28E-04	0.00E+00	0.00E+00	2.22E-04	2.22E-04	2.79E-05	1.25E-04	3.75E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	4.56E+00	9.37E-04	0.00E+00	0.00E+00	8.17E-04	8.17E-04	2.81E-05	3.83E-03	4.68E-03	1.04E+00	<1	4.55E+00	<1
Barium	0.00E+00	1.73E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.19E-03	0.00E+00	5.19E-03	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	7.84E-06	--	7.84E-06	5.32E-01	<1	6.70E-01	<1
Cadmium	1.89E-01	6.80E-04	0.00E+00	0.00E+00	3.89E-03	3.89E-03	2.04E-05	1.59E-04	4.07E-03	7.70E-01	<1	6.87E+00	<1
Chromium	1.21E+01	2.97E-03	0.00E+00	0.00E+00	4.35E-02	4.35E-02	8.93E-05	1.02E-02	5.38E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.34E-05	0.00E+00	5.34E-05	7.33E+00	<1	1.89E+01	<1
Copper	1.55E+01	9.09E-03	0.00E+00	0.00E+00	3.44E-01	3.44E-01	2.73E-04	1.31E-02	3.57E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.37E+01	1.75E-03	0.00E+00	0.00E+00	1.03E-01	1.03E-01	5.26E-05	1.15E-02	1.15E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.04E-03	0.00E+00	4.04E-03	5.15E+01	<1	1.46E+02	<1
Mercury	2.51E-02	1.46E-04	0.00E+00	0.00E+00	2.87E-04	2.87E-04	4.39E-06	2.11E-05	3.13E-04	1.41E+00	<1	1.41E+01	<1
Nickel	1.84E+01	3.96E-03	0.00E+00	0.00E+00	9.13E-02	9.13E-02	1.19E-04	1.55E-02	1.07E-01	1.70E+00	<1	1.48E+01	<1
Selenium	1.54E-01	7.23E-04	0.00E+00	0.00E+00	9.81E-03	9.81E-03	2.17E-05	1.30E-04	9.96E-03	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.63E-06	0.00E+00	7.63E-06	4.80E-01	<1	1.43E+00	<1
Vanadium	1.16E+01	2.33E-03	0.00E+00	0.00E+00	4.28E-03	4.28E-03	7.02E-05	9.74E-03	1.41E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.31E+01	2.54E-02	0.00E+00	0.00E+00	3.12E+00	3.12E+00	7.62E-04	4.47E-02	3.17E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.76E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-03	2.32E-04	1.46E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	8.80E+01	1.16E+00	0.00E+00	0.00E+00	4.23E-02	4.23E-02	3.48E-02	7.41E-02	1.51E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	5.93E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.99E-04	4.99E-04				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	1.12E+00	4.12E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.24E-05	9.43E-04	9.56E-04				
Fluoranthene	9.95E+00	1.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.29E-05	8.37E-03	8.42E-03				
Fluorene	4.10E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.45E-04	3.45E-04				
Naphthalene	2.88E-01	5.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.74E-05	2.43E-04	2.60E-04				
Phenanthrene	5.70E+00	5.53E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E-05	4.80E-03	4.82E-03				
Total LMW PAHs						0.00E+00	9.92E-05	1.52E-02	1.53E-02	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	5.48E+00	5.75E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.73E-05	4.61E-03	4.63E-03				
Benzo[A]Pyrene	5.98E+00	1.94E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.82E-05	5.03E-03	5.09E-03				
Benzo(b)fluoranthene	7.60E+00	5.09E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-04	6.39E-03	6.55E-03				
Benzo(g,h,i)perylene	5.37E+00	7.31E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.20E-05	4.52E-03	4.54E-03				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	4.60E-06	--	4.60E-06				
Chrysene	6.93E+00	3.69E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-04	5.83E-03	5.94E-03				
Dibenz(A,H)Anthracene	1.28E+00	6.70E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E-06	1.08E-03	1.08E-03				
Indeno (1,2,3-CD) Pyrene	5.43E+00	3.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.85E-06	4.57E-03	4.58E-03				
Pyrene	9.91E+00	1.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.00E-05	8.34E-03	8.38E-03				
Total HMW PAHs						0.00E+00	4.18E-04	4.04E-02	4.08E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.52E-01	5.25E-03	0.00E+00	0.00E+00	3.56E-03	3.56E-03	1.58E-04	1.28E-04	3.84E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.92E-02	0.00E+00	0.00E+00	0.00E+00	2.59E-04	2.59E-04	0.00E+00	1.62E-05	2.75E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H14-10
Refined Exposure Evaluation - North American Wolverine
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	6.17E-08	0.00E+00	0.00E+00	0.00E+00	8.03E-10	8.03E-10	0.00E+00	5.19E-11	8.54E-10				
1,2,3,7,8-PeCDD	3.09E-07	0.00E+00	0.00E+00	0.00E+00	4.72E-09	4.72E-09	0.00E+00	2.60E-10	4.98E-09				
1,2,3,4,7,8-HxCDD	6.41E-07	0.00E+00	0.00E+00	0.00E+00	1.05E-08	1.05E-09	0.00E+00	5.39E-11	1.11E-09				
1,2,3,6,7,8-HxCDD	3.32E-06	0.00E+00	0.00E+00	0.00E+00	6.42E-08	6.42E-09	0.00E+00	2.79E-10	6.69E-09				
1,2,3,7,8,9-HxCDD	1.88E-06	0.00E+00	0.00E+00	0.00E+00	3.43E-08	3.43E-09	0.00E+00	1.58E-10	3.59E-09				
1,2,3,4,6,7,8-HpCDD	9.56E-05	0.00E+00	0.00E+00	0.00E+00	2.58E-06	2.58E-08	0.00E+00	8.04E-10	2.66E-08				
OCDD	1.11E-03	0.00E+00	0.00E+00	0.00E+00	3.80E-05	1.14E-08	0.00E+00	2.79E-10	1.17E-08				
2,3,7,8-TCDF	7.38E-07	0.00E+00	0.00E+00	0.00E+00	2.77E-09	2.77E-10	0.00E+00	6.21E-11	3.39E-10				
1,2,3,7,8-PeCDF	3.90E-07	0.00E+00	0.00E+00	0.00E+00	1.47E-09	4.40E-11	0.00E+00	9.84E-12	5.38E-11				
2,3,4,7,8-PeCDF	5.05E-07	0.00E+00	0.00E+00	0.00E+00	1.90E-09	5.69E-10	0.00E+00	1.27E-10	6.97E-10				
1,2,3,4,7,8-HxCDF	1.92E-06	0.00E+00	0.00E+00	0.00E+00	7.22E-09	7.22E-10	0.00E+00	1.62E-10	8.83E-10				
1,2,3,6,7,8-HxCDF	7.62E-07	0.00E+00	0.00E+00	0.00E+00	2.86E-09	2.86E-10	0.00E+00	6.41E-11	3.51E-10				
2,3,4,6,7,8-HxCDF	1.05E-07	0.00E+00	0.00E+00	0.00E+00	3.95E-10	3.95E-11	0.00E+00	8.83E-12	4.83E-11				
1,2,3,7,8,9-HxCDF	8.42E-07	0.00E+00	0.00E+00	0.00E+00	3.16E-09	3.16E-10	0.00E+00	7.08E-11	3.87E-10				
1,2,3,4,6,7,8-HpCDF	1.50E-05	0.00E+00	0.00E+00	0.00E+00	5.64E-08	5.64E-10	0.00E+00	1.26E-10	6.90E-10				
1,2,3,4,7,8,9-HpCDF	3.35E-07	0.00E+00	0.00E+00	0.00E+00	1.26E-09	1.26E-11	0.00E+00	2.82E-12	1.54E-11				
OCDF	3.25E-05	0.00E+00	0.00E+00	0.00E+00	1.22E-07	3.66E-11	0.00E+00	8.20E-12	4.48E-11				
Total Dioxins/Furans						5.65E-08	0.00E+00	2.53E-09	5.90E-08	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H14-11
Refined Exposure Evaluation - Short-tailed Shrew
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-01	0.00E+00	1.53E-01	No TRV	--	No TRV	--
Antimony	1.48E-01	9.28E-04	0.00E+00	1.98E-02	0.00E+00	1.98E-02	1.24E-04	2.18E-04	2.02E-02	5.90E-02	<1	2.76E+00	<1
Arsenic	4.56E+00	9.37E-04	0.00E+00	9.44E-02	0.00E+00	9.44E-02	1.26E-04	6.72E-03	1.01E-01	1.04E+00	<1	4.55E+00	<1
Barium	0.00E+00	1.73E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.32E-02	0.00E+00	2.32E-02	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	3.50E-05	--	3.50E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	1.89E-01	6.80E-04	0.00E+00	2.95E-01	0.00E+00	2.95E-01	9.11E-05	2.79E-04	2.96E-01	7.70E-01	<1	6.87E+00	<1
Chromium	1.21E+01	2.97E-03	0.00E+00	4.96E-01	0.00E+00	4.96E-01	3.99E-04	1.78E-02	5.15E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.38E-04	0.00E+00	2.38E-04	7.33E+00	<1	1.89E+01	<1
Copper	1.55E+01	9.09E-03	0.00E+00	1.07E+00	0.00E+00	1.07E+00	1.22E-03	2.29E-02	1.10E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.37E+01	1.75E-03	0.00E+00	8.92E-01	0.00E+00	8.92E-01	2.35E-04	2.02E-02	9.12E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-02	0.00E+00	1.80E-02	5.15E+01	<1	1.46E+02	<1
Mercury	2.51E-02	1.46E-04	0.00E+00	1.32E-02	0.00E+00	1.32E-02	1.96E-05	3.70E-05	1.33E-02	1.41E+00	<1	1.41E+01	<1
Nickel	1.84E+01	3.96E-03	0.00E+00	1.92E+00	0.00E+00	1.92E+00	5.31E-04	2.72E-02	1.95E+00	1.70E+00	1.15E+00	1.48E+01	<1
Selenium	1.54E-01	7.23E-04	0.00E+00	3.16E-02	0.00E+00	3.16E-02	9.69E-05	2.27E-04	3.19E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.40E-05	0.00E+00	3.40E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	1.16E+01	2.33E-03	0.00E+00	6.52E-02	0.00E+00	6.52E-02	3.13E-04	1.71E-02	8.25E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.31E+01	2.54E-02	0.00E+00	4.22E+01	0.00E+00	4.22E+01	3.40E-03	7.83E-02	4.23E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.76E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.47E-03	4.06E-04	5.88E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	8.80E+01	1.16E+00	0.00E+00	1.46E+00	0.00E+00	1.46E+00	1.55E-01	1.30E-01	1.75E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	5.93E-01	0.00E+00	0.00E+00	1.17E-01	0.00E+00	1.17E-01	0.00E+00	8.74E-04	1.18E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	1.12E+00	4.12E-04	0.00E+00	3.64E-01	0.00E+00	3.64E-01	5.51E-05	1.65E-03	3.65E-01				
Fluoranthene	9.95E+00	1.76E-03	0.00E+00	4.05E+00	0.00E+00	4.05E+00	2.36E-04	1.47E-02	4.07E+00				
Fluorene	4.10E-01	0.00E+00	0.00E+00	5.26E-01	0.00E+00	5.26E-01	0.00E+00	6.05E-04	5.27E-01				
Naphthalene	2.88E-01	5.78E-04	0.00E+00	1.70E-01	0.00E+00	1.70E-01	7.75E-05	4.25E-04	1.70E-01				
Phenanthrene	5.70E+00	5.53E-04	0.00E+00	1.31E+00	0.00E+00	1.31E+00	7.41E-05	8.41E-03	1.32E+00				
Total LMW PAHs						6.54E+00	4.43E-04	2.66E-02	6.57E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	5.48E+00	5.75E-04	0.00E+00	1.17E+00	0.00E+00	1.17E+00	7.71E-05	8.08E-03	1.18E+00				
Benzo[A]Pyrene	5.98E+00	1.94E-03	0.00E+00	1.07E+00	0.00E+00	1.07E+00	2.60E-04	8.81E-03	1.07E+00				
Benzo(b)fluoranthene	7.60E+00	5.09E-03	0.00E+00	2.65E+00	0.00E+00	2.65E+00	6.82E-04	1.12E-02	2.66E+00				
Benzo(g,h,i)perylene	5.37E+00	7.31E-04	0.00E+00	2.12E+00	0.00E+00	2.12E+00	9.79E-05	7.92E-03	2.12E+00				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.05E-05	--	2.05E-05				
Chrysene	6.93E+00	3.69E-03	0.00E+00	2.13E+00	0.00E+00	2.13E+00	4.94E-04	1.02E-02	2.14E+00				
Dibenz(A,H)Anthracene	1.28E+00	6.70E-05	0.00E+00	3.98E-01	0.00E+00	3.98E-01	8.98E-06	1.89E-03	4.00E-01				
Indeno (1,2,3-CD) Pyrene	5.43E+00	3.28E-04	0.00E+00	2.08E+00	0.00E+00	2.08E+00	4.39E-05	8.00E-03	2.09E+00				
Pyrene	9.91E+00	1.33E-03	0.00E+00	2.32E+00	0.00E+00	2.32E+00	1.78E-04	1.46E-02	2.34E+00				
Total HMW PAHs						1.39E+01	1.86E-03	7.07E-02	1.40E+01	6.15E-01	2.28E+01	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.52E-01	5.25E-03	0.00E+00	1.11E+00	0.00E+00	1.11E+00	7.04E-04	2.24E-04	1.11E+00	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.92E-02	0.00E+00	0.00E+00	2.65E-02	0.00E+00	2.65E-02	0.00E+00	2.83E-05	2.66E-02	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H14-11
Refined Exposure Evaluation - Short-tailed Shrew
Main Plant Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	6.17E-08	0.00E+00	0.00E+00	1.38E-08	0.00E+00	1.38E-08	0.00E+00	9.10E-11	1.39E-08				
1,2,3,7,8-PeCDD	3.09E-07	0.00E+00	0.00E+00	9.26E-08	0.00E+00	9.26E-08	0.00E+00	4.56E-10	9.31E-08				
1,2,3,4,7,8-HxCDD	6.41E-07	0.00E+00	0.00E+00	2.19E-07	0.00E+00	2.19E-08	0.00E+00	9.45E-11	2.20E-08				
1,2,3,6,7,8-HxCDD	3.32E-06	0.00E+00	0.00E+00	1.53E-06	0.00E+00	1.53E-07	0.00E+00	4.89E-10	1.54E-07				
1,2,3,7,8,9-HxCDD	1.88E-06	0.00E+00	0.00E+00	7.83E-07	0.00E+00	7.83E-08	0.00E+00	2.77E-10	7.85E-08				
1,2,3,4,6,7,8-HpCDD	9.56E-05	0.00E+00	0.00E+00	8.14E-05	0.00E+00	8.14E-07	0.00E+00	1.41E-09	8.15E-07				
OCDD	1.11E-03	0.00E+00	0.00E+00	1.47E-03	0.00E+00	4.41E-07	0.00E+00	4.89E-10	4.41E-07				
2,3,7,8-TCDF	7.38E-07	0.00E+00	0.00E+00	2.59E-07	0.00E+00	2.59E-08	0.00E+00	1.09E-10	2.60E-08				
1,2,3,7,8-PeCDF	3.90E-07	0.00E+00	0.00E+00	1.22E-07	0.00E+00	3.66E-09	0.00E+00	1.72E-11	3.68E-09				
2,3,4,7,8-PeCDF	5.05E-07	0.00E+00	0.00E+00	1.66E-07	0.00E+00	4.97E-08	0.00E+00	2.23E-10	4.99E-08				
1,2,3,4,7,8-HxCDF	1.92E-06	0.00E+00	0.00E+00	8.02E-07	0.00E+00	8.02E-08	0.00E+00	2.83E-10	8.05E-08				
1,2,3,6,7,8-HxCDF	7.62E-07	0.00E+00	0.00E+00	2.69E-07	0.00E+00	2.69E-08	0.00E+00	1.12E-10	2.70E-08				
2,3,4,6,7,8-HxCDF	1.05E-07	0.00E+00	0.00E+00	2.59E-08	0.00E+00	2.59E-09	0.00E+00	1.55E-11	2.60E-09				
1,2,3,7,8,9-HxCDF	8.42E-07	0.00E+00	0.00E+00	3.03E-07	0.00E+00	3.03E-08	0.00E+00	1.24E-10	3.04E-08				
1,2,3,4,6,7,8-HpCDF	1.50E-05	0.00E+00	0.00E+00	9.11E-06	0.00E+00	9.11E-08	0.00E+00	2.21E-10	9.13E-08				
1,2,3,4,7,8,9-HpCDF	3.35E-07	0.00E+00	0.00E+00	1.02E-07	0.00E+00	1.02E-09	0.00E+00	4.94E-12	1.02E-09				
OCDF	3.25E-05	0.00E+00	0.00E+00	2.27E-05	0.00E+00	6.82E-09	0.00E+00	1.44E-11	6.83E-09				
Total Dioxins/Furans						1.93E-06	0.00E+00	4.43E-09	1.94E-06	5.62E-07	3.45E+00	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H15-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Central Landfills Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	1.14E+00	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	9.28E-04	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	1.00E+00	0.00E+00	Assumption[c]	5.00E-02	0.00E+00	Baes et al. (1984)[e]
Arsenic	NA	9.37E-04	6.57E+00	3.75E-02	2.46E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	9.12E-01	Sample et al. (1999)	Regression[f]	3.67E-02	Sample et al. (1998b)
Barium	NA	1.73E-01	1.97E+02	1.56E-01	3.07E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	1.79E+01	Sample et al. (1998a)	6.83E-04	1.34E-01	Baes et al. (1984)[e]
Beryllium	NA	2.61E-04	6.01E-01	Regression[a]	4.02E-01	USEPA (2007)	4.50E-02	2.70E-02	Sample et al. (1998a)	2.25E-03	1.35E-03	Baes et al. (1984)[e]
Cadmium	NA	6.80E-04	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	Regression[d]	0.00E+00	Sample et al. (1999)	Regression[f]	0.00E+00	Sample et al. (1998b)
Chromium	NA	2.97E-03	1.38E+01	4.10E-02	5.66E-01	Bechtel-Jacobs (1998a)[g]	3.06E-01	4.23E+00	Sample et al. (1998a)	Regression[f]	1.59E+00	Sample et al. (1998b)
Cobalt	NA	1.78E-03	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	9.09E-03	7.21E+02	Regression[a]	2.61E+01	Bechtel-Jacobs (1998a)	5.15E-01	3.71E+02	Sample et al. (1998a)	Regression[f]	1.99E+01	Sample et al. (1998b)
Lead	NA	1.75E-03	1.48E+01	Regression[a]	1.20E+00	Bechtel-Jacobs (1998a)	Regression[d]	7.07E+00	Sample et al. (1999)	Regression[f]	3.55E+00	Sample et al. (1998b)
Manganese	NA	1.34E-01	5.11E+02	7.90E-02	4.04E+01	Bechtel-Jacobs (1998a)[g]	Regression[d]	3.13E+01	Sample et al. (1999)	2.05E-02	1.05E+01	Sample et al. (1998b)[i]
Mercury	NA	1.46E-04	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	3.96E-03	2.35E+01	Regression[a]	1.15E+00	Bechtel-Jacobs (1998a)	7.78E-01	1.83E+01	Sample et al. (1998a)	Regression[f]	3.40E+00	Sample et al. (1998b)
Selenium	NA	7.23E-04	3.25E-01	Regression[a]	1.47E-01	Bechtel-Jacobs (1998a)	Regression[d]	4.07E-01	Sample et al. (1998a)	Regression[f]	4.32E-01	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	2.54E-04	1.11E-01	4.00E-03	4.45E-04	Baes et al. (1984)	5.41E-02	6.02E-03	USCHPPM (2004)	1.08E-01	1.20E-02	Baes et al. (1984)[e]
Vanadium	NA	2.33E-03	1.47E+01	4.85E-03	7.11E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	6.15E-01	Sample et al. (1998a)	1.23E-02	1.80E-01	Sample et al. (1998b)[i]
Zinc	NA	2.54E-02	5.60E+01	Regression[a]	4.49E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.20E+02	Sample et al. (1998a)	Regression[f]	1.04E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	4.08E-02	1.18E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	1.16E+00	1.40E+02	6.00E-02	8.40E+00	Baes et al. (1984)	1.24E-01	1.74E+01	USCHPPM (2004)	1.60E-02	2.24E+00	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	1.20E+00	8.90E-02	1.07E-01	USEPA (2007a)	2.92E+01	3.51E+01	USEPA (2007a)	2.53E-01	3.03E-01	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	2.24E+00	Regression[a]	1.93E-03	USEPA (2007a)	1.47E+00	3.29E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	4.12E-04	4.76E+00	Regression[a]	1.25E+00	USEPA (2007a)	2.42E+00	1.15E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluoranthene	4.95	1.76E-03	2.50E+01	5.00E-01	1.25E+01	USEPA (2007a)	3.04E+00	7.60E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluorene	4.18	0.00E+00	1.92E+00	Regression[a]	2.20E-03	USEPA (2007a)	9.57E+00	1.83E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Naphthalene	3.36	5.78E-04	4.84E-01	1.22E+01	5.90E+00	USEPA (2007a)	4.40E+00	2.13E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Phenanthrene	4.55	5.53E-04	1.84E+01	Regression[a]	5.15E+00	USEPA (2007a)	1.72E+00	3.16E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
LMW PAHs												
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	5.7	5.75E-04	1.07E+01	Regression[a]	2.72E-01	USEPA (2007a)	1.59E+00	1.70E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]

Table H15-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Central Landfills Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Benzo[A]Pyrene	6.11	1.94E-03	1.09E+01	Regression[a]	1.31E+00	USEPA (2007a)	1.33E+00	1.45E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	5.09E-03	1.34E+01	3.10E-01	4.16E+00	USEPA (2007a)	2.60E+00	3.49E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	7.31E-04	7.33E+00	Regression[a]	4.16E+00	USEPA (2007a)	2.94E+00	2.16E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	1.53E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	3.69E-03	1.21E+01	Regression[a]	2.93E-01	USEPA (2007a)	2.29E+00	2.77E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	6.70E-05	2.34E+00	1.30E-01	3.04E-01	USEPA (2007a)	2.31E+00	5.41E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.28E-04	8.68E+00	1.10E-01	9.55E-01	USEPA (2007a)	2.86E+00	2.48E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Pyrene	4.88	1.33E-03	1.63E+01	7.20E-01	1.18E+01	USEPA (2007a)	1.75E+00	2.86E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	5.25E-03	2.79E-01	2.38E-02	6.65E-03	USEPA (2007a)	5.44E+01	1.52E+01	USEPA (2007a)	7.79E-01	2.18E-01	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	0.00E+00	6.54E-01	0.00E+00	USEPA (2007a)	1.14E+01	0.00E+00	USEPA (2007a)	1.22E-01	0.00E+00	LANL (2015)
Dibenzofuran	3.71	0.00E+00	1.01E+00	1.88E+00	1.90E+00	USEPA (2007a)	6.96E+00	7.04E+00	USEPA (2007a)	5.60E-02	5.67E-02	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	1.56E-02	8.14E-01	1.27E-02	USEPA (2007a)	1.03E+01	1.61E-01	USEPA (2007a)	4.49E-01	7.00E-03	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	2.70E-07	9.41E-02	2.54E-08	USEPA (2007a)[b]	Regression[d]	5.89E-07	Sample et al. (1998a)	Regression[h]	1.35E-07	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	3.20E-07	5.17E-02	1.66E-08	USEPA (2007a)[b]	Regression[d]	7.20E-07	Sample et al. (1998a)	Regression[h]	1.63E-07	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	2.46E-06	2.82E-02	6.94E-08	USEPA (2007a)[b]	Regression[d]	8.03E-06	Sample et al. (1998a)	Regression[h]	1.54E-06	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	1.14E-06	2.82E-02	3.21E-08	USEPA (2007a)[b]	Regression[d]	3.23E-06	Sample et al. (1998a)	Regression[h]	6.59E-07	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	7.63E-05	1.55E-02	1.18E-06	USEPA (2007a)[b]	Regression[d]	4.65E-04	Sample et al. (1998a)	Regression[h]	6.70E-05	Sample et al. (1998b)
OCDD	9.50	0.00E+00	8.91E-04	8.45E-03	7.53E-06	USEPA (2007a)[b]	Regression[d]	8.49E-03	Sample et al. (1998a)	Regression[h]	9.98E-04	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	1.78E-06	1.69E-01	3.02E-07	USEPA (2007a)[b]	Regression[d]	5.47E-06	Sample et al. (1998a)	1.25E-01	2.23E-07	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	9.50E-07	9.24E-02	8.77E-08	USEPA (2007a)[b]	Regression[d]	2.61E-06	Sample et al. (1998a)	1.25E-01	1.19E-07	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	1.67E-06	3.70E-02	6.17E-08	USEPA (2007a)[b]	Regression[d]	5.08E-06	Sample et al. (1998a)	1.25E-01	2.09E-07	Sample et al. (1998b)[i]

Table H15-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Central Landfills Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	7.80E-07	3.70E-02	2.88E-08	USEPA (2007a)[b]	Regression[d]	2.06E-06	Sample et al. (1998a)	1.25E-01	9.76E-08	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	5.70E-07	5.08E-02	2.90E-08	USEPA (2007a)[b]	Regression[d]	1.42E-06	Sample et al. (1998a)	1.25E-01	7.13E-08	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	5.37E-06	2.77E-02	1.49E-07	USEPA (2007a)[b]	Regression[d]	2.02E-05	Sample et al. (1998a)	1.25E-01	6.72E-07	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	1.68E-05	1.52E-02	2.56E-07	USEPA (2007a)[b]	Regression[d]	7.77E-05	Sample et al. (1998a)	1.25E-01	2.10E-06	Sample et al. (1998b)[i]

Table H15-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Central Landfills Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([diet $_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H15-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Central Landfills Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	1.14E+00	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	9.28E-04	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	1.00E+00	0.00E+00	Assumption[c]	5.00E-02	0.00E+00	Baes et al. (1984)[e]
Arsenic	NA	9.37E-04	6.80E+00	3.75E-02	2.55E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	9.35E-01	Sample et al. (1999)	Regression[f]	3.77E-02	Sample et al. (1998b)
Barium	NA	1.73E-01	1.44E+02	1.56E-01	2.25E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	1.31E+01	Sample et al. (1998a)	6.83E-04	9.85E-02	Baes et al. (1984)[e]
Beryllium	NA	2.61E-04	7.33E-01	Regression[a]	4.65E-01	USEPA (2007)	4.50E-02	3.30E-02	Sample et al. (1998a)	2.25E-03	1.65E-03	Baes et al. (1984)[e]
Cadmium	NA	6.80E-04	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	Regression[d]	0.00E+00	Sample et al. (1999)	Regression[f]	0.00E+00	Sample et al. (1998b)
Chromium	NA	2.97E-03	1.13E+01	4.10E-02	4.61E-01	Bechtel-Jacobs (1998a)[g]	3.06E-01	3.44E+00	Sample et al. (1998a)	Regression[f]	1.37E+00	Sample et al. (1998b)
Cobalt	NA	1.78E-03	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	9.09E-03	1.93E+02	Regression[a]	1.55E+01	Bechtel-Jacobs (1998a)	5.15E-01	9.94E+01	Sample et al. (1998a)	Regression[f]	1.65E+01	Sample et al. (1998b)
Lead	NA	1.75E-03	1.42E+01	Regression[a]	1.18E+00	Bechtel-Jacobs (1998a)	Regression[d]	6.85E+00	Sample et al. (1999)	Regression[f]	3.49E+00	Sample et al. (1998b)
Manganese	NA	1.34E-01	4.83E+02	7.90E-02	3.81E+01	Bechtel-Jacobs (1998a)[g]	Regression[d]	3.01E+01	Sample et al. (1999)	2.05E-02	9.89E+00	Sample et al. (1998b)[i]
Mercury	NA	1.46E-04	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	3.96E-03	6.01E+01	Regression[a]	2.32E+00	Bechtel-Jacobs (1998a)	7.78E-01	4.67E+01	Sample et al. (1998a)	Regression[f]	5.27E+00	Sample et al. (1998b)
Selenium	NA	7.23E-04	4.52E-01	Regression[a]	2.12E-01	Bechtel-Jacobs (1998a)	Regression[d]	5.19E-01	Sample et al. (1998a)	Regression[f]	4.89E-01	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	2.54E-04	1.73E-01	4.00E-03	6.92E-04	Baes et al. (1984)	5.41E-02	9.36E-03	USCHPPM (2004)	1.08E-01	1.87E-02	Baes et al. (1984)[e]
Vanadium	NA	2.33E-03	2.53E+01	4.85E-03	1.23E-01	Bechtel-Jacobs (1998a)[g]	4.20E-02	1.06E+00	Sample et al. (1998a)	1.23E-02	3.11E-01	Sample et al. (1998b)[i]
Zinc	NA	2.54E-02	5.18E+01	Regression[a]	4.30E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.12E+02	Sample et al. (1998a)	Regression[f]	1.04E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	4.08E-02	1.41E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	1.16E+00	1.18E+02	6.00E-02	7.11E+00	Baes et al. (1984)	1.24E-01	1.47E+01	USCHPPM (2004)	1.60E-02	1.90E+00	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	1.03E-01	8.90E-02	9.15E-03	USEPA (2007a)	2.92E+01	3.01E+00	USEPA (2007a)	2.53E-01	2.60E-02	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	2.62E+00	Regression[a]	1.69E-03	USEPA (2007a)	1.47E+00	3.85E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	4.12E-04	4.73E+00	Regression[a]	1.25E+00	USEPA (2007a)	2.42E+00	1.14E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluoranthene	4.95	1.76E-03	2.43E+01	5.00E-01	1.22E+01	USEPA (2007a)	3.04E+00	7.40E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluorene	4.18	0.00E+00	2.32E+00	Regression[a]	1.87E-03	USEPA (2007a)	9.57E+00	2.22E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Naphthalene	3.36	5.78E-04	8.57E-01	1.22E+01	1.05E+01	USEPA (2007a)	4.40E+00	3.77E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Phenanthrene	4.55	5.53E-04	2.22E+01	Regression[a]	5.80E+00	USEPA (2007a)	1.72E+00	3.83E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
LMW PAHs												
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	5.7	5.75E-04	9.59E+00	Regression[a]	2.56E-01	USEPA (2007a)	1.59E+00	1.52E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	1.94E-03	8.52E+00	Regression[a]	1.03E+00	USEPA (2007a)	1.33E+00	1.13E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]

Table H15-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Central Landfills Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Benzo(b)fluoranthene	6.2	5.09E-03	1.18E+01	3.10E-01	3.64E+00	USEPA (2007a)	2.60E+00	3.06E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	7.31E-04	5.89E+00	Regression[a]	3.21E+00	USEPA (2007a)	2.94E+00	1.73E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	1.53E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	3.69E-03	1.28E+01	Regression[a]	3.03E-01	USEPA (2007a)	2.29E+00	2.93E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	6.70E-05	2.13E+00	1.30E-01	2.77E-01	USEPA (2007a)	2.31E+00	4.92E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.28E-04	6.73E+00	1.10E-01	7.41E-01	USEPA (2007a)	2.86E+00	1.93E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Pyrene	4.88	1.33E-03	1.39E+01	7.20E-01	1.00E+01	USEPA (2007a)	1.75E+00	2.44E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	5.25E-03	7.86E-02	2.38E-02	1.87E-03	USEPA (2007a)	5.44E+01	4.28E+00	USEPA (2007a)	7.79E-01	6.12E-02	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	0.00E+00	6.54E-01	0.00E+00	USEPA (2007a)	1.14E+01	0.00E+00	USEPA (2007a)	1.22E-01	0.00E+00	LANL (2015)
Dibenzofuran	3.71	0.00E+00	1.36E+00	1.88E+00	2.55E+00	USEPA (2007a)	6.96E+00	9.45E+00	USEPA (2007a)	5.60E-02	7.61E-02	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	8.43E-03	8.14E-01	6.86E-03	USEPA (2007a)	1.03E+01	8.69E-02	USEPA (2007a)	4.49E-01	3.78E-03	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	2.70E-07	9.41E-02	2.54E-08	USEPA (2007a)[b]	Regression[d]	5.89E-07	Sample et al. (1998a)	Regression[h]	1.35E-07	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	3.20E-07	5.17E-02	1.66E-08	USEPA (2007a)[b]	Regression[d]	7.20E-07	Sample et al. (1998a)	Regression[h]	1.63E-07	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	2.46E-06	2.82E-02	6.94E-08	USEPA (2007a)[b]	Regression[d]	8.03E-06	Sample et al. (1998a)	Regression[h]	1.54E-06	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	1.14E-06	2.82E-02	3.21E-08	USEPA (2007a)[b]	Regression[d]	3.23E-06	Sample et al. (1998a)	Regression[h]	6.59E-07	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	7.63E-05	1.55E-02	1.18E-06	USEPA (2007a)[b]	Regression[d]	4.65E-04	Sample et al. (1998a)	Regression[h]	6.70E-05	Sample et al. (1998b)
OCDD	9.50	0.00E+00	8.91E-04	8.45E-03	7.53E-06	USEPA (2007a)[b]	Regression[d]	8.49E-03	Sample et al. (1998a)	Regression[h]	9.98E-04	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	1.78E-06	1.69E-01	3.02E-07	USEPA (2007a)[b]	Regression[d]	5.47E-06	Sample et al. (1998a)	1.25E-01	2.23E-07	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	9.50E-07	9.24E-02	8.77E-08	USEPA (2007a)[b]	Regression[d]	2.61E-06	Sample et al. (1998a)	1.25E-01	1.19E-07	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	1.67E-06	3.70E-02	6.17E-08	USEPA (2007a)[b]	Regression[d]	5.08E-06	Sample et al. (1998a)	1.25E-01	2.09E-07	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	7.80E-07	3.70E-02	2.88E-08	USEPA (2007a)[b]	Regression[d]	2.06E-06	Sample et al. (1998a)	1.25E-01	9.76E-08	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H15-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Central Landfills Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	5.70E-07	5.08E-02	2.90E-08	USEPA (2007a)[b]	Regression[d]	1.42E-06	Sample et al. (1998a)	1.25E-01	7.13E-08	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	5.37E-06	2.77E-02	1.49E-07	USEPA (2007a)[b]	Regression[d]	2.02E-05	Sample et al. (1998a)	1.25E-01	6.72E-07	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	1.68E-05	1.52E-02	2.56E-07	USEPA (2007a)[b]	Regression[d]	7.77E-05	Sample et al. (1998a)	1.25E-01	2.10E-06	Sample et al. (1998b)[i]

Table H15-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Central Landfills Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H15-2
Refined Exposure Evaluation - American Woodcock
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-01	0.00E+00	1.34E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.09E-04	0.00E+00	1.09E-04	No TRV	--	No TRV	--
Arsenic	6.57E+00	9.37E-04	2.89E-03	9.64E-02	0.00E+00	9.93E-02	1.10E-04	5.79E-02	1.57E-01	2.24E+00	<1	4.51E+00	<1
Barium	1.97E+02	1.73E-01	3.60E-01	1.89E+00	0.00E+00	2.25E+00	2.03E-02	1.73E+00	4.00E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	6.01E-01	2.61E-04	4.73E-03	2.86E-03	0.00E+00	7.59E-03	3.07E-05	5.30E-03	1.29E-02	No TRV	--	No TRV	--
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.99E-05	0.00E+00	7.99E-05	1.47E+00	<1	6.35E+00	<1
Chromium	1.38E+01	2.97E-03	6.65E-03	4.47E-01	0.00E+00	4.53E-01	3.49E-04	1.22E-01	5.75E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.09E-04	0.00E+00	2.09E-04	7.61E+00	<1	2.02E+01	<1
Copper	7.21E+02	9.09E-03	3.06E-01	3.93E+01	0.00E+00	3.96E+01	1.07E-03	6.35E+00	4.59E+01	4.05E+00	1.13E+01	3.48E+01	1.32E+00
Lead	1.48E+01	1.75E-03	1.41E-02	7.48E-01	0.00E+00	7.62E-01	2.06E-04	1.30E-01	8.93E-01	1.63E+00	<1	4.46E+01	<1
Manganese	5.11E+02	1.34E-01	4.74E-01	3.31E+00	0.00E+00	3.79E+00	1.58E-02	4.50E+00	8.31E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.72E-05	--	1.72E-05	4.50E-01	<1	9.10E-01	<1
Nickel	2.35E+01	3.96E-03	1.35E-02	1.93E+00	0.00E+00	1.95E+00	4.65E-04	2.07E-01	2.16E+00	6.71E+00	<1	1.86E+01	<1
Selenium	3.25E-01	7.23E-04	1.73E-03	4.30E-02	0.00E+00	4.48E-02	8.49E-05	2.86E-03	4.77E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.11E-01	2.54E-04	5.23E-06	6.37E-04	0.00E+00	6.42E-04	2.98E-05	9.81E-04	1.65E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	1.47E+01	2.33E-03	8.35E-04	6.51E-02	0.00E+00	6.59E-02	2.74E-04	1.29E-01	1.95E-01	3.44E-01	<1	1.70E+00	<1
Zinc	5.60E+01	2.54E-02	5.28E-01	3.39E+01	0.00E+00	3.44E+01	2.98E-03	4.93E-01	3.49E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.18E+00	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-03	1.04E-02	1.52E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	1.40E+02	1.16E+00	9.87E-02	1.84E+00	0.00E+00	1.93E+00	1.36E-01	1.23E+00	3.30E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	1.20E+00	0.00E+00	1.25E-03	3.71E+00	0.00E+00	3.71E+00	0.00E+00	1.06E-02	3.72E+00	1.80E-01	2.07E+01	1.80E+00	2.07E+00
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.24E+00	0.00E+00	2.27E-05	3.48E-01	0.00E+00	3.48E-01	0.00E+00	1.97E-02	3.68E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.76E+00	4.12E-04	1.47E-02	1.22E+00	0.00E+00	1.23E+00	4.83E-05	4.19E-02	1.27E+00				
Fluoranthene	2.50E+01	1.76E-03	1.47E-01	8.04E+00	0.00E+00	8.19E+00	2.07E-04	2.20E-01	8.41E+00				
Fluorene	1.92E+00	0.00E+00	2.59E-05	1.94E+00	0.00E+00	1.94E+00	0.00E+00	1.69E-02	1.96E+00				
Naphthalene	4.84E-01	5.78E-04	6.93E-02	2.25E-01	0.00E+00	2.94E-01	6.79E-05	4.26E-03	2.99E-01				
Phenanthrene	1.84E+01	5.53E-04	6.06E-02	3.35E+00	0.00E+00	3.41E+00	6.50E-05	1.62E-01	3.57E+00				
Total LMW PAHs						1.54E+01	3.88E-04	4.65E-01	1.59E+01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.07E+01	5.75E-04	3.20E-03	1.79E+00	0.00E+00	1.80E+00	6.76E-05	9.39E-02	1.89E+00				
Benzo[A]Pyrene	1.09E+01	1.94E-03	1.54E-02	1.54E+00	0.00E+00	1.55E+00	2.28E-04	9.62E-02	1.65E+00				
Benzo(b)fluoranthene	1.34E+01	5.09E-03	4.88E-02	3.69E+00	0.00E+00	3.73E+00	5.98E-04	1.18E-01	3.85E+00				
Benzo(g,h,i)perylene	7.33E+00	7.31E-04	4.89E-02	2.28E+00	0.00E+00	2.33E+00	8.58E-05	6.46E-02	2.39E+00				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.80E-05	--	1.80E-05				
Chrysene	1.21E+01	3.69E-03	3.44E-03	2.92E+00	0.00E+00	2.93E+00	4.33E-04	1.06E-01	3.04E+00				
Dibenz(A,H)Anthracene	2.34E+00	6.70E-05	3.58E-03	5.72E-01	0.00E+00	5.75E-01	7.87E-06	2.06E-02	5.96E-01				
Indeno (1,2,3-CD) Pyrene	8.68E+00	3.28E-04	1.12E-02	2.63E+00	0.00E+00	2.64E+00	3.85E-05	7.65E-02	2.71E+00				
Pyrene	1.63E+01	1.33E-03	1.38E-01	3.02E+00	0.00E+00	3.16E+00	1.56E-04	1.44E-01	3.31E+00				
Total HMW PAHs						1.87E+01	1.63E-03	7.20E-01	1.94E+01	2.00E+00	9.72E+00	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.79E-01	5.25E-03	7.81E-05	1.61E+00	0.00E+00	1.61E+00	6.17E-04	2.46E-03	1.61E+00	1.10E+00	1.46E+00	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	1.01E+00	0.00E+00	2.24E-02	7.45E-01	0.00E+00	7.67E-01	0.00E+00	8.92E-03	7.76E-01	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.56E-02	ND	1.49E-04	1.70E-02	0.00E+00	1.71E-02	--	1.37E-04	1.73E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H15-2
Refined Exposure Evaluation - American Woodcock
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	2.70E-07	0.00E+00	2.98E-10	6.23E-08	0.00E+00	6.26E-08	0.00E+00	2.38E-09	6.50E-08				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	1.95E-10	7.61E-08	0.00E+00	7.63E-08	0.00E+00	2.82E-09	7.92E-08				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	8.15E-10	8.49E-07	0.00E+00	8.49E-09	0.00E+00	2.17E-10	8.71E-09				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	3.78E-10	3.42E-07	0.00E+00	3.42E-08	0.00E+00	1.00E-09	3.52E-08				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	1.39E-08	4.92E-05	0.00E+00	4.92E-08	0.00E+00	6.72E-10	4.99E-08				
OCDD	8.91E-04	0.00E+00	8.84E-08	8.98E-04	0.00E+00	8.98E-08	0.00E+00	7.85E-10	9.06E-08				
2,3,7,8-TCDF	1.78E-06	0.00E+00	3.54E-09	5.79E-07	0.00E+00	5.82E-07	0.00E+00	1.57E-08	5.98E-07				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	1.03E-09	2.76E-07	0.00E+00	2.77E-07	0.00E+00	8.37E-09	2.85E-07				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	7.25E-10	5.37E-07	0.00E+00	5.38E-08	0.00E+00	1.47E-09	5.52E-08				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	3.39E-10	2.18E-07	0.00E+00	2.19E-08	0.00E+00	6.87E-10	2.25E-08				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	3.40E-10	1.51E-07	0.00E+00	1.51E-08	0.00E+00	5.02E-10	1.56E-08				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	1.75E-09	2.14E-06	0.00E+00	2.14E-08	0.00E+00	4.73E-10	2.18E-08				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	3.00E-09	8.22E-06	0.00E+00	8.22E-10	0.00E+00	1.48E-11	8.37E-10				
Total Dioxins/Furans						1.29E-06	0.00E+00	3.51E-08	1.29E-06	1.75E-06	<1	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H15-3
Refined Exposure Evaluation - Mourning Dove
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-01	0.00E+00	1.30E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-04	0.00E+00	1.06E-04	No TRV	--	No TRV	--
Arsenic	6.57E+00	9.37E-04	2.81E-02	0.00E+00	0.00E+00	2.81E-02	1.07E-04	5.10E-02	7.92E-02	2.24E+00	<1	4.51E+00	<1
Barium	1.97E+02	1.73E-01	3.50E+00	0.00E+00	0.00E+00	3.50E+00	1.97E-02	1.53E+00	5.05E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	6.01E-01	2.61E-04	4.59E-02	0.00E+00	0.00E+00	4.59E-02	2.98E-05	4.66E-03	5.06E-02	No TRV	--	No TRV	--
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.76E-05	0.00E+00	7.76E-05	1.47E+00	<1	6.35E+00	<1
Chromium	1.38E+01	2.97E-03	6.46E-02	0.00E+00	0.00E+00	6.46E-02	3.39E-04	1.07E-01	1.72E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.03E-04	0.00E+00	2.03E-04	7.61E+00	<1	2.02E+01	<1
Copper	7.21E+02	9.09E-03	2.98E+00	0.00E+00	0.00E+00	2.98E+00	1.04E-03	5.59E+00	8.57E+00	4.05E+00	2.12E+00	3.48E+01	<1
Lead	1.48E+01	1.75E-03	1.37E-01	0.00E+00	0.00E+00	1.37E-01	2.00E-04	1.15E-01	2.52E-01	1.63E+00	<1	4.46E+01	<1
Manganese	5.11E+02	1.34E-01	4.61E+00	0.00E+00	0.00E+00	4.61E+00	1.53E-02	3.97E+00	8.59E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.67E-05	--	1.67E-05	4.50E-01	<1	9.10E-01	<1
Nickel	2.35E+01	3.96E-03	1.31E-01	0.00E+00	0.00E+00	1.31E-01	4.52E-04	1.83E-01	3.14E-01	6.71E+00	<1	1.86E+01	<1
Selenium	3.25E-01	7.23E-04	1.68E-02	0.00E+00	0.00E+00	1.68E-02	8.25E-05	2.52E-03	1.94E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.11E-01	2.54E-04	5.08E-05	0.00E+00	0.00E+00	5.08E-05	2.90E-05	8.64E-04	9.44E-04	3.50E-01	<1	3.50E+00	<1
Vanadium	1.47E+01	2.33E-03	8.11E-03	0.00E+00	0.00E+00	8.11E-03	2.66E-04	1.14E-01	1.22E-01	3.44E-01	<1	1.70E+00	<1
Zinc	5.60E+01	2.54E-02	5.13E+00	0.00E+00	0.00E+00	5.13E+00	2.89E-03	4.34E-01	5.56E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.18E+00	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E-03	9.16E-03	1.38E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	1.40E+02	1.16E+00	9.59E-01	0.00E+00	0.00E+00	9.59E-01	1.32E-01	1.09E+00	2.18E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	1.20E+00	0.00E+00	1.22E-02	0.00E+00	0.00E+00	1.22E-02	0.00E+00	9.31E-03	2.15E-02	1.80E-01	<1	1.80E+00	<1
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.24E+00	0.00E+00	2.20E-04	0.00E+00	0.00E+00	2.20E-04	0.00E+00	1.74E-02	1.76E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.76E+00	4.12E-04	1.43E-01	0.00E+00	0.00E+00	1.43E-01	4.70E-05	3.69E-02	1.80E-01				
Fluoranthene	2.50E+01	1.76E-03	1.43E+00	0.00E+00	0.00E+00	1.43E+00	2.01E-04	1.94E-01	1.62E+00				
Fluorene	1.92E+00	0.00E+00	2.51E-04	0.00E+00	0.00E+00	2.51E-04	0.00E+00	1.49E-02	1.51E-02				
Naphthalene	4.84E-01	5.78E-04	6.74E-01	0.00E+00	0.00E+00	6.74E-01	6.60E-05	3.76E-03	6.78E-01				
Phenanthrene	1.84E+01	5.53E-04	5.88E-01	0.00E+00	0.00E+00	5.88E-01	6.31E-05	1.43E-01	7.31E-01				
Total LMW PAHs						2.83E+00	3.77E-04	4.10E-01	3.24E+00	1.61E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.07E+01	5.75E-04	3.11E-02	0.00E+00	0.00E+00	3.11E-02	6.56E-05	8.27E-02	1.14E-01				
Benzo[A]Pyrene	1.09E+01	1.94E-03	1.49E-01	0.00E+00	0.00E+00	1.49E-01	2.21E-04	8.47E-02	2.34E-01				
Benzo(b)fluoranthene	1.34E+01	5.09E-03	4.74E-01	0.00E+00	0.00E+00	4.74E-01	5.81E-04	1.04E-01	5.79E-01				
Benzo(g,h,i)perylene	7.33E+00	7.31E-04	4.75E-01	0.00E+00	0.00E+00	4.75E-01	8.34E-05	5.69E-02	5.32E-01				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.75E-05	--	1.75E-05				
Chrysene	1.21E+01	3.69E-03	3.35E-02	0.00E+00	0.00E+00	3.35E-02	4.21E-04	9.38E-02	1.28E-01				
Dibenz(A,H)Anthracene	2.34E+00	6.70E-05	3.47E-02	0.00E+00	0.00E+00	3.47E-02	7.65E-06	1.82E-02	5.29E-02				
Indeno (1,2,3-CD) Pyrene	8.68E+00	3.28E-04	1.09E-01	0.00E+00	0.00E+00	1.09E-01	3.74E-05	6.74E-02	1.76E-01				
Pyrene	1.63E+01	1.33E-03	1.34E+00	0.00E+00	0.00E+00	1.34E+00	1.52E-04	1.27E-01	1.47E+00				
Total HMW PAHs						2.65E+00	1.59E-03	6.35E-01	3.29E+00	2.00E+00	1.64E+00	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.79E-01	5.25E-03	7.59E-04	0.00E+00	0.00E+00	7.59E-04	5.99E-04	2.17E-03	3.53E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	1.01E+00	0.00E+00	2.17E-01	0.00E+00	0.00E+00	2.17E-01	0.00E+00	7.86E-03	2.25E-01	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.56E-02	0.00E+00	1.45E-03	0.00E+00	0.00E+00	1.45E-03	0.00E+00	1.21E-04	1.57E-03	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H15-3
Refined Exposure Evaluation - Mourning Dove
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	2.70E-07	0.00E+00	2.90E-09	0.00E+00	0.00E+00	2.90E-09	0.00E+00	2.10E-09	5.00E-09				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	1.89E-09	0.00E+00	0.00E+00	1.89E-09	0.00E+00	2.48E-09	4.37E-09				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	7.92E-09	0.00E+00	0.00E+00	7.92E-11	0.00E+00	1.91E-10	2.70E-10				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	3.67E-09	0.00E+00	0.00E+00	3.67E-10	0.00E+00	8.85E-10	1.25E-09				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	1.35E-07	0.00E+00	0.00E+00	1.35E-10	0.00E+00	5.92E-10	7.27E-10				
OCDD	8.91E-04	0.00E+00	8.59E-07	0.00E+00	0.00E+00	8.59E-11	0.00E+00	6.92E-10	7.77E-10				
2,3,7,8-TCDF	1.78E-06	0.00E+00	3.44E-08	0.00E+00	0.00E+00	3.44E-08	0.00E+00	1.38E-08	4.83E-08				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	1.00E-08	0.00E+00	0.00E+00	1.00E-08	0.00E+00	7.37E-09	1.74E-08				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	7.05E-09	0.00E+00	0.00E+00	7.05E-10	0.00E+00	1.30E-09	2.00E-09				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	3.29E-09	0.00E+00	0.00E+00	3.29E-10	0.00E+00	6.05E-10	9.35E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	3.30E-09	0.00E+00	0.00E+00	3.30E-10	0.00E+00	4.42E-10	7.73E-10				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	1.70E-08	0.00E+00	0.00E+00	1.70E-10	0.00E+00	4.17E-10	5.86E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	2.92E-08	0.00E+00	0.00E+00	2.92E-12	0.00E+00	1.30E-11	1.60E-11				
Total Dioxins/Furans						5.14E-08	0.00E+00	3.09E-08	8.23E-08	1.75E-06	<1	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H15-4
Refined Exposure Evaluation - Red-tailed Hawk
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.36E-02	0.00E+00	9.36E-02	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E-05	0.00E+00	7.61E-05	No TRV	--	No TRV	--
Arsenic	6.57E+00	9.37E-04	0.00E+00	0.00E+00	3.01E-03	3.01E-03	7.68E-05	1.40E-02	1.71E-02	2.24E+00	<1	4.51E+00	<1
Barium	1.97E+02	1.73E-01	0.00E+00	0.00E+00	1.10E-02	1.10E-02	1.42E-02	4.19E-01	4.44E-01	7.35E+01	<1	1.31E+02	<1
Beryllium	6.01E-01	2.61E-04	0.00E+00	0.00E+00	1.11E-04	1.11E-04	2.14E-05	1.28E-03	1.41E-03	No TRV	--	No TRV	--
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.58E-05	0.00E+00	5.58E-05	1.47E+00	<1	6.35E+00	<1
Chromium	1.38E+01	2.97E-03	0.00E+00	0.00E+00	1.31E-01	1.31E-01	2.44E-04	2.94E-02	1.60E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-04	0.00E+00	1.46E-04	7.61E+00	<1	2.02E+01	<1
Copper	7.21E+02	9.09E-03	0.00E+00	0.00E+00	1.63E+00	1.63E+00	7.45E-04	1.54E+00	3.17E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.48E+01	1.75E-03	0.00E+00	0.00E+00	2.91E-01	2.91E-01	1.44E-04	3.16E-02	3.23E-01	1.63E+00	<1	4.46E+01	<1
Manganese	5.11E+02	1.34E-01	0.00E+00	0.00E+00	8.59E-01	8.59E-01	1.10E-02	1.09E+00	1.96E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.20E-05	--	1.20E-05	4.50E-01	<1	9.10E-01	<1
Nickel	2.35E+01	3.96E-03	0.00E+00	0.00E+00	2.79E-01	2.79E-01	3.25E-04	5.02E-02	3.30E-01	6.71E+00	<1	1.86E+01	<1
Selenium	3.25E-01	7.23E-04	0.00E+00	0.00E+00	3.54E-02	3.54E-02	5.93E-05	6.93E-04	3.62E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.11E-01	2.54E-04	0.00E+00	0.00E+00	9.88E-04	9.88E-04	2.08E-05	2.37E-04	1.25E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	1.47E+01	2.33E-03	0.00E+00	0.00E+00	1.48E-02	1.48E-02	1.91E-04	3.12E-02	4.62E-02	3.44E-01	<1	1.70E+00	<1
Zinc	5.60E+01	2.54E-02	0.00E+00	0.00E+00	8.55E+00	8.55E+00	2.08E-03	1.19E-01	8.68E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.18E+00	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-03	2.52E-03	5.86E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	1.40E+02	1.16E+00	0.00E+00	0.00E+00	1.84E-01	1.84E-01	9.49E-02	2.99E-01	5.77E-01	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	1.20E+00	0.00E+00	0.00E+00	0.00E+00	2.49E-02	2.49E-02	0.00E+00	2.56E-03	2.74E-02	1.80E-01	<1	1.80E+00	<1
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.24E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.77E-03	4.77E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.76E+00	4.12E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.37E-05	1.01E-02	1.02E-02				
Fluoranthene	2.50E+01	1.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.44E-04	5.33E-02	5.35E-02				
Fluorene	1.92E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.09E-03	4.09E-03				
Naphthalene	4.84E-01	5.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.74E-05	1.03E-03	1.08E-03				
Phenanthrene	1.84E+01	5.53E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.54E-05	3.92E-02	3.93E-02				
Total LMW PAHs						0.00E+00	2.71E-04	1.13E-01	1.13E-01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.07E+01	5.75E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.72E-05	2.27E-02	2.28E-02				
Benzo[A]Pyrene	1.09E+01	1.94E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-04	2.33E-02	2.34E-02				
Benzo(b)fluoranthene	1.34E+01	5.09E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-04	2.86E-02	2.90E-02				
Benzo(g,h,i)perylene	7.33E+00	7.31E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.99E-05	1.56E-02	1.57E-02				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.26E-05	--	1.26E-05				
Chrysene	1.21E+01	3.69E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.02E-04	2.58E-02	2.61E-02				
Dibenz(A,H)Anthracene	2.34E+00	6.70E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.49E-06	4.99E-03	5.00E-03				
Indeno (1,2,3-CD) Pyrene	8.68E+00	3.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.69E-05	1.85E-02	1.85E-02				
Pyrene	1.63E+01	1.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.09E-04	3.48E-02	3.50E-02				
Total HMW PAHs						0.00E+00	1.14E-03	1.74E-01	1.75E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.79E-01	5.25E-03	0.00E+00	0.00E+00	1.78E-02	1.78E-02	4.31E-04	5.96E-04	1.89E-02	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	1.01E+00	0.00E+00	0.00E+00	0.00E+00	4.65E-03	4.65E-03	0.00E+00	2.16E-03	6.81E-03	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.56E-02	0.00E+00	0.00E+00	0.00E+00	5.74E-04	5.74E-04	0.00E+00	3.32E-05	6.07E-04	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H15-4
Refined Exposure Evaluation - Red-tailed Hawk
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	2.70E-07	0.00E+00	0.00E+00	0.00E+00	1.11E-08	1.11E-08	0.00E+00	5.76E-10	1.17E-08				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	0.00E+00	0.00E+00	1.34E-08	1.34E-08	0.00E+00	6.82E-10	1.41E-08				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	0.00E+00	0.00E+00	1.26E-07	1.26E-09	0.00E+00	5.25E-11	1.31E-09				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	0.00E+00	0.00E+00	5.41E-08	5.41E-09	0.00E+00	2.43E-10	5.65E-09				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	0.00E+00	0.00E+00	5.49E-06	5.49E-09	0.00E+00	1.63E-10	5.66E-09				
OCDD	8.91E-04	0.00E+00	0.00E+00	0.00E+00	8.19E-05	8.19E-09	0.00E+00	1.90E-10	8.38E-09				
2,3,7,8-TCDF	1.78E-06	0.00E+00	0.00E+00	0.00E+00	1.83E-08	1.83E-08	0.00E+00	3.80E-09	2.21E-08				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	0.00E+00	0.00E+00	9.75E-09	9.75E-09	0.00E+00	2.03E-09	1.18E-08				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	0.00E+00	0.00E+00	1.71E-08	1.71E-09	0.00E+00	3.56E-10	2.07E-09				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	0.00E+00	0.00E+00	8.00E-09	8.00E-10	0.00E+00	1.66E-10	9.67E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	0.00E+00	0.00E+00	5.85E-09	5.85E-10	0.00E+00	1.22E-10	7.06E-10				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	0.00E+00	0.00E+00	5.51E-08	5.51E-10	0.00E+00	1.15E-10	6.65E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	0.00E+00	0.00E+00	1.72E-07	1.72E-11	0.00E+00	3.58E-12	2.08E-11				
Total Dioxins/Furans						7.65E-08	0.00E+00	8.49E-09	8.50E-08	1.75E-06	<1	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H15-5
Refined Exposure Evaluation - Yellow-billed Cuckoo
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.81E-01	0.00E+00	1.81E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E-04	0.00E+00	1.47E-04	No TRV	--	No TRV	--
Arsenic	6.57E+00	9.37E-04	0.00E+00	1.44E-01	0.00E+00	1.44E-01	1.48E-04	0.00E+00	1.45E-01	2.24E+00	<1	4.51E+00	<1
Barium	1.97E+02	1.73E-01	0.00E+00	2.83E+00	0.00E+00	2.83E+00	2.74E-02	0.00E+00	2.86E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	6.01E-01	2.61E-04	0.00E+00	4.28E-03	0.00E+00	4.28E-03	4.13E-05	0.00E+00	4.32E-03	No TRV	--	No TRV	--
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E-04	0.00E+00	1.08E-04	1.47E+00	<1	6.35E+00	<1
Chromium	1.38E+01	2.97E-03	0.00E+00	6.69E-01	0.00E+00	6.69E-01	4.71E-04	0.00E+00	6.70E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.82E-04	0.00E+00	2.82E-04	7.61E+00	<1	2.02E+01	<1
Copper	7.21E+02	9.09E-03	0.00E+00	5.88E+01	0.00E+00	5.88E+01	1.44E-03	0.00E+00	5.88E+01	4.05E+00	1.45E+01	3.48E+01	1.69E+00
Lead	1.48E+01	1.75E-03	0.00E+00	1.12E+00	0.00E+00	1.12E+00	2.77E-04	0.00E+00	1.12E+00	1.63E+00	<1	4.46E+01	<1
Manganese	5.11E+02	1.34E-01	0.00E+00	4.96E+00	0.00E+00	4.96E+00	2.13E-02	0.00E+00	4.98E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	2.31E-05	--	2.31E-05	4.50E-01	<1	9.10E-01	<1
Nickel	2.35E+01	3.96E-03	0.00E+00	2.90E+00	0.00E+00	2.90E+00	6.27E-04	0.00E+00	2.90E+00	6.71E+00	<1	1.86E+01	<1
Selenium	3.25E-01	7.23E-04	0.00E+00	6.45E-02	0.00E+00	6.45E-02	1.14E-04	0.00E+00	6.46E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.11E-01	2.54E-04	0.00E+00	9.54E-04	0.00E+00	9.54E-04	4.02E-05	0.00E+00	9.94E-04	3.50E-01	<1	3.50E+00	<1
Vanadium	1.47E+01	2.33E-03	0.00E+00	9.74E-02	0.00E+00	9.74E-02	3.70E-04	0.00E+00	9.78E-02	3.44E-01	<1	1.70E+00	<1
Zinc	5.60E+01	2.54E-02	0.00E+00	5.07E+01	0.00E+00	5.07E+01	4.01E-03	0.00E+00	5.07E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.18E+00	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.46E-03	0.00E+00	6.46E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	1.40E+02	1.16E+00	0.00E+00	2.75E+00	0.00E+00	2.75E+00	1.83E-01	0.00E+00	2.93E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	1.20E+00	0.00E+00	0.00E+00	5.56E+00	0.00E+00	5.56E+00	0.00E+00	0.00E+00	5.56E+00	1.80E-01	3.09E+01	1.80E+00	3.09E+00
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.24E+00	0.00E+00	0.00E+00	5.21E-01	0.00E+00	5.21E-01	0.00E+00	0.00E+00	5.21E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.76E+00	4.12E-04	0.00E+00	1.82E+00	0.00E+00	1.82E+00	6.52E-05	0.00E+00	1.82E+00				
Fluoranthene	2.50E+01	1.76E-03	0.00E+00	1.20E+01	0.00E+00	1.20E+01	2.79E-04	0.00E+00	1.20E+01				
Fluorene	1.92E+00	0.00E+00	0.00E+00	2.91E+00	0.00E+00	2.91E+00	0.00E+00	0.00E+00	2.91E+00				
Naphthalene	4.84E-01	5.78E-04	0.00E+00	3.37E-01	0.00E+00	3.37E-01	9.15E-05	0.00E+00	3.37E-01				
Phenanthrene	1.84E+01	5.53E-04	0.00E+00	5.01E+00	0.00E+00	5.01E+00	8.76E-05	0.00E+00	5.01E+00				
Total LMW PAHs						2.26E+01	5.23E-04	0.00E+00	2.26E+01	1.61E+01	1.41E+00	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.07E+01	5.75E-04	0.00E+00	2.68E+00	0.00E+00	2.68E+00	9.11E-05	0.00E+00	2.68E+00				
Benzo[A]Pyrene	1.09E+01	1.94E-03	0.00E+00	2.30E+00	0.00E+00	2.30E+00	3.07E-04	0.00E+00	2.30E+00				
Benzo(b)fluoranthene	1.34E+01	5.09E-03	0.00E+00	5.52E+00	0.00E+00	5.52E+00	8.06E-04	0.00E+00	5.52E+00				
Benzo(g,h,i)perylene	7.33E+00	7.31E-04	0.00E+00	3.41E+00	0.00E+00	3.41E+00	1.16E-04	0.00E+00	3.41E+00				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.43E-05	--	2.43E-05				
Chrysene	1.21E+01	3.69E-03	0.00E+00	4.38E+00	0.00E+00	4.38E+00	5.84E-04	0.00E+00	4.38E+00				
Dibenz(A,H)Anthracene	2.34E+00	6.70E-05	0.00E+00	8.56E-01	0.00E+00	8.56E-01	1.06E-05	0.00E+00	8.56E-01				
Indeno (1,2,3-CD) Pyrene	8.68E+00	3.28E-04	0.00E+00	3.93E+00	0.00E+00	3.93E+00	5.19E-05	0.00E+00	3.93E+00				
Pyrene	1.63E+01	1.33E-03	0.00E+00	4.53E+00	0.00E+00	4.53E+00	2.11E-04	0.00E+00	4.53E+00				
Total HMW PAHs						2.76E+01	2.20E-03	0.00E+00	2.76E+01	2.00E+00	1.38E+01	2.00E+01	1.38E+00
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.79E-01	5.25E-03	0.00E+00	2.41E+00	0.00E+00	2.41E+00	8.31E-04	0.00E+00	2.41E+00	1.10E+00	2.19E+00	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	1.01E+00	0.00E+00	0.00E+00	1.12E+00	0.00E+00	1.12E+00	0.00E+00	0.00E+00	1.12E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.56E-02	0.00E+00	0.00E+00	2.55E-02	0.00E+00	2.55E-02	0.00E+00	0.00E+00	2.55E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H15-5
Refined Exposure Evaluation - Yellow-billed Cuckoo
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	2.70E-07	0.00E+00	0.00E+00	9.33E-08	0.00E+00	9.33E-08	0.00E+00	0.00E+00	9.33E-08				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	0.00E+00	1.14E-07	0.00E+00	1.14E-07	0.00E+00	0.00E+00	1.14E-07				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	0.00E+00	1.27E-06	0.00E+00	1.27E-08	0.00E+00	0.00E+00	1.27E-08				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	0.00E+00	5.12E-07	0.00E+00	5.12E-08	0.00E+00	0.00E+00	5.12E-08				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	0.00E+00	7.36E-05	0.00E+00	7.36E-08	0.00E+00	0.00E+00	7.36E-08				
OCDD	8.91E-04	0.00E+00	0.00E+00	1.34E-03	0.00E+00	1.34E-07	0.00E+00	0.00E+00	1.34E-07				
2,3,7,8-TCDF	1.78E-06	0.00E+00	0.00E+00	8.67E-07	0.00E+00	8.67E-07	0.00E+00	0.00E+00	8.67E-07				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	0.00E+00	4.13E-07	0.00E+00	4.13E-07	0.00E+00	0.00E+00	4.13E-07				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	0.00E+00	8.04E-07	0.00E+00	8.04E-08	0.00E+00	0.00E+00	8.04E-08				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	0.00E+00	3.27E-07	0.00E+00	3.27E-08	0.00E+00	0.00E+00	3.27E-08				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	0.00E+00	2.26E-07	0.00E+00	2.26E-08	0.00E+00	0.00E+00	2.26E-08				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	0.00E+00	3.20E-06	0.00E+00	3.20E-08	0.00E+00	0.00E+00	3.20E-08				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	0.00E+00	1.23E-05	0.00E+00	1.23E-09	0.00E+00	0.00E+00	1.23E-09				
Total Dioxins/Furans						1.93E-06	0.00E+00	0.00E+00	1.93E-06	1.75E-06	1.10E+00	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H15-6
Refined Exposure Evaluation - Canada Lynx
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.57E-02	0.00E+00	3.57E-02	No TRV	--	No TRV	--
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-05	0.00E+00	2.90E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	6.57E+00	9.37E-04	0.00E+00	0.00E+00	1.15E-03	1.15E-03	2.93E-05	5.74E-03	6.92E-03	1.04E+00	<1	4.55E+00	<1
Barium	1.97E+02	1.73E-01	0.00E+00	0.00E+00	4.19E-03	4.19E-03	5.40E-03	1.72E-01	1.82E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	6.01E-01	2.61E-04	0.00E+00	0.00E+00	4.22E-05	4.22E-05	8.15E-06	5.26E-04	5.76E-04	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.12E-05	0.00E+00	2.12E-05	7.70E-01	<1	6.87E+00	<1
Chromium	1.38E+01	2.97E-03	0.00E+00	0.00E+00	4.98E-02	4.98E-02	9.29E-05	1.21E-02	6.20E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.56E-05	0.00E+00	5.56E-05	7.33E+00	<1	1.89E+01	<1
Copper	7.21E+02	9.09E-03	0.00E+00	0.00E+00	6.23E-01	6.23E-01	2.84E-04	6.31E-01	1.25E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.48E+01	1.75E-03	0.00E+00	0.00E+00	1.11E-01	1.11E-01	5.47E-05	1.29E-02	1.24E-01	4.70E+00	<1	1.86E+02	<1
Manganese	5.11E+02	1.34E-01	0.00E+00	0.00E+00	3.27E-01	3.27E-01	4.20E-03	4.47E-01	7.79E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	4.56E-06	--	4.56E-06	1.41E+00	<1	1.41E+01	<1
Nickel	2.35E+01	3.96E-03	0.00E+00	0.00E+00	1.06E-01	1.06E-01	1.24E-04	2.06E-02	1.27E-01	1.70E+00	<1	1.48E+01	<1
Selenium	3.25E-01	7.23E-04	0.00E+00	0.00E+00	1.35E-02	1.35E-02	2.26E-05	2.84E-04	1.38E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.11E-01	2.54E-04	0.00E+00	0.00E+00	3.76E-04	3.76E-04	7.94E-06	9.74E-05	4.82E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.47E+01	2.33E-03	0.00E+00	0.00E+00	5.63E-03	5.63E-03	7.29E-05	1.28E-02	1.85E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.60E+01	2.54E-02	0.00E+00	0.00E+00	3.26E+00	3.26E+00	7.92E-04	4.90E-02	3.31E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.18E+00	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-03	1.03E-03	2.31E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	1.40E+02	1.16E+00	0.00E+00	0.00E+00	7.00E-02	7.00E-02	3.62E-02	1.23E-01	2.29E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	1.20E+00	0.00E+00	0.00E+00	0.00E+00	9.48E-03	9.48E-03	0.00E+00	1.05E-03	1.05E-02	6.80E-02	<1	6.80E-01	<1
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.24E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.96E-03	1.96E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.76E+00	4.12E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E-05	4.16E-03	4.17E-03				
Fluoranthene	2.50E+01	1.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E-05	2.19E-02	2.19E-02				
Fluorene	1.92E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.68E-03	1.68E-03				
Naphthalene	4.84E-01	5.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.81E-05	4.23E-04	4.41E-04				
Phenanthrene	1.84E+01	5.53E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.73E-05	1.61E-02	1.61E-02				
Total LMW PAHs						0.00E+00	1.03E-04	4.62E-02	4.63E-02	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.07E+01	5.75E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-05	9.33E-03	9.34E-03				
Benzo[A]Pyrene	1.09E+01	1.94E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.06E-05	9.55E-03	9.61E-03				
Benzo(b)fluoranthene	1.34E+01	5.09E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-04	1.17E-02	1.19E-02				
Benzo(g,h,i)perylene	7.33E+00	7.31E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.28E-05	6.41E-03	6.44E-03				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	4.79E-06	--	4.79E-06				
Chrysene	1.21E+01	3.69E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-04	1.06E-02	1.07E-02				
Dibenz(A,H)Anthracene	2.34E+00	6.70E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.09E-06	2.05E-03	2.05E-03				
Indeno (1,2,3-CD) Pyrene	8.68E+00	3.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-05	7.60E-03	7.61E-03				
Pyrene	1.63E+01	1.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.16E-05	1.43E-02	1.43E-02				
Total HMW PAHs						0.00E+00	4.34E-04	7.15E-02	7.20E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.79E-01	5.25E-03	0.00E+00	0.00E+00	6.80E-03	6.80E-03	1.64E-04	2.44E-04	7.21E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	1.01E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-03	1.77E-03	0.00E+00	8.86E-04	2.66E-03	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.56E-02	0.00E+00	0.00E+00	0.00E+00	2.19E-04	2.19E-04	0.00E+00	1.36E-05	2.32E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H15-6
Refined Exposure Evaluation - Canada Lynx
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	2.70E-07	0.00E+00	0.00E+00	0.00E+00	4.23E-09	4.23E-09	0.00E+00	2.36E-10	4.46E-09				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	0.00E+00	0.00E+00	5.10E-09	5.10E-09	0.00E+00	2.80E-10	5.38E-09				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	0.00E+00	0.00E+00	4.80E-08	4.80E-09	0.00E+00	2.15E-10	5.01E-09				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	0.00E+00	0.00E+00	2.06E-08	2.06E-09	0.00E+00	9.97E-11	2.16E-09				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	0.00E+00	0.00E+00	2.09E-06	2.09E-08	0.00E+00	6.68E-10	2.16E-08				
OCDD	8.91E-04	0.00E+00	0.00E+00	0.00E+00	3.12E-05	9.36E-09	0.00E+00	2.34E-10	9.59E-09				
2,3,7,8-TCDF	1.78E-06	0.00E+00	0.00E+00	0.00E+00	6.96E-09	6.96E-10	0.00E+00	1.56E-10	8.51E-10				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	0.00E+00	0.00E+00	3.71E-09	1.11E-09	0.00E+00	2.49E-10	1.36E-09				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	0.00E+00	0.00E+00	6.53E-09	6.53E-10	0.00E+00	1.46E-10	7.99E-10				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	0.00E+00	0.00E+00	3.05E-09	3.05E-10	0.00E+00	6.82E-11	3.73E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	0.00E+00	0.00E+00	2.23E-09	2.23E-10	0.00E+00	4.99E-11	2.73E-10				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	0.00E+00	0.00E+00	2.10E-08	2.10E-10	0.00E+00	4.70E-11	2.57E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	0.00E+00	0.00E+00	6.57E-08	1.97E-11	0.00E+00	4.41E-12	2.41E-11				
Total Dioxins/Furans						4.97E-08	0.00E+00	2.45E-09	5.21E-08	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H15-7
Refined Exposure Evaluation - Grizzly Bear
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate						
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals															
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.47E-02	0.00E+00	2.47E-02	No TRV	--	No TRV	--
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-05	0.00E+00	2.00E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	6.57E+00	9.37E-04	3.46E-03	2.95E-03	7.92E-05	0.00E+00	6.49E-03	2.02E-05	3.97E-03	1.05E-02	1.04E+00	<1	4.55E+00	<1
Barium	1.97E+02	1.73E-01	4.30E-01	5.79E-02	2.90E-04	0.00E+00	4.89E-01	3.73E-03	1.19E-01	6.11E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	6.01E-01	2.61E-04	5.65E-03	8.76E-05	2.92E-06	0.00E+00	5.74E-03	5.64E-06	3.63E-04	6.11E-03	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E-05	0.00E+00	1.47E-05	7.70E-01	<1	6.87E+00	<1
Chromium	1.38E+01	2.97E-03	7.95E-03	1.37E-02	3.44E-03	0.00E+00	2.51E-02	6.42E-05	8.35E-03	3.35E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.84E-05	0.00E+00	3.84E-05	7.33E+00	<1	1.89E+01	<1
Copper	7.21E+02	9.09E-03	3.66E-01	1.20E+00	4.30E-02	0.00E+00	1.61E+00	1.96E-04	4.36E-01	2.05E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.48E+01	1.75E-03	1.69E-02	2.29E-02	7.67E-03	0.00E+00	4.75E-02	3.78E-05	8.95E-03	5.64E-02	4.70E+00	<1	1.86E+02	<1
Manganese	5.11E+02	1.34E-01	5.67E-01	1.01E-01	2.26E-02	0.00E+00	6.91E-01	2.90E-03	3.09E-01	1.00E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	0.00E+00	3.15E-06	--	3.15E-06	1.41E+00	<1	1.41E+01	<1
Nickel	2.35E+01	3.96E-03	1.61E-02	5.93E-02	7.35E-03	0.00E+00	8.28E-02	8.55E-05	1.42E-02	9.71E-02	1.70E+00	<1	1.48E+01	<1
Selenium	3.25E-01	7.23E-04	2.06E-03	1.32E-03	9.33E-04	0.00E+00	4.32E-03	1.56E-05	1.97E-04	4.53E-03	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.11E-01	2.54E-04	6.25E-06	1.95E-05	2.60E-05	0.00E+00	5.18E-05	5.49E-06	6.73E-05	1.25E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.47E+01	2.33E-03	9.97E-04	1.99E-03	3.89E-04	0.00E+00	3.38E-03	5.04E-05	8.86E-03	1.23E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.60E+01	2.54E-02	6.30E-01	1.04E+00	2.25E-01	0.00E+00	1.89E+00	5.48E-04	3.38E-02	1.93E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics															
Cyanide	1.18E+00	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.82E-04	7.14E-04	1.60E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	1.40E+02	1.16E+00	1.18E-01	5.63E-02	4.84E-03	0.00E+00	1.79E-01	2.50E-02	8.47E-02	2.89E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)															
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	1.20E+00	0.00E+00	1.50E-03	1.14E-01	6.55E-04	0.00E+00	1.16E-01	0.00E+00	7.26E-04	1.17E-01	6.80E-02	1.71E+00	6.80E-01	<1
Polycyclic Aromatic Hydrocarbons (PAHs)															
Low Molecular Weight (LMW) PAHs:															
Acenaphthene	2.24E+00	0.00E+00	2.71E-05	1.07E-02	0.00E+00	0.00E+00	1.07E-02	0.00E+00	1.35E-03	1.20E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.76E+00	4.12E-04	1.76E-02	3.73E-02	0.00E+00	0.00E+00	5.49E-02	8.89E-06	2.88E-03	5.77E-02				
Fluoranthene	2.50E+01	1.76E-03	1.76E-01	2.46E-01	0.00E+00	0.00E+00	4.22E-01	3.80E-05	1.51E-02	4.37E-01				
Fluorene	1.92E+00	0.00E+00	3.09E-05	5.94E-02	0.00E+00	0.00E+00	5.95E-02	0.00E+00	1.16E-03	6.06E-02				
Naphthalene	4.84E-01	5.78E-04	8.29E-02	6.90E-03	0.00E+00	0.00E+00	8.98E-02	1.25E-05	2.93E-04	9.01E-02				
Phenanthrene	1.84E+01	5.53E-04	7.24E-02	1.02E-01	0.00E+00	0.00E+00	1.75E-01	1.19E-05	1.11E-02	1.86E-01				
Total LMW PAHs							8.11E-01	7.13E-05	3.19E-02	8.43E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:															
Benzo(a)anthracene	1.07E+01	5.75E-04	3.82E-03	5.49E-02	0.00E+00	0.00E+00	5.87E-02	1.24E-05	6.45E-03	6.52E-02				
Benzo[A]Pyrene	1.09E+01	1.94E-03	1.84E-02	4.70E-02	0.00E+00	0.00E+00	6.54E-02	4.19E-05	6.60E-03	7.21E-02				
Benzo(b)fluoranthene	1.34E+01	5.09E-03	5.83E-02	1.13E-01	0.00E+00	0.00E+00	1.71E-01	1.10E-04	8.11E-03	1.79E-01				
Benzo(g,h,i)perylene	7.33E+00	7.31E-04	5.84E-02	6.98E-02	0.00E+00	0.00E+00	1.28E-01	1.58E-05	4.43E-03	1.33E-01				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	0.00E+00	3.31E-06	--	3.31E-06				
Chrysene	1.21E+01	3.69E-03	4.12E-03	8.96E-02	0.00E+00	0.00E+00	9.37E-02	7.96E-05	7.30E-03	1.01E-01				
Dibenz(A,H)Anthracene	2.34E+00	6.70E-05	4.27E-03	1.75E-02	0.00E+00	0.00E+00	2.18E-02	1.45E-06	1.42E-03	2.32E-02				
Indeno (1,2,3-CD) Pyrene	8.68E+00	3.28E-04	1.34E-02	8.05E-02	0.00E+00	0.00E+00	9.39E-02	7.08E-06	5.25E-03	9.91E-02				
Pyrene	1.63E+01	1.33E-03	1.65E-01	9.26E-02	0.00E+00	0.00E+00	2.58E-01	2.87E-05	9.88E-03	2.68E-01				
Total HMW PAHs							8.91E-01	3.00E-04	4.94E-02	9.41E-01	6.15E-01	1.53E+00	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs															
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.79E-01	5.25E-03	9.33E-05	4.92E-02	4.70E-04	0.00E+00	4.98E-02	1.13E-04	1.69E-04	5.01E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	1.01E+00	0.00E+00	2.67E-02	2.28E-02	1.23E-04	0.00E+00	4.96E-02	0.00E+00	6.12E-04	5.03E-02	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.56E-02	0.00E+00	1.78E-04	5.21E-04	1.51E-05	0.00E+00	7.14E-04	0.00E+00	9.43E-06	7.24E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H15-7
Refined Exposure Evaluation - Grizzly Bear
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate						
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)															
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans															
2,3,7,8-TCDD	2.70E-07	0.00E+00	3.57E-10	1.91E-09	2.92E-10	0.00E+00	2.56E-09	0.00E+00	1.63E-10	2.72E-09				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	2.32E-10	2.33E-09	3.52E-10	0.00E+00	2.92E-09	0.00E+00	1.93E-10	3.11E-09				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	9.74E-10	2.60E-08	3.32E-09	0.00E+00	3.03E-09	0.00E+00	1.49E-10	3.18E-09				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	4.51E-10	1.05E-08	1.42E-09	0.00E+00	1.23E-09	0.00E+00	6.89E-11	1.30E-09				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	1.66E-08	1.51E-06	1.45E-07	0.00E+00	1.67E-08	0.00E+00	4.61E-10	1.71E-08				
OCDD	8.91E-04	0.00E+00	1.06E-07	2.75E-05	2.16E-06	0.00E+00	8.93E-09	0.00E+00	1.62E-10	9.09E-09				
2,3,7,8-TCDF	1.78E-06	0.00E+00	4.23E-09	1.77E-08	4.81E-10	0.00E+00	2.25E-09	0.00E+00	1.08E-10	2.35E-09				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	1.23E-09	8.44E-09	2.57E-10	0.00E+00	2.98E-09	0.00E+00	1.72E-10	3.15E-09				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	8.67E-10	1.64E-08	4.51E-10	0.00E+00	1.78E-09	0.00E+00	1.01E-10	1.88E-09				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	4.05E-10	6.69E-09	2.11E-10	0.00E+00	7.30E-10	0.00E+00	4.72E-11	7.77E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	4.06E-10	4.62E-09	1.54E-10	0.00E+00	5.18E-10	0.00E+00	3.45E-11	5.52E-10				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	2.09E-09	6.54E-08	1.45E-09	0.00E+00	6.89E-10	0.00E+00	3.25E-11	7.22E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	3.59E-09	2.52E-07	4.54E-09	0.00E+00	7.80E-11	0.00E+00	3.05E-12	8.10E-11				
Total Dioxins/Furans							4.44E-08	0.00E+00	1.70E-09	4.61E-08	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H15-8
Refined Exposure Evaluation - Long-tailed Weasel
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.87E-02	0.00E+00	5.87E-02	No TRV	--	No TRV	--
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.78E-05	0.00E+00	4.78E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	6.80E+00	9.37E-04	0.00E+00	0.00E+00	1.94E-03	1.94E-03	4.82E-05	5.60E-03	7.59E-03	1.04E+00	<1	4.55E+00	<1
Barium	1.44E+02	1.73E-01	0.00E+00	0.00E+00	5.07E-03	5.07E-03	8.90E-03	1.19E-01	1.33E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	7.33E-01	2.61E-04	0.00E+00	0.00E+00	8.48E-05	8.48E-05	1.34E-05	6.03E-04	7.01E-04	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-05	0.00E+00	3.50E-05	7.70E-01	<1	6.87E+00	<1
Chromium	1.13E+01	2.97E-03	0.00E+00	0.00E+00	7.06E-02	7.06E-02	1.53E-04	9.27E-03	8.00E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.15E-05	0.00E+00	9.15E-05	7.33E+00	<1	1.89E+01	<1
Copper	1.93E+02	9.09E-03	0.00E+00	0.00E+00	8.48E-01	8.48E-01	4.68E-04	1.59E-01	1.01E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.42E+01	1.75E-03	0.00E+00	0.00E+00	1.80E-01	1.80E-01	9.01E-05	1.17E-02	1.91E-01	4.70E+00	<1	1.86E+02	<1
Manganese	4.83E+02	1.34E-01	0.00E+00	0.00E+00	5.09E-01	5.09E-01	6.92E-03	3.97E-01	9.13E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	7.51E-06	--	7.51E-06	1.41E+00	<1	1.41E+01	<1
Nickel	6.01E+01	3.96E-03	0.00E+00	0.00E+00	2.71E-01	2.71E-01	2.04E-04	4.95E-02	3.21E-01	1.70E+00	<1	1.48E+01	<1
Selenium	4.52E-01	7.23E-04	0.00E+00	0.00E+00	2.52E-02	2.52E-02	3.72E-05	3.72E-04	2.56E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.73E-01	2.54E-04	0.00E+00	0.00E+00	9.64E-04	9.64E-04	1.31E-05	1.43E-04	1.12E-03	4.80E-01	<1	1.43E+00	<1
Vanadium	2.53E+01	2.33E-03	0.00E+00	0.00E+00	1.60E-02	1.60E-02	1.20E-04	2.08E-02	3.69E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.18E+01	2.54E-02	0.00E+00	0.00E+00	5.34E+00	5.34E+00	1.30E-03	4.27E-02	5.38E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.41E+00	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-03	1.16E-03	3.26E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	1.18E+02	1.16E+00	0.00E+00	0.00E+00	9.76E-02	9.76E-02	5.96E-02	9.76E-02	2.55E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	1.03E-01	0.00E+00	0.00E+00	0.00E+00	1.34E-03	1.34E-03	0.00E+00	8.47E-05	1.42E-03	6.80E-02	<1	6.80E-01	<1
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.62E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.16E-03	2.16E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.73E+00	4.12E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.12E-05	3.89E-03	3.91E-03				
Fluoranthene	2.43E+01	1.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.06E-05	2.00E-02	2.01E-02				
Fluorene	2.32E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.91E-03	1.91E-03				
Naphthalene	8.57E-01	5.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.97E-05	7.05E-04	7.35E-04				
Phenanthrene	2.22E+01	5.53E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.85E-05	1.83E-02	1.83E-02				
Total LMW PAHs						0.00E+00	1.70E-04	4.70E-02	4.72E-02	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	9.59E+00	5.75E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.96E-05	7.90E-03	7.93E-03				
Benzo[A]Pyrene	8.52E+00	1.94E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.97E-05	7.01E-03	7.11E-03				
Benzo(b)fluoranthene	1.18E+01	5.09E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.62E-04	9.68E-03	9.94E-03				
Benzo(g,h,i)perylene	5.89E+00	7.31E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.76E-05	4.85E-03	4.89E-03				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	7.88E-06	--	7.88E-06				
Chrysene	1.28E+01	3.69E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.90E-04	1.05E-02	1.07E-02				
Dibenz(A,H)Anthracene	2.13E+00	6.70E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.45E-06	1.75E-03	1.76E-03				
Indeno (1,2,3-CD) Pyrene	6.73E+00	3.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.69E-05	5.55E-03	5.56E-03				
Pyrene	1.39E+01	1.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.84E-05	1.15E-02	1.15E-02				
Total HMW PAHs						0.00E+00	7.15E-04	5.87E-02	5.94E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	7.86E-02	5.25E-03	0.00E+00	0.00E+00	3.15E-03	3.15E-03	2.70E-04	6.47E-05	3.48E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	1.36E+00	0.00E+00	0.00E+00	0.00E+00	3.92E-03	3.92E-03	0.00E+00	1.12E-03	5.03E-03	No TRV	--	No TRV	--
Di-n-butyl phthalate	8.43E-03	0.00E+00	0.00E+00	0.00E+00	1.95E-04	1.95E-04	0.00E+00	6.94E-06	2.02E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H15-8
Refined Exposure Evaluation - Long-tailed Weasel
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	2.70E-07	0.00E+00	0.00E+00	0.00E+00	6.97E-09	6.97E-09	0.00E+00	2.22E-10	7.19E-09				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	0.00E+00	0.00E+00	8.40E-09	8.40E-09	0.00E+00	2.63E-10	8.66E-09				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	0.00E+00	0.00E+00	7.90E-08	7.90E-09	0.00E+00	2.03E-10	8.11E-09				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	0.00E+00	0.00E+00	3.39E-08	3.39E-09	0.00E+00	9.39E-11	3.49E-09				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	0.00E+00	0.00E+00	3.45E-06	3.45E-08	0.00E+00	6.28E-10	3.51E-08				
OCDD	8.91E-04	0.00E+00	0.00E+00	0.00E+00	5.14E-05	1.54E-08	0.00E+00	2.20E-10	1.56E-08				
2,3,7,8-TCDF	1.78E-06	0.00E+00	0.00E+00	0.00E+00	1.15E-08	1.15E-09	0.00E+00	1.47E-10	1.29E-09				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	0.00E+00	0.00E+00	6.12E-09	1.83E-09	0.00E+00	2.35E-10	2.07E-09				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	0.00E+00	0.00E+00	1.08E-08	1.08E-09	0.00E+00	1.38E-10	1.21E-09				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	0.00E+00	0.00E+00	5.02E-09	5.02E-10	0.00E+00	6.42E-11	5.66E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	0.00E+00	0.00E+00	3.67E-09	3.67E-10	0.00E+00	4.69E-11	4.14E-10				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	0.00E+00	0.00E+00	3.46E-08	3.46E-10	0.00E+00	4.42E-11	3.90E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	0.00E+00	0.00E+00	1.08E-07	3.24E-11	0.00E+00	4.15E-12	3.66E-11				
Total Dioxins/Furans						8.18E-08	0.00E+00	2.31E-09	8.42E-08	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H15-9
Refined Exposure Evaluation - Meadow Vole
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E-01	0.00E+00	1.71E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E-04	0.00E+00	1.39E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	6.80E+00	9.37E-04	3.83E-02	0.00E+00	0.00E+00	3.83E-02	1.41E-04	1.33E-02	5.17E-02	1.04E+00	<1	4.55E+00	<1
Barium	1.44E+02	1.73E-01	3.38E+00	0.00E+00	0.00E+00	3.38E+00	2.60E-02	2.82E-01	3.69E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	7.33E-01	2.61E-04	6.99E-02	0.00E+00	0.00E+00	6.99E-02	3.92E-05	1.43E-03	7.14E-02	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-04	0.00E+00	1.02E-04	7.70E-01	<1	6.87E+00	<1
Chromium	1.13E+01	2.97E-03	6.93E-02	0.00E+00	0.00E+00	6.93E-02	4.47E-04	2.20E-02	9.17E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.67E-04	0.00E+00	2.67E-04	7.33E+00	<1	1.89E+01	<1
Copper	1.93E+02	9.09E-03	2.33E+00	0.00E+00	0.00E+00	2.33E+00	1.37E-03	3.77E-01	2.71E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.42E+01	1.75E-03	1.77E-01	0.00E+00	0.00E+00	1.77E-01	2.63E-04	2.78E-02	2.05E-01	4.70E+00	<1	1.86E+02	<1
Manganese	4.83E+02	1.34E-01	5.73E+00	0.00E+00	0.00E+00	5.73E+00	2.02E-02	9.43E-01	6.69E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	2.19E-05	--	2.19E-05	1.41E+00	<1	1.41E+01	<1
Nickel	6.01E+01	3.96E-03	3.48E-01	0.00E+00	0.00E+00	3.48E-01	5.95E-04	1.17E-01	4.66E-01	1.70E+00	<1	1.48E+01	<1
Selenium	4.52E-01	7.23E-04	3.18E-02	0.00E+00	0.00E+00	3.18E-02	1.09E-04	8.83E-04	3.28E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.73E-01	2.54E-04	1.04E-04	0.00E+00	0.00E+00	1.04E-04	3.82E-05	3.38E-04	4.80E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	2.53E+01	2.33E-03	1.84E-02	0.00E+00	0.00E+00	1.84E-02	3.51E-04	4.94E-02	6.82E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.18E+01	2.54E-02	6.47E+00	0.00E+00	0.00E+00	6.47E+00	3.81E-03	1.01E-01	6.57E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.41E+00	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.13E-03	2.76E-03	8.89E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	1.18E+02	1.16E+00	1.07E+00	0.00E+00	0.00E+00	1.07E+00	1.74E-01	2.31E-01	1.47E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	1.03E-01	0.00E+00	1.37E-03	0.00E+00	0.00E+00	1.37E-03	0.00E+00	2.01E-04	1.58E-03	6.80E-02	<1	6.80E-01	<1
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.62E+00	0.00E+00	2.53E-04	0.00E+00	0.00E+00	2.53E-04	0.00E+00	5.11E-03	5.37E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.73E+00	4.12E-04	1.87E-01	0.00E+00	0.00E+00	1.87E-01	6.18E-05	9.23E-03	1.97E-01				
Fluoranthene	2.43E+01	1.76E-03	1.83E+00	0.00E+00	0.00E+00	1.83E+00	2.64E-04	4.75E-02	1.88E+00				
Fluorene	2.32E+00	0.00E+00	2.81E-04	0.00E+00	0.00E+00	2.81E-04	0.00E+00	4.52E-03	4.81E-03				
Naphthalene	8.57E-01	5.78E-04	1.57E+00	0.00E+00	0.00E+00	1.57E+00	8.69E-05	1.67E-03	1.57E+00				
Phenanthrene	2.22E+01	5.53E-04	8.71E-01	0.00E+00	0.00E+00	8.71E-01	8.31E-05	4.34E-02	9.15E-01				
Total LMW PAHs						4.46E+00	4.96E-04	1.11E-01	4.57E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	9.59E+00	5.75E-04	3.84E-02	0.00E+00	0.00E+00	3.84E-02	8.64E-05	1.87E-02	5.72E-02				
Benzo[A]Pyrene	8.52E+00	1.94E-03	1.54E-01	0.00E+00	0.00E+00	1.54E-01	2.91E-04	1.66E-02	1.71E-01				
Benzo(b)fluoranthene	1.18E+01	5.09E-03	5.48E-01	0.00E+00	0.00E+00	5.48E-01	7.65E-04	2.30E-02	5.71E-01				
Benzo(g,h,i)perylene	5.89E+00	7.31E-04	4.82E-01	0.00E+00	0.00E+00	4.82E-01	1.10E-04	1.15E-02	4.94E-01				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.30E-05	--	2.30E-05				
Chrysene	1.28E+01	3.69E-03	4.55E-02	0.00E+00	0.00E+00	4.55E-02	5.54E-04	2.50E-02	7.10E-02				
Dibenz(A,H)Anthracene	2.13E+00	6.70E-05	4.16E-02	0.00E+00	0.00E+00	4.16E-02	1.01E-05	4.16E-03	4.58E-02				
Indeno (1,2,3-CD) Pyrene	6.73E+00	3.28E-04	1.11E-01	0.00E+00	0.00E+00	1.11E-01	4.92E-05	1.32E-02	1.25E-01				
Pyrene	1.39E+01	1.33E-03	1.51E+00	0.00E+00	0.00E+00	1.51E+00	2.00E-04	2.72E-02	1.53E+00				
Total HMW PAHs						2.93E+00	2.09E-03	1.39E-01	3.07E+00	6.15E-01	4.99E+00	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	7.86E-02	5.25E-03	2.81E-04	0.00E+00	0.00E+00	2.81E-04	7.89E-04	1.53E-04	1.22E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	1.36E+00	0.00E+00	3.83E-01	0.00E+00	0.00E+00	3.83E-01	0.00E+00	2.65E-03	3.86E-01	No TRV	--	No TRV	--
Di-n-butyl phthalate	8.43E-03	0.00E+00	1.03E-03	0.00E+00	0.00E+00	1.03E-03	0.00E+00	1.65E-05	1.05E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H15-9
Refined Exposure Evaluation - Meadow Vole
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	2.70E-07	0.00E+00	3.82E-09	0.00E+00	0.00E+00	3.82E-09	0.00E+00	5.27E-10	4.34E-09				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	2.49E-09	0.00E+00	0.00E+00	2.49E-09	0.00E+00	6.25E-10	3.11E-09				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	1.04E-08	0.00E+00	0.00E+00	1.04E-09	0.00E+00	4.80E-10	1.52E-09				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	4.83E-09	0.00E+00	0.00E+00	4.83E-10	0.00E+00	2.23E-10	7.06E-10				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	1.78E-07	0.00E+00	0.00E+00	1.78E-09	0.00E+00	1.49E-09	3.27E-09				
OCDD	8.91E-04	0.00E+00	1.13E-06	0.00E+00	0.00E+00	3.39E-10	0.00E+00	5.22E-10	8.61E-10				
2,3,7,8-TCDF	1.78E-06	0.00E+00	4.53E-08	0.00E+00	0.00E+00	4.53E-09	0.00E+00	3.48E-10	4.88E-09				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	1.32E-08	0.00E+00	0.00E+00	3.95E-09	0.00E+00	5.57E-10	4.51E-09				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	9.28E-09	0.00E+00	0.00E+00	9.28E-10	0.00E+00	3.26E-10	1.25E-09				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	4.33E-09	0.00E+00	0.00E+00	4.33E-10	0.00E+00	1.52E-10	5.86E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	4.35E-09	0.00E+00	0.00E+00	4.35E-10	0.00E+00	1.11E-10	5.46E-10				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	2.23E-08	0.00E+00	0.00E+00	2.23E-10	0.00E+00	1.05E-10	3.28E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	3.84E-08	0.00E+00	0.00E+00	1.15E-11	0.00E+00	9.84E-12	2.14E-11				
Total Dioxins/Furans						2.05E-08	0.00E+00	5.48E-09	2.59E-08	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H15-10
Refined Exposure Evaluation - North American Wolverine
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E-02	0.00E+00	3.43E-02	No TRV	--	No TRV	--
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.79E-05	0.00E+00	2.79E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	6.80E+00	9.37E-04	0.00E+00	0.00E+00	1.13E-03	1.13E-03	2.81E-05	5.72E-03	6.88E-03	1.04E+00	<1	4.55E+00	<1
Barium	1.44E+02	1.73E-01	0.00E+00	0.00E+00	2.96E-03	2.96E-03	5.19E-03	1.21E-01	1.30E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	7.33E-01	2.61E-04	0.00E+00	0.00E+00	4.95E-05	4.95E-05	7.84E-06	6.16E-04	6.74E-04	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.04E-05	0.00E+00	2.04E-05	7.70E-01	<1	6.87E+00	<1
Chromium	1.13E+01	2.97E-03	0.00E+00	0.00E+00	4.12E-02	4.12E-02	8.93E-05	9.47E-03	5.08E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.34E-05	0.00E+00	5.34E-05	7.33E+00	<1	1.89E+01	<1
Copper	1.93E+02	9.09E-03	0.00E+00	0.00E+00	4.95E-01	4.95E-01	2.73E-04	1.62E-01	6.58E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.42E+01	1.75E-03	0.00E+00	0.00E+00	1.05E-01	1.05E-01	5.26E-05	1.20E-02	1.17E-01	4.70E+00	<1	1.86E+02	<1
Manganese	4.83E+02	1.34E-01	0.00E+00	0.00E+00	2.97E-01	2.97E-01	4.04E-03	4.06E-01	7.07E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	4.39E-06	--	4.39E-06	1.41E+00	<1	1.41E+01	<1
Nickel	6.01E+01	3.96E-03	0.00E+00	0.00E+00	1.58E-01	1.58E-01	1.19E-04	5.05E-02	2.09E-01	1.70E+00	<1	1.48E+01	<1
Selenium	4.52E-01	7.23E-04	0.00E+00	0.00E+00	1.47E-02	1.47E-02	2.17E-05	3.80E-04	1.51E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.73E-01	2.54E-04	0.00E+00	0.00E+00	5.63E-04	5.63E-04	7.63E-06	1.46E-04	7.16E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	2.53E+01	2.33E-03	0.00E+00	0.00E+00	9.35E-03	9.35E-03	7.02E-05	2.13E-02	3.07E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.18E+01	2.54E-02	0.00E+00	0.00E+00	3.12E+00	3.12E+00	7.62E-04	4.36E-02	3.16E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.41E+00	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-03	1.19E-03	2.42E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	1.18E+02	1.16E+00	0.00E+00	0.00E+00	5.70E-02	5.70E-02	3.48E-02	9.97E-02	1.91E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	1.03E-01	0.00E+00	0.00E+00	0.00E+00	7.81E-04	7.81E-04	0.00E+00	8.65E-05	8.68E-04	6.80E-02	<1	6.80E-01	<1
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.62E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.20E-03	2.20E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.73E+00	4.12E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.24E-05	3.98E-03	3.99E-03				
Fluoranthene	2.43E+01	1.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.29E-05	2.05E-02	2.05E-02				
Fluorene	2.32E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.95E-03	1.95E-03				
Naphthalene	8.57E-01	5.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.74E-05	7.21E-04	7.38E-04				
Phenanthrene	2.22E+01	5.53E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E-05	1.87E-02	1.87E-02				
Total LMW PAHs						0.00E+00	9.92E-05	4.80E-02	4.81E-02	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	9.59E+00	5.75E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.73E-05	8.07E-03	8.08E-03				
Benzo[A]Pyrene	8.52E+00	1.94E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.82E-05	7.17E-03	7.23E-03				
Benzo(b)fluoranthene	1.18E+01	5.09E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-04	9.89E-03	1.00E-02				
Benzo(g,h,i)perylene	5.89E+00	7.31E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.20E-05	4.95E-03	4.98E-03				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	4.60E-06	--	4.60E-06				
Chrysene	1.28E+01	3.69E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-04	1.07E-02	1.09E-02				
Dibenz(A,H)Anthracene	2.13E+00	6.70E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E-06	1.79E-03	1.79E-03				
Indeno (1,2,3-CD) Pyrene	6.73E+00	3.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.85E-06	5.67E-03	5.68E-03				
Pyrene	1.39E+01	1.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.00E-05	1.17E-02	1.18E-02				
Total HMW PAHs						0.00E+00	4.18E-04	6.00E-02	6.04E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	7.86E-02	5.25E-03	0.00E+00	0.00E+00	1.84E-03	1.84E-03	1.58E-04	6.61E-05	2.06E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	1.36E+00	0.00E+00	0.00E+00	0.00E+00	2.29E-03	2.29E-03	0.00E+00	1.14E-03	3.43E-03	No TRV	--	No TRV	--
Di-n-butyl phthalate	8.43E-03	0.00E+00	0.00E+00	0.00E+00	1.14E-04	1.14E-04	0.00E+00	7.09E-06	1.21E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H15-10
Refined Exposure Evaluation - North American Wolverine
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	2.70E-07	0.00E+00	0.00E+00	0.00E+00	4.07E-09	4.07E-09	0.00E+00	2.27E-10	4.29E-09				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	0.00E+00	0.00E+00	4.90E-09	4.90E-09	0.00E+00	2.69E-10	5.17E-09				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	0.00E+00	0.00E+00	4.61E-08	4.61E-09	0.00E+00	2.07E-10	4.82E-09				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	0.00E+00	0.00E+00	1.98E-08	1.98E-09	0.00E+00	9.59E-11	2.08E-09				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	0.00E+00	0.00E+00	2.01E-06	2.01E-08	0.00E+00	6.42E-10	2.08E-08				
OCDD	8.91E-04	0.00E+00	0.00E+00	0.00E+00	3.00E-05	9.00E-09	0.00E+00	2.25E-10	9.22E-09				
2,3,7,8-TCDF	1.78E-06	0.00E+00	0.00E+00	0.00E+00	6.69E-09	6.69E-10	0.00E+00	1.50E-10	8.19E-10				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	0.00E+00	0.00E+00	3.57E-09	1.07E-09	0.00E+00	2.40E-10	1.31E-09				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	0.00E+00	0.00E+00	6.28E-09	6.28E-10	0.00E+00	1.40E-10	7.68E-10				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	0.00E+00	0.00E+00	2.93E-09	2.93E-10	0.00E+00	6.56E-11	3.59E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	0.00E+00	0.00E+00	2.14E-09	2.14E-10	0.00E+00	4.80E-11	2.62E-10				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	0.00E+00	0.00E+00	2.02E-08	2.02E-10	0.00E+00	4.52E-11	2.47E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	0.00E+00	0.00E+00	6.31E-08	1.89E-11	0.00E+00	4.24E-12	2.32E-11				
Total Dioxins/Furans						4.78E-08	0.00E+00	2.36E-09	5.01E-08	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H15-11
Refined Exposure Evaluation -Short-tailed Shrew
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-01	0.00E+00	1.53E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.24E-04	0.00E+00	1.24E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	6.80E+00	9.37E-04	0.00E+00	1.25E-01	0.00E+00	1.25E-01	1.26E-04	1.00E-02	1.35E-01	1.04E+00	<1	4.55E+00	<1
Barium	1.44E+02	1.73E-01	0.00E+00	1.76E+00	0.00E+00	1.76E+00	2.32E-02	2.13E-01	2.00E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	7.33E-01	2.61E-04	0.00E+00	4.42E-03	0.00E+00	4.42E-03	3.50E-05	1.08E-03	5.53E-03	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.11E-05	0.00E+00	9.11E-05	7.70E-01	<1	6.87E+00	<1
Chromium	1.13E+01	2.97E-03	0.00E+00	4.62E-01	0.00E+00	4.62E-01	3.99E-04	1.66E-02	4.79E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.38E-04	0.00E+00	2.38E-04	7.33E+00	<1	1.89E+01	<1
Copper	1.93E+02	9.09E-03	0.00E+00	1.33E+01	0.00E+00	1.33E+01	1.22E-03	2.84E-01	1.36E+01	5.60E+00	2.43E+00	8.27E+01	<1
Lead	1.42E+01	1.75E-03	0.00E+00	9.19E-01	0.00E+00	9.19E-01	2.35E-04	2.10E-02	9.40E-01	4.70E+00	<1	1.86E+02	<1
Manganese	4.83E+02	1.34E-01	0.00E+00	4.04E+00	0.00E+00	4.04E+00	1.80E-02	7.11E-01	4.77E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.96E-05	--	1.96E-05	1.41E+00	<1	1.41E+01	<1
Nickel	6.01E+01	3.96E-03	0.00E+00	6.26E+00	0.00E+00	6.26E+00	5.31E-04	8.86E-02	6.35E+00	1.70E+00	3.74E+00	1.48E+01	<1
Selenium	4.52E-01	7.23E-04	0.00E+00	6.95E-02	0.00E+00	6.95E-02	9.69E-05	6.67E-04	7.03E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.73E-01	2.54E-04	0.00E+00	1.25E-03	0.00E+00	1.25E-03	3.40E-05	2.55E-04	1.54E-03	4.80E-01	<1	1.43E+00	<1
Vanadium	2.53E+01	2.33E-03	0.00E+00	1.42E-01	0.00E+00	1.42E-01	3.13E-04	3.73E-02	1.80E-01	4.16E+00	<1	9.44E+00	<1
Zinc	5.18E+01	2.54E-02	0.00E+00	4.18E+01	0.00E+00	4.18E+01	3.40E-03	7.64E-02	4.19E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.41E+00	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.47E-03	2.08E-03	7.55E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	1.18E+02	1.16E+00	0.00E+00	1.97E+00	0.00E+00	1.97E+00	1.55E-01	1.75E-01	2.30E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	1.03E-01	0.00E+00	0.00E+00	4.03E-01	0.00E+00	4.03E-01	0.00E+00	1.52E-04	4.03E-01	6.80E-02	5.93E+00	6.80E-01	<1
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.62E+00	0.00E+00	0.00E+00	5.16E-01	0.00E+00	5.16E-01	0.00E+00	3.86E-03	5.20E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.73E+00	4.12E-04	0.00E+00	1.53E+00	0.00E+00	1.53E+00	5.51E-05	6.97E-03	1.54E+00				
Fluoranthene	2.43E+01	1.76E-03	0.00E+00	9.91E+00	0.00E+00	9.91E+00	2.36E-04	3.59E-02	9.95E+00				
Fluorene	2.32E+00	0.00E+00	0.00E+00	2.97E+00	0.00E+00	2.97E+00	0.00E+00	3.41E-03	2.97E+00				
Naphthalene	8.57E-01	5.78E-04	0.00E+00	5.05E-01	0.00E+00	5.05E-01	7.75E-05	1.26E-03	5.06E-01				
Phenanthrene	2.22E+01	5.53E-04	0.00E+00	5.13E+00	0.00E+00	5.13E+00	7.41E-05	3.28E-02	5.16E+00				
Total LMW PAHs						2.06E+01	4.43E-04	8.42E-02	2.06E+01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	9.59E+00	5.75E-04	0.00E+00	2.04E+00	0.00E+00	2.04E+00	7.71E-05	1.41E-02	2.06E+00				
Benzo[A]Pyrene	8.52E+00	1.94E-03	0.00E+00	1.52E+00	0.00E+00	1.52E+00	2.60E-04	1.26E-02	1.53E+00				
Benzo(b)fluoranthene	1.18E+01	5.09E-03	0.00E+00	4.10E+00	0.00E+00	4.10E+00	6.82E-04	1.73E-02	4.11E+00				
Benzo(g,h,i)perylene	5.89E+00	7.31E-04	0.00E+00	2.32E+00	0.00E+00	2.32E+00	9.79E-05	8.68E-03	2.33E+00				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.05E-05	--	2.05E-05				
Chrysene	1.28E+01	3.69E-03	0.00E+00	3.92E+00	0.00E+00	3.92E+00	4.94E-04	1.88E-02	3.94E+00				
Dibenz(A,H)Anthracene	2.13E+00	6.70E-05	0.00E+00	6.60E-01	0.00E+00	6.60E-01	8.98E-06	3.14E-03	6.63E-01				
Indeno (1,2,3-CD) Pyrene	6.73E+00	3.28E-04	0.00E+00	2.58E+00	0.00E+00	2.58E+00	4.39E-05	9.93E-03	2.59E+00				
Pyrene	1.39E+01	1.33E-03	0.00E+00	3.27E+00	0.00E+00	3.27E+00	1.78E-04	2.05E-02	3.29E+00				
Total HMW PAHs						2.04E+01	1.86E-03	1.05E-01	2.05E+01	6.15E-01	3.34E+01	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	7.86E-02	5.25E-03	0.00E+00	5.73E-01	0.00E+00	5.73E-01	7.04E-04	1.16E-04	5.74E-01	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	1.36E+00	0.00E+00	0.00E+00	1.27E+00	0.00E+00	1.27E+00	0.00E+00	2.00E-03	1.27E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	8.43E-03	0.00E+00	0.00E+00	1.16E-02	0.00E+00	1.16E-02	0.00E+00	1.24E-05	1.17E-02	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H15-11
Refined Exposure Evaluation -Short-tailed Shrew
Central Landfills Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	2.70E-07	0.00E+00	0.00E+00	7.90E-08	0.00E+00	7.90E-08	0.00E+00	3.98E-10	7.94E-08				
1,2,3,7,8-PeCDD	3.20E-07	0.00E+00	0.00E+00	9.65E-08	0.00E+00	9.65E-08	0.00E+00	4.72E-10	9.70E-08				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.46E-06	0.00E+00	0.00E+00	1.08E-06	0.00E+00	1.08E-07	0.00E+00	3.63E-10	1.08E-07				
1,2,3,7,8,9-HxCDD	1.14E-06	0.00E+00	0.00E+00	4.33E-07	0.00E+00	4.33E-08	0.00E+00	1.68E-10	4.35E-08				
1,2,3,4,6,7,8-HpCDD	7.63E-05	0.00E+00	0.00E+00	6.23E-05	0.00E+00	6.23E-07	0.00E+00	1.12E-09	6.24E-07				
OCDD	8.91E-04	0.00E+00	0.00E+00	1.14E-03	0.00E+00	3.41E-07	0.00E+00	3.94E-10	3.42E-07				
2,3,7,8-TCDF	1.78E-06	0.00E+00	0.00E+00	7.34E-07	0.00E+00	7.34E-08	0.00E+00	2.62E-10	7.36E-08				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	9.50E-07	0.00E+00	0.00E+00	3.49E-07	0.00E+00	1.05E-07	0.00E+00	4.20E-10	1.05E-07				
1,2,3,4,7,8-HxCDF	1.67E-06	0.00E+00	0.00E+00	6.80E-07	0.00E+00	6.80E-08	0.00E+00	2.46E-10	6.83E-08				
1,2,3,6,7,8-HxCDF	7.80E-07	0.00E+00	0.00E+00	2.77E-07	0.00E+00	2.77E-08	0.00E+00	1.15E-10	2.78E-08				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	5.70E-07	0.00E+00	0.00E+00	1.91E-07	0.00E+00	1.91E-08	0.00E+00	8.40E-11	1.92E-08				
1,2,3,4,6,7,8-HpCDF	5.37E-06	0.00E+00	0.00E+00	2.71E-06	0.00E+00	2.71E-08	0.00E+00	7.92E-11	2.71E-08				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.68E-05	0.00E+00	0.00E+00	1.04E-05	0.00E+00	3.13E-09	0.00E+00	7.43E-12	3.13E-09				
Total Dioxins/Furans						1.61E-06	0.00E+00	4.13E-09	1.62E-06	5.62E-07	2.88E+00	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H16-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Industrial Landfills Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	2.80E+00	Regression[a]	1.04E-01	USEPA (2007)	1.00E+00	2.80E+00	Assumption[c]	5.00E-02	1.40E-01	Baes et al. (1984)[e]
Arsenic	NA	2.18E+01	3.75E-02	8.17E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	2.12E+00	Sample et al. (1999)	Regression[f]	9.78E-02	Sample et al. (1998b)
Barium	NA	2.21E+02	1.56E-01	3.45E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	2.02E+01	Sample et al. (1998a)	6.83E-04	1.51E-01	Baes et al. (1984)[e]
Beryllium	NA	6.49E+00	Regression[a]	2.31E+00	USEPA (2007)	4.50E-02	2.92E-01	Sample et al. (1998a)	2.25E-03	1.46E-02	Baes et al. (1984)[e]
Cadmium	NA	9.40E-01	Regression[a]	6.01E-01	Bechtel-Jacobs (1998a)	Regression[d]	7.88E+00	Sample et al. (1999)	Regression[f]	2.76E-01	Sample et al. (1998b)
Chromium	NA	3.58E+01	4.10E-02	1.47E+00	Bechtel-Jacobs (1998a)[g]	3.06E-01	1.09E+01	Sample et al. (1998a)	Regression[f]	3.21E+00	Sample et al. (1998b)
Cobalt	NA	1.09E+01	7.50E-03	8.20E-02	Bechtel-Jacobs (1998a)[g]	1.22E-01	1.33E+00	Sample et al. (1998a)	Regression[f]	2.62E-01	Sample et al. (1998b)
Copper	NA	5.06E+01	Regression[a]	9.15E+00	Bechtel-Jacobs (1998a)	5.15E-01	2.61E+01	Sample et al. (1998a)	Regression[f]	1.36E+01	Sample et al. (1998b)
Lead	NA	1.67E+01	Regression[a]	1.29E+00	Bechtel-Jacobs (1998a)	Regression[d]	7.81E+00	Sample et al. (1999)	Regression[f]	3.75E+00	Sample et al. (1998b)
Manganese	NA	0.00E+00	7.90E-02	0.00E+00	Bechtel-Jacobs (1998a)[g]	Regression[d]	0.00E+00	Sample et al. (1999)	2.05E-02	0.00E+00	Sample et al. (1998b)[i]
Mercury	NA	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	4.18E+02	Regression[a]	9.89E+00	Bechtel-Jacobs (1998a)	7.78E-01	3.25E+02	Sample et al. (1998a)	Regression[f]	1.30E+01	Sample et al. (1998b)
Selenium	NA	7.50E-01	Regression[a]	3.70E-01	Bechtel-Jacobs (1998a)	Regression[d]	7.51E-01	Sample et al. (1998a)	Regression[f]	5.92E-01	Sample et al. (1998b)
Silver		ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	1.70E-01	4.00E-03	6.80E-04	Baes et al. (1984)	5.41E-02	9.20E-03	USCHPPM (2004)	1.08E-01	1.84E-02	Baes et al. (1984)[e]
Vanadium	NA	1.53E+02	4.85E-03	7.43E-01	Bechtel-Jacobs (1998a)[g]	4.20E-02	6.43E+00	Sample et al. (1998a)	1.23E-02	1.88E+00	Sample et al. (1998b)[i]
Zinc	NA	6.50E+01	Regression[a]	4.88E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.36E+02	Sample et al. (1998a)	Regression[f]	1.05E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	1.90E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	3.58E+02	6.00E-02	2.15E+01	Baes et al. (1984)	1.24E-01	4.43E+01	USCHPPM (2004)	1.60E-02	5.72E+00	LANL (2015)
Polychlorinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	2.77E+00	Regression[a]	1.61E-03	USEPA (2007a)	1.47E+00	4.07E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	6.73E+01	5.00E-01	3.37E+01	USEPA (2007a)	3.04E+00	2.05E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluorene	4.18	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	1.64E+00	1.22E+01	2.00E+01	USEPA (2007a)	4.40E+00	7.22E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Phenanthrene	4.55	3.65E+01	Regression[a]	7.88E+00	USEPA (2007a)	1.72E+00	6.27E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
LMW PAHs											

Table H16-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Industrial Landfills Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	4.17E+01	Regression[a]	6.13E-01	USEPA (2007a)	1.59E+00	6.64E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	5.13E+01	Regression[a]	5.92E+00	USEPA (2007a)	1.33E+00	6.83E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	5.74E+01	3.10E-01	1.78E+01	USEPA (2007a)	2.60E+00	1.49E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	4.28E+01	Regression[a]	3.35E+01	USEPA (2007a)	2.94E+00	1.26E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	4.90E+01	Regression[a]	6.74E-01	USEPA (2007a)	2.29E+00	1.12E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	6.36E+01	7.20E-01	4.58E+01	USEPA (2007a)	1.75E+00	1.11E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
HMW PAHs											
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	ND	2.38E-02	0	USEPA (2007a)	5.44E+01	0	USEPA (2007a)	7.79E-01	0	LANL (2015)
Butylbenzylphthalate	4.84	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	ND	8.14E-01	0	USEPA (2007a)	1.03E+01	0	USEPA (2007a)	4.49E-01	0	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)

Table H16-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Industrial Landfills Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H16-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Industrial Landfills Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H16-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Industrial Landfills Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	2.88E+00	Regression[a]	1.06E-01	USEPA (2007)	1.00E+00	2.88E+00	Assumption[c]	5.00E-02	1.44E-01	Baes et al. (1984)[e]
Arsenic	NA	2.14E+01	3.75E-02	8.05E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	2.10E+00	Sample et al. (1999)	Regression[f]	9.66E-02	Sample et al. (1998b)
Barium	NA	1.83E+02	1.56E-01	2.86E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	1.67E+01	Sample et al. (1998a)	6.83E-04	1.25E-01	Baes et al. (1984)[e]
Beryllium	NA	6.93E+00	Regression[a]	2.42E+00	USEPA (2007)	4.50E-02	3.12E-01	Sample et al. (1998a)	2.25E-03	1.56E-02	Baes et al. (1984)[e]
Cadmium	NA	1.17E+00	Regression[a]	6.77E-01	Bechtel-Jacobs (1998a)	Regression[d]	9.37E+00	Sample et al. (1999)	Regression[f]	3.06E-01	Sample et al. (1998b)
Chromium	NA	2.27E+01	4.10E-02	9.29E-01	Bechtel-Jacobs (1998a)[g]	3.06E-01	6.93E+00	Sample et al. (1998a)	Regression[f]	2.29E+00	Sample et al. (1998b)
Cobalt	NA	1.09E+01	7.50E-03	8.17E-02	Bechtel-Jacobs (1998a)[g]	1.22E-01	1.33E+00	Sample et al. (1998a)	Regression[f]	2.60E-01	Sample et al. (1998b)
Copper	NA	5.34E+02	Regression[a]	2.32E+01	Bechtel-Jacobs (1998a)	5.15E-01	2.75E+02	Sample et al. (1998a)	Regression[f]	1.91E+01	Sample et al. (1998b)
Lead	NA	1.58E+01	Regression[a]	1.25E+00	Bechtel-Jacobs (1998a)	Regression[d]	7.48E+00	Sample et al. (1999)	Regression[f]	3.66E+00	Sample et al. (1998b)
Manganese	NA	0.00E+00	7.90E-02	0.00E+00	Bechtel-Jacobs (1998a)[g]	Regression[d]	0.00E+00	Sample et al. (1999)	2.05E-02	0.00E+00	Sample et al. (1998b)[i]
Mercury	NA	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	4.52E+02	Regression[a]	1.05E+01	Bechtel-Jacobs (1998a)	7.78E-01	3.52E+02	Sample et al. (1998a)	Regression[f]	1.35E+01	Sample et al. (1998b)
Selenium	NA	4.80E-01	Regression[a]	2.26E-01	Bechtel-Jacobs (1998a)	Regression[d]	5.42E-01	Sample et al. (1998a)	Regression[f]	5.01E-01	Sample et al. (1998b)
Silver		ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	1.85E-01	4.00E-03	7.40E-04	Baes et al. (1984)	5.41E-02	1.00E-02	USCHPPM (2004)	1.08E-01	2.00E-02	Baes et al. (1984)[e]
Vanadium	NA	1.51E+02	4.85E-03	7.30E-01	Bechtel-Jacobs (1998a)[g]	4.20E-02	6.32E+00	Sample et al. (1998a)	1.23E-02	1.85E+00	Sample et al. (1998b)[i]
Zinc	NA	5.65E+01	Regression[a]	4.51E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.21E+02	Sample et al. (1998a)	Regression[f]	1.04E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	1.73E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	5.13E+02	6.00E-02	3.08E+01	Baes et al. (1984)	1.24E-01	6.36E+01	USCHPPM (2004)	1.60E-02	8.21E+00	LANL (2015)
Polychlorinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	1.06E+00	Regression[a]	3.66E-03	USEPA (2007a)	1.47E+00	1.55E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	1.64E+01	5.00E-01	8.19E+00	USEPA (2007a)	3.04E+00	4.98E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluorene	4.18	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	5.04E-01	1.22E+01	6.15E+00	USEPA (2007a)	4.40E+00	2.22E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Phenanthrene	4.55	7.86E+00	Regression[a]	3.04E+00	USEPA (2007a)	1.72E+00	1.35E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
LMW PAHs											

Table H16-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Industrial Landfills Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	1.11E+01	Regression[a]	2.79E-01	USEPA (2007a)	1.59E+00	1.76E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	1.40E+01	Regression[a]	1.66E+00	USEPA (2007a)	1.33E+00	1.86E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	1.55E+01	3.10E-01	4.80E+00	USEPA (2007a)	2.60E+00	4.03E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	1.36E+01	Regression[a]	8.67E+00	USEPA (2007a)	2.94E+00	4.01E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	1.28E+01	Regression[a]	3.03E-01	USEPA (2007a)	2.29E+00	2.92E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	1.61E+01	7.20E-01	1.16E+01	USEPA (2007a)	1.75E+00	2.83E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
HMW PAHs											
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	ND	2.38E-02	0	USEPA (2007a)	5.44E+01	0	USEPA (2007a)	7.79E-01	0	LANL (2015)
Butylbenzylphthalate	4.84	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	ND	8.14E-01	0	USEPA (2007a)	1.03E+01	0	USEPA (2007a)	4.49E-01	0	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H16-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Industrial Landfills Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H16-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Industrial Landfills Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H16-2
Refined Exposure Evaluation - American Woodcock
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-01	0.00E+00	1.34E-01	1.10E+02	<1	1.10E+03	<1
Antimony	2.80E+00	9.28E-04	1.22E-03	2.96E-01	0.00E+00	2.97E-01	1.09E-04	2.47E-02	3.22E-01	No TRV	--	No TRV	--
Arsenic	2.18E+01	9.37E-04	9.59E-03	2.25E-01	0.00E+00	2.34E-01	1.10E-04	1.92E-01	4.26E-01	2.24E+00	<1	4.51E+00	<1
Barium	2.21E+02	1.73E-01	4.06E-01	2.13E+00	0.00E+00	2.54E+00	2.03E-02	1.95E+00	4.51E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	6.49E+00	2.61E-04	2.72E-02	3.09E-02	0.00E+00	5.81E-02	3.07E-05	5.72E-02	1.15E-01	No TRV	--	No TRV	--
Cadmium	9.40E-01	6.80E-04	7.06E-03	8.34E-01	0.00E+00	8.41E-01	7.99E-05	8.28E-03	8.49E-01	1.47E+00	<1	6.35E+00	<1
Chromium	3.58E+01	2.97E-03	1.72E-02	1.16E+00	0.00E+00	1.17E+00	3.49E-04	3.15E-01	1.49E+00	2.66E+00	<1	1.56E+01	<1
Cobalt	1.09E+01	1.78E-03	9.64E-04	1.41E-01	0.00E+00	1.42E-01	2.09E-04	9.64E-02	2.39E-01	7.61E+00	<1	2.02E+01	<1
Copper	5.06E+01	9.09E-03	1.08E-01	2.76E+00	0.00E+00	2.86E+00	1.07E-03	4.46E-01	3.31E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.67E+01	1.75E-03	1.51E-02	8.25E-01	0.00E+00	8.40E-01	2.06E-04	1.47E-01	9.88E-01	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.58E-02	0.00E+00	1.58E-02	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.72E-05	--	1.72E-05	4.50E-01	<1	9.10E-01	<1
Nickel	4.18E+02	3.96E-03	1.16E-01	3.44E+01	0.00E+00	3.45E+01	4.65E-04	3.68E+00	3.82E+01	6.71E+00	5.69E+00	1.86E+01	2.05E+00
Selenium	7.50E-01	7.23E-04	4.35E-03	7.94E-02	0.00E+00	8.38E-02	8.49E-05	6.61E-03	9.05E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.70E-01	2.54E-04	7.99E-06	9.72E-04	0.00E+00	9.80E-04	2.98E-05	1.50E-03	2.51E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	1.53E+02	2.33E-03	8.73E-03	6.80E-01	0.00E+00	6.89E-01	2.74E-04	1.35E+00	2.04E+00	3.44E-01	5.93E+00	1.70E+00	1.20E+00
Zinc	6.50E+01	2.54E-02	5.73E-01	3.56E+01	0.00E+00	3.61E+01	2.98E-03	5.72E-01	3.67E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.90E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-03	1.67E-03	6.47E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	3.58E+02	1.16E+00	2.52E-01	4.69E+00	0.00E+00	4.94E+00	1.36E-01	3.15E+00	8.23E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.77E+00	0.00E+00	1.89E-05	4.30E-01	0.00E+00	4.30E-01	0.00E+00	2.44E-02	4.54E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	4.83E-05	--	4.83E-05				
Fluoranthene	6.73E+01	1.76E-03	3.95E-01	2.16E+01	0.00E+00	2.20E+01	2.07E-04	5.93E-01	2.26E+01				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	1.64E+00	5.78E-04	2.35E-01	7.63E-01	0.00E+00	9.98E-01	6.79E-05	1.44E-02	1.01E+00				
Phenanthrene	3.65E+01	5.53E-04	9.26E-02	6.63E+00	0.00E+00	6.73E+00	6.50E-05	3.21E-01	7.05E+00				
Total LMW PAHs						3.02E+01	3.88E-04	9.53E-01	3.11E+01	1.61E+01	1.93E+00	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.17E+01	5.75E-04	7.20E-03	7.02E+00	0.00E+00	7.03E+00	6.76E-05	3.68E-01	7.39E+00				
Benzo[A]Pyrene	5.13E+01	1.94E-03	6.95E-02	7.22E+00	0.00E+00	7.29E+00	2.28E-04	4.52E-01	7.74E+00				
Benzo(b)fluoranthene	5.74E+01	5.09E-03	2.09E-01	1.58E+01	0.00E+00	1.60E+01	5.98E-04	5.06E-01	1.65E+01				
Benzo(g,h,i)perylene	4.28E+01	7.31E-04	3.94E-01	1.33E+01	0.00E+00	1.37E+01	8.58E-05	3.77E-01	1.41E+01				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.80E-05	--	1.80E-05				
Chrysene	4.90E+01	3.69E-03	7.92E-03	1.19E+01	0.00E+00	1.19E+01	4.33E-04	4.32E-01	1.23E+01				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	7.87E-06	--	7.87E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	3.85E-05	--	3.85E-05				
Pyrene	6.36E+01	1.33E-03	5.38E-01	1.18E+01	0.00E+00	1.23E+01	1.56E-04	5.61E-01	1.29E+01				
Total HMW PAHs						6.82E+01	1.63E-03	2.70E+00	7.09E+01	2.00E+00	3.54E+01	2.00E+01	3.54E+00
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	6.17E-04	--	6.17E-04	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	ND	--	--	--	0.00E+00	--	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H16-2
Refined Exposure Evaluation - American Woodcock
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

Table H16-3
Refined Exposure Evaluation - Mourning Dove
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-01	0.00E+00	1.30E-01	1.10E+02	<1	1.10E+03	<1
Antimony	2.80E+00	9.28E-04	1.18E-02	0.00E+00	0.00E+00	1.18E-02	1.06E-04	2.17E-02	3.37E-02	No TRV	--	No TRV	--
Arsenic	2.18E+01	9.37E-04	9.32E-02	0.00E+00	0.00E+00	9.32E-02	1.07E-04	1.69E-01	2.62E-01	2.24E+00	<1	4.51E+00	<1
Barium	2.21E+02	1.73E-01	3.94E+00	0.00E+00	0.00E+00	3.94E+00	1.97E-02	1.72E+00	5.68E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	6.49E+00	2.61E-04	2.64E-01	0.00E+00	0.00E+00	2.64E-01	2.98E-05	5.04E-02	3.14E-01	No TRV	--	No TRV	--
Cadmium	9.40E-01	6.80E-04	6.86E-02	0.00E+00	0.00E+00	6.86E-02	7.76E-05	7.30E-03	7.60E-02	1.47E+00	<1	6.35E+00	<1
Chromium	3.58E+01	2.97E-03	1.67E-01	0.00E+00	0.00E+00	1.67E-01	3.39E-04	2.78E-01	4.45E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	1.09E+01	1.78E-03	9.36E-03	0.00E+00	0.00E+00	9.36E-03	2.03E-04	8.49E-02	9.45E-02	7.61E+00	<1	2.02E+01	<1
Copper	5.06E+01	9.09E-03	1.04E+00	0.00E+00	0.00E+00	1.04E+00	1.04E-03	3.93E-01	1.44E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.67E+01	1.75E-03	1.47E-01	0.00E+00	0.00E+00	1.47E-01	2.00E-04	1.30E-01	2.77E-01	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-02	0.00E+00	1.53E-02	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.67E-05	--	1.67E-05	4.50E-01	<1	9.10E-01	<1
Nickel	4.18E+02	3.96E-03	1.13E+00	0.00E+00	0.00E+00	1.13E+00	4.52E-04	3.24E+00	4.37E+00	6.71E+00	<1	1.86E+01	<1
Selenium	7.50E-01	7.23E-04	4.22E-02	0.00E+00	0.00E+00	4.22E-02	8.25E-05	5.82E-03	4.81E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.70E-01	2.54E-04	7.76E-05	0.00E+00	0.00E+00	7.76E-05	2.90E-05	1.32E-03	1.43E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	1.53E+02	2.33E-03	8.48E-02	0.00E+00	0.00E+00	8.48E-02	2.66E-04	1.19E+00	1.27E+00	3.44E-01	3.70E+00	1.70E+00	<1
Zinc	6.50E+01	2.54E-02	5.57E+00	0.00E+00	0.00E+00	5.57E+00	2.89E-03	5.04E-01	6.07E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.90E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E-03	1.47E-03	6.13E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	3.58E+02	1.16E+00	2.45E+00	0.00E+00	0.00E+00	2.45E+00	1.32E-01	2.78E+00	5.36E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.77E+00	0.00E+00	1.84E-04	0.00E+00	0.00E+00	1.84E-04	0.00E+00	2.15E-02	2.17E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	4.70E-05	--	4.70E-05				
Fluoranthene	6.73E+01	1.76E-03	3.84E+00	0.00E+00	0.00E+00	3.84E+00	2.01E-04	5.22E-01	4.36E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	1.64E+00	5.78E-04	2.28E+00	0.00E+00	0.00E+00	2.28E+00	6.60E-05	1.27E-02	2.30E+00				
Phenanthrene	3.65E+01	5.53E-04	9.00E-01	0.00E+00	0.00E+00	9.00E-01	6.31E-05	2.83E-01	1.18E+00				
Total LMW PAHs						7.02E+00	3.77E-04	8.40E-01	7.86E+00	1.61E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.17E+01	5.75E-04	6.99E-02	0.00E+00	0.00E+00	6.99E-02	6.56E-05	3.24E-01	3.94E-01				
Benzo[A]Pyrene	5.13E+01	1.94E-03	6.76E-01	0.00E+00	0.00E+00	6.76E-01	2.21E-04	3.98E-01	1.07E+00				
Benzo(b)fluoranthene	5.74E+01	5.09E-03	2.03E+00	0.00E+00	0.00E+00	2.03E+00	5.81E-04	4.46E-01	2.48E+00				
Benzo(g,h,i)perylene	4.28E+01	7.31E-04	3.82E+00	0.00E+00	0.00E+00	3.82E+00	8.34E-05	3.32E-01	4.16E+00				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.75E-05	--	1.75E-05				
Chrysene	4.90E+01	3.69E-03	7.69E-02	0.00E+00	0.00E+00	7.69E-02	4.21E-04	3.80E-01	4.58E-01				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	7.65E-06	--	7.65E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	3.74E-05	--	3.74E-05				
Pyrene	6.36E+01	1.33E-03	5.23E+00	0.00E+00	0.00E+00	5.23E+00	1.52E-04	4.94E-01	5.72E+00				
Total HMW PAHs						1.19E+01	1.59E-03	2.37E+00	1.43E+01	2.00E+00	7.14E+00	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	5.99E-04	--	5.99E-04	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H16-3
Refined Exposure Evaluation - Mourning Dove
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H16-4
Refined Exposure Evaluation - Red-tailed Hawk
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.36E-02	0.00E+00	9.36E-02	1.10E+02	<1	1.10E+03	<1
Antimony	2.80E+00	9.28E-04	0.00E+00	0.00E+00	1.15E-02	1.15E-02	7.61E-05	5.97E-03	1.75E-02	No TRV	--	No TRV	--
Arsenic	2.18E+01	9.37E-04	0.00E+00	0.00E+00	8.02E-03	8.02E-03	7.68E-05	4.64E-02	5.45E-02	2.24E+00	<1	4.51E+00	<1
Barium	2.21E+02	1.73E-01	0.00E+00	0.00E+00	1.24E-02	1.24E-02	1.42E-02	4.72E-01	4.99E-01	7.35E+01	<1	1.31E+02	<1
Beryllium	6.49E+00	2.61E-04	0.00E+00	0.00E+00	1.20E-03	1.20E-03	2.14E-05	1.38E-02	1.51E-02	No TRV	--	No TRV	--
Cadmium	9.40E-01	6.80E-04	0.00E+00	0.00E+00	2.27E-02	2.27E-02	5.58E-05	2.00E-03	2.47E-02	1.47E+00	<1	6.35E+00	<1
Chromium	3.58E+01	2.97E-03	0.00E+00	0.00E+00	2.63E-01	2.63E-01	2.44E-04	7.62E-02	3.39E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	1.09E+01	1.78E-03	0.00E+00	0.00E+00	2.15E-02	2.15E-02	1.46E-04	2.33E-02	4.49E-02	7.61E+00	<1	2.02E+01	<1
Copper	5.06E+01	9.09E-03	0.00E+00	0.00E+00	1.11E+00	1.11E+00	7.45E-04	1.08E-01	1.22E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.67E+01	1.75E-03	0.00E+00	0.00E+00	3.07E-01	3.07E-01	1.44E-04	3.56E-02	3.43E-01	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-02	0.00E+00	1.10E-02	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.20E-05	--	1.20E-05	4.50E-01	<1	9.10E-01	<1
Nickel	4.18E+02	3.96E-03	0.00E+00	0.00E+00	1.07E+00	1.07E+00	3.25E-04	8.91E-01	1.96E+00	6.71E+00	<1	1.86E+01	<1
Selenium	7.50E-01	7.23E-04	0.00E+00	0.00E+00	4.86E-02	4.86E-02	5.93E-05	1.60E-03	5.02E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.70E-01	2.54E-04	0.00E+00	0.00E+00	1.51E-03	1.51E-03	2.08E-05	3.62E-04	1.89E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	1.53E+02	2.33E-03	0.00E+00	0.00E+00	1.55E-01	1.55E-01	1.91E-04	3.27E-01	4.81E-01	3.44E-01	1.40E+00	1.70E+00	<1
Zinc	6.50E+01	2.54E-02	0.00E+00	0.00E+00	8.64E+00	8.64E+00	2.08E-03	1.38E-01	8.79E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.90E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-03	4.05E-04	3.75E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	3.58E+02	1.16E+00	0.00E+00	0.00E+00	4.69E-01	4.69E-01	9.49E-02	7.62E-01	1.33E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.77E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-03	5.90E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	3.37E-05	--	3.37E-05				
Fluoranthene	6.73E+01	1.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.44E-04	1.44E-01	1.44E-01				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	1.64E+00	5.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.74E-05	3.50E-03	3.54E-03				
Phenanthrene	3.65E+01	5.53E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.54E-05	7.78E-02	7.78E-02				
Total LMW PAHs						0.00E+00	2.71E-04	2.31E-01	2.31E-01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.17E+01	5.75E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.72E-05	8.90E-02	8.91E-02				
Benzo[A]Pyrene	5.13E+01	1.94E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-04	1.09E-01	1.10E-01				
Benzo(b)fluoranthene	5.74E+01	5.09E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-04	1.22E-01	1.23E-01				
Benzo(g,h,i)perylene	4.28E+01	7.31E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.99E-05	9.12E-02	9.13E-02				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.26E-05	--	1.26E-05				
Chrysene	4.90E+01	3.69E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.02E-04	1.05E-01	1.05E-01				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	5.49E-06	--	5.49E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	2.69E-05	--	2.69E-05				
Pyrene	6.36E+01	1.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.09E-04	1.36E-01	1.36E-01				
Total HMW PAHs						0.00E+00	1.14E-03	6.52E-01	6.53E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	4.31E-04	--	4.31E-04	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H16-4
Refined Exposure Evaluation - Red-tailed Hawk
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H16-5
Refined Exposure Evaluation - Yellow-billed Cuckoo
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.81E-01	0.00E+00	1.81E-01	1.10E+02	<1	1.10E+03	<1
Antimony	2.80E+00	9.28E-04	0.00E+00	4.43E-01	0.00E+00	4.43E-01	1.47E-04	0.00E+00	4.43E-01	No TRV	--	No TRV	--
Arsenic	2.18E+01	9.37E-04	0.00E+00	3.36E-01	0.00E+00	3.36E-01	1.48E-04	0.00E+00	3.37E-01	2.24E+00	<1	4.51E+00	<1
Barium	2.21E+02	1.73E-01	0.00E+00	3.19E+00	0.00E+00	3.19E+00	2.74E-02	0.00E+00	3.22E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	6.49E+00	2.61E-04	0.00E+00	4.63E-02	0.00E+00	4.63E-02	4.13E-05	0.00E+00	4.63E-02	No TRV	--	No TRV	--
Cadmium	9.40E-01	6.80E-04	0.00E+00	1.25E+00	0.00E+00	1.25E+00	1.08E-04	0.00E+00	1.25E+00	1.47E+00	<1	6.35E+00	<1
Chromium	3.58E+01	2.97E-03	0.00E+00	1.73E+00	0.00E+00	1.73E+00	4.71E-04	0.00E+00	1.73E+00	2.66E+00	<1	1.56E+01	<1
Cobalt	1.09E+01	1.78E-03	0.00E+00	2.11E-01	0.00E+00	2.11E-01	2.82E-04	0.00E+00	2.12E-01	7.61E+00	<1	2.02E+01	<1
Copper	5.06E+01	9.09E-03	0.00E+00	4.13E+00	0.00E+00	4.13E+00	1.44E-03	0.00E+00	4.13E+00	4.05E+00	1.02E+00	3.48E+01	<1
Lead	1.67E+01	1.75E-03	0.00E+00	1.24E+00	0.00E+00	1.24E+00	2.77E-04	0.00E+00	1.24E+00	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.13E-02	0.00E+00	2.13E-02	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	2.31E-05	--	2.31E-05	4.50E-01	<1	9.10E-01	<1
Nickel	4.18E+02	3.96E-03	0.00E+00	5.15E+01	0.00E+00	5.15E+01	6.27E-04	0.00E+00	5.15E+01	6.71E+00	7.67E+00	1.86E+01	2.77E+00
Selenium	7.50E-01	7.23E-04	0.00E+00	1.19E-01	0.00E+00	1.19E-01	1.14E-04	0.00E+00	1.19E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.70E-01	2.54E-04	0.00E+00	1.46E-03	0.00E+00	1.46E-03	4.02E-05	0.00E+00	1.50E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	1.53E+02	2.33E-03	0.00E+00	1.02E+00	0.00E+00	1.02E+00	3.70E-04	0.00E+00	1.02E+00	3.44E-01	2.96E+00	1.70E+00	<1
Zinc	6.50E+01	2.54E-02	0.00E+00	5.32E+01	0.00E+00	5.32E+01	4.01E-03	0.00E+00	5.32E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.90E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.46E-03	0.00E+00	6.46E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	3.58E+02	1.16E+00	0.00E+00	7.02E+00	0.00E+00	7.02E+00	1.83E-01	0.00E+00	7.20E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.77E+00	0.00E+00	0.00E+00	6.44E-01	0.00E+00	6.44E-01	0.00E+00	0.00E+00	6.44E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	6.52E-05	--	6.52E-05				
Fluoranthene	6.73E+01	1.76E-03	0.00E+00	3.24E+01	0.00E+00	3.24E+01	2.79E-04	0.00E+00	3.24E+01				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	1.64E+00	5.78E-04	0.00E+00	1.14E+00	0.00E+00	1.14E+00	9.15E-05	0.00E+00	1.14E+00				
Phenanthrene	3.65E+01	5.53E-04	0.00E+00	9.93E+00	0.00E+00	9.93E+00	8.76E-05	0.00E+00	9.93E+00				
Total LMW PAHs						4.41E+01	5.23E-04	0.00E+00	4.41E+01	1.61E+01	2.74E+00	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.17E+01	5.75E-04	0.00E+00	1.05E+01	0.00E+00	1.05E+01	9.11E-05	0.00E+00	1.05E+01				
Benzo[A]Pyrene	5.13E+01	1.94E-03	0.00E+00	1.08E+01	0.00E+00	1.08E+01	3.07E-04	0.00E+00	1.08E+01				
Benzo(b)fluoranthene	5.74E+01	5.09E-03	0.00E+00	2.36E+01	0.00E+00	2.36E+01	8.06E-04	0.00E+00	2.37E+01				
Benzo(g,h,i)perylene	4.28E+01	7.31E-04	0.00E+00	1.99E+01	0.00E+00	1.99E+01	1.16E-04	0.00E+00	1.99E+01				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.43E-05	--	2.43E-05				
Chrysene	4.90E+01	3.69E-03	0.00E+00	1.78E+01	0.00E+00	1.78E+01	5.84E-04	0.00E+00	1.78E+01				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	1.06E-05	--	1.06E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	5.19E-05	--	5.19E-05				
Pyrene	6.36E+01	1.33E-03	0.00E+00	1.76E+01	0.00E+00	1.76E+01	2.11E-04	0.00E+00	1.76E+01				
Total HMW PAHs						1.00E+02	2.20E-03	0.00E+00	1.00E+02	2.00E+00	5.01E+01	2.00E+01	5.01E+00
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	8.31E-04	--	8.31E-04	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H16-5
Refined Exposure Evaluation - Yellow-billed Cuckoo
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H16-6
Refined Exposure Evaluation - Canada Lynx
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.57E-02	0.00E+00	3.57E-02	No TRV	--	No TRV	--
Antimony	2.80E+00	9.28E-04	0.00E+00	0.00E+00	4.37E-03	4.37E-03	2.90E-05	2.45E-03	6.85E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	2.18E+01	9.37E-04	0.00E+00	0.00E+00	3.06E-03	3.06E-03	2.93E-05	1.90E-02	2.21E-02	1.04E+00	<1	4.55E+00	<1
Barium	2.21E+02	1.73E-01	0.00E+00	0.00E+00	4.72E-03	4.72E-03	5.40E-03	1.94E-01	2.04E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	6.49E+00	2.61E-04	0.00E+00	0.00E+00	4.56E-04	4.56E-04	8.15E-06	5.68E-03	6.15E-03	5.32E-01	<1	6.70E-01	<1
Cadmium	9.40E-01	6.80E-04	0.00E+00	0.00E+00	8.63E-03	8.63E-03	2.12E-05	8.22E-04	9.48E-03	7.70E-01	<1	6.87E+00	<1
Chromium	3.58E+01	2.97E-03	0.00E+00	0.00E+00	1.00E-01	1.00E-01	9.29E-05	3.13E-02	1.32E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	1.09E+01	1.78E-03	0.00E+00	0.00E+00	8.18E-03	8.18E-03	5.56E-05	9.57E-03	1.78E-02	7.33E+00	<1	1.89E+01	<1
Copper	5.06E+01	9.09E-03	0.00E+00	0.00E+00	4.24E-01	4.24E-01	2.84E-04	4.43E-02	4.69E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.67E+01	1.75E-03	0.00E+00	0.00E+00	1.17E-01	1.17E-01	5.47E-05	1.46E-02	1.32E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.20E-03	0.00E+00	4.20E-03	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	4.56E-06	--	4.56E-06	1.41E+00	<1	1.41E+01	<1
Nickel	4.18E+02	3.96E-03	0.00E+00	0.00E+00	4.06E-01	4.06E-01	1.24E-04	3.66E-01	7.72E-01	1.70E+00	<1	1.48E+01	<1
Selenium	7.50E-01	7.23E-04	0.00E+00	0.00E+00	1.85E-02	1.85E-02	2.26E-05	6.56E-04	1.92E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.70E-01	2.54E-04	0.00E+00	0.00E+00	5.75E-04	5.75E-04	7.94E-06	1.49E-04	7.31E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.53E+02	2.33E-03	0.00E+00	0.00E+00	5.89E-02	5.89E-02	7.29E-05	1.34E-01	1.93E-01	4.16E+00	<1	9.44E+00	<1
Zinc	6.50E+01	2.54E-02	0.00E+00	0.00E+00	3.29E+00	3.29E+00	7.92E-04	5.68E-02	3.35E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.90E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-03	1.66E-04	1.44E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	3.58E+02	1.16E+00	0.00E+00	0.00E+00	1.79E-01	1.79E-01	3.62E-02	3.13E-01	5.28E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.77E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.42E-03	2.42E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	1.29E-05	--	1.29E-05				
Fluoranthene	6.73E+01	1.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E-05	5.89E-02	5.89E-02				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	1.64E+00	5.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.81E-05	1.43E-03	1.45E-03				
Phenanthrene	3.65E+01	5.53E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.73E-05	3.19E-02	3.19E-02				
Total LMW PAHs						0.00E+00	1.03E-04	9.46E-02	9.47E-02	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.17E+01	5.75E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-05	3.65E-02	3.65E-02				
Benzo[A]Pyrene	5.13E+01	1.94E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.06E-05	4.49E-02	4.50E-02				
Benzo(b)fluoranthene	5.74E+01	5.09E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-04	5.03E-02	5.04E-02				
Benzo(g,h,i)perylene	4.28E+01	7.31E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.28E-05	3.74E-02	3.75E-02				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	4.79E-06	--	4.79E-06				
Chrysene	4.90E+01	3.69E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-04	4.29E-02	4.30E-02				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	2.09E-06	--	2.09E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	1.02E-05	--	1.02E-05				
Pyrene	6.36E+01	1.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.16E-05	5.57E-02	5.57E-02				
Total HMW PAHs						0.00E+00	4.34E-04	2.68E-01	2.68E-01	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	1.64E-04	--	1.64E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H16-6
Refined Exposure Evaluation - Canada Lynx
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H16-7
Refined Exposure Evaluation - Grizzly Bear
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate						
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.47E-02	0.00E+00	2.47E-02	No TRV	--	No TRV	--
Antimony	2.80E+00	9.28E-04	1.45E-03	9.07E-03	3.02E-04	0.00E+00	1.08E-02	2.00E-05	1.69E-03	1.25E-02	5.90E-02	<1	2.76E+00	<1
Arsenic	2.18E+01	9.37E-04	1.15E-02	6.88E-03	2.11E-04	0.00E+00	1.86E-02	2.02E-05	1.32E-02	3.17E-02	1.04E+00	<1	4.55E+00	<1
Barium	2.21E+02	1.73E-01	4.85E-01	6.53E-02	3.26E-04	0.00E+00	5.50E-01	3.73E-03	1.34E-01	6.88E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	6.49E+00	2.61E-04	3.24E-02	9.47E-04	3.16E-05	0.00E+00	3.34E-02	5.64E-06	3.93E-03	3.74E-02	5.32E-01	<1	6.70E-01	<1
Cadmium	9.40E-01	6.80E-04	8.44E-03	2.55E-02	5.97E-04	0.00E+00	3.46E-02	1.47E-05	5.68E-04	3.52E-02	7.70E-01	<1	6.87E+00	<1
Chromium	3.58E+01	2.97E-03	2.06E-02	3.54E-02	6.92E-03	0.00E+00	6.29E-02	6.42E-05	2.16E-02	8.46E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	1.09E+01	1.78E-03	1.15E-03	4.32E-03	5.65E-04	0.00E+00	6.04E-03	3.84E-05	6.61E-03	1.27E-02	7.33E+00	<1	1.89E+01	<1
Copper	5.06E+01	9.09E-03	1.28E-01	8.44E-02	2.93E-02	0.00E+00	2.42E-01	1.96E-04	3.06E-02	2.73E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.67E+01	1.75E-03	1.81E-02	2.53E-02	8.10E-03	0.00E+00	5.14E-02	3.78E-05	1.01E-02	6.16E-02	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-03	0.00E+00	2.90E-03	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	0.00E+00	3.15E-06	--	3.15E-06	1.41E+00	<1	1.41E+01	<1
Nickel	4.18E+02	3.96E-03	1.39E-01	1.05E+00	2.81E-02	0.00E+00	1.22E+00	8.55E-05	2.53E-01	1.47E+00	1.70E+00	<1	1.48E+01	<1
Selenium	7.50E-01	7.23E-04	5.19E-03	2.43E-03	1.28E-03	0.00E+00	8.90E-03	1.56E-05	4.54E-04	9.37E-03	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.70E-01	2.54E-04	9.55E-06	2.98E-05	3.97E-05	0.00E+00	7.91E-05	5.49E-06	1.03E-04	1.87E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.53E+02	2.33E-03	1.04E-02	2.08E-02	4.07E-03	0.00E+00	3.53E-02	5.04E-05	9.26E-02	1.28E-01	4.16E+00	<1	9.44E+00	<1
Zinc	6.50E+01	2.54E-02	6.85E-01	1.09E+00	2.28E-01	0.00E+00	2.00E+00	5.48E-04	3.93E-02	2.04E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	1.90E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.82E-04	1.15E-04	9.96E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	3.58E+02	1.16E+00	3.01E-01	1.44E-01	1.24E-02	0.00E+00	4.57E-01	2.50E-02	2.16E-01	6.98E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	2.77E+00	0.00E+00	2.26E-05	1.32E-02	0.00E+00	0.00E+00	1.32E-02	0.00E+00	1.67E-03	1.49E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	0.00E+00	8.89E-06	--	8.89E-06				
Fluoranthene	6.73E+01	1.76E-03	4.72E-01	6.63E-01	0.00E+00	0.00E+00	1.14E+00	3.80E-05	4.07E-02	1.18E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	1.64E+00	5.78E-04	2.81E-01	2.34E-02	0.00E+00	0.00E+00	3.04E-01	1.25E-05	9.92E-04	3.05E-01				
Phenanthrene	3.65E+01	5.53E-04	1.11E-01	2.03E-01	0.00E+00	0.00E+00	3.14E-01	1.19E-05	2.21E-02	3.36E-01				
Total LMW PAHs							1.77E+00	7.13E-05	6.54E-02	1.83E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	4.17E+01	5.75E-04	8.60E-03	2.15E-01	0.00E+00	0.00E+00	2.24E-01	1.24E-05	2.52E-02	2.49E-01				
Benzo[A]Pyrene	5.13E+01	1.94E-03	8.31E-02	2.21E-01	0.00E+00	0.00E+00	3.04E-01	4.19E-05	3.10E-02	3.35E-01				
Benzo(b)fluoranthene	5.74E+01	5.09E-03	2.50E-01	4.84E-01	0.00E+00	0.00E+00	7.34E-01	1.10E-04	3.47E-02	7.69E-01				
Benzo(g,h,i)perylene	4.28E+01	7.31E-04	4.70E-01	4.07E-01	0.00E+00	0.00E+00	8.78E-01	1.58E-05	2.59E-02	9.04E-01				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	0.00E+00	3.31E-06	--	3.31E-06				
Chrysene	4.90E+01	3.69E-03	9.46E-03	3.64E-01	0.00E+00	0.00E+00	3.73E-01	7.96E-05	2.96E-02	4.03E-01				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	0.00E+00	1.45E-06	--	1.45E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	0.00E+00	7.08E-06	--	7.08E-06				
Pyrene	6.36E+01	1.33E-03	6.43E-01	3.61E-01	0.00E+00	0.00E+00	1.00E+00	2.87E-05	3.85E-02	1.04E+00				
Total HMW PAHs							3.52E+00	3.00E-04	1.85E-01	3.70E+00	6.15E-01	6.02E+00	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	0.00E+00	1.13E-04	--	1.13E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H16-7
Refined Exposure Evaluation - Grizzly Bear
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)											
			Diet					Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans							0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H16-8
Refined Exposure Evaluation - Long-tailed Weasel
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.87E-02	0.00E+00	5.87E-02	No TRV	--	No TRV	--
Antimony	2.88E+00	9.28E-04	0.00E+00	0.00E+00	7.40E-03	7.40E-03	4.78E-05	2.37E-03	9.81E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	2.14E+01	9.37E-04	0.00E+00	0.00E+00	4.97E-03	4.97E-03	4.82E-05	1.77E-02	2.27E-02	1.04E+00	<1	4.55E+00	<1
Barium	1.83E+02	1.73E-01	0.00E+00	0.00E+00	6.43E-03	6.43E-03	8.90E-03	1.51E-01	1.66E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	6.93E+00	2.61E-04	0.00E+00	0.00E+00	8.02E-04	8.02E-04	1.34E-05	5.70E-03	6.52E-03	5.32E-01	<1	6.70E-01	<1
Cadmium	1.17E+00	6.80E-04	0.00E+00	0.00E+00	1.58E-02	1.58E-02	3.50E-05	9.61E-04	1.67E-02	7.70E-01	<1	6.87E+00	<1
Chromium	2.27E+01	2.97E-03	0.00E+00	0.00E+00	1.18E-01	1.18E-01	1.53E-04	1.87E-02	1.37E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	1.09E+01	1.78E-03	0.00E+00	0.00E+00	1.34E-02	1.34E-02	9.15E-05	8.97E-03	2.25E-02	7.33E+00	<1	1.89E+01	<1
Copper	5.34E+02	9.09E-03	0.00E+00	0.00E+00	9.82E-01	9.82E-01	4.68E-04	4.39E-01	1.42E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.58E+01	1.75E-03	0.00E+00	0.00E+00	1.88E-01	1.88E-01	9.01E-05	1.30E-02	2.02E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.92E-03	0.00E+00	6.92E-03	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	7.51E-06	--	7.51E-06	1.41E+00	<1	1.41E+01	<1
Nickel	4.52E+02	3.96E-03	0.00E+00	0.00E+00	6.94E-01	6.94E-01	2.04E-04	3.72E-01	1.07E+00	1.70E+00	<1	1.48E+01	<1
Selenium	4.80E-01	7.23E-04	0.00E+00	0.00E+00	2.58E-02	2.58E-02	3.72E-05	3.95E-04	2.62E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.85E-01	2.54E-04	0.00E+00	0.00E+00	1.03E-03	1.03E-03	1.31E-05	1.52E-04	1.20E-03	4.80E-01	<1	1.43E+00	<1
Vanadium	1.51E+02	2.33E-03	0.00E+00	0.00E+00	9.53E-02	9.53E-02	1.20E-04	1.24E-01	2.19E-01	4.16E+00	<1	9.44E+00	<1
Zinc	5.65E+01	2.54E-02	0.00E+00	0.00E+00	5.37E+00	5.37E+00	1.30E-03	4.65E-02	5.42E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.73E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-03	1.42E-04	2.24E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	5.13E+02	1.16E+00	0.00E+00	0.00E+00	4.23E-01	4.23E-01	5.96E-02	4.23E-01	9.05E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.06E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.70E-04	8.70E-04				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	2.12E-05	--	2.12E-05				
Fluoranthene	1.64E+01	1.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.06E-05	1.35E-02	1.36E-02				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	5.04E-01	5.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.97E-05	4.15E-04	4.45E-04				
Phenanthrene	7.86E+00	5.53E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.85E-05	6.48E-03	6.50E-03				
Total LMW PAHs						0.00E+00	1.70E-04	2.12E-02	2.14E-02	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.11E+01	5.75E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.96E-05	9.14E-03	9.16E-03				
Benzo[A]Pyrene	1.40E+01	1.94E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.97E-05	1.15E-02	1.16E-02				
Benzo(b)fluoranthene	1.55E+01	5.09E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.62E-04	1.28E-02	1.30E-02				
Benzo(g,h,i)perylene	1.36E+01	7.31E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.76E-05	1.12E-02	1.13E-02				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	7.88E-06	--	7.88E-06				
Chrysene	1.28E+01	3.69E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.90E-04	1.05E-02	1.07E-02				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	3.45E-06	--	3.45E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	1.69E-05	--	1.69E-05				
Pyrene	1.61E+01	1.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.84E-05	1.33E-02	1.34E-02				
Total HMW PAHs						0.00E+00	7.15E-04	6.85E-02	6.92E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	2.70E-04	--	2.70E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H16-8
Refined Exposure Evaluation - Long-tailed Weasel
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H16-9
Refined Exposure Evaluation - Meadow Vole
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E-01	0.00E+00	1.71E-01	No TRV	--	No TRV	--
Antimony	2.88E+00	9.28E-04	1.60E-02	0.00E+00	0.00E+00	1.60E-02	1.39E-04	5.62E-03	2.17E-02	5.90E-02	<1	2.76E+00	<1
Arsenic	2.14E+01	9.37E-04	1.21E-01	0.00E+00	0.00E+00	1.21E-01	1.41E-04	4.19E-02	1.63E-01	1.04E+00	<1	4.55E+00	<1
Barium	1.83E+02	1.73E-01	4.29E+00	0.00E+00	0.00E+00	4.29E+00	2.60E-02	3.58E-01	4.67E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	6.93E+00	2.61E-04	3.64E-01	0.00E+00	0.00E+00	3.64E-01	3.92E-05	1.35E-02	3.78E-01	5.32E-01	<1	6.70E-01	<1
Cadmium	1.17E+00	6.80E-04	1.02E-01	0.00E+00	0.00E+00	1.02E-01	1.02E-04	2.28E-03	1.04E-01	7.70E-01	<1	6.87E+00	<1
Chromium	2.27E+01	2.97E-03	1.40E-01	0.00E+00	0.00E+00	1.40E-01	4.47E-04	4.42E-02	1.84E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	1.09E+01	1.78E-03	1.23E-02	0.00E+00	0.00E+00	1.23E-02	2.67E-04	2.13E-02	3.38E-02	7.33E+00	<1	1.89E+01	<1
Copper	5.34E+02	9.09E-03	3.48E+00	0.00E+00	0.00E+00	3.48E+00	1.37E-03	1.04E+00	4.52E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.58E+01	1.75E-03	1.88E-01	0.00E+00	0.00E+00	1.88E-01	2.63E-04	3.10E-02	2.19E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E-02	0.00E+00	2.02E-02	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	2.19E-05	--	2.19E-05	1.41E+00	<1	1.41E+01	<1
Nickel	4.52E+02	3.96E-03	1.58E+00	0.00E+00	0.00E+00	1.58E+00	5.95E-04	8.83E-01	2.46E+00	1.70E+00	1.45E+00	1.48E+01	<1
Selenium	4.80E-01	7.23E-04	3.40E-02	0.00E+00	0.00E+00	3.40E-02	1.09E-04	9.37E-04	3.50E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.85E-01	2.54E-04	1.11E-04	0.00E+00	0.00E+00	1.11E-04	3.82E-05	3.61E-04	5.11E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.51E+02	2.33E-03	1.10E-01	0.00E+00	0.00E+00	1.10E-01	3.51E-04	2.94E-01	4.04E-01	4.16E+00	<1	9.44E+00	<1
Zinc	5.65E+01	2.54E-02	6.78E+00	0.00E+00	0.00E+00	6.78E+00	3.81E-03	1.10E-01	6.90E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.73E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.13E-03	3.37E-04	6.47E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	5.13E+02	1.16E+00	4.63E+00	0.00E+00	0.00E+00	4.63E+00	1.74E-01	1.00E+00	5.80E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.06E+00	0.00E+00	5.51E-04	0.00E+00	0.00E+00	5.51E-04	0.00E+00	2.06E-03	2.61E-03				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	6.18E-05	--	6.18E-05				
Fluoranthene	1.64E+01	1.76E-03	1.23E+00	0.00E+00	0.00E+00	1.23E+00	2.64E-04	3.20E-02	1.26E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	5.04E-01	5.78E-04	9.23E-01	0.00E+00	0.00E+00	9.23E-01	8.69E-05	9.84E-04	9.24E-01				
Phenanthrene	7.86E+00	5.53E-04	4.57E-01	0.00E+00	0.00E+00	4.57E-01	8.31E-05	1.54E-02	4.73E-01				
Total LMW PAHs						2.61E+00	4.96E-04	5.04E-02	2.66E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.11E+01	5.75E-04	4.19E-02	0.00E+00	0.00E+00	4.19E-02	8.64E-05	2.17E-02	6.36E-02				
Benzo[A]Pyrene	1.40E+01	1.94E-03	2.50E-01	0.00E+00	0.00E+00	2.50E-01	2.91E-04	2.73E-02	2.78E-01				
Benzo(b)fluoranthene	1.55E+01	5.09E-03	7.22E-01	0.00E+00	0.00E+00	7.22E-01	7.65E-04	3.03E-02	7.53E-01				
Benzo(g,h,i)perylene	1.36E+01	7.31E-04	1.30E+00	0.00E+00	0.00E+00	1.30E+00	1.10E-04	2.67E-02	1.33E+00				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.30E-05	--	2.30E-05				
Chrysene	1.28E+01	3.69E-03	4.55E-02	0.00E+00	0.00E+00	4.55E-02	5.54E-04	2.49E-02	7.10E-02				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	1.01E-05	--	1.01E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	4.92E-05	--	4.92E-05				
Pyrene	1.61E+01	1.33E-03	1.75E+00	0.00E+00	0.00E+00	1.75E+00	2.00E-04	3.15E-02	1.78E+00				
Total HMW PAHs						4.11E+00	2.09E-03	1.62E-01	4.27E+00	6.15E-01	6.95E+00	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	7.89E-04	--	7.89E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H16-9
Refined Exposure Evaluation - Meadow Vole
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H16-10
Refined Exposure Evaluation - North American Wolverine
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E-02	0.00E+00	3.43E-02	No TRV	--	No TRV	--
Antimony	2.88E+00	9.28E-04	0.00E+00	0.00E+00	4.32E-03	4.32E-03	2.79E-05	2.42E-03	6.77E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	2.14E+01	9.37E-04	0.00E+00	0.00E+00	2.90E-03	2.90E-03	2.81E-05	1.80E-02	2.10E-02	1.04E+00	<1	4.55E+00	<1
Barium	1.83E+02	1.73E-01	0.00E+00	0.00E+00	3.75E-03	3.75E-03	5.19E-03	1.54E-01	1.63E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	6.93E+00	2.61E-04	0.00E+00	0.00E+00	4.68E-04	4.68E-04	7.84E-06	5.83E-03	6.30E-03	5.32E-01	<1	6.70E-01	<1
Cadmium	1.17E+00	6.80E-04	0.00E+00	0.00E+00	9.20E-03	9.20E-03	2.04E-05	9.82E-04	1.02E-02	7.70E-01	<1	6.87E+00	<1
Chromium	2.27E+01	2.97E-03	0.00E+00	0.00E+00	6.89E-02	6.89E-02	8.93E-05	1.91E-02	8.80E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	1.09E+01	1.78E-03	0.00E+00	0.00E+00	7.82E-03	7.82E-03	5.34E-05	9.16E-03	1.70E-02	7.33E+00	<1	1.89E+01	<1
Copper	5.34E+02	9.09E-03	0.00E+00	0.00E+00	5.73E-01	5.73E-01	2.73E-04	4.49E-01	1.02E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.58E+01	1.75E-03	0.00E+00	0.00E+00	1.10E-01	1.10E-01	5.26E-05	1.33E-02	1.23E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.04E-03	0.00E+00	4.04E-03	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	4.39E-06	--	4.39E-06	1.41E+00	<1	1.41E+01	<1
Nickel	4.52E+02	3.96E-03	0.00E+00	0.00E+00	4.05E-01	4.05E-01	1.19E-04	3.80E-01	7.86E-01	1.70E+00	<1	1.48E+01	<1
Selenium	4.80E-01	7.23E-04	0.00E+00	0.00E+00	1.50E-02	1.50E-02	2.17E-05	4.04E-04	1.55E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.85E-01	2.54E-04	0.00E+00	0.00E+00	6.01E-04	6.01E-04	7.63E-06	1.56E-04	7.65E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.51E+02	2.33E-03	0.00E+00	0.00E+00	5.56E-02	5.56E-02	7.02E-05	1.27E-01	1.82E-01	4.16E+00	<1	9.44E+00	<1
Zinc	5.65E+01	2.54E-02	0.00E+00	0.00E+00	3.14E+00	3.14E+00	7.62E-04	4.75E-02	3.18E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.73E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-03	1.45E-04	1.37E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	5.13E+02	1.16E+00	0.00E+00	0.00E+00	2.47E-01	2.47E-01	3.48E-02	4.32E-01	7.13E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.06E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.89E-04	8.89E-04				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	1.24E-05	--	1.24E-05				
Fluoranthene	1.64E+01	1.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.29E-05	1.38E-02	1.38E-02				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	5.04E-01	5.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.74E-05	4.24E-04	4.41E-04				
Phenanthrene	7.86E+00	5.53E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E-05	6.62E-03	6.63E-03				
Total LMW PAHs						0.00E+00	9.92E-05	2.17E-02	2.18E-02	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.11E+01	5.75E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.73E-05	9.33E-03	9.35E-03				
Benzo[A]Pyrene	1.40E+01	1.94E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.82E-05	1.18E-02	1.18E-02				
Benzo(b)fluoranthene	1.55E+01	5.09E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-04	1.30E-02	1.32E-02				
Benzo(g,h,i)perylene	1.36E+01	7.31E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.20E-05	1.15E-02	1.15E-02				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	4.60E-06	--	4.60E-06				
Chrysene	1.28E+01	3.69E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-04	1.07E-02	1.09E-02				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	2.01E-06	--	2.01E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	9.85E-06	--	9.85E-06				
Pyrene	1.61E+01	1.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.00E-05	1.36E-02	1.36E-02				
Total HMW PAHs						0.00E+00	4.18E-04	6.99E-02	7.04E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	1.58E-04	--	1.58E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H16-10
Refined Exposure Evaluation - North American Wolverine
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H16-11
Refined Exposure Evaluation - Short-tailed Shrew
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-01	0.00E+00	1.53E-01	No TRV	--	No TRV	--
Antimony	2.88E+00	9.28E-04	0.00E+00	3.85E-01	0.00E+00	3.85E-01	1.24E-04	4.24E-03	3.90E-01	5.90E-02	6.60E+00	2.76E+00	<1
Arsenic	2.14E+01	9.37E-04	0.00E+00	2.82E-01	0.00E+00	2.82E-01	1.26E-04	3.16E-02	3.14E-01	1.04E+00	<1	4.55E+00	<1
Barium	1.83E+02	1.73E-01	0.00E+00	2.23E+00	0.00E+00	2.23E+00	2.32E-02	2.70E-01	2.53E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	6.93E+00	2.61E-04	0.00E+00	4.18E-02	0.00E+00	4.18E-02	3.50E-05	1.02E-02	5.20E-02	5.32E-01	<1	6.70E-01	<1
Cadmium	1.17E+00	6.80E-04	0.00E+00	1.26E+00	0.00E+00	1.26E+00	9.11E-05	1.72E-03	1.26E+00	7.70E-01	1.63E+00	6.87E+00	<1
Chromium	2.27E+01	2.97E-03	0.00E+00	9.29E-01	0.00E+00	9.29E-01	3.99E-04	3.34E-02	9.63E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	1.09E+01	1.78E-03	0.00E+00	1.78E-01	0.00E+00	1.78E-01	2.38E-04	1.61E-02	1.94E-01	7.33E+00	<1	1.89E+01	<1
Copper	5.34E+02	9.09E-03	0.00E+00	3.68E+01	0.00E+00	3.68E+01	1.22E-03	7.87E-01	3.76E+01	5.60E+00	6.72E+00	8.27E+01	<1
Lead	1.58E+01	1.75E-03	0.00E+00	1.00E+00	0.00E+00	1.00E+00	2.35E-04	2.34E-02	1.03E+00	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-02	0.00E+00	1.80E-02	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.96E-05	--	1.96E-05	1.41E+00	<1	1.41E+01	<1
Nickel	4.52E+02	3.96E-03	0.00E+00	4.71E+01	0.00E+00	4.71E+01	5.31E-04	6.66E-01	4.78E+01	1.70E+00	2.81E+01	1.48E+01	3.23E+00
Selenium	4.80E-01	7.23E-04	0.00E+00	7.26E-02	0.00E+00	7.26E-02	9.69E-05	7.08E-04	7.34E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.85E-01	2.54E-04	0.00E+00	1.34E-03	0.00E+00	1.34E-03	3.40E-05	2.73E-04	1.65E-03	4.80E-01	<1	1.43E+00	<1
Vanadium	1.51E+02	2.33E-03	0.00E+00	8.47E-01	0.00E+00	8.47E-01	3.13E-04	2.22E-01	1.07E+00	4.16E+00	<1	9.44E+00	<1
Zinc	5.65E+01	2.54E-02	0.00E+00	4.31E+01	0.00E+00	4.31E+01	3.40E-03	8.33E-02	4.31E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.73E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.47E-03	2.54E-04	5.73E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	5.13E+02	1.16E+00	0.00E+00	8.53E+00	0.00E+00	8.53E+00	1.55E-01	7.57E-01	9.44E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	1.06E+00	0.00E+00	0.00E+00	2.08E-01	0.00E+00	2.08E-01	0.00E+00	1.56E-03	2.10E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	5.51E-05	--	5.51E-05				
Fluoranthene	1.64E+01	1.76E-03	0.00E+00	6.67E+00	0.00E+00	6.67E+00	2.36E-04	2.41E-02	6.70E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	5.04E-01	5.78E-04	0.00E+00	2.97E-01	0.00E+00	2.97E-01	7.75E-05	7.43E-04	2.98E-01				
Phenanthrene	7.86E+00	5.53E-04	0.00E+00	1.81E+00	0.00E+00	1.81E+00	7.41E-05	1.16E-02	1.82E+00				
Total LMW PAHs						8.99E+00	4.43E-04	3.80E-02	9.03E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.11E+01	5.75E-04	0.00E+00	2.36E+00	0.00E+00	2.36E+00	7.71E-05	1.64E-02	2.38E+00				
Benzo[A]Pyrene	1.40E+01	1.94E-03	0.00E+00	2.49E+00	0.00E+00	2.49E+00	2.60E-04	2.06E-02	2.51E+00				
Benzo(b)fluoranthene	1.55E+01	5.09E-03	0.00E+00	5.40E+00	0.00E+00	5.40E+00	6.82E-04	2.28E-02	5.42E+00				
Benzo(g,h,i)perylene	1.36E+01	7.31E-04	0.00E+00	5.38E+00	0.00E+00	5.38E+00	9.79E-05	2.01E-02	5.40E+00				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.05E-05	--	2.05E-05				
Chrysene	1.28E+01	3.69E-03	0.00E+00	3.92E+00	0.00E+00	3.92E+00	4.94E-04	1.88E-02	3.94E+00				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	8.98E-06	--	8.98E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	4.39E-05	--	4.39E-05				
Pyrene	1.61E+01	1.33E-03	0.00E+00	3.79E+00	0.00E+00	3.79E+00	1.78E-04	2.38E-02	3.81E+00				
Total HMW PAHs						2.33E+01	1.86E-03	1.23E-01	2.35E+01	6.15E-01	3.82E+01	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	7.04E-04	--	7.04E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H16-11
Refined Exposure Evaluation - Short-tailed Shrew
Industrial Landfill Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H17-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Eastern Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	1.14E+00	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	9.28E-04	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	9.37E-04	6.38E+00	3.75E-02	2.40E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	8.94E-01	Sample et al. (1999)	Regression[f]	3.58E-02	Sample et al. (1998b)
Barium	NA	1.73E-01	5.79E+02	1.56E-01	9.04E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	5.27E+01	Sample et al. (1998a)	6.83E-04	3.95E-01	Baes et al. (1984)[e]
Beryllium	NA	2.61E-04	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	6.80E-04	4.23E-01	Regression[a]	3.89E-01	Bechtel-Jacobs (1998a)	Regression[d]	4.18E+00	Sample et al. (1999)	Regression[f]	1.90E-01	Sample et al. (1998b)
Chromium	NA	2.97E-03	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	1.78E-03	5.36E+00	7.50E-03	4.02E-02	Bechtel-Jacobs (1998a)[g]	1.22E-01	6.54E-01	Sample et al. (1998a)	Regression[f]	1.03E-01	Sample et al. (1998b)
Copper	NA	9.09E-03	1.33E+01	Regression[a]	5.41E+00	Bechtel-Jacobs (1998a)	5.15E-01	6.87E+00	Sample et al. (1998a)	Regression[f]	1.12E+01	Sample et al. (1998b)
Lead	NA	1.75E-03	1.85E+01	Regression[a]	1.36E+00	Bechtel-Jacobs (1998a)	Regression[d]	8.46E+00	Sample et al. (1999)	Regression[f]	3.92E+00	Sample et al. (1998b)
Manganese	NA	1.34E-01	1.44E+03	7.90E-02	1.14E+02	Bechtel-Jacobs (1998a)[g]	Regression[d]	6.36E+01	Sample et al. (1999)	2.05E-02	2.96E+01	Sample et al. (1998b)[i]
Mercury	NA	1.46E-04	4.62E-02	Regression[a]	6.94E-02	Bechtel-Jacobs (1998a)	3.93E+00	1.82E-01	Sample et al. (1998a)	3.81E-01	1.76E-02	LANL (2015)
Nickel	NA	3.96E-03	4.07E+01	Regression[a]	1.73E+00	Bechtel-Jacobs (1998a)	7.78E-01	3.16E+01	Sample et al. (1998a)	Regression[f]	4.39E+00	Sample et al. (1998b)
Selenium	NA	7.23E-04	6.40E-01	Regression[a]	3.10E-01	Bechtel-Jacobs (1998a)	Regression[d]	6.69E-01	Sample et al. (1998a)	Regression[f]	5.58E-01	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	2.54E-04	1.16E-01	4.00E-03	4.65E-04	Baes et al. (1984)	5.41E-02	6.29E-03	USCHPPM (2004)	1.08E-01	1.26E-02	Baes et al. (1984)[e]
Vanadium	NA	2.33E-03	1.65E+01	4.85E-03	7.99E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	6.91E-01	Sample et al. (1998a)	1.23E-02	2.03E-01	Sample et al. (1998b)[i]
Zinc	NA	2.54E-02	8.04E+01	Regression[a]	5.49E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.61E+02	Sample et al. (1998a)	Regression[f]	1.07E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	4.08E-02	2.98E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	1.16E+00	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	4.12E-04	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	1.76E-03	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	5.78E-04	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Phenanthrene	4.55	5.53E-04	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs												
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	5.7	5.75E-04	4.74E-01	Regression[a]	4.28E-02	USEPA (2007a)	1.59E+00	7.54E-01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	1.94E-03	6.72E-01	Regression[a]	8.64E-02	USEPA (2007a)	1.33E+00	8.94E-01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]

Table H17-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Eastern Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Benzo(b)fluoranthene	6.2	5.09E-03	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	7.31E-04	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	1.53E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	3.69E-03	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	6.70E-05	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.28E-04	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	1.33E-03	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	5.25E-03	1.50E-01	2.38E-02	3.57E-03	USEPA (2007a)	5.44E+01	8.16E+00	USEPA (2007a)	7.79E-01	1.17E-01	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	8.14E-01	0.00E+00	USEPA (2007a)	1.03E+01	0.00E+00	USEPA (2007a)	4.49E-01	0.00E+00	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	0.00E+00	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H17-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Eastern Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[j]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[j]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[j]
OCDF	8.87	0.00E+00	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	a

Table H17-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Eastern Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([diet$_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H17-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Eastern Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	1.14E+00	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	9.28E-04	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	9.37E-04	5.61E+00	3.75E-02	2.10E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	8.16E-01	Sample et al. (1999)	Regression[f]	3.22E-02	Sample et al. (1998b)
Barium	NA	1.73E-01	3.81E+02	1.56E-01	5.94E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	3.46E+01	Sample et al. (1998a)	6.83E-04	2.60E-01	Baes et al. (1984)[e]
Beryllium	NA	2.61E-04	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	6.80E-04	1.95E-01	Regression[a]	2.55E-01	Bechtel-Jacobs (1998a)	Regression[d]	2.26E+00	Sample et al. (1999)	Regression[f]	1.31E-01	Sample et al. (1998b)
Chromium	NA	2.97E-03	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	1.78E-03	4.99E+00	7.50E-03	3.74E-02	Bechtel-Jacobs (1998a)[g]	1.22E-01	6.08E-01	Sample et al. (1998a)	Regression[f]	9.37E-02	Sample et al. (1998b)
Copper	NA	9.09E-03	1.22E+01	Regression[a]	5.22E+00	Bechtel-Jacobs (1998a)	5.15E-01	6.26E+00	Sample et al. (1998a)	Regression[f]	1.11E+01	Sample et al. (1998b)
Lead	NA	1.75E-03	1.26E+01	Regression[a]	1.10E+00	Bechtel-Jacobs (1998a)	Regression[d]	6.23E+00	Sample et al. (1999)	Regression[f]	3.31E+00	Sample et al. (1998b)
Manganese	NA	1.34E-01	8.21E+02	7.90E-02	6.48E+01	Bechtel-Jacobs (1998a)[g]	Regression[d]	4.33E+01	Sample et al. (1999)	2.05E-02	1.68E+01	Sample et al. (1998b)[i]
Mercury	NA	1.46E-04	2.87E-02	Regression[a]	5.35E-02	Bechtel-Jacobs (1998a)	3.93E+00	1.13E-01	Sample et al. (1998a)	3.81E-01	1.09E-02	LANL (2015)
Nickel	NA	3.96E-03	1.62E+01	Regression[a]	8.71E-01	Bechtel-Jacobs (1998a)	7.78E-01	1.26E+01	Sample et al. (1998a)	Regression[f]	2.86E+00	Sample et al. (1998b)
Selenium	NA	7.23E-04	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	Regression[d]	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	2.54E-04	7.24E-02	4.00E-03	2.90E-04	Baes et al. (1984)	5.41E-02	3.92E-03	USCHPPM (2004)	1.08E-01	7.83E-03	Baes et al. (1984)[e]
Vanadium	NA	2.33E-03	1.29E+01	4.85E-03	6.25E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	5.41E-01	Sample et al. (1998a)	1.23E-02	1.59E-01	Sample et al. (1998b)[i]
Zinc	NA	2.54E-02	6.05E+01	Regression[a]	4.69E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.29E+02	Sample et al. (1998a)	Regression[f]	1.05E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	4.08E-02	1.74E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	1.16E+00	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	4.12E-04	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	1.76E-03	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	5.78E-04	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Phenanthrene	4.55	5.53E-04	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs												
High Molecular Weight (HMW) PAHs:												

Table H17-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Eastern Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Benzo(a)anthracene	5.7	5.75E-04	1.96E-01	Regression[a]	2.53E-02	USEPA (2007a)	1.59E+00	3.11E-01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	1.94E-03	3.08E-01	Regression[a]	4.03E-02	USEPA (2007a)	1.33E+00	4.09E-01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	5.09E-03	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	7.31E-04	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	1.53E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	3.69E-03	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	6.70E-05	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.28E-04	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	1.33E-03	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	5.25E-03	6.25E-02	2.38E-02	1.49E-03	USEPA (2007a)	5.44E+01	3.40E+00	USEPA (2007a)	7.79E-01	4.87E-02	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	8.14E-01	0.00E+00	USEPA (2007a)	1.03E+01	0.00E+00	USEPA (2007a)	4.49E-01	0.00E+00	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	0.00E+00	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H17-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Eastern Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
2,3,4,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H17-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Eastern Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([diet$_{Invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H17-2
Refined Exposure Evaluation - American Woodcock
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-01	0.00E+00	1.34E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	9.28E-04	--	--	--	0.00E+00	1.09E-04	--	1.09E-04	No TRV	--	No TRV	--
Arsenic	6.38E+00	9.37E-04	2.81E-03	9.45E-02	0.00E+00	9.73E-02	1.10E-04	5.62E-02	1.54E-01	2.24E+00	<1	4.51E+00	<1
Barium	5.79E+02	1.73E-01	1.06E+00	5.57E+00	0.00E+00	6.64E+00	2.03E-02	5.11E+00	1.18E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	3.07E-05	--	3.07E-05	No TRV	--	No TRV	--
Cadmium	4.23E-01	6.80E-04	4.57E-03	4.42E-01	0.00E+00	4.47E-01	7.99E-05	3.73E-03	4.50E-01	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	3.49E-04	--	3.49E-04	2.66E+00	<1	1.56E+01	<1
Cobalt	5.36E+00	1.78E-03	4.72E-04	6.92E-02	0.00E+00	6.96E-02	2.09E-04	4.72E-02	1.17E-01	7.61E+00	<1	2.02E+01	<1
Copper	1.33E+01	9.09E-03	6.36E-02	7.26E-01	0.00E+00	7.90E-01	1.07E-03	1.17E-01	9.08E-01	4.05E+00	<1	3.48E+01	<1
Lead	1.85E+01	1.75E-03	1.60E-02	8.95E-01	0.00E+00	9.11E-01	2.06E-04	1.63E-01	1.07E+00	1.63E+00	<1	4.46E+01	<1
Manganese	1.44E+03	1.34E-01	1.34E+00	6.72E+00	0.00E+00	8.06E+00	1.58E-02	1.27E+01	2.08E+01	1.79E+02	<1	3.77E+02	<1
Mercury	4.62E-02	1.46E-04	8.15E-04	1.92E-02	0.00E+00	2.00E-02	1.72E-05	4.07E-04	2.04E-02	4.50E-01	<1	9.10E-01	<1
Nickel	4.07E+01	3.96E-03	2.03E-02	3.35E+00	0.00E+00	3.37E+00	4.65E-04	3.58E-01	3.73E+00	6.71E+00	<1	1.86E+01	<1
Selenium	6.40E-01	7.23E-04	3.65E-03	7.07E-02	0.00E+00	7.44E-02	8.49E-05	5.64E-03	8.01E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.16E-01	2.54E-04	5.47E-06	6.66E-04	0.00E+00	6.71E-04	2.98E-05	1.03E-03	1.73E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	1.65E+01	2.33E-03	9.38E-04	7.31E-02	0.00E+00	7.41E-02	2.74E-04	1.45E-01	2.19E-01	3.44E-01	<1	1.70E+00	<1
Zinc	8.04E+01	2.54E-02	6.45E-01	3.81E+01	0.00E+00	3.88E+01	2.98E-03	7.08E-01	3.95E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.98E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-03	2.62E-03	7.42E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.36E-01	--	1.36E-01	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	4.83E-05	--	4.83E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.07E-04	--	2.07E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	6.79E-05	--	6.79E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	6.50E-05	--	6.50E-05				
Total LMW PAHs						0.00E+00	3.88E-04	0.00E+00	3.88E-04	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.74E-01	5.75E-04	5.03E-04	7.97E-02	0.00E+00	8.02E-02	6.76E-05	4.18E-03	8.44E-02				
Benzo[A]Pyrene	6.72E-01	1.94E-03	1.02E-03	9.46E-02	0.00E+00	9.56E-02	2.28E-04	5.92E-03	1.02E-01				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	5.98E-04	--	5.98E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	8.58E-05	--	8.58E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.80E-05	--	1.80E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	4.33E-04	--	4.33E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	7.87E-06	--	7.87E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	3.85E-05	--	3.85E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	1.56E-04	--	1.56E-04				
Total HMW PAHs						1.76E-01	1.63E-03	1.01E-02	1.88E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.50E-01	5.25E-03	4.19E-05	8.63E-01	0.00E+00	8.63E-01	6.17E-04	1.32E-03	8.65E-01	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H17-2
Refined Exposure Evaluation - American Woodcock
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H17-3
Refined Exposure Evaluation - Mourning Dove
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-01	0.00E+00	1.30E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	9.28E-04	--	--	--	0.00E+00	1.06E-04	--	1.06E-04	No TRV	--	No TRV	--
Arsenic	6.38E+00	9.37E-04	2.73E-02	0.00E+00	0.00E+00	2.73E-02	1.07E-04	4.95E-02	7.70E-02	2.24E+00	<1	4.51E+00	<1
Barium	5.79E+02	1.73E-01	1.03E+01	0.00E+00	0.00E+00	1.03E+01	1.97E-02	4.50E+00	1.48E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	2.98E-05	--	2.98E-05	No TRV	--	No TRV	--
Cadmium	4.23E-01	6.80E-04	4.44E-02	0.00E+00	0.00E+00	4.44E-02	7.76E-05	3.29E-03	4.78E-02	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	3.39E-04	--	3.39E-04	2.66E+00	<1	1.56E+01	<1
Cobalt	5.36E+00	1.78E-03	4.59E-03	0.00E+00	0.00E+00	4.59E-03	2.03E-04	4.16E-02	4.64E-02	7.61E+00	<1	2.02E+01	<1
Copper	1.33E+01	9.09E-03	6.18E-01	0.00E+00	0.00E+00	6.18E-01	1.04E-03	1.04E-01	7.22E-01	4.05E+00	<1	3.48E+01	<1
Lead	1.85E+01	1.75E-03	1.55E-01	0.00E+00	0.00E+00	1.55E-01	2.00E-04	1.43E-01	2.99E-01	1.63E+00	<1	4.46E+01	<1
Manganese	1.44E+03	1.34E-01	1.30E+01	0.00E+00	0.00E+00	1.30E+01	1.53E-02	1.12E+01	2.42E+01	1.79E+02	<1	3.77E+02	<1
Mercury	4.62E-02	1.46E-04	7.92E-03	0.00E+00	0.00E+00	7.92E-03	1.67E-05	3.59E-04	8.29E-03	4.50E-01	<1	9.10E-01	<1
Nickel	4.07E+01	3.96E-03	1.98E-01	0.00E+00	0.00E+00	1.98E-01	4.52E-04	3.16E-01	5.14E-01	6.71E+00	<1	1.86E+01	<1
Selenium	6.40E-01	7.23E-04	3.54E-02	0.00E+00	0.00E+00	3.54E-02	8.25E-05	4.97E-03	4.05E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.16E-01	2.54E-04	5.31E-05	0.00E+00	0.00E+00	5.31E-05	2.90E-05	9.03E-04	9.85E-04	3.50E-01	<1	3.50E+00	<1
Vanadium	1.65E+01	2.33E-03	9.11E-03	0.00E+00	0.00E+00	9.11E-03	2.66E-04	1.28E-01	1.37E-01	3.44E-01	<1	1.70E+00	<1
Zinc	8.04E+01	2.54E-02	6.27E+00	0.00E+00	0.00E+00	6.27E+00	2.89E-03	6.24E-01	6.89E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.98E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E-03	2.31E-03	6.97E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.32E-01	--	1.32E-01	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	4.70E-05	--	4.70E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.01E-04	--	2.01E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	6.60E-05	--	6.60E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	6.31E-05	--	6.31E-05				
Total LMW PAHs						0.00E+00	3.77E-04	0.00E+00	3.77E-04	1.61E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.74E-01	5.75E-04	4.88E-03	0.00E+00	0.00E+00	4.88E-03	6.56E-05	3.68E-03	8.63E-03				
Benzo[A]Pyrene	6.72E-01	1.94E-03	9.86E-03	0.00E+00	0.00E+00	9.86E-03	2.21E-04	5.22E-03	1.53E-02				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	5.81E-04	--	5.81E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	8.34E-05	--	8.34E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.75E-05	--	1.75E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	4.21E-04	--	4.21E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	7.65E-06	--	7.65E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	3.74E-05	--	3.74E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	1.52E-04	--	1.52E-04				
Total HMW PAHs						1.47E-02	1.59E-03	8.90E-03	2.52E-02	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.50E-01	5.25E-03	4.07E-04	0.00E+00	0.00E+00	4.07E-04	5.99E-04	1.16E-03	2.17E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--

Table H17-3
Refined Exposure Evaluation - Mourning Dove
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H17-4
Refined Exposure Evaluation - Red-tailed Hawk
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.36E-02	0.00E+00	9.36E-02	1.10E+02	<1	1.10E+03	<1
Antimony	ND	9.28E-04	--	--	--	0.00E+00	7.61E-05	--	7.61E-05	No TRV	--	No TRV	--
Arsenic	6.38E+00	9.37E-04	0.00E+00	0.00E+00	2.94E-03	2.94E-03	7.68E-05	1.36E-02	1.66E-02	2.24E+00	<1	4.51E+00	<1
Barium	5.79E+02	1.73E-01	0.00E+00	0.00E+00	3.24E-02	3.24E-02	1.42E-02	1.24E+00	1.28E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	2.14E-05	--	2.14E-05	No TRV	--	No TRV	--
Cadmium	4.23E-01	6.80E-04	0.00E+00	0.00E+00	1.55E-02	1.55E-02	5.58E-05	9.03E-04	1.65E-02	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	2.44E-04	--	2.44E-04	2.66E+00	<1	1.56E+01	<1
Cobalt	5.36E+00	1.78E-03	0.00E+00	0.00E+00	8.46E-03	8.46E-03	1.46E-04	1.14E-02	2.00E-02	7.61E+00	<1	2.02E+01	<1
Copper	1.33E+01	9.09E-03	0.00E+00	0.00E+00	9.19E-01	9.19E-01	7.45E-04	2.84E-02	9.48E-01	4.05E+00	<1	3.48E+01	<1
Lead	1.85E+01	1.75E-03	0.00E+00	0.00E+00	3.21E-01	3.21E-01	1.44E-04	3.94E-02	3.61E-01	1.63E+00	<1	4.46E+01	<1
Manganese	1.44E+03	1.34E-01	0.00E+00	0.00E+00	2.43E+00	2.43E+00	1.10E-02	3.08E+00	5.51E+00	1.79E+02	<1	3.77E+02	<1
Mercury	4.62E-02	1.46E-04	0.00E+00	0.00E+00	1.44E-03	1.44E-03	1.20E-05	9.85E-05	1.55E-03	4.50E-01	<1	9.10E-01	<1
Nickel	4.07E+01	3.96E-03	0.00E+00	0.00E+00	3.60E-01	3.60E-01	3.25E-04	8.67E-02	4.47E-01	6.71E+00	<1	1.86E+01	<1
Selenium	6.40E-01	7.23E-04	0.00E+00	0.00E+00	4.57E-02	4.57E-02	5.93E-05	1.36E-03	4.72E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.16E-01	2.54E-04	0.00E+00	0.00E+00	1.03E-03	1.03E-03	2.08E-05	2.48E-04	1.30E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	1.65E+01	2.33E-03	0.00E+00	0.00E+00	1.66E-02	1.66E-02	1.91E-04	3.51E-02	5.19E-02	3.44E-01	<1	1.70E+00	<1
Zinc	8.04E+01	2.54E-02	0.00E+00	0.00E+00	8.78E+00	8.78E+00	2.08E-03	1.71E-01	8.95E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.98E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-03	6.35E-04	3.98E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	9.49E-02	--	9.49E-02	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	3.37E-05	--	3.37E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	1.44E-04	--	1.44E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	4.74E-05	--	4.74E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	4.54E-05	--	4.54E-05				
Total LMW PAHs						0.00E+00	2.71E-04	0.00E+00	2.71E-04	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.74E-01	5.75E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.72E-05	1.01E-03	1.06E-03				
Benzo[A]Pyrene	6.72E-01	1.94E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-04	1.43E-03	1.59E-03				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	4.17E-04	--	4.17E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	5.99E-05	--	5.99E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.26E-05	--	1.26E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	3.02E-04	--	3.02E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	5.49E-06	--	5.49E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	2.69E-05	--	2.69E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	1.09E-04	--	1.09E-04				
Total HMW PAHs						0.00E+00	1.14E-03	2.44E-03	3.58E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.50E-01	5.25E-03	0.00E+00	0.00E+00	9.58E-03	9.58E-03	4.31E-04	3.20E-04	1.03E-02	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H17-4
Refined Exposure Evaluation - Red-tailed Hawk
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H17-5
Refined Exposure Evaluation - Yellow-billed Cuckoo
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.81E-01	0.00E+00	1.81E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	9.28E-04	--	--	--	0.00E+00	1.47E-04	--	1.47E-04	No TRV	--	No TRV	--
Arsenic	6.38E+00	9.37E-04	0.00E+00	1.42E-01	0.00E+00	1.42E-01	1.48E-04	0.00E+00	1.42E-01	2.24E+00	<1	4.51E+00	<1
Barium	5.79E+02	1.73E-01	0.00E+00	8.35E+00	0.00E+00	8.35E+00	2.74E-02	0.00E+00	8.38E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	4.13E-05	--	4.13E-05	No TRV	--	No TRV	--
Cadmium	4.23E-01	6.80E-04	0.00E+00	6.62E-01	0.00E+00	6.62E-01	1.08E-04	0.00E+00	6.62E-01	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	4.71E-04	--	4.71E-04	2.66E+00	<1	1.56E+01	<1
Cobalt	5.36E+00	1.78E-03	0.00E+00	1.04E-01	0.00E+00	1.04E-01	2.82E-04	0.00E+00	1.04E-01	7.61E+00	<1	2.02E+01	<1
Copper	1.33E+01	9.09E-03	0.00E+00	1.09E+00	0.00E+00	1.09E+00	1.44E-03	0.00E+00	1.09E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.85E+01	1.75E-03	0.00E+00	1.34E+00	0.00E+00	1.34E+00	2.77E-04	0.00E+00	1.34E+00	1.63E+00	<1	4.46E+01	<1
Manganese	1.44E+03	1.34E-01	0.00E+00	1.01E+01	0.00E+00	1.01E+01	2.13E-02	0.00E+00	1.01E+01	1.79E+02	<1	3.77E+02	<1
Mercury	4.62E-02	1.46E-04	0.00E+00	2.88E-02	0.00E+00	2.88E-02	2.31E-05	0.00E+00	2.88E-02	4.50E-01	<1	9.10E-01	<1
Nickel	4.07E+01	3.96E-03	0.00E+00	5.01E+00	0.00E+00	5.01E+00	6.27E-04	0.00E+00	5.01E+00	6.71E+00	<1	1.86E+01	<1
Selenium	6.40E-01	7.23E-04	0.00E+00	1.06E-01	0.00E+00	1.06E-01	1.14E-04	0.00E+00	1.06E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.16E-01	2.54E-04	0.00E+00	9.97E-04	0.00E+00	9.97E-04	4.02E-05	0.00E+00	1.04E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	1.65E+01	2.33E-03	0.00E+00	1.09E-01	0.00E+00	1.09E-01	3.70E-04	0.00E+00	1.10E-01	3.44E-01	<1	1.70E+00	<1
Zinc	8.04E+01	2.54E-02	0.00E+00	5.71E+01	0.00E+00	5.71E+01	4.01E-03	0.00E+00	5.71E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.98E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.46E-03	0.00E+00	6.46E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.83E-01	--	1.83E-01	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	6.52E-05	--	6.52E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.79E-04	--	2.79E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	9.15E-05	--	9.15E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	8.76E-05	--	8.76E-05				
Total LMW PAHs						0.00E+00	5.23E-04	0.00E+00	5.23E-04	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.74E-01	5.75E-04	0.00E+00	1.19E-01	0.00E+00	1.19E-01	9.11E-05	0.00E+00	1.19E-01				
Benzo[A]Pyrene	6.72E-01	1.94E-03	0.00E+00	1.42E-01	0.00E+00	1.42E-01	3.07E-04	0.00E+00	1.42E-01				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	8.06E-04	--	8.06E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	1.16E-04	--	1.16E-04				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.43E-05	--	2.43E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	5.84E-04	--	5.84E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	1.06E-05	--	1.06E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	5.19E-05	--	5.19E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	2.11E-04	--	2.11E-04				
Total HMW PAHs						2.61E-01	2.20E-03	0.00E+00	2.63E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.50E-01	5.25E-03	0.00E+00	1.29E+00	0.00E+00	1.29E+00	8.31E-04	0.00E+00	1.29E+00	1.10E+00	1.18E+00	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H17-5
Refined Exposure Evaluation - Yellow-billed Cuckoo
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H17-6
Refined Exposure Evaluation - Canada Lynx
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.57E-02	0.00E+00	3.57E-02	No TRV	--	No TRV	--
Antimony	ND	9.28E-04	--	--	--	0.00E+00	2.90E-05	--	2.90E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	6.38E+00	9.37E-04	0.00E+00	0.00E+00	1.12E-03	1.12E-03	2.93E-05	5.58E-03	6.73E-03	1.04E+00	<1	4.55E+00	<1
Barium	5.79E+02	1.73E-01	0.00E+00	0.00E+00	1.24E-02	1.24E-02	5.40E-03	5.07E-01	5.25E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	8.15E-06	--	8.15E-06	5.32E-01	<1	6.70E-01	<1
Cadmium	4.23E-01	6.80E-04	0.00E+00	0.00E+00	5.92E-03	5.92E-03	2.12E-05	3.70E-04	6.31E-03	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	9.29E-05	--	9.29E-05	2.40E+00	<1	5.82E+01	<1
Cobalt	5.36E+00	1.78E-03	0.00E+00	0.00E+00	3.22E-03	3.22E-03	5.56E-05	4.69E-03	7.97E-03	7.33E+00	<1	1.89E+01	<1
Copper	1.33E+01	9.09E-03	0.00E+00	0.00E+00	3.50E-01	3.50E-01	2.84E-04	1.17E-02	3.62E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.85E+01	1.75E-03	0.00E+00	0.00E+00	1.22E-01	1.22E-01	5.47E-05	1.62E-02	1.39E-01	4.70E+00	<1	1.86E+02	<1
Manganese	1.44E+03	1.34E-01	0.00E+00	0.00E+00	9.24E-01	9.24E-01	4.20E-03	1.26E+00	2.19E+00	5.15E+01	<1	1.46E+02	<1
Mercury	4.62E-02	1.46E-04	0.00E+00	0.00E+00	5.50E-04	5.50E-04	4.56E-06	4.04E-05	5.95E-04	1.41E+00	<1	1.41E+01	<1
Nickel	4.07E+01	3.96E-03	0.00E+00	0.00E+00	1.37E-01	1.37E-01	1.24E-04	3.56E-02	1.73E-01	1.70E+00	<1	1.48E+01	<1
Selenium	6.40E-01	7.23E-04	0.00E+00	0.00E+00	1.74E-02	1.74E-02	2.26E-05	5.60E-04	1.80E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.16E-01	2.54E-04	0.00E+00	0.00E+00	3.93E-04	3.93E-04	7.94E-06	1.02E-04	5.03E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.65E+01	2.33E-03	0.00E+00	0.00E+00	6.33E-03	6.33E-03	7.29E-05	1.44E-02	2.08E-02	4.16E+00	<1	9.44E+00	<1
Zinc	8.04E+01	2.54E-02	0.00E+00	0.00E+00	3.34E+00	3.34E+00	7.92E-04	7.03E-02	3.41E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.98E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-03	2.61E-04	1.54E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	3.62E-02	--	3.62E-02	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	1.29E-05	--	1.29E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	5.50E-05	--	5.50E-05				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	1.81E-05	--	1.81E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	1.73E-05	--	1.73E-05				
Total LMW PAHs						0.00E+00	1.03E-04	0.00E+00	1.03E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	4.74E-01	5.75E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-05	4.15E-04	4.33E-04				
Benzo[A]Pyrene	6.72E-01	1.94E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.06E-05	5.88E-04	6.49E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	1.59E-04	--	1.59E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	2.28E-05	--	2.28E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	4.79E-06	--	4.79E-06				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	1.15E-04	--	1.15E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	2.09E-06	--	2.09E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	1.02E-05	--	1.02E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	4.16E-05	--	4.16E-05				
Total HMW PAHs						0.00E+00	4.34E-04	1.00E-03	1.44E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.50E-01	5.25E-03	0.00E+00	0.00E+00	3.65E-03	3.65E-03	1.64E-04	1.31E-04	3.95E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H17-6
Refined Exposure Evaluation - Canada Lynx
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H17-7
Refined Exposure Evaluation - Grizzly Bear
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate						
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.47E-02	0.00E+00	2.47E-02	No TRV	--	No TRV	--
Antimony	ND	9.28E-04	--	--	--	0.00E+00	0.00E+00	2.00E-05	--	2.00E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	6.38E+00	9.37E-04	3.36E-03	2.90E-03	7.74E-05	0.00E+00	6.34E-03	2.02E-05	3.86E-03	1.02E-02	1.04E+00	<1	4.55E+00	<1
Barium	5.79E+02	1.73E-01	1.27E+00	1.71E-01	8.54E-04	0.00E+00	1.44E+00	3.73E-03	3.50E-01	1.79E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	0.00E+00	5.64E-06	--	5.64E-06	5.32E-01	<1	6.70E-01	<1
Cadmium	4.23E-01	6.80E-04	5.46E-03	1.35E-02	4.09E-04	0.00E+00	1.94E-02	1.47E-05	2.56E-04	1.97E-02	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	0.00E+00	6.42E-05	--	6.42E-05	2.40E+00	<1	5.82E+01	<1
Cobalt	5.36E+00	1.78E-03	5.65E-04	2.12E-03	2.23E-04	0.00E+00	2.91E-03	3.84E-05	3.24E-03	6.19E-03	7.33E+00	<1	1.89E+01	<1
Copper	1.33E+01	9.09E-03	7.60E-02	2.22E-02	2.42E-02	0.00E+00	1.22E-01	1.96E-04	8.06E-03	1.31E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.85E+01	1.75E-03	1.91E-02	2.74E-02	8.46E-03	0.00E+00	5.50E-02	3.78E-05	1.12E-02	6.62E-02	4.70E+00	<1	1.86E+02	<1
Manganese	1.44E+03	1.34E-01	1.60E+00	2.06E-01	6.39E-02	0.00E+00	1.87E+00	2.90E-03	8.72E-01	2.74E+00	5.15E+01	<1	1.46E+02	<1
Mercury	4.62E-02	1.46E-04	9.74E-04	5.88E-04	3.80E-05	0.00E+00	1.60E-03	3.15E-06	2.79E-05	1.63E-03	1.41E+00	<1	1.41E+01	<1
Nickel	4.07E+01	3.96E-03	2.43E-02	1.03E-01	9.49E-03	0.00E+00	1.36E-01	8.55E-05	2.46E-02	1.61E-01	1.70E+00	<1	1.48E+01	<1
Selenium	6.40E-01	7.23E-04	4.36E-03	2.17E-03	1.20E-03	0.00E+00	7.73E-03	1.56E-05	3.87E-04	8.13E-03	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.16E-01	2.54E-04	6.53E-06	2.04E-05	2.72E-05	0.00E+00	5.41E-05	5.49E-06	7.04E-05	1.30E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.65E+01	2.33E-03	1.12E-03	2.24E-03	4.37E-04	0.00E+00	3.80E-03	5.04E-05	9.96E-03	1.38E-02	4.16E+00	<1	9.44E+00	<1
Zinc	8.04E+01	2.54E-02	7.71E-01	1.17E+00	2.31E-01	0.00E+00	2.17E+00	5.48E-04	4.86E-02	2.22E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	2.98E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.82E-04	1.80E-04	1.06E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	0.00E+00	2.50E-02	--	2.50E-02	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	0.00E+00	8.89E-06	--	8.89E-06				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	0.00E+00	3.80E-05	--	3.80E-05				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	0.00E+00	1.25E-05	--	1.25E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	0.00E+00	1.19E-05	--	1.19E-05				
Total LMW PAHs							0.00E+00	7.13E-05	0.00E+00	7.13E-05	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	4.74E-01	5.75E-04	6.01E-04	2.44E-03	0.00E+00	0.00E+00	3.04E-03	1.24E-05	2.87E-04	3.34E-03				
Benzo[A]Pyrene	6.72E-01	1.94E-03	1.21E-03	2.90E-03	0.00E+00	0.00E+00	4.11E-03	4.19E-05	4.07E-04	4.56E-03				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	0.00E+00	1.10E-04	--	1.10E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	0.00E+00	1.58E-05	--	1.58E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	0.00E+00	3.31E-06	--	3.31E-06				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	0.00E+00	7.96E-05	--	7.96E-05				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	0.00E+00	1.45E-06	--	1.45E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	0.00E+00	7.08E-06	--	7.08E-06				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	0.00E+00	2.87E-05	--	2.87E-05				
Total HMW PAHs							7.15E-03	3.00E-04	6.93E-04	8.15E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.50E-01	5.25E-03	5.01E-05	2.64E-02	2.52E-04	0.00E+00	2.67E-02	1.13E-04	9.07E-05	2.69E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H17-7
Refined Exposure Evaluation - Grizzly Bear
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)											
			Diet					Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans							0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H17-8
Refined Exposure Evaluation - Long-tailed Weasel
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.87E-02	0.00E+00	5.87E-02	No TRV	--	No TRV	--
Antimony	ND	9.28E-04	--	--	--	0.00E+00	4.78E-05	--	4.78E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	5.61E+00	9.37E-04	0.00E+00	0.00E+00	1.66E-03	1.66E-03	4.82E-05	4.62E-03	6.33E-03	1.04E+00	<1	4.55E+00	<1
Barium	3.81E+02	1.73E-01	0.00E+00	0.00E+00	1.34E-02	1.34E-02	8.90E-03	3.13E-01	3.36E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	1.34E-05	--	1.34E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	1.95E-01	6.80E-04	0.00E+00	0.00E+00	6.76E-03	6.76E-03	3.50E-05	1.60E-04	6.95E-03	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	1.53E-04	--	1.53E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	4.99E+00	1.78E-03	0.00E+00	0.00E+00	4.82E-03	4.82E-03	9.15E-05	4.10E-03	9.02E-03	7.33E+00	<1	1.89E+01	<1
Copper	1.22E+01	9.09E-03	0.00E+00	0.00E+00	5.69E-01	5.69E-01	4.68E-04	1.00E-02	5.79E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.26E+01	1.75E-03	0.00E+00	0.00E+00	1.71E-01	1.71E-01	9.01E-05	1.04E-02	1.81E-01	4.70E+00	<1	1.86E+02	<1
Manganese	8.21E+02	1.34E-01	0.00E+00	0.00E+00	8.66E-01	8.66E-01	6.92E-03	6.76E-01	1.55E+00	5.15E+01	<1	1.46E+02	<1
Mercury	2.87E-02	1.46E-04	0.00E+00	0.00E+00	5.63E-04	5.63E-04	7.51E-06	2.36E-05	5.94E-04	1.41E+00	<1	1.41E+01	<1
Nickel	1.62E+01	3.96E-03	0.00E+00	0.00E+00	1.47E-01	1.47E-01	2.04E-04	1.34E-02	1.61E-01	1.70E+00	<1	1.48E+01	<1
Selenium	ND	7.23E-04	--	--	--	0.00E+00	3.72E-05	--	3.72E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	7.24E-02	2.54E-04	0.00E+00	0.00E+00	4.03E-04	4.03E-04	1.31E-05	5.96E-05	4.76E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.29E+01	2.33E-03	0.00E+00	0.00E+00	8.16E-03	8.16E-03	1.20E-04	1.06E-02	1.89E-02	4.16E+00	<1	9.44E+00	<1
Zinc	6.05E+01	2.54E-02	0.00E+00	0.00E+00	5.40E+00	5.40E+00	1.30E-03	4.98E-02	5.45E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.74E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-03	1.43E-04	2.24E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	5.96E-02	--	5.96E-02	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	2.12E-05	--	2.12E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	9.06E-05	--	9.06E-05				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	2.97E-05	--	2.97E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	2.85E-05	--	2.85E-05				
Total LMW PAHs						0.00E+00	1.70E-04	0.00E+00	1.70E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.96E-01	5.75E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.96E-05	1.61E-04	1.91E-04				
Benzo[A]Pyrene	3.08E-01	1.94E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.97E-05	2.53E-04	3.53E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	2.62E-04	--	2.62E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	3.76E-05	--	3.76E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	7.88E-06	--	7.88E-06				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	1.90E-04	--	1.90E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	3.45E-06	--	3.45E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	1.69E-05	--	1.69E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	6.84E-05	--	6.84E-05				
Total HMW PAHs						0.00E+00	7.15E-04	4.14E-04	1.13E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	6.25E-02	5.25E-03	0.00E+00	0.00E+00	2.51E-03	2.51E-03	2.70E-04	5.15E-05	2.83E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H17-8
Refined Exposure Evaluation - Long-tailed Weasel
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H17-9
Refined Exposure Evaluation - Meadow Vole
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E-01	0.00E+00	1.71E-01	No TRV	--	No TRV	--
Antimony	ND	9.28E-04	--	--	--	0.00E+00	1.39E-04	--	1.39E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	5.61E+00	9.37E-04	3.16E-02	0.00E+00	0.00E+00	3.16E-02	1.41E-04	1.10E-02	4.27E-02	1.04E+00	<1	4.55E+00	<1
Barium	3.81E+02	1.73E-01	8.92E+00	0.00E+00	0.00E+00	8.92E+00	2.60E-02	7.43E-01	9.69E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	3.92E-05	--	3.92E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	1.95E-01	6.80E-04	3.82E-02	0.00E+00	0.00E+00	3.82E-02	1.02E-04	3.80E-04	3.87E-02	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	4.47E-04	--	4.47E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	4.99E+00	1.78E-03	5.62E-03	0.00E+00	0.00E+00	5.62E-03	2.67E-04	9.74E-03	1.56E-02	7.33E+00	<1	1.89E+01	<1
Copper	1.22E+01	9.09E-03	7.84E-01	0.00E+00	0.00E+00	7.84E-01	1.37E-03	2.37E-02	8.09E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.26E+01	1.75E-03	1.65E-01	0.00E+00	0.00E+00	1.65E-01	2.63E-04	2.47E-02	1.90E-01	4.70E+00	<1	1.86E+02	<1
Manganese	8.21E+02	1.34E-01	9.74E+00	0.00E+00	0.00E+00	9.74E+00	2.02E-02	1.60E+00	1.14E+01	5.15E+01	<1	1.46E+02	<1
Mercury	2.87E-02	1.46E-04	8.04E-03	0.00E+00	0.00E+00	8.04E-03	2.19E-05	5.61E-05	8.12E-03	1.41E+00	<1	1.41E+01	<1
Nickel	1.62E+01	3.96E-03	1.31E-01	0.00E+00	0.00E+00	1.31E-01	5.95E-04	3.17E-02	1.63E-01	1.70E+00	<1	1.48E+01	<1
Selenium	ND	7.23E-04	--	--	--	0.00E+00	1.09E-04	--	1.09E-04	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	7.24E-02	2.54E-04	4.35E-05	0.00E+00	0.00E+00	4.35E-05	3.82E-05	1.41E-04	2.23E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.29E+01	2.33E-03	9.39E-03	0.00E+00	0.00E+00	9.39E-03	3.51E-04	2.52E-02	3.49E-02	4.16E+00	<1	9.44E+00	<1
Zinc	6.05E+01	2.54E-02	7.05E+00	0.00E+00	0.00E+00	7.05E+00	3.81E-03	1.18E-01	7.17E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.74E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.13E-03	3.39E-04	6.47E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.74E-01	--	1.74E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	6.18E-05	--	6.18E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.64E-04	--	2.64E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	8.69E-05	--	8.69E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	8.31E-05	--	8.31E-05				
Total LMW PAHs						0.00E+00	4.96E-04	0.00E+00	4.96E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.96E-01	5.75E-04	3.80E-03	0.00E+00	0.00E+00	3.80E-03	8.64E-05	3.82E-04	4.27E-03				
Benzo[A]Pyrene	3.08E-01	1.94E-03	6.06E-03	0.00E+00	0.00E+00	6.06E-03	2.91E-04	6.01E-04	6.95E-03				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	7.65E-04	--	7.65E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	1.10E-04	--	1.10E-04				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.30E-05	--	2.30E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	5.54E-04	--	5.54E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	1.01E-05	--	1.01E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	4.92E-05	--	4.92E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	2.00E-04	--	2.00E-04				
Total HMW PAHs						9.86E-03	2.09E-03	9.83E-04	1.29E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	6.25E-02	5.25E-03	2.23E-04	0.00E+00	0.00E+00	2.23E-04	7.89E-04	1.22E-04	1.13E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H17-9
Refined Exposure Evaluation - Meadow Vole
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H17-10
Refined Exposure Evaluation - North American Wolverine
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E-02	0.00E+00	3.43E-02	No TRV	--	No TRV	--
Antimony	ND	9.28E-04	--	--	--	0.00E+00	2.79E-05	--	2.79E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	5.61E+00	9.37E-04	0.00E+00	0.00E+00	9.68E-04	9.68E-04	2.81E-05	4.72E-03	5.72E-03	1.04E+00	<1	4.55E+00	<1
Barium	3.81E+02	1.73E-01	0.00E+00	0.00E+00	7.80E-03	7.80E-03	5.19E-03	3.20E-01	3.33E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	7.84E-06	--	7.84E-06	5.32E-01	<1	6.70E-01	<1
Cadmium	1.95E-01	6.80E-04	0.00E+00	0.00E+00	3.95E-03	3.95E-03	2.04E-05	1.64E-04	4.13E-03	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	8.93E-05	--	8.93E-05	2.40E+00	<1	5.82E+01	<1
Cobalt	4.99E+00	1.78E-03	0.00E+00	0.00E+00	2.82E-03	2.82E-03	5.34E-05	4.19E-03	7.06E-03	7.33E+00	<1	1.89E+01	<1
Copper	1.22E+01	9.09E-03	0.00E+00	0.00E+00	3.32E-01	3.32E-01	2.73E-04	1.02E-02	3.43E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.26E+01	1.75E-03	0.00E+00	0.00E+00	9.96E-02	9.96E-02	5.26E-05	1.06E-02	1.10E-01	4.70E+00	<1	1.86E+02	<1
Manganese	8.21E+02	1.34E-01	0.00E+00	0.00E+00	5.05E-01	5.05E-01	4.04E-03	6.90E-01	1.20E+00	5.15E+01	<1	1.46E+02	<1
Mercury	2.87E-02	1.46E-04	0.00E+00	0.00E+00	3.29E-04	3.29E-04	4.39E-06	2.41E-05	3.57E-04	1.41E+00	<1	1.41E+01	<1
Nickel	1.62E+01	3.96E-03	0.00E+00	0.00E+00	8.61E-02	8.61E-02	1.19E-04	1.37E-02	9.98E-02	1.70E+00	<1	1.48E+01	<1
Selenium	ND	7.23E-04	--	--	--	0.00E+00	2.17E-05	--	2.17E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	7.24E-02	2.54E-04	0.00E+00	0.00E+00	2.35E-04	2.35E-04	7.63E-06	6.09E-05	3.04E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.29E+01	2.33E-03	0.00E+00	0.00E+00	4.76E-03	4.76E-03	7.02E-05	1.08E-02	1.57E-02	4.16E+00	<1	9.44E+00	<1
Zinc	6.05E+01	2.54E-02	0.00E+00	0.00E+00	3.15E+00	3.15E+00	7.62E-04	5.09E-02	3.20E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.74E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-03	1.46E-04	1.37E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	3.48E-02	--	3.48E-02	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	1.24E-05	--	1.24E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	5.29E-05	--	5.29E-05				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	1.74E-05	--	1.74E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	1.66E-05	--	1.66E-05				
Total LMW PAHs						0.00E+00	9.92E-05	0.00E+00	9.92E-05	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.96E-01	5.75E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.73E-05	1.65E-04	1.82E-04				
Benzo[A]Pyrene	3.08E-01	1.94E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.82E-05	2.59E-04	3.17E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	1.53E-04	--	1.53E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	2.20E-05	--	2.20E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	4.60E-06	--	4.60E-06				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	1.11E-04	--	1.11E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	2.01E-06	--	2.01E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	9.85E-06	--	9.85E-06				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	4.00E-05	--	4.00E-05				
Total HMW PAHs						0.00E+00	4.18E-04	4.23E-04	8.41E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	6.25E-02	5.25E-03	0.00E+00	0.00E+00	1.46E-03	1.46E-03	1.58E-04	5.26E-05	1.67E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H17-10
Refined Exposure Evaluation - North American Wolverine
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H17-11
Refined Exposure Evaluation - Short-tailed Shrew
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-01	0.00E+00	1.53E-01	No TRV	--	No TRV	--
Antimony	ND	9.28E-04	--	--	--	0.00E+00	1.24E-04	--	1.24E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	5.61E+00	9.37E-04	0.00E+00	1.09E-01	0.00E+00	1.09E-01	1.26E-04	8.27E-03	1.18E-01	1.04E+00	<1	4.55E+00	<1
Barium	3.81E+02	1.73E-01	0.00E+00	4.64E+00	0.00E+00	4.64E+00	2.32E-02	5.61E-01	5.22E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	3.50E-05	--	3.50E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	1.95E-01	6.80E-04	0.00E+00	3.02E-01	0.00E+00	3.02E-01	9.11E-05	2.87E-04	3.03E-01	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	3.99E-04	--	3.99E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	4.99E+00	1.78E-03	0.00E+00	8.15E-02	0.00E+00	8.15E-02	2.38E-04	7.35E-03	8.91E-02	7.33E+00	<1	1.89E+01	<1
Copper	1.22E+01	9.09E-03	0.00E+00	8.39E-01	0.00E+00	8.39E-01	1.22E-03	1.79E-02	8.58E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.26E+01	1.75E-03	0.00E+00	8.35E-01	0.00E+00	8.35E-01	2.35E-04	1.86E-02	8.54E-01	4.70E+00	<1	1.86E+02	<1
Manganese	8.21E+02	1.34E-01	0.00E+00	5.80E+00	0.00E+00	5.80E+00	1.80E-02	1.21E+00	7.03E+00	5.15E+01	<1	1.46E+02	<1
Mercury	2.87E-02	1.46E-04	0.00E+00	1.51E-02	0.00E+00	1.51E-02	1.96E-05	4.23E-05	1.52E-02	1.41E+00	<1	1.41E+01	<1
Nickel	1.62E+01	3.96E-03	0.00E+00	1.69E+00	0.00E+00	1.69E+00	5.31E-04	2.39E-02	1.72E+00	1.70E+00	1.01E+00	1.48E+01	<1
Selenium	ND	7.23E-04	--	--	--	0.00E+00	9.69E-05	--	9.69E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	7.24E-02	2.54E-04	0.00E+00	5.25E-04	0.00E+00	5.25E-04	3.40E-05	1.07E-04	6.66E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.29E+01	2.33E-03	0.00E+00	7.25E-02	0.00E+00	7.25E-02	3.13E-04	1.90E-02	9.19E-02	4.16E+00	<1	9.44E+00	<1
Zinc	6.05E+01	2.54E-02	0.00E+00	4.40E+01	0.00E+00	4.40E+01	3.40E-03	8.92E-02	4.41E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.74E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.47E-03	2.56E-04	5.73E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.55E-01	--	1.55E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	5.51E-05	--	5.51E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.36E-04	--	2.36E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	7.75E-05	--	7.75E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	7.41E-05	--	7.41E-05				
Total LMW PAHs						0.00E+00	4.43E-04	0.00E+00	4.43E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.96E-01	5.75E-04	0.00E+00	4.17E-02	0.00E+00	4.17E-02	7.71E-05	2.89E-04	4.21E-02				
Benzo[A]Pyrene	3.08E-01	1.94E-03	0.00E+00	5.48E-02	0.00E+00	5.48E-02	2.60E-04	4.53E-04	5.55E-02				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	6.82E-04	--	6.82E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	9.79E-05	--	9.79E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.05E-05	--	2.05E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	4.94E-04	--	4.94E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	8.98E-06	--	8.98E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	4.39E-05	--	4.39E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	1.78E-04	--	1.78E-04				
Total HMW PAHs						9.65E-02	1.86E-03	7.42E-04	9.91E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	6.25E-02	5.25E-03	0.00E+00	4.56E-01	0.00E+00	4.56E-01	7.04E-04	9.22E-05	4.57E-01	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H17-11
Refined Exposure Evaluation - Short-tailed Shrew
Eastern Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H18-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North-Central Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	6.26E+00	3.75E-02	2.35E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	8.82E-01	Sample et al. (1999)	Regression[f]	3.53E-02	Sample et al. (1998b)
Barium	NA	2.95E+02	1.56E-01	4.61E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	2.69E+01	Sample et al. (1998a)	6.83E-04	2.02E-01	Baes et al. (1984)[e]
Beryllium	NA	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	3.90E-01	Regression[a]	3.72E-01	Bechtel-Jacobs (1998a)	Regression[d]	3.92E+00	Sample et al. (1999)	Regression[f]	1.82E-01	Sample et al. (1998b)
Chromium	NA	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	5.83E+00	7.50E-03	4.37E-02	Bechtel-Jacobs (1998a)[g]	1.22E-01	7.11E-01	Sample et al. (1998a)	Regression[f]	1.15E-01	Sample et al. (1998b)
Copper	NA	1.35E+01	Regression[a]	5.44E+00	Bechtel-Jacobs (1998a)	5.15E-01	6.96E+00	Sample et al. (1998a)	Regression[f]	1.12E+01	Sample et al. (1998b)
Lead	NA	1.29E+01	Regression[a]	1.11E+00	Bechtel-Jacobs (1998a)	Regression[d]	6.33E+00	Sample et al. (1999)	Regression[f]	3.34E+00	Sample et al. (1998b)
Manganese	NA	1.14E+03	7.90E-02	9.01E+01	Bechtel-Jacobs (1998a)[g]	Regression[d]	5.41E+01	Sample et al. (1999)	2.05E-02	2.34E+01	Sample et al. (1998b)[i]
Mercury	NA	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	7.78E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Selenium	NA	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	Regression[d]	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Silver		ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	1.90E-01	4.00E-03	7.60E-04	Baes et al. (1984)	5.41E-02	1.03E-02	USCHPPM (2004)	1.08E-01	2.06E-02	Baes et al. (1984)[e]
Vanadium	NA	1.34E+01	4.85E-03	6.52E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	5.64E-01	Sample et al. (1998a)	1.23E-02	1.65E-01	Sample et al. (1998b)[i]
Zinc	NA	6.77E+01	Regression[a]	4.99E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.41E+02	Sample et al. (1998a)	Regression[f]	1.06E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	1.58E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Phenanthrene	4.55	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]

Table H18-1a
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Baseline Ecological Risk Assessment
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Columbia Falls, Montana

Analyte	log K_{ow}	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
LMW PAHs											
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	ND	Regression[a]	0	USEPA (2007a)	1.59E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs											
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	1.21E-01	2.38E-02	2.87E-03	USEPA (2007a)	5.44E+01	6.56E+00	USEPA (2007a)	7.79E-01	9.40E-02	LANL (2015)
Butylbenzylphthalate	4.84	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	8.14E-01	0.00E+00	USEPA (2007a)	1.03E+01	0.00E+00	USEPA (2007a)	4.49E-01	0.00E+00	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)

Table H18-1a
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Baseline Ecological Risk Assessment
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Columbia Falls, Montana

Analyte	log K_{ow}	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H18-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North-Central Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H18-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North-Central Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	6.86E+00	3.75E-02	2.57E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	9.40E-01	Sample et al. (1999)	Regression[f]	3.80E-02	Sample et al. (1998b)
Barium	NA	2.19E+02	1.56E-01	3.41E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	1.99E+01	Sample et al. (1998a)	6.83E-04	1.49E-01	Baes et al. (1984)[e]
Beryllium	NA	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	2.14E-01	Regression[a]	2.68E-01	Bechtel-Jacobs (1998a)	Regression[d]	2.43E+00	Sample et al. (1999)	Regression[f]	1.37E-01	Sample et al. (1998b)
Chromium	NA	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	5.91E+00	7.50E-03	4.43E-02	Bechtel-Jacobs (1998a)[g]	1.22E-01	7.21E-01	Sample et al. (1998a)	Regression[f]	1.17E-01	Sample et al. (1998b)
Copper	NA	1.47E+01	Regression[a]	5.62E+00	Bechtel-Jacobs (1998a)	5.15E-01	7.57E+00	Sample et al. (1998a)	Regression[f]	1.14E+01	Sample et al. (1998b)
Lead	NA	1.22E+01	Regression[a]	1.08E+00	Bechtel-Jacobs (1998a)	Regression[d]	6.06E+00	Sample et al. (1999)	Regression[f]	3.26E+00	Sample et al. (1998b)
Manganese	NA	5.81E+02	7.90E-02	4.59E+01	Bechtel-Jacobs (1998a)[g]	Regression[d]	3.42E+01	Sample et al. (1999)	2.05E-02	1.19E+01	Sample et al. (1998b)[i]
Mercury	NA	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	7.78E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Selenium	NA	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	Regression[d]	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Silver		ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	1.13E-01	4.00E-03	4.50E-04	Baes et al. (1984)	5.41E-02	6.09E-03	USCHPPM (2004)	1.08E-01	1.22E-02	Baes et al. (1984)[e]
Vanadium	NA	1.22E+01	4.85E-03	5.94E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	5.14E-01	Sample et al. (1998a)	1.23E-02	1.51E-01	Sample et al. (1998b)[i]
Zinc	NA	5.65E+01	Regression[a]	4.52E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.21E+02	Sample et al. (1998a)	Regression[f]	1.04E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	1.03E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Phenanthrene	4.55	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs											

Table H18-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North-Central Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	ND	Regression[a]	0	USEPA (2007a)	1.59E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs											
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	1.62E-01	2.38E-02	3.84E-03	USEPA (2007a)	5.44E+01	8.79E+00	USEPA (2007a)	7.79E-01	1.26E-01	LANL (2015)
Butylbenzylphthalate	4.84	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	8.14E-01	0.00E+00	USEPA (2007a)	1.03E+01	0.00E+00	USEPA (2007a)	4.49E-01	0.00E+00	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)

Table H18-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North-Central Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H18-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North-Central Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([diet$_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H18-2
Refined Exposure Evaluation - American Woodcock
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-01	0.00E+00	1.34E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	9.28E-04	--	--	--	0.00E+00	1.09E-04	--	1.09E-04	No TRV	--	No TRV	--
Arsenic	6.26E+00	9.37E-04	2.76E-03	9.33E-02	0.00E+00	9.60E-02	1.10E-04	5.52E-02	1.51E-01	2.24E+00	<1	4.51E+00	<1
Barium	2.95E+02	1.73E-01	5.42E-01	2.84E+00	0.00E+00	3.38E+00	2.03E-02	2.60E+00	6.01E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	3.07E-05	--	3.07E-05	No TRV	--	No TRV	--
Cadmium	3.90E-01	6.80E-04	4.37E-03	4.14E-01	0.00E+00	4.19E-01	7.99E-05	3.44E-03	4.22E-01	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	3.49E-04	--	3.49E-04	2.66E+00	<1	1.56E+01	<1
Cobalt	5.83E+00	1.78E-03	5.13E-04	7.52E-02	0.00E+00	7.57E-02	2.09E-04	5.13E-02	1.27E-01	7.61E+00	<1	2.02E+01	<1
Copper	1.35E+01	9.09E-03	6.39E-02	7.36E-01	0.00E+00	8.00E-01	1.07E-03	1.19E-01	9.21E-01	4.05E+00	<1	3.48E+01	<1
Lead	1.29E+01	1.75E-03	1.31E-02	6.69E-01	0.00E+00	6.82E-01	2.06E-04	1.14E-01	7.96E-01	1.63E+00	<1	4.46E+01	<1
Manganese	1.14E+03	1.34E-01	1.06E+00	5.72E+00	0.00E+00	6.78E+00	1.58E-02	1.00E+01	1.68E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.72E-05	--	1.72E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.65E-04	0.00E+00	4.65E-04	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.49E-05	0.00E+00	8.49E-05	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.90E-01	2.54E-04	8.93E-06	1.09E-03	0.00E+00	1.10E-03	2.98E-05	1.67E-03	2.80E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	1.34E+01	2.33E-03	7.65E-04	5.97E-02	0.00E+00	6.04E-02	2.74E-04	1.18E-01	1.79E-01	3.44E-01	<1	1.70E+00	<1
Zinc	6.77E+01	2.54E-02	5.86E-01	3.60E+01	0.00E+00	3.66E+01	2.98E-03	5.97E-01	3.72E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.58E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-03	1.40E-03	6.19E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.36E-01	--	1.36E-01	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	4.83E-05	--	4.83E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.07E-04	--	2.07E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	6.79E-05	--	6.79E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	6.50E-05	--	6.50E-05				
Total LMW PAHs						0.00E+00	3.88E-04	0.00E+00	3.88E-04	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	6.76E-05	--	6.76E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	2.28E-04	--	2.28E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	5.98E-04	--	5.98E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	8.58E-05	--	8.58E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.80E-05	--	1.80E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	4.33E-04	--	4.33E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	7.87E-06	--	7.87E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	3.85E-05	--	3.85E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	1.56E-04	--	1.56E-04				
Total HMW PAHs						0.00E+00	1.63E-03	0.00E+00	1.63E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.21E-01	5.25E-03	3.37E-05	6.94E-01	0.00E+00	6.94E-01	6.17E-04	1.06E-03	6.96E-01	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H18-2
Refined Exposure Evaluation - American Woodcock
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H18-3
Refined Exposure Evaluation - Mourning Dove
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-01	0.00E+00	1.30E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	9.28E-04	--	--	--	0.00E+00	1.06E-04	--	1.06E-04	No TRV	--	No TRV	--
Arsenic	6.26E+00	9.37E-04	2.68E-02	0.00E+00	0.00E+00	2.68E-02	1.07E-04	4.86E-02	7.56E-02	2.24E+00	<1	4.51E+00	<1
Barium	2.95E+02	1.73E-01	5.26E+00	0.00E+00	0.00E+00	5.26E+00	1.97E-02	2.29E+00	7.57E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	2.98E-05	--	2.98E-05	No TRV	--	No TRV	--
Cadmium	3.90E-01	6.80E-04	4.24E-02	0.00E+00	0.00E+00	4.24E-02	7.76E-05	3.03E-03	4.56E-02	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	3.39E-04	--	3.39E-04	2.66E+00	<1	1.56E+01	<1
Cobalt	5.83E+00	1.78E-03	4.99E-03	0.00E+00	0.00E+00	4.99E-03	2.03E-04	4.52E-02	5.04E-02	7.61E+00	<1	2.02E+01	<1
Copper	1.35E+01	9.09E-03	6.21E-01	0.00E+00	0.00E+00	6.21E-01	1.04E-03	1.05E-01	7.27E-01	4.05E+00	<1	3.48E+01	<1
Lead	1.29E+01	1.75E-03	1.27E-01	0.00E+00	0.00E+00	1.27E-01	2.00E-04	1.00E-01	2.27E-01	1.63E+00	<1	4.46E+01	<1
Manganese	1.14E+03	1.34E-01	1.03E+01	0.00E+00	0.00E+00	1.03E+01	1.53E-02	8.85E+00	1.91E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.67E-05	--	1.67E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.52E-04	0.00E+00	4.52E-04	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.25E-05	0.00E+00	8.25E-05	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.90E-01	2.54E-04	8.67E-05	0.00E+00	0.00E+00	8.67E-05	2.90E-05	1.47E-03	1.59E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	1.34E+01	2.33E-03	7.44E-03	0.00E+00	0.00E+00	7.44E-03	2.66E-04	1.04E-01	1.12E-01	3.44E-01	<1	1.70E+00	<1
Zinc	6.77E+01	2.54E-02	5.70E+00	0.00E+00	0.00E+00	5.70E+00	2.89E-03	5.26E-01	6.23E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.58E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E-03	1.23E-03	5.89E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.32E-01	--	1.32E-01	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	4.70E-05	--	4.70E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.01E-04	--	2.01E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	6.60E-05	--	6.60E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	6.31E-05	--	6.31E-05				
Total LMW PAHs						0.00E+00	3.77E-04	0.00E+00	3.77E-04	1.61E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	6.56E-05	--	6.56E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	2.21E-04	--	2.21E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	5.81E-04	--	5.81E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	8.34E-05	--	8.34E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.75E-05	--	1.75E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	4.21E-04	--	4.21E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	7.65E-06	--	7.65E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	3.74E-05	--	3.74E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	1.52E-04	--	1.52E-04				
Total HMW PAHs						0.00E+00	1.59E-03	0.00E+00	1.59E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.21E-01	5.25E-03	3.28E-04	0.00E+00	0.00E+00	3.28E-04	5.99E-04	9.36E-04	1.86E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H18-3
Refined Exposure Evaluation - Mourning Dove
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H18-4
Refined Exposure Evaluation - Red-tailed Hawk
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.36E-02	0.00E+00	9.36E-02	1.10E+02	<1	1.10E+03	<1
Antimony	ND	9.28E-04	--	--	--	0.00E+00	7.61E-05	--	7.61E-05	No TRV	--	No TRV	--
Arsenic	6.26E+00	9.37E-04	0.00E+00	0.00E+00	2.89E-03	2.89E-03	7.68E-05	1.34E-02	1.63E-02	2.24E+00	<1	4.51E+00	<1
Barium	2.95E+02	1.73E-01	0.00E+00	0.00E+00	1.65E-02	1.65E-02	1.42E-02	6.30E-01	6.61E-01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	2.14E-05	--	2.14E-05	No TRV	--	No TRV	--
Cadmium	3.90E-01	6.80E-04	0.00E+00	0.00E+00	1.50E-02	1.50E-02	5.58E-05	8.32E-04	1.58E-02	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	2.44E-04	--	2.44E-04	2.66E+00	<1	1.56E+01	<1
Cobalt	5.83E+00	1.78E-03	0.00E+00	0.00E+00	9.42E-03	9.42E-03	1.46E-04	1.24E-02	2.20E-02	7.61E+00	<1	2.02E+01	<1
Copper	1.35E+01	9.09E-03	0.00E+00	0.00E+00	9.21E-01	9.21E-01	7.45E-04	2.88E-02	9.50E-01	4.05E+00	<1	3.48E+01	<1
Lead	1.29E+01	1.75E-03	0.00E+00	0.00E+00	2.74E-01	2.74E-01	1.44E-04	2.75E-02	3.02E-01	1.63E+00	<1	4.46E+01	<1
Manganese	1.14E+03	1.34E-01	0.00E+00	0.00E+00	1.92E+00	1.92E+00	1.10E-02	2.43E+00	4.36E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.20E-05	--	1.20E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.25E-04	0.00E+00	3.25E-04	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.93E-05	0.00E+00	5.93E-05	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.90E-01	2.54E-04	0.00E+00	0.00E+00	1.69E-03	1.69E-03	2.08E-05	4.05E-04	2.11E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	1.34E+01	2.33E-03	0.00E+00	0.00E+00	1.36E-02	1.36E-02	1.91E-04	2.86E-02	4.24E-02	3.44E-01	<1	1.70E+00	<1
Zinc	6.77E+01	2.54E-02	0.00E+00	0.00E+00	8.67E+00	8.67E+00	2.08E-03	1.44E-01	8.82E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.58E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-03	3.38E-04	3.69E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	9.49E-02	--	9.49E-02	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	3.37E-05	--	3.37E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	1.44E-04	--	1.44E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	4.74E-05	--	4.74E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	4.54E-05	--	4.54E-05				
Total LMW PAHs						0.00E+00	2.71E-04	0.00E+00	2.71E-04	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	4.72E-05	--	4.72E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	1.59E-04	--	1.59E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	4.17E-04	--	4.17E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	5.99E-05	--	5.99E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.26E-05	--	1.26E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	3.02E-04	--	3.02E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	5.49E-06	--	5.49E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	2.69E-05	--	2.69E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	1.09E-04	--	1.09E-04				
Total HMW PAHs						0.00E+00	1.14E-03	0.00E+00	1.14E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.21E-01	5.25E-03	0.00E+00	0.00E+00	7.71E-03	7.71E-03	4.31E-04	2.57E-04	8.39E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H18-4
Refined Exposure Evaluation - Red-tailed Hawk
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H18-5
Refined Exposure Evaluation - Yellow-billed Cuckoo
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.81E-01	0.00E+00	1.81E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	9.28E-04	--	--	--	0.00E+00	1.47E-04	--	1.47E-04	No TRV	--	No TRV	--
Arsenic	6.26E+00	9.37E-04	0.00E+00	1.40E-01	0.00E+00	1.40E-01	1.48E-04	0.00E+00	1.40E-01	2.24E+00	<1	4.51E+00	<1
Barium	2.95E+02	1.73E-01	0.00E+00	4.26E+00	0.00E+00	4.26E+00	2.74E-02	0.00E+00	4.28E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	4.13E-05	--	4.13E-05	No TRV	--	No TRV	--
Cadmium	3.90E-01	6.80E-04	0.00E+00	6.20E-01	0.00E+00	6.20E-01	1.08E-04	0.00E+00	6.20E-01	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	4.71E-04	--	4.71E-04	2.66E+00	<1	1.56E+01	<1
Cobalt	5.83E+00	1.78E-03	0.00E+00	1.13E-01	0.00E+00	1.13E-01	2.82E-04	0.00E+00	1.13E-01	7.61E+00	<1	2.02E+01	<1
Copper	1.35E+01	9.09E-03	0.00E+00	1.10E+00	0.00E+00	1.10E+00	1.44E-03	0.00E+00	1.10E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.29E+01	1.75E-03	0.00E+00	1.00E+00	0.00E+00	1.00E+00	2.77E-04	0.00E+00	1.00E+00	1.63E+00	<1	4.46E+01	<1
Manganese	1.14E+03	1.34E-01	0.00E+00	8.57E+00	0.00E+00	8.57E+00	2.13E-02	0.00E+00	8.59E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	2.31E-05	--	2.31E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.27E-04	0.00E+00	6.27E-04	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-04	0.00E+00	1.14E-04	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.90E-01	2.54E-04	0.00E+00	1.63E-03	0.00E+00	1.63E-03	4.02E-05	0.00E+00	1.67E-03	3.50E-01	<1	3.50E+00	<1
Vanadium	1.34E+01	2.33E-03	0.00E+00	8.93E-02	0.00E+00	8.93E-02	3.70E-04	0.00E+00	8.97E-02	3.44E-01	<1	1.70E+00	<1
Zinc	6.77E+01	2.54E-02	0.00E+00	5.40E+01	0.00E+00	5.40E+01	4.01E-03	0.00E+00	5.40E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.58E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.46E-03	0.00E+00	6.46E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.83E-01	--	1.83E-01	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	6.52E-05	--	6.52E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.79E-04	--	2.79E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	9.15E-05	--	9.15E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	8.76E-05	--	8.76E-05				
Total LMW PAHs						0.00E+00	5.23E-04	0.00E+00	5.23E-04	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	9.11E-05	--	9.11E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	3.07E-04	--	3.07E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	8.06E-04	--	8.06E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	1.16E-04	--	1.16E-04				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.43E-05	--	2.43E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	5.84E-04	--	5.84E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	1.06E-05	--	1.06E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	5.19E-05	--	5.19E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	2.11E-04	--	2.11E-04				
Total HMW PAHs						0.00E+00	2.20E-03	0.00E+00	2.20E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.21E-01	5.25E-03	0.00E+00	1.04E+00	0.00E+00	1.04E+00	8.31E-04	0.00E+00	1.04E+00	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H18-5
Refined Exposure Evaluation - Yellow-billed Cuckoo
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H18-6
Refined Exposure Evaluation - Canada Lynx
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.57E-02	0.00E+00	3.57E-02	No TRV	--	No TRV	--
Antimony	ND	9.28E-04	--	--	--	0.00E+00	2.90E-05	--	2.90E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	6.26E+00	9.37E-04	0.00E+00	0.00E+00	1.10E-03	1.10E-03	2.93E-05	5.48E-03	6.61E-03	1.04E+00	<1	4.55E+00	<1
Barium	2.95E+02	1.73E-01	0.00E+00	0.00E+00	6.30E-03	6.30E-03	5.40E-03	2.59E-01	2.70E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	8.15E-06	--	8.15E-06	5.32E-01	<1	6.70E-01	<1
Cadmium	3.90E-01	6.80E-04	0.00E+00	0.00E+00	5.70E-03	5.70E-03	2.12E-05	3.41E-04	6.06E-03	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	9.29E-05	--	9.29E-05	2.40E+00	<1	5.82E+01	<1
Cobalt	5.83E+00	1.78E-03	0.00E+00	0.00E+00	3.59E-03	3.59E-03	5.56E-05	5.10E-03	8.74E-03	7.33E+00	<1	1.89E+01	<1
Copper	1.35E+01	9.09E-03	0.00E+00	0.00E+00	3.51E-01	3.51E-01	2.84E-04	1.18E-02	3.63E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.29E+01	1.75E-03	0.00E+00	0.00E+00	1.04E-01	1.04E-01	5.47E-05	1.13E-02	1.16E-01	4.70E+00	<1	1.86E+02	<1
Manganese	1.14E+03	1.34E-01	0.00E+00	0.00E+00	7.30E-01	7.30E-01	4.20E-03	9.97E-01	1.73E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	4.56E-06	--	4.56E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.24E-04	0.00E+00	1.24E-04	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.26E-05	0.00E+00	2.26E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.90E-01	2.54E-04	0.00E+00	0.00E+00	6.42E-04	6.42E-04	7.94E-06	1.66E-04	8.16E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.34E+01	2.33E-03	0.00E+00	0.00E+00	5.16E-03	5.16E-03	7.29E-05	1.18E-02	1.70E-02	4.16E+00	<1	9.44E+00	<1
Zinc	6.77E+01	2.54E-02	0.00E+00	0.00E+00	3.30E+00	3.30E+00	7.92E-04	5.93E-02	3.36E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.58E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-03	1.39E-04	1.41E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	3.62E-02	--	3.62E-02	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	1.29E-05	--	1.29E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	5.50E-05	--	5.50E-05				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	1.81E-05	--	1.81E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	1.73E-05	--	1.73E-05				
Total LMW PAHs						0.00E+00	1.03E-04	0.00E+00	1.03E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	1.80E-05	--	1.80E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	6.06E-05	--	6.06E-05				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	1.59E-04	--	1.59E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	2.28E-05	--	2.28E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	4.79E-06	--	4.79E-06				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	1.15E-04	--	1.15E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	2.09E-06	--	2.09E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	1.02E-05	--	1.02E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	4.16E-05	--	4.16E-05				
Total HMW PAHs						0.00E+00	4.34E-04	0.00E+00	4.34E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.21E-01	5.25E-03	0.00E+00	0.00E+00	2.94E-03	2.94E-03	1.64E-04	1.06E-04	3.21E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H18-6
Refined Exposure Evaluation - Canada Lynx
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H18-7
Refined Exposure Evaluation - Grizzly Bear
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate						
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.47E-02	0.00E+00	2.47E-02	No TRV	--	No TRV	--
Antimony	ND	9.28E-04	--	--	--	0.00E+00	0.00E+00	2.00E-05	--	2.00E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	6.26E+00	9.37E-04	3.30E-03	2.86E-03	7.62E-05	0.00E+00	6.23E-03	2.02E-05	3.79E-03	1.00E-02	1.04E+00	<1	4.55E+00	<1
Barium	2.95E+02	1.73E-01	6.47E-01	8.71E-02	4.36E-04	0.00E+00	7.35E-01	3.73E-03	1.79E-01	9.17E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	0.00E+00	5.64E-06	--	5.64E-06	5.32E-01	<1	6.70E-01	<1
Cadmium	3.90E-01	6.80E-04	5.22E-03	1.27E-02	3.94E-04	0.00E+00	1.83E-02	1.47E-05	2.36E-04	1.86E-02	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	0.00E+00	6.42E-05	--	6.42E-05	2.40E+00	<1	5.82E+01	<1
Cobalt	5.83E+00	1.78E-03	6.13E-04	2.30E-03	2.48E-04	0.00E+00	3.16E-03	3.84E-05	3.52E-03	6.73E-03	7.33E+00	<1	1.89E+01	<1
Copper	1.35E+01	9.09E-03	7.64E-02	2.26E-02	2.42E-02	0.00E+00	1.23E-01	1.96E-04	8.18E-03	1.32E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.29E+01	1.75E-03	1.56E-02	2.05E-02	7.22E-03	0.00E+00	4.33E-02	3.78E-05	7.80E-03	5.12E-02	4.70E+00	<1	1.86E+02	<1
Manganese	1.14E+03	1.34E-01	1.26E+00	1.75E-01	5.05E-02	0.00E+00	1.49E+00	2.90E-03	6.89E-01	2.18E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	0.00E+00	3.15E-06	--	3.15E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.55E-05	0.00E+00	8.55E-05	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-05	0.00E+00	1.56E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.90E-01	2.54E-04	1.07E-05	3.33E-05	4.44E-05	0.00E+00	8.84E-05	5.49E-06	1.15E-04	2.09E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.34E+01	2.33E-03	9.15E-04	1.83E-03	3.57E-04	0.00E+00	3.10E-03	5.04E-05	8.12E-03	1.13E-02	4.16E+00	<1	9.44E+00	<1
Zinc	6.77E+01	2.54E-02	7.01E-01	1.10E+00	2.28E-01	0.00E+00	2.03E+00	5.48E-04	4.10E-02	2.07E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	1.58E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.82E-04	9.58E-05	9.77E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	0.00E+00	2.50E-02	--	2.50E-02	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	0.00E+00	8.89E-06	--	8.89E-06				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	0.00E+00	3.80E-05	--	3.80E-05				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	0.00E+00	1.25E-05	--	1.25E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	0.00E+00	1.19E-05	--	1.19E-05				
Total LMW PAHs							0.00E+00	7.13E-05	0.00E+00	7.13E-05	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	0.00E+00	1.24E-05	--	1.24E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	0.00E+00	4.19E-05	--	4.19E-05				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	0.00E+00	1.10E-04	--	1.10E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	0.00E+00	1.58E-05	--	1.58E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	0.00E+00	3.31E-06	--	3.31E-06				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	0.00E+00	7.96E-05	--	7.96E-05				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	0.00E+00	1.45E-06	--	1.45E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	0.00E+00	7.08E-06	--	7.08E-06				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	0.00E+00	2.87E-05	--	2.87E-05				
Total HMW PAHs							0.00E+00	3.00E-04	0.00E+00	3.00E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.21E-01	5.25E-03	4.03E-05	2.13E-02	2.03E-04	0.00E+00	2.15E-02	1.13E-04	7.29E-05	2.17E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H18-7
Refined Exposure Evaluation - Grizzly Bear
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)											
			Diet					Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans							0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H18-8
Refined Exposure Evaluation - Long-tailed Weasel
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.87E-02	0.00E+00	5.87E-02	No TRV	--	No TRV	--
Antimony	ND	9.28E-04	--	--	--	0.00E+00	4.78E-05	--	4.78E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	6.86E+00	9.37E-04	0.00E+00	0.00E+00	1.95E-03	1.95E-03	4.82E-05	5.65E-03	7.65E-03	1.04E+00	<1	4.55E+00	<1
Barium	2.19E+02	1.73E-01	0.00E+00	0.00E+00	7.69E-03	7.69E-03	8.90E-03	1.80E-01	1.97E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	1.34E-05	--	1.34E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	2.14E-01	6.80E-04	0.00E+00	0.00E+00	7.06E-03	7.06E-03	3.50E-05	1.76E-04	7.27E-03	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	1.53E-04	--	1.53E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	5.91E+00	1.78E-03	0.00E+00	0.00E+00	6.02E-03	6.02E-03	9.15E-05	4.86E-03	1.10E-02	7.33E+00	<1	1.89E+01	<1
Copper	1.47E+01	9.09E-03	0.00E+00	0.00E+00	5.85E-01	5.85E-01	4.68E-04	1.21E-02	5.97E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.22E+01	1.75E-03	0.00E+00	0.00E+00	1.68E-01	1.68E-01	9.01E-05	1.01E-02	1.78E-01	4.70E+00	<1	1.86E+02	<1
Manganese	5.81E+02	1.34E-01	0.00E+00	0.00E+00	6.13E-01	6.13E-01	6.92E-03	4.78E-01	1.10E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	7.51E-06	--	7.51E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.04E-04	0.00E+00	2.04E-04	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.72E-05	0.00E+00	3.72E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.13E-01	2.54E-04	0.00E+00	0.00E+00	6.26E-04	6.26E-04	1.31E-05	9.26E-05	7.32E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.22E+01	2.33E-03	0.00E+00	0.00E+00	7.75E-03	7.75E-03	1.20E-04	1.01E-02	1.80E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.65E+01	2.54E-02	0.00E+00	0.00E+00	5.37E+00	5.37E+00	1.30E-03	4.65E-02	5.42E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.03E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-03	8.49E-05	2.19E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	5.96E-02	--	5.96E-02	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	2.12E-05	--	2.12E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	9.06E-05	--	9.06E-05				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	2.97E-05	--	2.97E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	2.85E-05	--	2.85E-05				
Total LMW PAHs						0.00E+00	1.70E-04	0.00E+00	1.70E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	2.96E-05	--	2.96E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	9.97E-05	--	9.97E-05				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	2.62E-04	--	2.62E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	3.76E-05	--	3.76E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	7.88E-06	--	7.88E-06				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	1.90E-04	--	1.90E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	3.45E-06	--	3.45E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	1.69E-05	--	1.69E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	6.84E-05	--	6.84E-05				
Total HMW PAHs						0.00E+00	7.15E-04	0.00E+00	7.15E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.62E-01	5.25E-03	0.00E+00	0.00E+00	6.48E-03	6.48E-03	2.70E-04	1.33E-04	6.88E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H18-8
Refined Exposure Evaluation - Long-tailed Weasel
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H18-9
Refined Exposure Evaluation - Meadow Vole
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E-01	0.00E+00	1.71E-01	No TRV	--	No TRV	--
Antimony	ND	9.28E-04	--	--	--	0.00E+00	1.39E-04	--	1.39E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	6.86E+00	9.37E-04	3.87E-02	0.00E+00	0.00E+00	3.87E-02	1.41E-04	1.34E-02	5.22E-02	1.04E+00	<1	4.55E+00	<1
Barium	2.19E+02	1.73E-01	5.13E+00	0.00E+00	0.00E+00	5.13E+00	2.60E-02	4.28E-01	5.58E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	3.92E-05	--	3.92E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	2.14E-01	6.80E-04	4.02E-02	0.00E+00	0.00E+00	4.02E-02	1.02E-04	4.17E-04	4.08E-02	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	4.47E-04	--	4.47E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	5.91E+00	1.78E-03	6.66E-03	0.00E+00	0.00E+00	6.66E-03	2.67E-04	1.15E-02	1.85E-02	7.33E+00	<1	1.89E+01	<1
Copper	1.47E+01	9.09E-03	8.45E-01	0.00E+00	0.00E+00	8.45E-01	1.37E-03	2.87E-02	8.75E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.22E+01	1.75E-03	1.62E-01	0.00E+00	0.00E+00	1.62E-01	2.63E-04	2.39E-02	1.86E-01	4.70E+00	<1	1.86E+02	<1
Manganese	5.81E+02	1.34E-01	6.89E+00	0.00E+00	0.00E+00	6.89E+00	2.02E-02	1.13E+00	8.05E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	2.19E-05	--	2.19E-05	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.95E-04	0.00E+00	5.95E-04	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.09E-04	0.00E+00	1.09E-04	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.13E-01	2.54E-04	6.76E-05	0.00E+00	0.00E+00	6.76E-05	3.82E-05	2.20E-04	3.25E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.22E+01	2.33E-03	8.92E-03	0.00E+00	0.00E+00	8.92E-03	3.51E-04	2.39E-02	3.32E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.65E+01	2.54E-02	6.78E+00	0.00E+00	0.00E+00	6.78E+00	3.81E-03	1.10E-01	6.90E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.03E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.13E-03	2.01E-04	6.33E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.74E-01	--	1.74E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	6.18E-05	--	6.18E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.64E-04	--	2.64E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	8.69E-05	--	8.69E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	8.31E-05	--	8.31E-05				
Total LMW PAHs						0.00E+00	4.96E-04	0.00E+00	4.96E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	8.64E-05	--	8.64E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	2.91E-04	--	2.91E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	7.65E-04	--	7.65E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	1.10E-04	--	1.10E-04				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.30E-05	--	2.30E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	5.54E-04	--	5.54E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	1.01E-05	--	1.01E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	4.92E-05	--	4.92E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	2.00E-04	--	2.00E-04				
Total HMW PAHs						0.00E+00	2.09E-03	0.00E+00	2.09E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.62E-01	5.25E-03	5.78E-04	0.00E+00	0.00E+00	5.78E-04	7.89E-04	3.16E-04	1.68E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H18-9
Refined Exposure Evaluation - Meadow Vole
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H18-10
Refined Exposure Evaluation - North American Wolverine
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E-02	0.00E+00	3.43E-02	No TRV	--	No TRV	--
Antimony	ND	9.28E-04	--	--	--	0.00E+00	2.79E-05	--	2.79E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	6.86E+00	9.37E-04	0.00E+00	0.00E+00	1.14E-03	1.14E-03	2.81E-05	5.77E-03	6.94E-03	1.04E+00	<1	4.55E+00	<1
Barium	2.19E+02	1.73E-01	0.00E+00	0.00E+00	4.49E-03	4.49E-03	5.19E-03	1.84E-01	1.94E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	7.84E-06	--	7.84E-06	5.32E-01	<1	6.70E-01	<1
Cadmium	2.14E-01	6.80E-04	0.00E+00	0.00E+00	4.12E-03	4.12E-03	2.04E-05	1.80E-04	4.32E-03	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	8.93E-05	--	8.93E-05	2.40E+00	<1	5.82E+01	<1
Cobalt	5.91E+00	1.78E-03	0.00E+00	0.00E+00	3.52E-03	3.52E-03	5.34E-05	4.97E-03	8.54E-03	7.33E+00	<1	1.89E+01	<1
Copper	1.47E+01	9.09E-03	0.00E+00	0.00E+00	3.41E-01	3.41E-01	2.73E-04	1.24E-02	3.54E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.22E+01	1.75E-03	0.00E+00	0.00E+00	9.81E-02	9.81E-02	5.26E-05	1.03E-02	1.08E-01	4.70E+00	<1	1.86E+02	<1
Manganese	5.81E+02	1.34E-01	0.00E+00	0.00E+00	3.58E-01	3.58E-01	4.04E-03	4.89E-01	8.51E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	4.39E-06	--	4.39E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.19E-04	0.00E+00	1.19E-04	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.17E-05	0.00E+00	2.17E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.13E-01	2.54E-04	0.00E+00	0.00E+00	3.66E-04	3.66E-04	7.63E-06	9.46E-05	4.68E-04	4.80E-01	<1	1.43E+00	<1
Vanadium	1.22E+01	2.33E-03	0.00E+00	0.00E+00	4.52E-03	4.52E-03	7.02E-05	1.03E-02	1.49E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.65E+01	2.54E-02	0.00E+00	0.00E+00	3.14E+00	3.14E+00	7.62E-04	4.76E-02	3.18E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.03E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-03	8.67E-05	1.31E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	3.48E-02	--	3.48E-02	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	1.24E-05	--	1.24E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	5.29E-05	--	5.29E-05				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	1.74E-05	--	1.74E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	1.66E-05	--	1.66E-05				
Total LMW PAHs						0.00E+00	9.92E-05	0.00E+00	9.92E-05	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	1.73E-05	--	1.73E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	5.82E-05	--	5.82E-05				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	1.53E-04	--	1.53E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	2.20E-05	--	2.20E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	4.60E-06	--	4.60E-06				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	1.11E-04	--	1.11E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	2.01E-06	--	2.01E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	9.85E-06	--	9.85E-06				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	4.00E-05	--	4.00E-05				
Total HMW PAHs						0.00E+00	4.18E-04	0.00E+00	4.18E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.62E-01	5.25E-03	0.00E+00	0.00E+00	3.78E-03	3.78E-03	1.58E-04	1.36E-04	4.08E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H18-10
Refined Exposure Evaluation - North American Wolverine
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H18-11
Refined Exposure Evaluation - Short-tailed Shrew
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-01	0.00E+00	1.53E-01	No TRV	--	No TRV	--
Antimony	ND	9.28E-04	--	--	--	0.00E+00	1.24E-04	--	1.24E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	6.86E+00	9.37E-04	0.00E+00	1.26E-01	0.00E+00	1.26E-01	1.26E-04	1.01E-02	1.36E-01	1.04E+00	<1	4.55E+00	<1
Barium	2.19E+02	1.73E-01	0.00E+00	2.67E+00	0.00E+00	2.67E+00	2.32E-02	3.23E-01	3.02E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	3.50E-05	--	3.50E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	2.14E-01	6.80E-04	0.00E+00	3.25E-01	0.00E+00	3.25E-01	9.11E-05	3.15E-04	3.26E-01	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	3.99E-04	--	3.99E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	5.91E+00	1.78E-03	0.00E+00	9.66E-02	0.00E+00	9.66E-02	2.38E-04	8.71E-03	1.06E-01	7.33E+00	<1	1.89E+01	<1
Copper	1.47E+01	9.09E-03	0.00E+00	1.01E+00	0.00E+00	1.01E+00	1.22E-03	2.17E-02	1.04E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.22E+01	1.75E-03	0.00E+00	8.13E-01	0.00E+00	8.13E-01	2.35E-04	1.80E-02	8.31E-01	4.70E+00	<1	1.86E+02	<1
Manganese	5.81E+02	1.34E-01	0.00E+00	4.58E+00	0.00E+00	4.58E+00	1.80E-02	8.56E-01	5.45E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.96E-05	--	1.96E-05	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.31E-04	0.00E+00	5.31E-04	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.69E-05	0.00E+00	9.69E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.13E-01	2.54E-04	0.00E+00	8.16E-04	0.00E+00	8.16E-04	3.40E-05	1.66E-04	1.02E-03	4.80E-01	<1	1.43E+00	<1
Vanadium	1.22E+01	2.33E-03	0.00E+00	6.89E-02	0.00E+00	6.89E-02	3.13E-04	1.80E-02	8.73E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.65E+01	2.54E-02	0.00E+00	4.31E+01	0.00E+00	4.31E+01	3.40E-03	8.33E-02	4.31E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.03E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.47E-03	1.52E-04	5.62E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.55E-01	--	1.55E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	5.51E-05	--	5.51E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.36E-04	--	2.36E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	7.75E-05	--	7.75E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	7.41E-05	--	7.41E-05				
Total LMW PAHs						0.00E+00	4.43E-04	0.00E+00	4.43E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	7.71E-05	--	7.71E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	2.60E-04	--	2.60E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	6.82E-04	--	6.82E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	9.79E-05	--	9.79E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.05E-05	--	2.05E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	4.94E-04	--	4.94E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	8.98E-06	--	8.98E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	4.39E-05	--	4.39E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	1.78E-04	--	1.78E-04				
Total HMW PAHs						0.00E+00	1.86E-03	0.00E+00	1.86E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.62E-01	5.25E-03	0.00E+00	1.18E+00	0.00E+00	1.18E+00	7.04E-04	2.38E-04	1.18E+00	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H18-11
Refined Exposure Evaluation - Short-tailed Shrew
North-Central Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H19-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Western Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	1.14E+00	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	9.28E-04	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	1.00E+00	0.00E+00	Assumption[c]	5.00E-02	0.00E+00	Baes et al. (1984)[e]
Arsenic	NA	9.37E-04	5.98E+00	3.75E-02	2.24E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	8.53E-01	Sample et al. (1999)	Regression[f]	3.39E-02	Sample et al. (1998b)
Barium	NA	1.73E-01	3.07E+02	1.56E-01	4.79E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	2.79E+01	Sample et al. (1998a)	6.83E-04	2.09E-01	Baes et al. (1984)[e]
Beryllium	NA	2.61E-04	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	4.50E-02	0.00E+00	Sample et al. (1998a)	2.25E-03	0.00E+00	Baes et al. (1984)[e]
Cadmium	NA	6.80E-04	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	Regression[d]	0.00E+00	Sample et al. (1999)	Regression[f]	0.00E+00	Sample et al. (1998b)
Chromium	NA	2.97E-03	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	1.78E-03	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	9.09E-03	1.77E+01	Regression[a]	6.05E+00	Bechtel-Jacobs (1998a)	5.15E-01	9.10E+00	Sample et al. (1998a)	Regression[f]	1.17E+01	Sample et al. (1998b)
Lead	NA	1.75E-03	1.56E+01	Regression[a]	1.24E+00	Bechtel-Jacobs (1998a)	Regression[d]	7.38E+00	Sample et al. (1999)	Regression[f]	3.64E+00	Sample et al. (1998b)
Manganese	NA	1.34E-01	6.26E+02	7.90E-02	4.94E+01	Bechtel-Jacobs (1998a)[g]	Regression[d]	3.60E+01	Sample et al. (1999)	2.05E-02	1.28E+01	Sample et al. (1998b)[i]
Mercury	NA	1.46E-04	ND	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	3.96E-03	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	7.78E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Selenium	NA	7.23E-04	4.46E-01	Regression[a]	2.09E-01	Bechtel-Jacobs (1998a)	Regression[d]	5.14E-01	Sample et al. (1998a)	Regression[f]	4.87E-01	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	2.54E-04	0.00E+00	4.00E-03	0.00E+00	Baes et al. (1984)	5.41E-02	0.00E+00	USCHPPM (2004)	1.08E-01	0.00E+00	Baes et al. (1984)[e]
Vanadium	NA	2.33E-03	1.29E+01	4.85E-03	6.25E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	5.41E-01	Sample et al. (1998a)	1.23E-02	1.58E-01	Sample et al. (1998b)[i]
Zinc	NA	2.54E-02	6.72E+01	Regression[a]	4.97E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.40E+02	Sample et al. (1998a)	Regression[f]	1.06E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	4.08E-02	4.35E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	1.16E+00	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	4.12E-04	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	1.76E-03	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	5.78E-04	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Phenanthrene	4.55	5.53E-04	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs												
High Molecular Weight (HMW) PAHs:												

Table H19-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Western Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Benzo(a)anthracene	5.7	5.75E-04	ND	Regression[a]	0	USEPA (2007a)	1.59E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	1.94E-03	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	5.09E-03	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	7.31E-04	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	1.53E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	3.69E-03	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	6.70E-05	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.28E-04	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	1.33E-03	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	5.25E-03	4.92E-02	2.38E-02	1.17E-03	USEPA (2007a)	5.44E+01	2.68E+00	USEPA (2007a)	7.79E-01	3.84E-02	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	8.14E-01	0.00E+00	USEPA (2007a)	1.03E+01	0.00E+00	USEPA (2007a)	4.49E-01	0.00E+00	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	1.84E-06	9.41E-02	1.73E-07	USEPA (2007a)[b]	Regression[d]	5.69E-06	Sample et al. (1998a)	Regression[h]	1.12E-06	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	1.61E-07	5.17E-02	8.33E-09	USEPA (2007a)[b]	Regression[d]	3.20E-07	Sample et al. (1998a)	Regression[h]	7.67E-08	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	1.07E-06	2.82E-02	3.02E-08	USEPA (2007a)[b]	Regression[d]	3.00E-06	Sample et al. (1998a)	Regression[h]	6.15E-07	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	1.11E-06	2.82E-02	3.13E-08	USEPA (2007a)[b]	Regression[d]	3.13E-06	Sample et al. (1998a)	Regression[h]	6.40E-07	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	8.62E-07	2.82E-02	2.43E-08	USEPA (2007a)[b]	Regression[d]	2.32E-06	Sample et al. (1998a)	Regression[h]	4.85E-07	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	4.70E-06	1.55E-02	7.29E-08	USEPA (2007a)[b]	Regression[d]	1.72E-05	Sample et al. (1998a)	Regression[h]	3.13E-06	Sample et al. (1998b)
OCDD	9.50	0.00E+00	2.52E-05	8.45E-03	2.13E-07	USEPA (2007a)[b]	Regression[d]	1.26E-04	Sample et al. (1998a)	Regression[h]	1.98E-05	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H19-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Western Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
2,3,4,7,8-PeCDF	6.94	0.00E+00	2.80E-07	9.24E-02	2.59E-08	USEPA (2007a)[b]	Regression[d]	6.15E-07	Sample et al. (1998a)	1.25E-01	3.50E-08	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	8.00E-07	3.70E-02	2.96E-08	USEPA (2007a)[b]	Regression[d]	2.13E-06	Sample et al. (1998a)	1.25E-01	1.00E-07	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	7.60E-07	3.70E-02	2.81E-08	USEPA (2007a)[b]	Regression[d]	2.00E-06	Sample et al. (1998a)	1.25E-01	9.51E-08	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	9.20E-07	5.08E-02	4.67E-08	USEPA (2007a)[b]	Regression[d]	2.51E-06	Sample et al. (1998a)	1.25E-01	1.15E-07	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	2.03E-06	2.77E-02	5.62E-08	USEPA (2007a)[b]	Regression[d]	6.39E-06	Sample et al. (1998a)	1.25E-01	2.54E-07	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	2.82E-06	1.52E-02	4.29E-08	USEPA (2007a)[b]	Regression[d]	9.43E-06	Sample et al. (1998a)	1.25E-01	3.53E-07	Sample et al. (1998b)[i]

Table H19-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Western Undeveloped Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assummed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H19-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Western Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	1.14E+00	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	9.28E-04	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	1.00E+00	0.00E+00	Assumption[c]	5.00E-02	0.00E+00	Baes et al. (1984)[e]
Arsenic	NA	9.37E-04	5.94E+00	3.75E-02	2.23E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	8.50E-01	Sample et al. (1999)	Regression[f]	3.38E-02	Sample et al. (1998b)
Barium	NA	1.73E-01	2.60E+02	1.56E-01	4.05E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	2.36E+01	Sample et al. (1998a)	6.83E-04	1.77E-01	Baes et al. (1984)[e]
Beryllium	NA	2.61E-04	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	4.50E-02	0.00E+00	Sample et al. (1998a)	2.25E-03	0.00E+00	Baes et al. (1984)[e]
Cadmium	NA	6.80E-04	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	Regression[d]	0.00E+00	Sample et al. (1999)	Regression[f]	0.00E+00	Sample et al. (1998b)
Chromium	NA	2.97E-03	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	1.78E-03	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	9.09E-03	1.67E+01	Regression[a]	5.91E+00	Bechtel-Jacobs (1998a)	5.15E-01	8.60E+00	Sample et al. (1998a)	Regression[f]	1.16E+01	Sample et al. (1998b)
Lead	NA	1.75E-03	1.26E+01	Regression[a]	1.10E+00	Bechtel-Jacobs (1998a)	Regression[d]	6.22E+00	Sample et al. (1999)	Regression[f]	3.31E+00	Sample et al. (1998b)
Manganese	NA	1.34E-01	4.29E+02	7.90E-02	3.39E+01	Bechtel-Jacobs (1998a)[g]	Regression[d]	2.78E+01	Sample et al. (1999)	2.05E-02	8.80E+00	Sample et al. (1998b)[i]
Mercury	NA	1.46E-04	ND	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	3.96E-03	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	7.78E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Selenium	NA	7.23E-04	3.21E-01	Regression[a]	1.45E-01	Bechtel-Jacobs (1998a)	Regression[d]	4.04E-01	Sample et al. (1998a)	Regression[f]	4.30E-01	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	2.54E-04	0.00E+00	4.00E-03	0.00E+00	Baes et al. (1984)	5.41E-02	0.00E+00	USCHPPM (2004)	1.08E-01	0.00E+00	Baes et al. (1984)[e]
Vanadium	NA	2.33E-03	1.27E+01	4.85E-03	6.17E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	5.34E-01	Sample et al. (1998a)	1.23E-02	1.56E-01	Sample et al. (1998b)[i]
Zinc	NA	2.54E-02	5.28E+01	Regression[a]	4.35E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.14E+02	Sample et al. (1998a)	Regression[f]	1.04E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	4.08E-02	1.31E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	1.16E+00	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	4.12E-04	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	1.76E-03	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	5.78E-04	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Phenanthrene	4.55	5.53E-04	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs												
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	5.7	5.75E-04	ND	Regression[a]	0	USEPA (2007a)	1.59E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]

Table H19-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Western Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Benzo[A]Pyrene	6.11	1.94E-03	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	5.09E-03	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	7.31E-04	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	1.53E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	3.69E-03	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	6.70E-05	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.28E-04	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	1.33E-03	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	5.25E-03	4.29E-02	2.38E-02	1.02E-03	USEPA (2007a)	5.44E+01	2.34E+00	USEPA (2007a)	7.79E-01	3.34E-02	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	8.14E-01	0.00E+00	USEPA (2007a)	1.03E+01	0.00E+00	USEPA (2007a)	4.49E-01	0.00E+00	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	1.39E-06	9.41E-02	1.31E-07	USEPA (2007a)[b]	Regression[d]	4.09E-06	Sample et al. (1998a)	Regression[h]	8.20E-07	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	8.70E-08	5.17E-02	4.50E-09	USEPA (2007a)[b]	Regression[d]	1.54E-07	Sample et al. (1998a)	Regression[h]	3.90E-08	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	2.90E-07	2.82E-02	8.18E-09	USEPA (2007a)[b]	Regression[d]	6.41E-07	Sample et al. (1998a)	Regression[h]	1.46E-07	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	2.39E-07	2.82E-02	6.74E-09	USEPA (2007a)[b]	Regression[d]	5.10E-07	Sample et al. (1998a)	Regression[h]	1.18E-07	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	1.83E-06	1.55E-02	2.84E-08	USEPA (2007a)[b]	Regression[d]	5.66E-06	Sample et al. (1998a)	Regression[h]	1.11E-06	Sample et al. (1998b)
OCDD	9.50	0.00E+00	1.36E-05	8.45E-03	1.15E-07	USEPA (2007a)[b]	Regression[d]	6.06E-05	Sample et al. (1998a)	Regression[h]	1.01E-05	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	0.00E+00	1.53E-07	9.24E-02	1.41E-08	USEPA (2007a)[b]	Regression[d]	3.01E-07	Sample et al. (1998a)	1.25E-01	1.91E-08	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	2.35E-07	3.70E-02	8.69E-09	USEPA (2007a)[b]	Regression[d]	5.00E-07	Sample et al. (1998a)	1.25E-01	2.94E-08	Sample et al. (1998b)[i]

Table H19-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Western Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	2.37E-07	3.70E-02	8.76E-09	USEPA (2007a)[b]	Regression[d]	5.05E-07	Sample et al. (1998a)	1.25E-01	2.96E-08	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	2.64E-07	5.08E-02	1.34E-08	USEPA (2007a)[b]	Regression[d]	5.74E-07	Sample et al. (1998a)	1.25E-01	3.30E-08	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	3.45E-07	2.77E-02	9.55E-09	USEPA (2007a)[b]	Regression[d]	7.87E-07	Sample et al. (1998a)	1.25E-01	4.32E-08	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	1.32E-06	1.52E-02	2.01E-08	USEPA (2007a)[b]	Regression[d]	3.84E-06	Sample et al. (1998a)	1.25E-01	1.65E-07	Sample et al. (1998b)[i]

Table H19-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Western Undeveloped Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assummed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([diet$_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H19-2
Refined Exposure Evaluation - American Woodcock
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-01	0.00E+00	1.34E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.09E-04	0.00E+00	1.09E-04	No TRV	--	No TRV	--
Arsenic	5.98E+00	9.37E-04	2.64E-03	9.02E-02	0.00E+00	9.29E-02	1.10E-04	5.27E-02	1.46E-01	2.24E+00	<1	4.51E+00	<1
Barium	3.07E+02	1.73E-01	5.62E-01	2.95E+00	0.00E+00	3.51E+00	2.03E-02	2.70E+00	6.24E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	2.61E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.07E-05	0.00E+00	3.07E-05	No TRV	--	No TRV	--
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.99E-05	0.00E+00	7.99E-05	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	3.49E-04	--	3.49E-04	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.09E-04	0.00E+00	2.09E-04	7.61E+00	<1	2.02E+01	<1
Copper	1.77E+01	9.09E-03	7.10E-02	9.62E-01	0.00E+00	1.03E+00	1.07E-03	1.56E-01	1.19E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.56E+01	1.75E-03	1.45E-02	7.80E-01	0.00E+00	7.95E-01	2.06E-04	1.37E-01	9.33E-01	1.63E+00	<1	4.46E+01	<1
Manganese	6.26E+02	1.34E-01	5.81E-01	3.80E+00	0.00E+00	4.38E+00	1.58E-02	5.52E+00	9.91E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.72E-05	--	1.72E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.65E-04	0.00E+00	4.65E-04	6.71E+00	<1	1.86E+01	<1
Selenium	4.46E-01	7.23E-04	2.45E-03	5.43E-02	0.00E+00	5.68E-02	8.49E-05	3.93E-03	6.08E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.98E-05	0.00E+00	2.98E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	1.29E+01	2.33E-03	7.34E-04	5.72E-02	0.00E+00	5.79E-02	2.74E-04	1.13E-01	1.72E-01	3.44E-01	<1	1.70E+00	<1
Zinc	6.72E+01	2.54E-02	5.84E-01	3.60E+01	0.00E+00	3.65E+01	2.98E-03	5.92E-01	3.71E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.35E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-03	3.84E-03	8.63E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.36E-01	--	1.36E-01	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	4.83E-05	--	4.83E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.07E-04	--	2.07E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	6.79E-05	--	6.79E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	6.50E-05	--	6.50E-05				
Total LMW PAHs						0.00E+00	3.88E-04	0.00E+00	3.88E-04	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	6.76E-05	--	6.76E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	2.28E-04	--	2.28E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	5.98E-04	--	5.98E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	8.58E-05	--	8.58E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.80E-05	--	1.80E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	4.33E-04	--	4.33E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	7.87E-06	--	7.87E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	3.85E-05	--	3.85E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	1.56E-04	--	1.56E-04				
Total HMW PAHs						0.00E+00	1.63E-03	0.00E+00	1.63E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.92E-02	5.25E-03	1.38E-05	2.83E-01	0.00E+00	2.83E-01	6.17E-04	4.34E-04	2.84E-01	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H19-2
Refined Exposure Evaluation - American Woodcock
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.84E-06	0.00E+00	2.03E-09	6.02E-07	0.00E+00	6.04E-07	0.00E+00	1.62E-08	6.20E-07				
1,2,3,7,8-PeCDD	1.61E-07	0.00E+00	9.79E-11	3.38E-08	0.00E+00	3.39E-08	0.00E+00	1.42E-09	3.53E-08				
1,2,3,4,7,8-HxCDD	1.07E-06	0.00E+00	3.54E-10	3.17E-07	0.00E+00	1.59E-08	0.00E+00	4.71E-10	1.63E-08				
1,2,3,6,7,8-HxCDD	1.11E-06	0.00E+00	3.68E-10	3.31E-07	0.00E+00	3.32E-09	0.00E+00	9.78E-11	3.41E-09				
1,2,3,7,8,9-HxCDD	8.62E-07	0.00E+00	2.86E-10	2.46E-07	0.00E+00	2.46E-08	0.00E+00	7.60E-10	2.54E-08				
1,2,3,4,6,7,8-HpCDD	4.70E-06	0.00E+00	8.56E-10	1.82E-06	0.00E+00	1.82E-09	0.00E+00	4.14E-11	1.87E-09				
OCDD	2.52E-05	0.00E+00	2.50E-09	1.33E-05	0.00E+00	1.33E-09	0.00E+00	2.22E-11	1.35E-09				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	2.80E-07	0.00E+00	3.04E-10	6.50E-08	0.00E+00	6.53E-08	0.00E+00	2.47E-09	6.78E-08				
1,2,3,4,7,8-HxCDF	8.00E-07	0.00E+00	3.47E-10	2.25E-07	0.00E+00	2.25E-08	0.00E+00	7.05E-10	2.32E-08				
1,2,3,6,7,8-HxCDF	7.60E-07	0.00E+00	3.30E-10	2.12E-07	0.00E+00	2.12E-08	0.00E+00	6.70E-10	2.19E-08				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	9.20E-07	0.00E+00	5.49E-10	2.65E-07	0.00E+00	2.66E-08	0.00E+00	8.11E-10	2.74E-08				
1,2,3,4,6,7,8-HpCDF	2.03E-06	0.00E+00	6.60E-10	6.76E-07	0.00E+00	6.77E-09	0.00E+00	1.79E-10	6.95E-09				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	2.82E-06	0.00E+00	5.04E-10	9.97E-07	0.00E+00	9.98E-11	0.00E+00	2.48E-12	1.02E-10				
Total Dioxins/Furans						8.27E-07	0.00E+00	2.39E-08	8.27E-07	1.75E-06	<1	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H19-3
Refined Exposure Evaluation - Mourning Dove
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-01	0.00E+00	1.30E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-04	0.00E+00	1.06E-04	No TRV	--	No TRV	--
Arsenic	5.98E+00	9.37E-04	2.56E-02	0.00E+00	0.00E+00	2.56E-02	1.07E-04	4.64E-02	7.21E-02	2.24E+00	<1	4.51E+00	<1
Barium	3.07E+02	1.73E-01	5.46E+00	0.00E+00	0.00E+00	5.46E+00	1.97E-02	2.38E+00	7.86E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	2.61E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.98E-05	0.00E+00	2.98E-05	No TRV	--	No TRV	--
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.76E-05	0.00E+00	7.76E-05	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	3.39E-04	--	3.39E-04	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.03E-04	0.00E+00	2.03E-04	7.61E+00	<1	2.02E+01	<1
Copper	1.77E+01	9.09E-03	6.90E-01	0.00E+00	0.00E+00	6.90E-01	1.04E-03	1.37E-01	8.28E-01	4.05E+00	<1	3.48E+01	<1
Lead	1.56E+01	1.75E-03	1.41E-01	0.00E+00	0.00E+00	1.41E-01	2.00E-04	1.21E-01	2.63E-01	1.63E+00	<1	4.46E+01	<1
Manganese	6.26E+02	1.34E-01	5.64E+00	0.00E+00	0.00E+00	5.64E+00	1.53E-02	4.86E+00	1.05E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.67E-05	--	1.67E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.52E-04	0.00E+00	4.52E-04	6.71E+00	<1	1.86E+01	<1
Selenium	4.46E-01	7.23E-04	2.38E-02	0.00E+00	0.00E+00	2.38E-02	8.25E-05	3.46E-03	2.74E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-05	0.00E+00	2.90E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	1.29E+01	2.33E-03	7.13E-03	0.00E+00	0.00E+00	7.13E-03	2.66E-04	1.00E-01	1.07E-01	3.44E-01	<1	1.70E+00	<1
Zinc	6.72E+01	2.54E-02	5.67E+00	0.00E+00	0.00E+00	5.67E+00	2.89E-03	5.21E-01	6.20E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.35E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E-03	3.38E-03	8.04E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.32E-01	--	1.32E-01	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	4.70E-05	--	4.70E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.01E-04	--	2.01E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	6.60E-05	--	6.60E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	6.31E-05	--	6.31E-05				
Total LMW PAHs						0.00E+00	3.77E-04	0.00E+00	3.77E-04	1.61E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	6.56E-05	--	6.56E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	2.21E-04	--	2.21E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	5.81E-04	--	5.81E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	8.34E-05	--	8.34E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.75E-05	--	1.75E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	4.21E-04	--	4.21E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	7.65E-06	--	7.65E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	3.74E-05	--	3.74E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	1.52E-04	--	1.52E-04				
Total HMW PAHs						0.00E+00	1.59E-03	0.00E+00	1.59E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.92E-02	5.25E-03	1.34E-04	0.00E+00	0.00E+00	1.34E-04	5.99E-04	3.82E-04	1.12E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H19-3
Refined Exposure Evaluation - Mourning Dove
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.84E-06	0.00E+00	1.98E-08	0.00E+00	0.00E+00	1.98E-08	0.00E+00	1.43E-08	3.40E-08				
1,2,3,7,8-PeCDD	1.61E-07	0.00E+00	9.51E-10	0.00E+00	0.00E+00	9.51E-10	0.00E+00	1.25E-09	2.20E-09				
1,2,3,4,7,8-HxCDD	1.07E-06	0.00E+00	3.44E-09	0.00E+00	0.00E+00	1.72E-10	0.00E+00	4.15E-10	5.87E-10				
1,2,3,6,7,8-HxCDD	1.11E-06	0.00E+00	3.57E-09	0.00E+00	0.00E+00	3.57E-11	0.00E+00	8.62E-11	1.22E-10				
1,2,3,7,8,9-HxCDD	8.62E-07	0.00E+00	2.77E-09	0.00E+00	0.00E+00	2.77E-10	0.00E+00	6.69E-10	9.46E-10				
1,2,3,4,6,7,8-HpCDD	4.70E-06	0.00E+00	8.32E-09	0.00E+00	0.00E+00	8.32E-12	0.00E+00	3.65E-11	4.48E-11				
OCDD	2.52E-05	0.00E+00	2.43E-08	0.00E+00	0.00E+00	2.43E-12	0.00E+00	1.96E-11	2.20E-11				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	2.80E-07	0.00E+00	2.95E-09	0.00E+00	0.00E+00	2.95E-09	0.00E+00	2.17E-09	5.12E-09				
1,2,3,4,7,8-HxCDF	8.00E-07	0.00E+00	3.38E-09	0.00E+00	0.00E+00	3.38E-10	0.00E+00	6.21E-10	9.58E-10				
1,2,3,6,7,8-HxCDF	7.60E-07	0.00E+00	3.21E-09	0.00E+00	0.00E+00	3.21E-10	0.00E+00	5.90E-10	9.11E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	9.20E-07	0.00E+00	5.33E-09	0.00E+00	0.00E+00	5.33E-10	0.00E+00	7.14E-10	1.25E-09				
1,2,3,4,6,7,8-HpCDF	2.03E-06	0.00E+00	6.41E-09	0.00E+00	0.00E+00	6.41E-11	0.00E+00	1.58E-10	2.22E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	2.82E-06	0.00E+00	4.90E-09	0.00E+00	0.00E+00	4.90E-13	0.00E+00	2.19E-12	2.68E-12				
Total Dioxins/Furans						2.54E-08	0.00E+00	2.10E-08	4.64E-08	1.75E-06	<1	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H19-4
Refined Exposure Evaluation - Red-tailed Hawk
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.36E-02	0.00E+00	9.36E-02	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E-05	0.00E+00	7.61E-05	No TRV	--	No TRV	--
Arsenic	5.98E+00	9.37E-04	0.00E+00	0.00E+00	2.78E-03	2.78E-03	7.68E-05	1.27E-02	1.56E-02	2.24E+00	<1	4.51E+00	<1
Barium	3.07E+02	1.73E-01	0.00E+00	0.00E+00	1.72E-02	1.72E-02	1.42E-02	6.54E-01	6.85E-01	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	2.61E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.14E-05	0.00E+00	2.14E-05	No TRV	--	No TRV	--
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.58E-05	0.00E+00	5.58E-05	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	2.44E-04	--	2.44E-04	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-04	0.00E+00	1.46E-04	7.61E+00	<1	2.02E+01	<1
Copper	1.77E+01	9.09E-03	0.00E+00	0.00E+00	9.57E-01	9.57E-01	7.45E-04	3.77E-02	9.95E-01	4.05E+00	<1	3.48E+01	<1
Lead	1.56E+01	1.75E-03	0.00E+00	0.00E+00	2.98E-01	2.98E-01	1.44E-04	3.33E-02	3.32E-01	1.63E+00	<1	4.46E+01	<1
Manganese	6.26E+02	1.34E-01	0.00E+00	0.00E+00	1.05E+00	1.05E+00	1.10E-02	1.33E+00	2.40E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.20E-05	--	1.20E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.25E-04	0.00E+00	3.25E-04	6.71E+00	<1	1.86E+01	<1
Selenium	4.46E-01	7.23E-04	0.00E+00	0.00E+00	3.99E-02	3.99E-02	5.93E-05	9.52E-04	4.10E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.08E-05	0.00E+00	2.08E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	1.29E+01	2.33E-03	0.00E+00	0.00E+00	1.30E-02	1.30E-02	1.91E-04	2.75E-02	4.06E-02	3.44E-01	<1	1.70E+00	<1
Zinc	6.72E+01	2.54E-02	0.00E+00	0.00E+00	8.67E+00	8.67E+00	2.08E-03	1.43E-01	8.81E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.35E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-03	9.28E-04	4.28E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	9.49E-02	--	9.49E-02	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	3.37E-05	--	3.37E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	1.44E-04	--	1.44E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	4.74E-05	--	4.74E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	4.54E-05	--	4.54E-05				
Total LMW PAHs						0.00E+00	2.71E-04	0.00E+00	2.71E-04	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	4.72E-05	--	4.72E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	1.59E-04	--	1.59E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	4.17E-04	--	4.17E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	5.99E-05	--	5.99E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.26E-05	--	1.26E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	3.02E-04	--	3.02E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	5.49E-06	--	5.49E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	2.69E-05	--	2.69E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	1.09E-04	--	1.09E-04				
Total HMW PAHs						0.00E+00	1.14E-03	0.00E+00	1.14E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.92E-02	5.25E-03	0.00E+00	0.00E+00	3.15E-03	3.15E-03	4.31E-04	1.05E-04	3.68E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H19-4
Refined Exposure Evaluation - Red-tailed Hawk
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.84E-06	0.00E+00	0.00E+00	0.00E+00	9.15E-08	9.15E-08	0.00E+00	3.92E-09	9.54E-08				
1,2,3,7,8-PeCDD	1.61E-07	0.00E+00	0.00E+00	0.00E+00	6.29E-09	6.29E-09	0.00E+00	3.43E-10	6.63E-09				
1,2,3,4,7,8-HxCDD	1.07E-06	0.00E+00	0.00E+00	0.00E+00	5.04E-08	2.52E-09	0.00E+00	1.14E-10	2.64E-09				
1,2,3,6,7,8-HxCDD	1.11E-06	0.00E+00	0.00E+00	0.00E+00	5.25E-08	5.25E-10	0.00E+00	2.37E-11	5.49E-10				
1,2,3,7,8,9-HxCDD	8.62E-07	0.00E+00	0.00E+00	0.00E+00	3.98E-08	3.98E-09	0.00E+00	1.84E-10	4.16E-09				
1,2,3,4,6,7,8-HpCDD	4.70E-06	0.00E+00	0.00E+00	0.00E+00	2.57E-07	2.57E-10	0.00E+00	1.00E-11	2.67E-10				
OCDD	2.52E-05	0.00E+00	0.00E+00	0.00E+00	1.63E-06	1.63E-10	0.00E+00	5.37E-12	1.68E-10				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	2.80E-07	0.00E+00	0.00E+00	0.00E+00	2.87E-09	2.87E-09	0.00E+00	5.97E-10	3.47E-09				
1,2,3,4,7,8-HxCDF	8.00E-07	0.00E+00	0.00E+00	0.00E+00	8.21E-09	8.21E-10	0.00E+00	1.71E-10	9.91E-10				
1,2,3,6,7,8-HxCDF	7.60E-07	0.00E+00	0.00E+00	0.00E+00	7.80E-09	7.80E-10	0.00E+00	1.62E-10	9.42E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	9.20E-07	0.00E+00	0.00E+00	0.00E+00	9.44E-09	9.44E-10	0.00E+00	1.96E-10	1.14E-09				
1,2,3,4,6,7,8-HpCDF	2.03E-06	0.00E+00	0.00E+00	0.00E+00	2.08E-08	2.08E-10	0.00E+00	4.33E-11	2.52E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	2.82E-06	0.00E+00	0.00E+00	0.00E+00	2.89E-08	2.89E-12	0.00E+00	6.01E-13	3.49E-12				
Total Dioxins/Furans						1.11E-07	0.00E+00	5.77E-09	1.17E-07	1.75E-06	<1	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H19-5
Refined Exposure Evaluation - Yellow-billed Cuckoo
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.81E-01	0.00E+00	1.81E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E-04	0.00E+00	1.47E-04	No TRV	--	No TRV	--
Arsenic	5.98E+00	9.37E-04	0.00E+00	1.35E-01	0.00E+00	1.35E-01	1.48E-04	0.00E+00	1.35E-01	2.24E+00	<1	4.51E+00	<1
Barium	3.07E+02	1.73E-01	0.00E+00	4.42E+00	0.00E+00	4.42E+00	2.74E-02	0.00E+00	4.45E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	2.61E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.13E-05	0.00E+00	4.13E-05	No TRV	--	No TRV	--
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E-04	0.00E+00	1.08E-04	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	4.71E-04	--	4.71E-04	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.82E-04	0.00E+00	2.82E-04	7.61E+00	<1	2.02E+01	<1
Copper	1.77E+01	9.09E-03	0.00E+00	1.44E+00	0.00E+00	1.44E+00	1.44E-03	0.00E+00	1.44E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.56E+01	1.75E-03	0.00E+00	1.17E+00	0.00E+00	1.17E+00	2.77E-04	0.00E+00	1.17E+00	1.63E+00	<1	4.46E+01	<1
Manganese	6.26E+02	1.34E-01	0.00E+00	5.69E+00	0.00E+00	5.69E+00	2.13E-02	0.00E+00	5.72E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	2.31E-05	--	2.31E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.27E-04	0.00E+00	6.27E-04	6.71E+00	<1	1.86E+01	<1
Selenium	4.46E-01	7.23E-04	0.00E+00	8.13E-02	0.00E+00	8.13E-02	1.14E-04	0.00E+00	8.14E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.02E-05	0.00E+00	4.02E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	1.29E+01	2.33E-03	0.00E+00	8.56E-02	0.00E+00	8.56E-02	3.70E-04	0.00E+00	8.60E-02	3.44E-01	<1	1.70E+00	<1
Zinc	6.72E+01	2.54E-02	0.00E+00	5.38E+01	0.00E+00	5.38E+01	4.01E-03	0.00E+00	5.38E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.35E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.46E-03	0.00E+00	6.46E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.83E-01	--	1.83E-01	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	6.52E-05	--	6.52E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.79E-04	--	2.79E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	9.15E-05	--	9.15E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	8.76E-05	--	8.76E-05				
Total LMW PAHs						0.00E+00	5.23E-04	0.00E+00	5.23E-04	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	9.11E-05	--	9.11E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	3.07E-04	--	3.07E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	8.06E-04	--	8.06E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	1.16E-04	--	1.16E-04				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.43E-05	--	2.43E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	5.84E-04	--	5.84E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	1.06E-05	--	1.06E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	5.19E-05	--	5.19E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	2.11E-04	--	2.11E-04				
Total HMW PAHs						0.00E+00	2.20E-03	0.00E+00	2.20E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.92E-02	5.25E-03	0.00E+00	4.24E-01	0.00E+00	4.24E-01	8.31E-04	0.00E+00	4.25E-01	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H19-5
Refined Exposure Evaluation - Yellow-billed Cuckoo
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.84E-06	0.00E+00	0.00E+00	9.01E-07	0.00E+00	9.01E-07	0.00E+00	0.00E+00	9.01E-07				
1,2,3,7,8-PeCDD	1.61E-07	0.00E+00	0.00E+00	5.06E-08	0.00E+00	5.06E-08	0.00E+00	0.00E+00	5.06E-08				
1,2,3,4,7,8-HxCDD	1.07E-06	0.00E+00	0.00E+00	4.75E-07	0.00E+00	2.37E-08	0.00E+00	0.00E+00	2.37E-08				
1,2,3,6,7,8-HxCDD	1.11E-06	0.00E+00	0.00E+00	4.96E-07	0.00E+00	4.96E-09	0.00E+00	0.00E+00	4.96E-09				
1,2,3,7,8,9-HxCDD	8.62E-07	0.00E+00	0.00E+00	3.68E-07	0.00E+00	3.68E-08	0.00E+00	0.00E+00	3.68E-08				
1,2,3,4,6,7,8-HpCDD	4.70E-06	0.00E+00	0.00E+00	2.73E-06	0.00E+00	2.73E-09	0.00E+00	0.00E+00	2.73E-09				
OCDD	2.52E-05	0.00E+00	0.00E+00	1.99E-05	0.00E+00	1.99E-09	0.00E+00	0.00E+00	1.99E-09				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	2.80E-07	0.00E+00	0.00E+00	9.74E-08	0.00E+00	9.74E-08	0.00E+00	0.00E+00	9.74E-08				
1,2,3,4,7,8-HxCDF	8.00E-07	0.00E+00	0.00E+00	3.37E-07	0.00E+00	3.37E-08	0.00E+00	0.00E+00	3.37E-08				
1,2,3,6,7,8-HxCDF	7.60E-07	0.00E+00	0.00E+00	3.17E-07	0.00E+00	3.17E-08	0.00E+00	0.00E+00	3.17E-08				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	9.20E-07	0.00E+00	0.00E+00	3.97E-07	0.00E+00	3.97E-08	0.00E+00	0.00E+00	3.97E-08				
1,2,3,4,6,7,8-HpCDF	2.03E-06	0.00E+00	0.00E+00	1.01E-06	0.00E+00	1.01E-08	0.00E+00	0.00E+00	1.01E-08				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	2.82E-06	0.00E+00	0.00E+00	1.49E-06	0.00E+00	1.49E-10	0.00E+00	0.00E+00	1.49E-10				
Total Dioxins/Furans						1.24E-06	0.00E+00	0.00E+00	1.24E-06	1.75E-06	<1	1.75E-05	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H19-6
Refined Exposure Evaluation - Canada Lynx
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.57E-02	0.00E+00	3.57E-02	No TRV	--	No TRV	--
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-05	0.00E+00	2.90E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	5.98E+00	9.37E-04	0.00E+00	0.00E+00	1.06E-03	1.06E-03	2.93E-05	5.23E-03	6.32E-03	1.04E+00	<1	4.55E+00	<1
Barium	3.07E+02	1.73E-01	0.00E+00	0.00E+00	6.54E-03	6.54E-03	5.40E-03	2.68E-01	2.80E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	2.61E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.15E-06	0.00E+00	8.15E-06	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.12E-05	0.00E+00	2.12E-05	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	9.29E-05	--	9.29E-05	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.56E-05	0.00E+00	5.56E-05	7.33E+00	<1	1.89E+01	<1
Copper	1.77E+01	9.09E-03	0.00E+00	0.00E+00	3.64E-01	3.64E-01	2.84E-04	1.55E-02	3.80E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.56E+01	1.75E-03	0.00E+00	0.00E+00	1.14E-01	1.14E-01	5.47E-05	1.36E-02	1.27E-01	4.70E+00	<1	1.86E+02	<1
Manganese	6.26E+02	1.34E-01	0.00E+00	0.00E+00	4.01E-01	4.01E-01	4.20E-03	5.48E-01	9.53E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	4.56E-06	--	4.56E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.24E-04	0.00E+00	1.24E-04	1.70E+00	<1	1.48E+01	<1
Selenium	4.46E-01	7.23E-04	0.00E+00	0.00E+00	1.52E-02	1.52E-02	2.26E-05	3.90E-04	1.56E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.94E-06	0.00E+00	7.94E-06	4.80E-01	<1	1.43E+00	<1
Vanadium	1.29E+01	2.33E-03	0.00E+00	0.00E+00	4.95E-03	4.95E-03	7.29E-05	1.13E-02	1.63E-02	4.16E+00	<1	9.44E+00	<1
Zinc	6.72E+01	2.54E-02	0.00E+00	0.00E+00	3.30E+00	3.30E+00	7.92E-04	5.88E-02	3.36E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.35E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-03	3.81E-04	1.66E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	3.62E-02	--	3.62E-02	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	1.29E-05	--	1.29E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	5.50E-05	--	5.50E-05				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	1.81E-05	--	1.81E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	1.73E-05	--	1.73E-05				
Total LMW PAHs						0.00E+00	1.03E-04	0.00E+00	1.03E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	1.80E-05	--	1.80E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	6.06E-05	--	6.06E-05				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	1.59E-04	--	1.59E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	2.28E-05	--	2.28E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	4.79E-06	--	4.79E-06				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	1.15E-04	--	1.15E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	2.09E-06	--	2.09E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	1.02E-05	--	1.02E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	4.16E-05	--	4.16E-05				
Total HMW PAHs						0.00E+00	4.34E-04	0.00E+00	4.34E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.92E-02	5.25E-03	0.00E+00	0.00E+00	1.20E-03	1.20E-03	1.64E-04	4.31E-05	1.41E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H19-6
Refined Exposure Evaluation - Canada Lynx
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.84E-06	0.00E+00	0.00E+00	0.00E+00	3.49E-08	3.49E-08	0.00E+00	1.61E-09	3.65E-08				
1,2,3,7,8-PeCDD	1.61E-07	0.00E+00	0.00E+00	0.00E+00	2.40E-09	2.40E-09	0.00E+00	1.41E-10	2.54E-09				
1,2,3,4,7,8-HxCDD	1.07E-06	0.00E+00	0.00E+00	0.00E+00	1.92E-08	1.92E-09	0.00E+00	9.36E-11	2.02E-09				
1,2,3,6,7,8-HxCDD	1.11E-06	0.00E+00	0.00E+00	0.00E+00	2.00E-08	2.00E-09	0.00E+00	9.71E-11	2.10E-09				
1,2,3,7,8,9-HxCDD	8.62E-07	0.00E+00	0.00E+00	0.00E+00	1.52E-08	1.52E-09	0.00E+00	7.54E-11	1.59E-09				
1,2,3,4,6,7,8-HpCDD	4.70E-06	0.00E+00	0.00E+00	0.00E+00	9.78E-08	9.78E-10	0.00E+00	4.11E-11	1.02E-09				
OCDD	2.52E-05	0.00E+00	0.00E+00	0.00E+00	6.19E-07	1.86E-10	0.00E+00	6.61E-12	1.92E-10				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	2.80E-07	0.00E+00	0.00E+00	0.00E+00	1.09E-09	3.28E-10	0.00E+00	7.35E-11	4.02E-10				
1,2,3,4,7,8-HxCDF	8.00E-07	0.00E+00	0.00E+00	0.00E+00	3.13E-09	3.13E-10	0.00E+00	7.00E-11	3.83E-10				
1,2,3,6,7,8-HxCDF	7.60E-07	0.00E+00	0.00E+00	0.00E+00	2.97E-09	2.97E-10	0.00E+00	6.65E-11	3.64E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	9.20E-07	0.00E+00	0.00E+00	0.00E+00	3.60E-09	3.60E-10	0.00E+00	8.05E-11	4.40E-10				
1,2,3,4,6,7,8-HpCDF	2.03E-06	0.00E+00	0.00E+00	0.00E+00	7.93E-09	7.93E-11	0.00E+00	1.78E-11	9.71E-11				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	2.82E-06	0.00E+00	0.00E+00	0.00E+00	1.10E-08	3.31E-12	0.00E+00	7.40E-13	4.05E-12				
Total Dioxins/Furans						4.52E-08	0.00E+00	2.37E-09	4.76E-08	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H19-7
Refined Exposure Evaluation - Grizzly Bear
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals														
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.47E-02	0.00E+00	2.47E-02	No TRV	--	No TRV	--
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-05	0.00E+00	2.00E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	5.98E+00	9.37E-04	3.15E-03	2.76E-03	7.33E-05	0.00E+00	5.99E-03	2.02E-05	3.61E-03	9.62E-03	1.04E+00	<1	4.55E+00	<1
Barium	3.07E+02	1.73E-01	6.72E-01	9.04E-02	4.52E-04	0.00E+00	7.63E-01	3.73E-03	1.85E-01	9.52E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	2.61E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.64E-06	0.00E+00	5.64E-06	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E-05	0.00E+00	1.47E-05	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	0.00E+00	6.42E-05	--	6.42E-05	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.84E-05	0.00E+00	3.84E-05	7.33E+00	<1	1.89E+01	<1
Copper	1.77E+01	9.09E-03	8.49E-02	2.95E-02	2.52E-02	0.00E+00	1.40E-01	1.96E-04	1.07E-02	1.50E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.56E+01	1.75E-03	1.74E-02	2.39E-02	7.85E-03	0.00E+00	4.91E-02	3.78E-05	9.43E-03	5.86E-02	4.70E+00	<1	1.86E+02	<1
Manganese	6.26E+02	1.34E-01	6.94E-01	1.17E-01	2.77E-02	0.00E+00	8.38E-01	2.90E-03	3.78E-01	1.22E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	0.00E+00	3.15E-06	--	3.15E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.55E-05	0.00E+00	8.55E-05	1.70E+00	<1	1.48E+01	<1
Selenium	4.46E-01	7.23E-04	2.93E-03	1.66E-03	1.05E-03	0.00E+00	5.64E-03	1.56E-05	2.70E-04	5.93E-03	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.49E-06	0.00E+00	5.49E-06	4.80E-01	<1	1.43E+00	<1
Vanadium	1.29E+01	2.33E-03	8.77E-04	1.75E-03	3.42E-04	0.00E+00	2.97E-03	5.04E-05	7.79E-03	1.08E-02	4.16E+00	<1	9.44E+00	<1
Zinc	6.72E+01	2.54E-02	6.98E-01	1.10E+00	2.28E-01	0.00E+00	2.03E+00	5.48E-04	4.06E-02	2.07E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	4.35E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.82E-04	2.63E-04	1.14E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	0.00E+00	2.50E-02	--	2.50E-02	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	0.00E+00	8.89E-06	--	8.89E-06				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	0.00E+00	3.80E-05	--	3.80E-05				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	0.00E+00	1.25E-05	--	1.25E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	0.00E+00	1.19E-05	--	1.19E-05				
Total LMW PAHs							0.00E+00	7.13E-05	0.00E+00	7.13E-05	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	0.00E+00	1.24E-05	--	1.24E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	0.00E+00	4.19E-05	--	4.19E-05				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	0.00E+00	1.10E-04	--	1.10E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	0.00E+00	1.58E-05	--	1.58E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	0.00E+00	3.31E-06	--	3.31E-06				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	0.00E+00	7.96E-05	--	7.96E-05				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	0.00E+00	1.45E-06	--	1.45E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	0.00E+00	7.08E-06	--	7.08E-06				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	0.00E+00	2.87E-05	--	2.87E-05				
Total HMW PAHs							0.00E+00	3.00E-04	0.00E+00	3.00E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.92E-02	5.25E-03	1.64E-05	8.68E-03	8.29E-05	0.00E+00	8.78E-03	1.13E-04	2.98E-05	8.92E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H19-7
Refined Exposure Evaluation - Grizzly Bear
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)											
			Diet					Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	1.84E-06	0.00E+00	2.43E-09	1.84E-08	2.41E-09	0.00E+00	2.33E-08	0.00E+00	1.11E-09	2.44E-08				
1,2,3,7,8-PeCDD	1.61E-07	0.00E+00	1.17E-10	1.04E-09	1.66E-10	0.00E+00	1.32E-09	0.00E+00	9.74E-11	1.42E-09				
1,2,3,4,7,8-HxCDD	1.07E-06	0.00E+00	4.24E-10	9.72E-09	1.33E-09	0.00E+00	1.15E-09	0.00E+00	6.47E-11	1.21E-09				
1,2,3,6,7,8-HxCDD	1.11E-06	0.00E+00	4.39E-10	1.01E-08	1.38E-09	0.00E+00	1.20E-09	0.00E+00	6.71E-11	1.26E-09				
1,2,3,7,8,9-HxCDD	8.62E-07	0.00E+00	3.41E-10	7.53E-09	1.05E-09	0.00E+00	8.91E-10	0.00E+00	5.21E-11	9.44E-10				
1,2,3,4,6,7,8-HpCDD	4.70E-06	0.00E+00	1.02E-09	5.59E-08	6.76E-09	0.00E+00	6.37E-10	0.00E+00	2.84E-11	6.65E-10				
OCDD	2.52E-05	0.00E+00	2.99E-09	4.07E-07	4.28E-08	0.00E+00	1.36E-10	0.00E+00	4.57E-12	1.40E-10				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	2.80E-07	0.00E+00	3.63E-10	1.99E-09	7.56E-11	0.00E+00	7.29E-10	0.00E+00	5.08E-11	7.80E-10				
1,2,3,4,7,8-HxCDF	8.00E-07	0.00E+00	4.15E-10	6.89E-09	2.16E-10	0.00E+00	7.52E-10	0.00E+00	4.84E-11	8.01E-10				
1,2,3,6,7,8-HxCDF	7.60E-07	0.00E+00	3.94E-10	6.49E-09	2.05E-10	0.00E+00	7.09E-10	0.00E+00	4.60E-11	7.54E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	9.20E-07	0.00E+00	6.56E-10	8.13E-09	2.49E-10	0.00E+00	9.03E-10	0.00E+00	5.56E-11	9.59E-10				
1,2,3,4,6,7,8-HpCDF	2.03E-06	0.00E+00	7.89E-10	2.07E-08	5.48E-10	0.00E+00	2.21E-10	0.00E+00	1.23E-11	2.33E-10				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	2.82E-06	0.00E+00	6.03E-10	3.06E-08	7.62E-10	0.00E+00	9.57E-12	0.00E+00	5.12E-13	1.01E-11				
Total Dioxins/Furans							3.19E-08	0.00E+00	1.64E-09	3.36E-08	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H19-8
Refined Exposure Evaluation - Long-tailed Weasel
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.87E-02	0.00E+00	5.87E-02	No TRV	--	No TRV	--
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.78E-05	0.00E+00	4.78E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	5.94E+00	9.37E-04	0.00E+00	0.00E+00	1.74E-03	1.74E-03	4.82E-05	4.89E-03	6.68E-03	1.04E+00	<1	4.55E+00	<1
Barium	2.60E+02	1.73E-01	0.00E+00	0.00E+00	9.13E-03	9.13E-03	8.90E-03	2.14E-01	2.32E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	2.61E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-05	0.00E+00	1.34E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-05	0.00E+00	3.50E-05	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	1.53E-04	--	1.53E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.15E-05	0.00E+00	9.15E-05	7.33E+00	<1	1.89E+01	<1
Copper	1.67E+01	9.09E-03	0.00E+00	0.00E+00	5.95E-01	5.95E-01	4.68E-04	1.37E-02	6.10E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.26E+01	1.75E-03	0.00E+00	0.00E+00	1.70E-01	1.70E-01	9.01E-05	1.04E-02	1.81E-01	4.70E+00	<1	1.86E+02	<1
Manganese	4.29E+02	1.34E-01	0.00E+00	0.00E+00	4.53E-01	4.53E-01	6.92E-03	3.54E-01	8.14E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	7.51E-06	--	7.51E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.04E-04	0.00E+00	2.04E-04	1.70E+00	<1	1.48E+01	<1
Selenium	3.21E-01	7.23E-04	0.00E+00	0.00E+00	2.22E-02	2.22E-02	3.72E-05	2.65E-04	2.25E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.31E-05	0.00E+00	1.31E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	1.27E+01	2.33E-03	0.00E+00	0.00E+00	8.05E-03	8.05E-03	1.20E-04	1.05E-02	1.86E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.28E+01	2.54E-02	0.00E+00	0.00E+00	5.35E+00	5.35E+00	1.30E-03	4.34E-02	5.39E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.31E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-03	1.08E-04	2.21E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	5.96E-02	--	5.96E-02	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	2.12E-05	--	2.12E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	9.06E-05	--	9.06E-05				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	2.97E-05	--	2.97E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	2.85E-05	--	2.85E-05				
Total LMW PAHs						0.00E+00	1.70E-04	0.00E+00	1.70E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	2.96E-05	--	2.96E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	9.97E-05	--	9.97E-05				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	2.62E-04	--	2.62E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	3.76E-05	--	3.76E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	7.88E-06	--	7.88E-06				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	1.90E-04	--	1.90E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	3.45E-06	--	3.45E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	1.69E-05	--	1.69E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	6.84E-05	--	6.84E-05				
Total HMW PAHs						0.00E+00	7.15E-04	0.00E+00	7.15E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.29E-02	5.25E-03	0.00E+00	0.00E+00	1.72E-03	1.72E-03	2.70E-04	3.53E-05	2.03E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H19-8
Refined Exposure Evaluation - Long-tailed Weasel
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.39E-06	0.00E+00	0.00E+00	0.00E+00	4.22E-08	4.22E-08	0.00E+00	1.14E-09	4.33E-08				
1,2,3,7,8-PeCDD	8.70E-08	0.00E+00	0.00E+00	0.00E+00	2.01E-09	2.01E-09	0.00E+00	7.16E-11	2.08E-09				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.90E-07	0.00E+00	0.00E+00	0.00E+00	7.53E-09	7.53E-10	0.00E+00	2.39E-11	7.77E-10				
1,2,3,7,8,9-HxCDD	2.39E-07	0.00E+00	0.00E+00	0.00E+00	6.09E-09	6.09E-10	0.00E+00	1.97E-11	6.29E-10				
1,2,3,4,6,7,8-HpCDD	1.83E-06	0.00E+00	0.00E+00	0.00E+00	5.71E-08	5.71E-10	0.00E+00	1.51E-11	5.86E-10				
OCDD	1.36E-05	0.00E+00	0.00E+00	0.00E+00	5.18E-07	1.55E-10	0.00E+00	3.36E-12	1.59E-10				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	1.53E-07	0.00E+00	0.00E+00	0.00E+00	9.85E-10	2.95E-10	0.00E+00	3.78E-11	3.33E-10				
1,2,3,4,7,8-HxCDF	2.35E-07	0.00E+00	0.00E+00	0.00E+00	1.51E-09	1.51E-10	0.00E+00	1.93E-11	1.71E-10				
1,2,3,6,7,8-HxCDF	2.37E-07	0.00E+00	0.00E+00	0.00E+00	1.53E-09	1.53E-10	0.00E+00	1.95E-11	1.72E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	2.64E-07	0.00E+00	0.00E+00	0.00E+00	1.70E-09	1.70E-10	0.00E+00	2.17E-11	1.92E-10				
1,2,3,4,6,7,8-HpCDF	3.45E-07	0.00E+00	0.00E+00	0.00E+00	2.22E-09	2.22E-11	0.00E+00	2.84E-12	2.51E-11				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.32E-06	0.00E+00	0.00E+00	0.00E+00	8.50E-09	2.55E-12	0.00E+00	3.26E-13	2.88E-12				
Total Dioxins/Furans						4.71E-08	0.00E+00	1.38E-09	4.85E-08	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H19-9
Refined Exposure Evaluation - Meadow Vole
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E-01	0.00E+00	1.71E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E-04	0.00E+00	1.39E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	5.94E+00	9.37E-04	3.35E-02	0.00E+00	0.00E+00	3.35E-02	1.41E-04	1.16E-02	4.52E-02	1.04E+00	<1	4.55E+00	<1
Barium	2.60E+02	1.73E-01	6.09E+00	0.00E+00	0.00E+00	6.09E+00	2.60E-02	5.08E-01	6.62E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	2.61E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.92E-05	0.00E+00	3.92E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-04	0.00E+00	1.02E-04	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	4.47E-04	--	4.47E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.67E-04	0.00E+00	2.67E-04	7.33E+00	<1	1.89E+01	<1
Copper	1.67E+01	9.09E-03	8.88E-01	0.00E+00	0.00E+00	8.88E-01	1.37E-03	3.26E-02	9.22E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.26E+01	1.75E-03	1.65E-01	0.00E+00	0.00E+00	1.65E-01	2.63E-04	2.47E-02	1.90E-01	4.70E+00	<1	1.86E+02	<1
Manganese	4.29E+02	1.34E-01	5.10E+00	0.00E+00	0.00E+00	5.10E+00	2.02E-02	8.39E-01	5.96E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	2.19E-05	--	2.19E-05	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.95E-04	0.00E+00	5.95E-04	1.70E+00	<1	1.48E+01	<1
Selenium	3.21E-01	7.23E-04	2.18E-02	0.00E+00	0.00E+00	2.18E-02	1.09E-04	6.28E-04	2.25E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.82E-05	0.00E+00	3.82E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	1.27E+01	2.33E-03	9.26E-03	0.00E+00	0.00E+00	9.26E-03	3.51E-04	2.48E-02	3.44E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.28E+01	2.54E-02	6.53E+00	0.00E+00	0.00E+00	6.53E+00	3.81E-03	1.03E-01	6.64E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.31E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.13E-03	2.56E-04	6.39E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.74E-01	--	1.74E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	6.18E-05	--	6.18E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.64E-04	--	2.64E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	8.69E-05	--	8.69E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	8.31E-05	--	8.31E-05				
Total LMW PAHs						0.00E+00	4.96E-04	0.00E+00	4.96E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	8.64E-05	--	8.64E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	2.91E-04	--	2.91E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	7.65E-04	--	7.65E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	1.10E-04	--	1.10E-04				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.30E-05	--	2.30E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	5.54E-04	--	5.54E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	1.01E-05	--	1.01E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	4.92E-05	--	4.92E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	2.00E-04	--	2.00E-04				
Total HMW PAHs						0.00E+00	2.09E-03	0.00E+00	2.09E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.29E-02	5.25E-03	1.53E-04	0.00E+00	0.00E+00	1.53E-04	7.89E-04	8.38E-05	1.03E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H19-9
Refined Exposure Evaluation - Meadow Vole
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.39E-06	0.00E+00	1.96E-08	0.00E+00	0.00E+00	1.96E-08	0.00E+00	2.71E-09	2.24E-08				
1,2,3,7,8-PeCDD	8.70E-08	0.00E+00	6.76E-10	0.00E+00	0.00E+00	6.76E-10	0.00E+00	1.70E-10	8.46E-10				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.90E-07	0.00E+00	1.23E-09	0.00E+00	0.00E+00	1.23E-10	0.00E+00	5.66E-11	1.79E-10				
1,2,3,7,8,9-HxCDD	2.39E-07	0.00E+00	1.01E-09	0.00E+00	0.00E+00	1.01E-10	0.00E+00	4.67E-11	1.48E-10				
1,2,3,4,6,7,8-HpCDD	1.83E-06	0.00E+00	4.26E-09	0.00E+00	0.00E+00	4.26E-11	0.00E+00	3.57E-11	7.84E-11				
OCDD	1.36E-05	0.00E+00	1.73E-08	0.00E+00	0.00E+00	5.18E-12	0.00E+00	7.97E-12	1.31E-11				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	1.53E-07	0.00E+00	2.12E-09	0.00E+00	0.00E+00	6.37E-10	0.00E+00	8.96E-11	7.26E-10				
1,2,3,4,7,8-HxCDF	2.35E-07	0.00E+00	1.31E-09	0.00E+00	0.00E+00	1.31E-10	0.00E+00	4.59E-11	1.76E-10				
1,2,3,6,7,8-HxCDF	2.37E-07	0.00E+00	1.32E-09	0.00E+00	0.00E+00	1.32E-10	0.00E+00	4.63E-11	1.78E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	2.64E-07	0.00E+00	2.01E-09	0.00E+00	0.00E+00	2.01E-10	0.00E+00	5.16E-11	2.53E-10				
1,2,3,4,6,7,8-HpCDF	3.45E-07	0.00E+00	1.43E-09	0.00E+00	0.00E+00	1.43E-11	0.00E+00	6.74E-12	2.11E-11				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.32E-06	0.00E+00	3.02E-09	0.00E+00	0.00E+00	9.06E-13	0.00E+00	7.73E-13	1.68E-12				
Total Dioxins/Furans						2.17E-08	0.00E+00	3.27E-09	2.50E-08	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H19-10
Refined Exposure Evaluation - North American Wolverine
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E-02	0.00E+00	3.43E-02	No TRV	--	No TRV	--
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.79E-05	0.00E+00	2.79E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	5.94E+00	9.37E-04	0.00E+00	0.00E+00	1.01E-03	1.01E-03	2.81E-05	5.00E-03	6.04E-03	1.04E+00	<1	4.55E+00	<1
Barium	2.60E+02	1.73E-01	0.00E+00	0.00E+00	5.33E-03	5.33E-03	5.19E-03	2.19E-01	2.29E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	2.61E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.84E-06	0.00E+00	7.84E-06	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.04E-05	0.00E+00	2.04E-05	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	8.93E-05	--	8.93E-05	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.34E-05	0.00E+00	5.34E-05	7.33E+00	<1	1.89E+01	<1
Copper	1.67E+01	9.09E-03	0.00E+00	0.00E+00	3.48E-01	3.48E-01	2.73E-04	1.40E-02	3.62E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.26E+01	1.75E-03	0.00E+00	0.00E+00	9.95E-02	9.95E-02	5.26E-05	1.06E-02	1.10E-01	4.70E+00	<1	1.86E+02	<1
Manganese	4.29E+02	1.34E-01	0.00E+00	0.00E+00	2.65E-01	2.65E-01	4.04E-03	3.61E-01	6.30E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	4.39E-06	--	4.39E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.19E-04	0.00E+00	1.19E-04	1.70E+00	<1	1.48E+01	<1
Selenium	3.21E-01	7.23E-04	0.00E+00	0.00E+00	1.29E-02	1.29E-02	2.17E-05	2.70E-04	1.32E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.63E-06	0.00E+00	7.63E-06	4.80E-01	<1	1.43E+00	<1
Vanadium	1.27E+01	2.33E-03	0.00E+00	0.00E+00	4.70E-03	4.70E-03	7.02E-05	1.07E-02	1.55E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.28E+01	2.54E-02	0.00E+00	0.00E+00	3.12E+00	3.12E+00	7.62E-04	4.44E-02	3.17E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.31E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-03	1.10E-04	1.34E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	3.48E-02	--	3.48E-02	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	1.24E-05	--	1.24E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	5.29E-05	--	5.29E-05				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	1.74E-05	--	1.74E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	1.66E-05	--	1.66E-05				
Total LMW PAHs						0.00E+00	9.92E-05	0.00E+00	9.92E-05	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	1.73E-05	--	1.73E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	5.82E-05	--	5.82E-05				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	1.53E-04	--	1.53E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	2.20E-05	--	2.20E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	4.60E-06	--	4.60E-06				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	1.11E-04	--	1.11E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	2.01E-06	--	2.01E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	9.85E-06	--	9.85E-06				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	4.00E-05	--	4.00E-05				
Total HMW PAHs						0.00E+00	4.18E-04	0.00E+00	4.18E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.29E-02	5.25E-03	0.00E+00	0.00E+00	1.00E-03	1.00E-03	1.58E-04	3.61E-05	1.20E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H19-10
Refined Exposure Evaluation - North American Wolverine
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.39E-06	0.00E+00	0.00E+00	0.00E+00	2.46E-08	2.46E-08	0.00E+00	1.17E-09	2.58E-08				
1,2,3,7,8-PeCDD	8.70E-08	0.00E+00	0.00E+00	0.00E+00	1.17E-09	1.17E-09	0.00E+00	7.32E-11	1.24E-09				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.90E-07	0.00E+00	0.00E+00	0.00E+00	4.40E-09	4.40E-10	0.00E+00	2.44E-11	4.64E-10				
1,2,3,7,8,9-HxCDD	2.39E-07	0.00E+00	0.00E+00	0.00E+00	3.56E-09	3.56E-10	0.00E+00	2.01E-11	3.76E-10				
1,2,3,4,6,7,8-HpCDD	1.83E-06	0.00E+00	0.00E+00	0.00E+00	3.33E-08	3.33E-10	0.00E+00	1.54E-11	3.49E-10				
OCDD	1.36E-05	0.00E+00	0.00E+00	0.00E+00	3.02E-07	9.07E-11	0.00E+00	3.43E-12	9.41E-11				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	1.53E-07	0.00E+00	0.00E+00	0.00E+00	5.75E-10	1.73E-10	0.00E+00	3.86E-11	2.11E-10				
1,2,3,4,7,8-HxCDF	2.35E-07	0.00E+00	0.00E+00	0.00E+00	8.83E-10	8.83E-11	0.00E+00	1.98E-11	1.08E-10				
1,2,3,6,7,8-HxCDF	2.37E-07	0.00E+00	0.00E+00	0.00E+00	8.91E-10	8.91E-11	0.00E+00	1.99E-11	1.09E-10				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	2.64E-07	0.00E+00	0.00E+00	0.00E+00	9.92E-10	9.92E-11	0.00E+00	2.22E-11	1.21E-10				
1,2,3,4,6,7,8-HpCDF	3.45E-07	0.00E+00	0.00E+00	0.00E+00	1.30E-09	1.30E-11	0.00E+00	2.90E-12	1.59E-11				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.32E-06	0.00E+00	0.00E+00	0.00E+00	4.96E-09	1.49E-12	0.00E+00	3.33E-13	1.82E-12				
Total Dioxins/Furans						2.75E-08	0.00E+00	1.41E-09	2.89E-08	5.62E-07	<1	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H19-11
Refined Exposure Evaluation - Short-tailed Shrew
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-01	0.00E+00	1.53E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	9.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.24E-04	0.00E+00	1.24E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	5.94E+00	9.37E-04	0.00E+00	1.14E-01	0.00E+00	1.14E-01	1.26E-04	8.76E-03	1.23E-01	1.04E+00	<1	4.55E+00	<1
Barium	2.60E+02	1.73E-01	0.00E+00	3.17E+00	0.00E+00	3.17E+00	2.32E-02	3.83E-01	3.58E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	2.61E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-05	0.00E+00	3.50E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	0.00E+00	6.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.11E-05	0.00E+00	9.11E-05	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	3.99E-04	--	3.99E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.38E-04	0.00E+00	2.38E-04	7.33E+00	<1	1.89E+01	<1
Copper	1.67E+01	9.09E-03	0.00E+00	1.15E+00	0.00E+00	1.15E+00	1.22E-03	2.46E-02	1.18E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.26E+01	1.75E-03	0.00E+00	8.34E-01	0.00E+00	8.34E-01	2.35E-04	1.86E-02	8.53E-01	4.70E+00	<1	1.86E+02	<1
Manganese	4.29E+02	1.34E-01	0.00E+00	3.73E+00	0.00E+00	3.73E+00	1.80E-02	6.33E-01	4.38E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.96E-05	--	1.96E-05	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.31E-04	0.00E+00	5.31E-04	1.70E+00	<1	1.48E+01	<1
Selenium	3.21E-01	7.23E-04	0.00E+00	5.41E-02	0.00E+00	5.41E-02	9.69E-05	4.74E-04	5.47E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	2.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.40E-05	0.00E+00	3.40E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	1.27E+01	2.33E-03	0.00E+00	7.16E-02	0.00E+00	7.16E-02	3.13E-04	1.87E-02	9.06E-02	4.16E+00	<1	9.44E+00	<1
Zinc	5.28E+01	2.54E-02	0.00E+00	4.21E+01	0.00E+00	4.21E+01	3.40E-03	7.78E-02	4.22E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.31E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.47E-03	1.93E-04	5.66E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.55E-01	--	1.55E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	5.51E-05	--	5.51E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.36E-04	--	2.36E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	5.78E-04	--	--	--	0.00E+00	7.75E-05	--	7.75E-05				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	7.41E-05	--	7.41E-05				
Total LMW PAHs						0.00E+00	4.43E-04	0.00E+00	4.43E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	7.71E-05	--	7.71E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	2.60E-04	--	2.60E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	6.82E-04	--	6.82E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	9.79E-05	--	9.79E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.05E-05	--	2.05E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	4.94E-04	--	4.94E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	8.98E-06	--	8.98E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	4.39E-05	--	4.39E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	1.78E-04	--	1.78E-04				
Total HMW PAHs						0.00E+00	1.86E-03	0.00E+00	1.86E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.29E-02	5.25E-03	0.00E+00	3.13E-01	0.00E+00	3.13E-01	7.04E-04	6.33E-05	3.14E-01	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H19-11
Refined Exposure Evaluation - Short-tailed Shrew
Western Undeveloped Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	1.39E-06	0.00E+00	0.00E+00	5.48E-07	0.00E+00	5.48E-07	0.00E+00	2.05E-09	5.50E-07				
1,2,3,7,8-PeCDD	8.70E-08	0.00E+00	0.00E+00	2.07E-08	0.00E+00	2.07E-08	0.00E+00	1.28E-10	2.08E-08				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	2.90E-07	0.00E+00	0.00E+00	8.59E-08	0.00E+00	8.59E-09	0.00E+00	4.28E-11	8.63E-09				
1,2,3,7,8,9-HxCDD	2.39E-07	0.00E+00	0.00E+00	6.84E-08	0.00E+00	6.84E-09	0.00E+00	3.52E-11	6.87E-09				
1,2,3,4,6,7,8-HpCDD	1.83E-06	0.00E+00	0.00E+00	7.58E-07	0.00E+00	7.58E-09	0.00E+00	2.70E-11	7.61E-09				
OCDD	1.36E-05	0.00E+00	0.00E+00	8.12E-06	0.00E+00	2.43E-09	0.00E+00	6.01E-12	2.44E-09				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	1.53E-07	0.00E+00	0.00E+00	4.03E-08	0.00E+00	1.21E-08	0.00E+00	6.77E-11	1.22E-08				
1,2,3,4,7,8-HxCDF	2.35E-07	0.00E+00	0.00E+00	6.70E-08	0.00E+00	6.70E-09	0.00E+00	3.46E-11	6.74E-09				
1,2,3,6,7,8-HxCDF	2.37E-07	0.00E+00	0.00E+00	6.77E-08	0.00E+00	6.77E-09	0.00E+00	3.49E-11	6.80E-09				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	2.64E-07	0.00E+00	0.00E+00	7.69E-08	0.00E+00	7.69E-09	0.00E+00	3.89E-11	7.73E-09				
1,2,3,4,6,7,8-HpCDF	3.45E-07	0.00E+00	0.00E+00	1.05E-07	0.00E+00	1.05E-09	0.00E+00	5.09E-12	1.06E-09				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	1.32E-06	0.00E+00	0.00E+00	5.15E-07	0.00E+00	1.55E-10	0.00E+00	5.84E-13	1.55E-10				
Total Dioxins/Furans						6.28E-07	0.00E+00	2.47E-09	6.31E-07	5.62E-07	1.12E+00	3.76E-06	<1

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H20-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Flathead River Riparian Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	1.14E+00	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	9.28E-04	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	9.37E-04	4.90E+00	3.75E-02	1.84E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	7.42E-01	Sample et al. (1999)	Regression[f]	2.89E-02	Sample et al. (1998b)
Barium	NA	1.73E-01	1.58E+02	1.56E-01	2.47E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	1.44E+01	Sample et al. (1998a)	6.83E-04	1.08E-01	Baes et al. (1984)[e]
Beryllium	NA	2.61E-04	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	6.80E-04	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	Regression[d]	0	Sample et al. (1999)	Regression[f]	0	Sample et al. (1998b)
Chromium	NA	2.97E-03	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	1.78E-03	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	9.09E-03	1.71E+01	Regression[a]	5.97E+00	Bechtel-Jacobs (1998a)	5.15E-01	8.81E+00	Sample et al. (1998a)	Regression[f]	1.16E+01	Sample et al. (1998b)
Lead	NA	1.75E-03	1.01E+01	Regression[a]	9.67E-01	Bechtel-Jacobs (1998a)	Regression[d]	5.18E+00	Sample et al. (1999)	Regression[f]	2.99E+00	Sample et al. (1998b)
Manganese	NA	1.34E-01	3.63E+02	7.90E-02	2.86E+01	Bechtel-Jacobs (1998a)[g]	Regression[d]	2.48E+01	Sample et al. (1999)	2.05E-02	7.43E+00	Sample et al. (1998b)[i]
Mercury	NA	1.46E-04	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	3.96E-03	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	7.78E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Selenium	NA	7.23E-04	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	Regression[d]	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	2.54E-04	ND	4.00E-03	0	Baes et al. (1984)	5.41E-02	0	USCHPPM (2004)	1.08E-01	0	Baes et al. (1984)[e]
Vanadium	NA	2.33E-03	0.00E+00	4.85E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	4.20E-02	0.00E+00	Sample et al. (1998a)	1.23E-02	0.00E+00	Sample et al. (1998b)[i]
Zinc	NA	2.54E-02	4.70E+01	Regression[a]	4.08E+01	Bechtel-Jacobs (1998a)	Regression[d]	3.02E+02	Sample et al. (1998a)	Regression[f]	1.03E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	4.08E-02	8.76E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	1.16E+00	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	4.12E-04	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	1.76E-03	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	5.78E-04	8.10E-01	1.22E+01	9.88E+00	USEPA (2007a)	4.40E+00	3.56E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Phenanthrene	4.55	5.53E-04	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs												
High Molecular Weight (HMW) PAHs:												

Table H20-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Flathead River Riparian Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Benzo(a)anthracene	5.7	5.75E-04	ND	Regression[a]	0	USEPA (2007a)	1.59E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	1.94E-03	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	5.09E-03	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	7.31E-04	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	1.53E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	3.69E-03	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	6.70E-05	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.28E-04	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	1.33E-03	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	5.25E-03	ND	2.38E-02	0	USEPA (2007a)	5.44E+01	0	USEPA (2007a)	7.79E-01	0	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	1.40E-02	8.14E-01	1.14E-02	USEPA (2007a)	1.03E+01	1.44E-01	USEPA (2007a)	4.49E-01	6.29E-03	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	0.00E+00	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H20-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Flathead River Riparian Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
2,3,4,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H20-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Flathead River Riparian Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H20-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Flathead River Riparian Area (0 -2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals												
Aluminum	NA	1.14E+00	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	9.28E-04	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	9.37E-04	4.88E+00	3.75E-02	1.83E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	7.39E-01	Sample et al. (1999)	Regression[f]	2.87E-02	Sample et al. (1998b)
Barium	NA	1.73E-01	1.41E+02	1.56E-01	2.20E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	1.29E+01	Sample et al. (1998a)	6.83E-04	9.64E-02	Baes et al. (1984)[e]
Beryllium	NA	2.61E-04	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	6.80E-04	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	Regression[d]	0	Sample et al. (1999)	Regression[f]	0	Sample et al. (1998b)
Chromium	NA	2.97E-03	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	1.78E-03	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	9.09E-03	1.59E+01	Regression[a]	5.80E+00	Bechtel-Jacobs (1998a)	5.15E-01	8.19E+00	Sample et al. (1998a)	Regression[f]	1.15E+01	Sample et al. (1998b)
Lead	NA	1.75E-03	9.42E+00	Regression[a]	9.33E-01	Bechtel-Jacobs (1998a)	Regression[d]	4.91E+00	Sample et al. (1999)	Regression[f]	2.91E+00	Sample et al. (1998b)
Manganese	NA	1.34E-01	3.12E+02	7.90E-02	2.47E+01	Bechtel-Jacobs (1998a)[g]	Regression[d]	2.24E+01	Sample et al. (1999)	2.05E-02	6.40E+00	Sample et al. (1998b)[i]
Mercury	NA	1.46E-04	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	3.96E-03	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	7.78E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Selenium	NA	7.23E-04	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	Regression[d]	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Silver		0.00E+00	ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	2.54E-04	ND	4.00E-03	0	Baes et al. (1984)	5.41E-02	0	USCHPPM (2004)	1.08E-01	0	Baes et al. (1984)[e]
Vanadium	NA	2.33E-03	0.00E+00	4.85E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	4.20E-02	0.00E+00	Sample et al. (1998a)	1.23E-02	0.00E+00	Sample et al. (1998b)[i]
Zinc	NA	2.54E-02	4.30E+01	Regression[a]	3.88E+01	Bechtel-Jacobs (1998a)	Regression[d]	2.94E+02	Sample et al. (1998a)	Regression[f]	1.02E+02	Sample et al. (1998b)
Inorganics - Other Inorganics												
Cyanide	NA	4.08E-02	1.24E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	1.16E+00	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	0.00E+00	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	3.92	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	4.12E-04	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	1.76E-03	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	0.00E+00	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	5.78E-04	3.60E-01	1.22E+01	4.39E+00	USEPA (2007a)	4.40E+00	1.58E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Phenanthrene	4.55	5.53E-04	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs												
High Molecular Weight (HMW) PAHs:												

Table H20-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Flathead River Riparian Area (0 -2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Benzo(a)anthracene	5.7	5.75E-04	ND	Regression[a]	0	USEPA (2007a)	1.59E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	1.94E-03	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	5.09E-03	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	7.31E-04	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	1.53E-04	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	3.69E-03	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	6.70E-05	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	3.28E-04	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	1.33E-03	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs												
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	4.57	0.00E+00	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		0.00E+00	ND									
2-Chloronaphthalene	3.81	0.00E+00	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	0.00E+00	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	5.25E-03	ND	2.38E-02	0	USEPA (2007a)	5.44E+01	0	USEPA (2007a)	7.79E-01	0	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	0.00E+00	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	0.00E+00	2.70E-02	8.14E-01	2.20E-02	USEPA (2007a)	1.03E+01	2.78E-01	USEPA (2007a)	4.49E-01	1.21E-02	LANL (2015)
Di-n-octyl phthalate	8.54	0.00E+00	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	0.00E+00	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	0.00E+00	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	0.00E+00	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	0.00E+00	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	3.59	0.00E+00	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans												
2,3,7,8-TCDD	6.92	0.00E+00	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	0.00E+00	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	0.00E+00	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	0.00E+00	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	0.00E+00	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	0.00E+00	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H20-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Flathead River Riparian Area (0 -2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
				Plants			Soil Invertebrates			Small Mammals		
				Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
2,3,4,7,8-PeCDF	6.94	0.00E+00	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	0.00E+00	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	0.00E+00	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	0.00E+00	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	0.00E+00	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H20-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Flathead River Riparian Area (0 -2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	0.938	USEPA (2007)
Beryllium	-0.5361	0.7345	USEPA (2007)
Cadmium	-0.475	0.546	Bechtel-Jacobs (1998)
Copper	0.668	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Mercury	-0.996	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	0.748	Bechtel-Jacobs (1998)
Selenium	-0.677	1.104	Bechtel-Jacobs (1998)
Zinc	1.575	0.554	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-0.8556	USEPA (2007)
Acenaphthylene	-1.144	0.791	USEPA (2007)
Anthracene	-0.9887	0.7784	USEPA (2007)
Benzo(a)anthracene	-2.7078	0.5944	USEPA (2007)
Benzo(a)pyrene	-2.0615	0.975	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.1829	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	0.8595	USEPA (2007)
Chrysene	-2.7078	0.5944	USEPA (2007)
Fluorene	-5.562	-0.8556	USEPA (2007)
Phenanthrene	-0.1665	0.6203	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	0.706	Sample et al. (1999)
Cadmium	2.114	0.795	Sample et al. (1999)
Lead	-0.218	0.807	Sample et al. (1999)
Manganese	-0.809	0.682	Sample et al. (1999)
Selenium	-0.075	0.733	Sample et al. (1999)
Zinc	4.449	0.328	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.182	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	0.8188	Sample et al. (1998b)
Cadmium	-1.2571	0.4723	Sample et al. (1998b)
Chromium	-1.4599	0.7338	Sample et al. (1998b)
Cobalt	-4.4669	1.307	Sample et al. (1998b)
Copper	2.042	0.1444	Sample et al. (1998b)
Lead	0.0761	0.4422	Sample et al. (1998b)
Nickel	-0.2462	0.4658	Sample et al. (1998b)
Selenium	-0.4158	0.3764	Sample et al. (1998b)
Zinc	4.3632	0.0706	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.0993	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H20-2
Refined Exposure Evaluation - American Woodcock
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-01	0.00E+00	1.34E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	9.28E-04	--	--	--	0.00E+00	1.09E-04	--	1.09E-04	No TRV	--	No TRV	--
Arsenic	4.90E+00	9.37E-04	2.16E-03	7.84E-02	0.00E+00	8.06E-02	1.10E-04	4.32E-02	1.24E-01	2.24E+00	<1	4.51E+00	<1
Barium	1.58E+02	1.73E-01	2.90E-01	1.52E+00	0.00E+00	1.81E+00	2.03E-02	1.39E+00	3.23E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	3.07E-05	--	3.07E-05	No TRV	--	No TRV	--
Cadmium	ND	6.80E-04	--	--	--	0.00E+00	7.99E-05	--	7.99E-05	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	3.49E-04	--	3.49E-04	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.09E-04	0.00E+00	2.09E-04	7.61E+00	<1	2.02E+01	<1
Copper	1.71E+01	9.09E-03	7.01E-02	9.31E-01	0.00E+00	1.00E+00	1.07E-03	1.51E-01	1.15E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.01E+01	1.75E-03	1.14E-02	5.48E-01	0.00E+00	5.59E-01	2.06E-04	8.86E-02	6.48E-01	1.63E+00	<1	4.46E+01	<1
Manganese	3.63E+02	1.34E-01	3.37E-01	2.62E+00	0.00E+00	2.96E+00	1.58E-02	3.19E+00	6.17E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.72E-05	--	1.72E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.65E-04	0.00E+00	4.65E-04	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.49E-05	0.00E+00	8.49E-05	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	2.54E-04	--	--	--	0.00E+00	2.98E-05	--	2.98E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	0.00E+00	2.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E-04	0.00E+00	2.74E-04	3.44E-01	<1	1.70E+00	<1
Zinc	4.70E+01	2.54E-02	4.79E-01	3.20E+01	0.00E+00	3.25E+01	2.98E-03	4.14E-01	3.29E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.76E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-03	7.72E-03	1.25E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.36E-01	--	1.36E-01	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	4.83E-05	--	4.83E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.07E-04	--	2.07E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	8.10E-01	5.78E-04	1.16E-01	3.77E-01	0.00E+00	4.93E-01	6.79E-05	7.14E-03	5.00E-01				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	6.50E-05	--	6.50E-05				
Total LMW PAHs						4.93E-01	3.88E-04	7.14E-03	5.00E-01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	6.76E-05	--	6.76E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	2.28E-04	--	2.28E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	5.98E-04	--	5.98E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	8.58E-05	--	8.58E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.80E-05	--	1.80E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	4.33E-04	--	4.33E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	7.87E-06	--	7.87E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	3.85E-05	--	3.85E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	1.56E-04	--	1.56E-04				
Total HMW PAHs						0.00E+00	1.63E-03	0.00E+00	1.63E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	6.17E-04	--	6.17E-04	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.40E-02	ND	1.34E-04	1.53E-02	0.00E+00	1.54E-02	--	1.23E-04	1.55E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H20-2
Refined Exposure Evaluation - American Woodcock
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H20-3
Refined Exposure Evaluation - Mourning Dove
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-01	0.00E+00	1.30E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	9.28E-04	--	--	--	0.00E+00	1.06E-04	--	1.06E-04	No TRV	--	No TRV	--
Arsenic	4.90E+00	9.37E-04	2.10E-02	0.00E+00	0.00E+00	2.10E-02	1.07E-04	3.80E-02	5.91E-02	2.24E+00	<1	4.51E+00	<1
Barium	1.58E+02	1.73E-01	2.82E+00	0.00E+00	0.00E+00	2.82E+00	1.97E-02	1.23E+00	4.06E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	2.98E-05	--	2.98E-05	No TRV	--	No TRV	--
Cadmium	ND	6.80E-04	--	--	--	0.00E+00	7.76E-05	--	7.76E-05	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	3.39E-04	--	3.39E-04	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.03E-04	0.00E+00	2.03E-04	7.61E+00	<1	2.02E+01	<1
Copper	1.71E+01	9.09E-03	6.81E-01	0.00E+00	0.00E+00	6.81E-01	1.04E-03	1.33E-01	8.15E-01	4.05E+00	<1	3.48E+01	<1
Lead	1.01E+01	1.75E-03	1.10E-01	0.00E+00	0.00E+00	1.10E-01	2.00E-04	7.81E-02	1.89E-01	1.63E+00	<1	4.46E+01	<1
Manganese	3.63E+02	1.34E-01	3.27E+00	0.00E+00	0.00E+00	3.27E+00	1.53E-02	2.81E+00	6.10E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.67E-05	--	1.67E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.52E-04	0.00E+00	4.52E-04	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.25E-05	0.00E+00	8.25E-05	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	2.54E-04	--	--	--	0.00E+00	2.90E-05	--	2.90E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	0.00E+00	2.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E-04	0.00E+00	2.66E-04	3.44E-01	<1	1.70E+00	<1
Zinc	4.70E+01	2.54E-02	4.65E+00	0.00E+00	0.00E+00	4.65E+00	2.89E-03	3.65E-01	5.02E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.76E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E-03	6.80E-03	1.15E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.32E-01	--	1.32E-01	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	4.70E-05	--	4.70E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.01E-04	--	2.01E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	8.10E-01	5.78E-04	1.13E+00	0.00E+00	0.00E+00	1.13E+00	6.60E-05	6.29E-03	1.13E+00				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	6.31E-05	--	6.31E-05				
Total LMW PAHs						1.13E+00	3.77E-04	6.29E-03	1.13E+00	1.61E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	6.56E-05	--	6.56E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	2.21E-04	--	2.21E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	5.81E-04	--	5.81E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	8.34E-05	--	8.34E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.75E-05	--	1.75E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	4.21E-04	--	4.21E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	7.65E-06	--	7.65E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	3.74E-05	--	3.74E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	1.52E-04	--	1.52E-04				
Total HMW PAHs						0.00E+00	1.59E-03	0.00E+00	1.59E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	5.99E-04	--	5.99E-04	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.40E-02	0.00E+00	1.30E-03	0.00E+00	0.00E+00	1.30E-03	0.00E+00	1.09E-04	1.41E-03	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H20-3
Refined Exposure Evaluation - Mourning Dove
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H20-4
Refined Exposure Evaluation - Red-tailed Hawk
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.36E-02	0.00E+00	9.36E-02	1.10E+02	<1	1.10E+03	<1
Antimony	ND	9.28E-04	--	--	--	0.00E+00	7.61E-05	--	7.61E-05	No TRV	--	No TRV	--
Arsenic	4.90E+00	9.37E-04	0.00E+00	0.00E+00	2.37E-03	2.37E-03	7.68E-05	1.05E-02	1.29E-02	2.24E+00	<1	4.51E+00	<1
Barium	1.58E+02	1.73E-01	0.00E+00	0.00E+00	8.85E-03	8.85E-03	1.42E-02	3.37E-01	3.60E-01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	2.14E-05	--	2.14E-05	No TRV	--	No TRV	--
Cadmium	ND	6.80E-04	--	--	--	0.00E+00	5.58E-05	--	5.58E-05	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	2.44E-04	--	2.44E-04	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-04	0.00E+00	1.46E-04	7.61E+00	<1	2.02E+01	<1
Copper	1.71E+01	9.09E-03	0.00E+00	0.00E+00	9.52E-01	9.52E-01	7.45E-04	3.65E-02	9.89E-01	4.05E+00	<1	3.48E+01	<1
Lead	1.01E+01	1.75E-03	0.00E+00	0.00E+00	2.46E-01	2.46E-01	1.44E-04	2.14E-02	2.67E-01	1.63E+00	<1	4.46E+01	<1
Manganese	3.63E+02	1.34E-01	0.00E+00	0.00E+00	6.10E-01	6.10E-01	1.10E-02	7.73E-01	1.39E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.20E-05	--	1.20E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.25E-04	0.00E+00	3.25E-04	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.93E-05	0.00E+00	5.93E-05	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	2.54E-04	--	--	--	0.00E+00	2.08E-05	--	2.08E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	0.00E+00	2.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.91E-04	0.00E+00	1.91E-04	3.44E-01	<1	1.70E+00	<1
Zinc	4.70E+01	2.54E-02	0.00E+00	0.00E+00	8.45E+00	8.45E+00	2.08E-03	1.00E-01	8.55E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.76E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-03	1.87E-03	5.22E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	9.49E-02	--	9.49E-02	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	3.37E-05	--	3.37E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	1.44E-04	--	1.44E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	8.10E-01	5.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.74E-05	1.73E-03	1.77E-03				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	4.54E-05	--	4.54E-05				
Total LMW PAHs						0.00E+00	2.71E-04	1.73E-03	2.00E-03	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	4.72E-05	--	4.72E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	1.59E-04	--	1.59E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	4.17E-04	--	4.17E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	5.99E-05	--	5.99E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	1.26E-05	--	1.26E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	3.02E-04	--	3.02E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	5.49E-06	--	5.49E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	2.69E-05	--	2.69E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	1.09E-04	--	1.09E-04				
Total HMW PAHs						0.00E+00	1.14E-03	0.00E+00	1.14E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	4.31E-04	--	4.31E-04	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.40E-02	0.00E+00	0.00E+00	0.00E+00	5.16E-04	5.16E-04	0.00E+00	2.99E-05	5.45E-04	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H20-4
Refined Exposure Evaluation - Red-tailed Hawk
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H20-5
Refined Exposure Evaluation - Yellow-billed Cuckoo
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.81E-01	0.00E+00	1.81E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	9.28E-04	--	--	--	0.00E+00	1.47E-04	--	1.47E-04	No TRV	--	No TRV	--
Arsenic	4.90E+00	9.37E-04	0.00E+00	1.17E-01	0.00E+00	1.17E-01	1.48E-04	0.00E+00	1.18E-01	2.24E+00	<1	4.51E+00	<1
Barium	1.58E+02	1.73E-01	0.00E+00	2.28E+00	0.00E+00	2.28E+00	2.74E-02	0.00E+00	2.31E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	4.13E-05	--	4.13E-05	No TRV	--	No TRV	--
Cadmium	ND	6.80E-04	--	--	--	0.00E+00	1.08E-04	--	1.08E-04	1.47E+00	<1	6.35E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	4.71E-04	--	4.71E-04	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.82E-04	0.00E+00	2.82E-04	7.61E+00	<1	2.02E+01	<1
Copper	1.71E+01	9.09E-03	0.00E+00	1.39E+00	0.00E+00	1.39E+00	1.44E-03	0.00E+00	1.40E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.01E+01	1.75E-03	0.00E+00	8.20E-01	0.00E+00	8.20E-01	2.77E-04	0.00E+00	8.20E-01	1.63E+00	<1	4.46E+01	<1
Manganese	3.63E+02	1.34E-01	0.00E+00	3.92E+00	0.00E+00	3.92E+00	2.13E-02	0.00E+00	3.95E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	2.31E-05	--	2.31E-05	4.50E-01	<1	9.10E-01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.27E-04	0.00E+00	6.27E-04	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-04	0.00E+00	1.14E-04	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	2.54E-04	--	--	--	0.00E+00	4.02E-05	--	4.02E-05	3.50E-01	<1	3.50E+00	<1
Vanadium	0.00E+00	2.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.70E-04	0.00E+00	3.70E-04	3.44E-01	<1	1.70E+00	<1
Zinc	4.70E+01	2.54E-02	0.00E+00	4.79E+01	0.00E+00	4.79E+01	4.01E-03	0.00E+00	4.79E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.76E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.46E-03	0.00E+00	6.46E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.83E-01	--	1.83E-01	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	6.52E-05	--	6.52E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.79E-04	--	2.79E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	8.10E-01	5.78E-04	0.00E+00	5.64E-01	0.00E+00	5.64E-01	9.15E-05	0.00E+00	5.64E-01				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	8.76E-05	--	8.76E-05				
Total LMW PAHs						5.64E-01	5.23E-04	0.00E+00	5.65E-01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	9.11E-05	--	9.11E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	3.07E-04	--	3.07E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	8.06E-04	--	8.06E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	1.16E-04	--	1.16E-04				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.43E-05	--	2.43E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	5.84E-04	--	5.84E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	1.06E-05	--	1.06E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	5.19E-05	--	5.19E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	2.11E-04	--	2.11E-04				
Total HMW PAHs						0.00E+00	2.20E-03	0.00E+00	2.20E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	8.31E-04	--	8.31E-04	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.40E-02	0.00E+00	0.00E+00	2.29E-02	0.00E+00	2.29E-02	0.00E+00	0.00E+00	2.29E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H20-5
Refined Exposure Evaluation - Yellow-billed Cuckoo
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H20-6
Refined Exposure Evaluation - Canada Lynx
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.57E-02	0.00E+00	3.57E-02	No TRV	--	No TRV	--
Antimony	ND	9.28E-04	--	--	--	0.00E+00	2.90E-05	--	2.90E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	4.90E+00	9.37E-04	0.00E+00	0.00E+00	9.02E-04	9.02E-04	2.93E-05	4.29E-03	5.22E-03	1.04E+00	<1	4.55E+00	<1
Barium	1.58E+02	1.73E-01	0.00E+00	0.00E+00	3.37E-03	3.37E-03	5.40E-03	1.38E-01	1.47E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	8.15E-06	--	8.15E-06	5.32E-01	<1	6.70E-01	<1
Cadmium	ND	6.80E-04	--	--	--	0.00E+00	2.12E-05	--	2.12E-05	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	9.29E-05	--	9.29E-05	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.56E-05	0.00E+00	5.56E-05	7.33E+00	<1	1.89E+01	<1
Copper	1.71E+01	9.09E-03	0.00E+00	0.00E+00	3.63E-01	3.63E-01	2.84E-04	1.50E-02	3.78E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.01E+01	1.75E-03	0.00E+00	0.00E+00	9.36E-02	9.36E-02	5.47E-05	8.80E-03	1.02E-01	4.70E+00	<1	1.86E+02	<1
Manganese	3.63E+02	1.34E-01	0.00E+00	0.00E+00	2.32E-01	2.32E-01	4.20E-03	3.17E-01	5.54E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	4.56E-06	--	4.56E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.24E-04	0.00E+00	1.24E-04	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.26E-05	0.00E+00	2.26E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	2.54E-04	--	--	--	0.00E+00	7.94E-06	--	7.94E-06	4.80E-01	<1	1.43E+00	<1
Vanadium	0.00E+00	2.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.29E-05	0.00E+00	7.29E-05	4.16E+00	<1	9.44E+00	<1
Zinc	4.70E+01	2.54E-02	0.00E+00	0.00E+00	3.22E+00	3.22E+00	7.92E-04	4.11E-02	3.26E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.76E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-03	7.66E-04	2.04E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	3.62E-02	--	3.62E-02	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	1.29E-05	--	1.29E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	5.50E-05	--	5.50E-05				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	8.10E-01	5.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.81E-05	7.09E-04	7.27E-04				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	1.73E-05	--	1.73E-05				
Total LMW PAHs						0.00E+00	1.03E-04	7.09E-04	8.12E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	1.80E-05	--	1.80E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	6.06E-05	--	6.06E-05				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	1.59E-04	--	1.59E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	2.28E-05	--	2.28E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	4.79E-06	--	4.79E-06				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	1.15E-04	--	1.15E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	2.09E-06	--	2.09E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	1.02E-05	--	1.02E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	4.16E-05	--	4.16E-05				
Total HMW PAHs						0.00E+00	4.34E-04	0.00E+00	4.34E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	1.64E-04	--	1.64E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.40E-02	0.00E+00	0.00E+00	0.00E+00	1.96E-04	1.96E-04	0.00E+00	1.22E-05	2.09E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H20-6
Refined Exposure Evaluation - Canada Lynx
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H20-7
Refined Exposure Evaluation - Grizzly Bear
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)										
			Diet					Water	Substrate				
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.47E-02	0.00E+00	2.47E-02	No TRV	--	No TRV	--
Antimony	ND	9.28E-04	--	--	--	0.00E+00	0.00E+00	2.00E-05	--	2.00E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	4.90E+00	9.37E-04	2.58E-03	2.40E-03	6.23E-05	0.00E+00	5.05E-03	2.02E-05	2.96E-03	8.03E-03	1.04E+00	<1	4.55E+00	<1
Barium	1.58E+02	1.73E-01	3.46E-01	4.66E-02	2.33E-04	0.00E+00	3.93E-01	3.73E-03	9.56E-02	4.93E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	0.00E+00	5.64E-06	--	5.64E-06	5.32E-01	<1	6.70E-01	<1
Cadmium	ND	6.80E-04	--	--	--	0.00E+00	0.00E+00	1.47E-05	--	1.47E-05	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	0.00E+00	6.42E-05	--	6.42E-05	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.84E-05	0.00E+00	3.84E-05	7.33E+00	<1	1.89E+01	<1
Copper	1.71E+01	9.09E-03	8.38E-02	2.85E-02	2.51E-02	0.00E+00	1.37E-01	1.96E-04	1.03E-02	1.48E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.01E+01	1.75E-03	1.36E-02	1.68E-02	6.47E-03	0.00E+00	3.68E-02	3.78E-05	6.08E-03	4.29E-02	4.70E+00	<1	1.86E+02	<1
Manganese	3.63E+02	1.34E-01	4.02E-01	8.03E-02	1.61E-02	0.00E+00	4.98E-01	2.90E-03	2.19E-01	7.21E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	0.00E+00	3.15E-06	--	3.15E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.55E-05	0.00E+00	8.55E-05	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-05	0.00E+00	1.56E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	2.54E-04	--	--	--	0.00E+00	0.00E+00	5.49E-06	--	5.49E-06	4.80E-01	<1	1.43E+00	<1
Vanadium	0.00E+00	2.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.04E-05	0.00E+00	5.04E-05	4.16E+00	<1	9.44E+00	<1
Zinc	4.70E+01	2.54E-02	5.72E-01	9.80E-01	2.22E-01	0.00E+00	1.77E+00	5.48E-04	2.84E-02	1.80E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	8.76E-01	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.82E-04	5.30E-04	1.41E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	0.00E+00	2.50E-02	--	2.50E-02	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	0.00E+00	8.89E-06	--	8.89E-06				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	0.00E+00	3.80E-05	--	3.80E-05				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	8.10E-01	5.78E-04	1.39E-01	1.15E-02	0.00E+00	0.00E+00	1.50E-01	1.25E-05	4.90E-04	1.51E-01				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	0.00E+00	1.19E-05	--	1.19E-05				
Total LMW PAHs							1.50E-01	7.13E-05	4.90E-04	1.51E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	0.00E+00	1.24E-05	--	1.24E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	0.00E+00	4.19E-05	--	4.19E-05				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	0.00E+00	1.10E-04	--	1.10E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	0.00E+00	1.58E-05	--	1.58E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	0.00E+00	3.31E-06	--	3.31E-06				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	0.00E+00	7.96E-05	--	7.96E-05				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	0.00E+00	1.45E-06	--	1.45E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	0.00E+00	7.08E-06	--	7.08E-06				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	0.00E+00	2.87E-05	--	2.87E-05				
Total HMW PAHs							0.00E+00	3.00E-04	0.00E+00	3.00E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	0.00E+00	1.13E-04	--	1.13E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	1.40E-02	0.00E+00	1.60E-04	4.68E-04	1.36E-05	0.00E+00	6.41E-04	0.00E+00	8.47E-06	6.50E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H20-7
Refined Exposure Evaluation - Grizzly Bear
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)											
			Diet					Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans							0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H20-8
Refined Exposure Evaluation - Long-tailed Weasel
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.87E-02	0.00E+00	5.87E-02	No TRV	--	No TRV	--
Antimony	ND	9.28E-04	--	--	--	0.00E+00	4.78E-05	--	4.78E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	4.88E+00	9.37E-04	0.00E+00	0.00E+00	1.48E-03	1.48E-03	4.82E-05	4.02E-03	5.54E-03	1.04E+00	<1	4.55E+00	<1
Barium	1.41E+02	1.73E-01	0.00E+00	0.00E+00	4.96E-03	4.96E-03	8.90E-03	1.16E-01	1.30E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	1.34E-05	--	1.34E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	ND	6.80E-04	--	--	--	0.00E+00	3.50E-05	--	3.50E-05	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	1.53E-04	--	1.53E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.15E-05	0.00E+00	9.15E-05	7.33E+00	<1	1.89E+01	<1
Copper	1.59E+01	9.09E-03	0.00E+00	0.00E+00	5.91E-01	5.91E-01	4.68E-04	1.31E-02	6.05E-01	5.60E+00	<1	8.27E+01	<1
Lead	9.42E+00	1.75E-03	0.00E+00	0.00E+00	1.50E-01	1.50E-01	9.01E-05	7.76E-03	1.58E-01	4.70E+00	<1	1.86E+02	<1
Manganese	3.12E+02	1.34E-01	0.00E+00	0.00E+00	3.29E-01	3.29E-01	6.92E-03	2.57E-01	5.93E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	7.51E-06	--	7.51E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.04E-04	0.00E+00	2.04E-04	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.72E-05	0.00E+00	3.72E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	2.54E-04	--	--	--	0.00E+00	1.31E-05	--	1.31E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	0.00E+00	2.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-04	0.00E+00	1.20E-04	4.16E+00	<1	9.44E+00	<1
Zinc	4.30E+01	2.54E-02	0.00E+00	0.00E+00	5.27E+00	5.27E+00	1.30E-03	3.54E-02	5.31E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.24E+00	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-03	1.02E-03	3.12E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	5.96E-02	--	5.96E-02	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	2.12E-05	--	2.12E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	9.06E-05	--	9.06E-05				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	3.60E-01	5.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.97E-05	2.96E-04	3.26E-04				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	2.85E-05	--	2.85E-05				
Total LMW PAHs						0.00E+00	1.70E-04	2.96E-04	4.66E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	2.96E-05	--	2.96E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	9.97E-05	--	9.97E-05				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	2.62E-04	--	2.62E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	3.76E-05	--	3.76E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	7.88E-06	--	7.88E-06				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	1.90E-04	--	1.90E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	3.45E-06	--	3.45E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	1.69E-05	--	1.69E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	6.84E-05	--	6.84E-05				
Total HMW PAHs						0.00E+00	7.15E-04	0.00E+00	7.15E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	2.70E-04	--	2.70E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	2.70E-02	0.00E+00	0.00E+00	0.00E+00	6.24E-04	6.24E-04	0.00E+00	2.22E-05	6.46E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H20-8
Refined Exposure Evaluation - Long-tailed Weasel
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H20-9
Refined Exposure Evaluation - Meadow Vole
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E-01	0.00E+00	1.71E-01	No TRV	--	No TRV	--
Antimony	ND	9.28E-04	--	--	--	0.00E+00	1.39E-04	--	1.39E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	4.88E+00	9.37E-04	2.75E-02	0.00E+00	0.00E+00	2.75E-02	1.41E-04	9.53E-03	3.72E-02	1.04E+00	<1	4.55E+00	<1
Barium	1.41E+02	1.73E-01	3.31E+00	0.00E+00	0.00E+00	3.31E+00	2.60E-02	2.76E-01	3.61E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	3.92E-05	--	3.92E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	ND	6.80E-04	--	--	--	0.00E+00	1.02E-04	--	1.02E-04	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	4.47E-04	--	4.47E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.67E-04	0.00E+00	2.67E-04	7.33E+00	<1	1.89E+01	<1
Copper	1.59E+01	9.09E-03	8.71E-01	0.00E+00	0.00E+00	8.71E-01	1.37E-03	3.11E-02	9.04E-01	5.60E+00	<1	8.27E+01	<1
Lead	9.42E+00	1.75E-03	1.40E-01	0.00E+00	0.00E+00	1.40E-01	2.63E-04	1.84E-02	1.59E-01	4.70E+00	<1	1.86E+02	<1
Manganese	3.12E+02	1.34E-01	3.70E+00	0.00E+00	0.00E+00	3.70E+00	2.02E-02	6.10E-01	4.33E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	2.19E-05	--	2.19E-05	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.95E-04	0.00E+00	5.95E-04	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.09E-04	0.00E+00	1.09E-04	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	2.54E-04	--	--	--	0.00E+00	3.82E-05	--	3.82E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	0.00E+00	2.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.51E-04	0.00E+00	3.51E-04	4.16E+00	<1	9.44E+00	<1
Zinc	4.30E+01	2.54E-02	5.83E+00	0.00E+00	0.00E+00	5.83E+00	3.81E-03	8.39E-02	5.92E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.24E+00	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.13E-03	2.42E-03	8.55E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.74E-01	--	1.74E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	6.18E-05	--	6.18E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.64E-04	--	2.64E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	3.60E-01	5.78E-04	6.60E-01	0.00E+00	0.00E+00	6.60E-01	8.69E-05	7.03E-04	6.61E-01				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	8.31E-05	--	8.31E-05				
Total LMW PAHs						6.60E-01	4.96E-04	7.03E-04	6.61E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	8.64E-05	--	8.64E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	2.91E-04	--	2.91E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	7.65E-04	--	7.65E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	1.10E-04	--	1.10E-04				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.30E-05	--	2.30E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	5.54E-04	--	5.54E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	1.01E-05	--	1.01E-05				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	4.92E-05	--	4.92E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	2.00E-04	--	2.00E-04				
Total HMW PAHs						0.00E+00	2.09E-03	0.00E+00	2.09E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	7.89E-04	--	7.89E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	2.70E-02	0.00E+00	3.30E-03	0.00E+00	0.00E+00	3.30E-03	0.00E+00	5.27E-05	3.36E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H20-9
Refined Exposure Evaluation - Meadow Vole
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H20-10
Refined Exposure Evaluation - North American Wolverine
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E-02	0.00E+00	3.43E-02	No TRV	--	No TRV	--
Antimony	ND	9.28E-04	--	--	--	0.00E+00	2.79E-05	--	2.79E-05	5.90E-02	<1	2.76E+00	<1
Arsenic	4.88E+00	9.37E-04	0.00E+00	0.00E+00	8.63E-04	8.63E-04	2.81E-05	4.10E-03	4.99E-03	1.04E+00	<1	4.55E+00	<1
Barium	1.41E+02	1.73E-01	0.00E+00	0.00E+00	2.90E-03	2.90E-03	5.19E-03	1.19E-01	1.27E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	7.84E-06	--	7.84E-06	5.32E-01	<1	6.70E-01	<1
Cadmium	ND	6.80E-04	--	--	--	0.00E+00	2.04E-05	--	2.04E-05	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	8.93E-05	--	8.93E-05	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.34E-05	0.00E+00	5.34E-05	7.33E+00	<1	1.89E+01	<1
Copper	1.59E+01	9.09E-03	0.00E+00	0.00E+00	3.45E-01	3.45E-01	2.73E-04	1.34E-02	3.59E-01	5.60E+00	<1	8.27E+01	<1
Lead	9.42E+00	1.75E-03	0.00E+00	0.00E+00	8.74E-02	8.74E-02	5.26E-05	7.92E-03	9.54E-02	4.70E+00	<1	1.86E+02	<1
Manganese	3.12E+02	1.34E-01	0.00E+00	0.00E+00	1.92E-01	1.92E-01	4.04E-03	2.63E-01	4.59E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	4.39E-06	--	4.39E-06	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.19E-04	0.00E+00	1.19E-04	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.17E-05	0.00E+00	2.17E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	2.54E-04	--	--	--	0.00E+00	7.63E-06	--	7.63E-06	4.80E-01	<1	1.43E+00	<1
Vanadium	0.00E+00	2.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.02E-05	0.00E+00	7.02E-05	4.16E+00	<1	9.44E+00	<1
Zinc	4.30E+01	2.54E-02	0.00E+00	0.00E+00	3.08E+00	3.08E+00	7.62E-04	3.62E-02	3.11E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.24E+00	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-03	1.04E-03	2.27E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	3.48E-02	--	3.48E-02	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	1.24E-05	--	1.24E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	5.29E-05	--	5.29E-05				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	3.60E-01	5.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.74E-05	3.03E-04	3.20E-04				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	1.66E-05	--	1.66E-05				
Total LMW PAHs						0.00E+00	9.92E-05	3.03E-04	4.02E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	1.73E-05	--	1.73E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	5.82E-05	--	5.82E-05				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	1.53E-04	--	1.53E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	2.20E-05	--	2.20E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	4.60E-06	--	4.60E-06				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	1.11E-04	--	1.11E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	2.01E-06	--	2.01E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	9.85E-06	--	9.85E-06				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	4.00E-05	--	4.00E-05				
Total HMW PAHs						0.00E+00	4.18E-04	0.00E+00	4.18E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	1.58E-04	--	1.58E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	2.70E-02	0.00E+00	0.00E+00	0.00E+00	3.64E-04	3.64E-04	0.00E+00	2.27E-05	3.87E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H20-10
Refined Exposure Evaluation - North American Wolverine
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H20-11
Refined Exposure Evaluation - Short-tailed Shrew
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-01	0.00E+00	1.53E-01	No TRV	--	No TRV	--
Antimony	ND	9.28E-04	--	--	--	0.00E+00	1.24E-04	--	1.24E-04	5.90E-02	<1	2.76E+00	<1
Arsenic	4.88E+00	9.37E-04	0.00E+00	9.91E-02	0.00E+00	9.91E-02	1.26E-04	7.19E-03	1.06E-01	1.04E+00	<1	4.55E+00	<1
Barium	1.41E+02	1.73E-01	0.00E+00	1.72E+00	0.00E+00	1.72E+00	2.32E-02	2.08E-01	1.95E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	2.61E-04	--	--	--	0.00E+00	3.50E-05	--	3.50E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	ND	6.80E-04	--	--	--	0.00E+00	9.11E-05	--	9.11E-05	7.70E-01	<1	6.87E+00	<1
Chromium	ND	2.97E-03	--	--	--	0.00E+00	3.99E-04	--	3.99E-04	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	1.78E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.38E-04	0.00E+00	2.38E-04	7.33E+00	<1	1.89E+01	<1
Copper	1.59E+01	9.09E-03	0.00E+00	1.10E+00	0.00E+00	1.10E+00	1.22E-03	2.34E-02	1.12E+00	5.60E+00	<1	8.27E+01	<1
Lead	9.42E+00	1.75E-03	0.00E+00	6.58E-01	0.00E+00	6.58E-01	2.35E-04	1.39E-02	6.73E-01	4.70E+00	<1	1.86E+02	<1
Manganese	3.12E+02	1.34E-01	0.00E+00	3.00E+00	0.00E+00	3.00E+00	1.80E-02	4.60E-01	3.48E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	1.46E-04	--	--	--	0.00E+00	1.96E-05	--	1.96E-05	1.41E+00	<1	1.41E+01	<1
Nickel	0.00E+00	3.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.31E-04	0.00E+00	5.31E-04	1.70E+00	<1	1.48E+01	<1
Selenium	0.00E+00	7.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.69E-05	0.00E+00	9.69E-05	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	2.54E-04	--	--	--	0.00E+00	3.40E-05	--	3.40E-05	4.80E-01	<1	1.43E+00	<1
Vanadium	0.00E+00	2.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.13E-04	0.00E+00	3.13E-04	4.16E+00	<1	9.44E+00	<1
Zinc	4.30E+01	2.54E-02	0.00E+00	3.94E+01	0.00E+00	3.94E+01	3.40E-03	6.34E-02	3.94E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	1.24E+00	4.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.47E-03	1.82E-03	7.30E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	1.16E+00	--	--	--	0.00E+00	1.55E-01	--	1.55E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	4.12E-04	--	--	--	0.00E+00	5.51E-05	--	5.51E-05				
Fluoranthene	ND	1.76E-03	--	--	--	0.00E+00	2.36E-04	--	2.36E-04				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	3.60E-01	5.78E-04	0.00E+00	2.12E-01	0.00E+00	2.12E-01	7.75E-05	5.31E-04	2.13E-01				
Phenanthrene	ND	5.53E-04	--	--	--	0.00E+00	7.41E-05	--	7.41E-05				
Total LMW PAHs						2.12E-01	4.43E-04	5.31E-04	2.13E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	5.75E-04	--	--	--	0.00E+00	7.71E-05	--	7.71E-05				
Benzo[A]Pyrene	ND	1.94E-03	--	--	--	0.00E+00	2.60E-04	--	2.60E-04				
Benzo(b)fluoranthene	ND	5.09E-03	--	--	--	0.00E+00	6.82E-04	--	6.82E-04				
Benzo(g,h,i)perylene	ND	7.31E-04	--	--	--	0.00E+00	9.79E-05	--	9.79E-05				
Benzo(k)fluoranthene	ND	1.53E-04	--	--	--	0.00E+00	2.05E-05	--	2.05E-05				
Chrysene	ND	3.69E-03	--	--	--	0.00E+00	4.94E-04	--	4.94E-04				
Dibenz(A,H)Anthracene	ND	6.70E-05	--	--	--	0.00E+00	8.98E-06	--	8.98E-06				
Indeno (1,2,3-CD) Pyrene	ND	3.28E-04	--	--	--	0.00E+00	4.39E-05	--	4.39E-05				
Pyrene	ND	1.33E-03	--	--	--	0.00E+00	1.78E-04	--	1.78E-04				
Total HMW PAHs						0.00E+00	1.86E-03	0.00E+00	1.86E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	5.25E-03	--	--	--	0.00E+00	7.04E-04	--	7.04E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	2.70E-02	0.00E+00	0.00E+00	3.73E-02	0.00E+00	3.73E-02	0.00E+00	3.98E-05	3.74E-02	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H20-11
Refined Exposure Evaluation - Short-tailed Shrew
Flathead River Riparian Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H21-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North Percolation Pond Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	9.30E-01	Regression[a]	3.69E-02	USEPA (2007)	1.00E+00	9.30E-01	Assumption[c]	5.00E-02	4.65E-02	Baes et al. (1984)[e]
Arsenic	NA	1.35E+01	3.75E-02	5.08E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.52E+00	Sample et al. (1999)	Regression[f]	6.63E-02	Sample et al. (1998b)
Barium	NA	2.45E+02	1.56E-01	3.82E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	2.23E+01	Sample et al. (1998a)	6.83E-04	1.67E-01	Baes et al. (1984)[e]
Beryllium	NA	3.99E+00	Regression[a]	1.62E+00	USEPA (2007)	4.50E-02	1.80E-01	Sample et al. (1998a)	2.25E-03	8.99E-03	Baes et al. (1984)[e]
Cadmium	NA	3.62E+00	Regression[a]	1.26E+00	Bechtel-Jacobs (1998a)	Regression[d]	2.30E+01	Sample et al. (1999)	Regression[f]	5.22E-01	Sample et al. (1998b)
Chromium	NA	2.87E+01	4.10E-02	1.18E+00	Bechtel-Jacobs (1998a)[g]	3.06E-01	8.79E+00	Sample et al. (1998a)	Regression[f]	2.73E+00	Sample et al. (1998b)
Cobalt	NA	9.47E+00	7.50E-03	7.10E-02	Bechtel-Jacobs (1998a)[g]	1.22E-01	1.16E+00	Sample et al. (1998a)	Regression[f]	2.17E-01	Sample et al. (1998b)
Copper	NA	4.43E+01	Regression[a]	8.69E+00	Bechtel-Jacobs (1998a)	5.15E-01	2.28E+01	Sample et al. (1998a)	Regression[f]	1.33E+01	Sample et al. (1998b)
Lead	NA	1.11E+02	Regression[a]	3.72E+00	Bechtel-Jacobs (1998a)	Regression[d]	3.59E+01	Sample et al. (1999)	Regression[f]	8.65E+00	Sample et al. (1998b)
Manganese	NA	0.00E+00	7.90E-02	0.00E+00	Bechtel-Jacobs (1998a)[g]	Regression[d]	0.00E+00	Sample et al. (1999)	2.05E-02	0.00E+00	Sample et al. (1998b)[i]
Mercury	NA	6.31E-02	Regression[a]	8.22E-02	Bechtel-Jacobs (1998a)	3.93E+00	2.48E-01	Sample et al. (1998a)	3.81E-01	2.41E-02	LANL (2015)
Nickel	NA	3.60E+02	Regression[a]	8.84E+00	Bechtel-Jacobs (1998a)	7.78E-01	2.80E+02	Sample et al. (1998a)	Regression[f]	1.21E+01	Sample et al. (1998b)
Selenium	NA	1.83E+00	Regression[a]	9.88E-01	Bechtel-Jacobs (1998a)	Regression[d]	1.44E+00	Sample et al. (1998a)	Regression[f]	8.28E-01	Sample et al. (1998b)
Silver		ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	1.89E+00	4.00E-03	7.56E-03	Baes et al. (1984)	5.41E-02	1.02E-01	USCHPPM (2004)	1.08E-01	2.05E-01	Baes et al. (1984)[e]
Vanadium	NA	1.10E+02	4.85E-03	5.35E-01	Bechtel-Jacobs (1998a)[g]	4.20E-02	4.63E+00	Sample et al. (1998a)	1.23E-02	1.36E+00	Sample et al. (1998b)[i]
Zinc	NA	3.42E+02	Regression[a]	1.22E+02	Bechtel-Jacobs (1998a)	Regression[d]	5.80E+02	Sample et al. (1998a)	Regression[f]	1.19E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	4.12E+01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	1.47E+02	6.00E-02	8.80E+00	Baes et al. (1984)	1.24E-01	1.82E+01	USCHPPM (2004)	1.60E-02	2.35E+00	LANL (2015)
Polychlorinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	8.19E+01	Regression[a]	8.86E-05	USEPA (2007a)	1.47E+00	1.20E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	1.13E+02	Regression[a]	1.47E+01	USEPA (2007a)	2.42E+00	2.73E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluoranthene	4.95	2.24E+03	5.00E-01	1.12E+03	USEPA (2007a)	3.04E+00	6.80E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluorene	4.18	2.57E+01	Regression[a]	2.39E-04	USEPA (2007a)	9.57E+00	2.46E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Naphthalene	3.36	3.65E+00	1.22E+01	4.45E+01	USEPA (2007a)	4.40E+00	1.61E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Phenanthrene	4.55	2.85E+02	Regression[a]	2.82E+01	USEPA (2007a)	1.72E+00	4.91E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]

Table H21-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North Percolation Pond Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
LMW PAHs											
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	1.12E+03	Regression[a]	4.33E+00	USEPA (2007a)	1.59E+00	1.78E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	1.27E+03	Regression[a]	1.35E+02	USEPA (2007a)	1.33E+00	1.69E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	1.00E+03	3.10E-01	3.11E+02	USEPA (2007a)	2.60E+00	2.61E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	6.99E+02	Regression[a]	9.13E+02	USEPA (2007a)	2.94E+00	2.06E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	7.20E+02	Regression[a]	3.30E+01	USEPA (2007a)	2.60E+00	1.87E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Chrysene	5.7	1.17E+03	Regression[a]	4.44E+00	USEPA (2007a)	2.29E+00	2.67E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	2.37E+02	1.30E-01	3.08E+01	USEPA (2007a)	2.31E+00	5.47E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	6.43E+02	1.10E-01	7.07E+01	USEPA (2007a)	2.86E+00	1.84E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Pyrene	4.88	1.96E+03	7.20E-01	1.41E+03	USEPA (2007a)	1.75E+00	3.44E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
HMW PAHs											
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	1.80E-01	2.38E-02	4.28E-03	USEPA (2007a)	5.44E+01	9.79E+00	USEPA (2007a)	7.79E-01	1.40E-01	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	6.54E-01	0.00E+00	USEPA (2007a)	1.14E+01	0.00E+00	USEPA (2007a)	1.22E-01	0.00E+00	LANL (2015)
Dibenzofuran	3.71	7.70E+00	1.88E+00	1.45E+01	USEPA (2007a)	6.96E+00	5.36E+01	USEPA (2007a)	5.60E-02	4.32E-01	Calculated[j]
Di-n-butyl phthalate	4.61	ND	8.14E-01	0	USEPA (2007a)	1.03E+01	0	USEPA (2007a)	4.49E-01	0	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)

Table H21-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North Percolation Pond Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H21-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North Percolation Pond Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	9.38E-01	USEPA (2007)
Beryllium	-0.5361	7.35E-01	USEPA (2007)
Cadmium	-0.475	5.46E-01	Bechtel-Jacobs (1998)
Copper	0.668	3.94E-01	Bechtel-Jacobs (1998)
Lead	-1.328	5.61E-01	Bechtel-Jacobs (1998)
Mercury	-9.96E-01	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	7.48E-01	Bechtel-Jacobs (1998)
Selenium	-0.677	1.10E+00	Bechtel-Jacobs (1998)
Zinc	1.575	5.54E-01	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-8.56E-01	USEPA (2007)
Acenaphthylene	-1.144	7.91E-01	USEPA (2007)
Anthracene	-0.9887	7.78E-01	USEPA (2007)
Benzo(a)anthracene	-2.7078	5.94E-01	USEPA (2007)
Benzo(a)pyrene	-2.0615	9.75E-01	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.18E+00	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	8.60E-01	USEPA (2007)
Chrysene	-2.7078	5.94E-01	USEPA (2007)
Fluorene	-5.562	-8.56E-01	USEPA (2007)
Phenanthrene	-0.1665	6.20E-01	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	7.06E-01	Sample et al. (1999)
Cadmium	2.114	7.95E-01	Sample et al. (1999)
Lead	-0.218	8.07E-01	Sample et al. (1999)
Manganese	-0.809	6.82E-01	Sample et al. (1999)
Selenium	-0.075	7.33E-01	Sample et al. (1999)
Zinc	4.449	3.28E-01	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.18E+00	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	8.19E-01	Sample et al. (1998b)
Cadmium	-1.2571	4.72E-01	Sample et al. (1998b)
Chromium	-1.4599	7.34E-01	Sample et al. (1998b)
Cobalt	-4.4669	1.31E+00	Sample et al. (1998b)
Copper	2.042	1.44E-01	Sample et al. (1998b)
Lead	0.0761	4.42E-01	Sample et al. (1998b)
Nickel	-0.2462	4.66E-01	Sample et al. (1998b)
Selenium	-0.4158	3.76E-01	Sample et al. (1998b)
Zinc	4.3632	7.06E-02	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.10E+00	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H21-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North Percolation Pond Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	6.04E-01	Regression[a]	2.46E-02	USEPA (2007)	1.00E+00	6.04E-01	Assumption[c]	5.00E-02	3.02E-02	Baes et al. (1984)[e]
Arsenic	NA	1.46E+01	3.75E-02	5.47E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.60E+00	Sample et al. (1999)	Regression[f]	7.04E-02	Sample et al. (1998b)
Barium	NA	4.73E+02	1.56E-01	7.38E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	4.31E+01	Sample et al. (1998a)	6.83E-04	3.23E-01	Baes et al. (1984)[e]
Beryllium	NA	6.46E+00	Regression[a]	2.30E+00	USEPA (2007)	4.50E-02	2.91E-01	Sample et al. (1998a)	2.25E-03	1.45E-02	Baes et al. (1984)[e]
Cadmium	NA	3.05E+00	Regression[a]	1.14E+00	Bechtel-Jacobs (1998a)	Regression[d]	2.01E+01	Sample et al. (1999)	Regression[f]	4.82E-01	Sample et al. (1998b)
Chromium	NA	2.32E+01	4.10E-02	9.50E-01	Bechtel-Jacobs (1998a)[g]	3.06E-01	7.09E+00	Sample et al. (1998a)	Regression[f]	2.33E+00	Sample et al. (1998b)
Cobalt	NA	7.37E+00	7.50E-03	5.53E-02	Bechtel-Jacobs (1998a)[g]	1.22E-01	9.00E-01	Sample et al. (1998a)	Regression[f]	1.56E-01	Sample et al. (1998b)
Copper	NA	2.66E+01	Regression[a]	7.11E+00	Bechtel-Jacobs (1998a)	5.15E-01	1.37E+01	Sample et al. (1998a)	Regression[f]	1.24E+01	Sample et al. (1998b)
Lead	NA	9.67E+01	Regression[a]	3.44E+00	Bechtel-Jacobs (1998a)	Regression[d]	3.22E+01	Sample et al. (1999)	Regression[f]	8.15E+00	Sample et al. (1998b)
Manganese	NA	0.00E+00	7.90E-02	0.00E+00	Bechtel-Jacobs (1998a)[g]	Regression[d]	0.00E+00	Sample et al. (1999)	2.05E-02	0.00E+00	Sample et al. (1998b)[i]
Mercury	NA	3.13E-02	Regression[a]	5.61E-02	Bechtel-Jacobs (1998a)	3.93E+00	1.23E-01	Sample et al. (1998a)	3.81E-01	1.19E-02	LANL (2015)
Nickel	NA	3.26E+02	Regression[a]	8.22E+00	Bechtel-Jacobs (1998a)	7.78E-01	2.54E+02	Sample et al. (1998a)	Regression[f]	1.16E+01	Sample et al. (1998b)
Selenium	NA	1.13E+00	Regression[a]	5.81E-01	Bechtel-Jacobs (1998a)	Regression[d]	1.01E+00	Sample et al. (1998a)	Regression[f]	6.91E-01	Sample et al. (1998b)
Silver		ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	1.99E+00	4.00E-03	7.94E-03	Baes et al. (1984)	5.41E-02	1.07E-01	USCHPPM (2004)	1.08E-01	2.15E-01	Baes et al. (1984)[e]
Vanadium	NA	7.64E+01	4.85E-03	3.70E-01	Bechtel-Jacobs (1998a)[g]	4.20E-02	3.21E+00	Sample et al. (1998a)	1.23E-02	9.40E-01	Sample et al. (1998b)[i]
Zinc	NA	2.45E+02	Regression[a]	1.02E+02	Bechtel-Jacobs (1998a)	Regression[d]	5.20E+02	Sample et al. (1998a)	Regression[f]	1.16E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	4.45E+01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	1.10E+02	6.00E-02	6.59E+00	Baes et al. (1984)	1.24E-01	1.36E+01	USCHPPM (2004)	1.60E-02	1.76E+00	LANL (2015)
Polychlorinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	2.49E+01	Regression[a]	2.45E-04	USEPA (2007a)	1.47E+00	3.67E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	4.90E+01	Regression[a]	7.70E+00	USEPA (2007a)	2.42E+00	1.19E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluoranthene	4.95	6.10E+02	5.00E-01	3.05E+02	USEPA (2007a)	3.04E+00	1.85E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Fluorene	4.18	1.30E+01	Regression[a]	4.27E-04	USEPA (2007a)	9.57E+00	1.25E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Naphthalene	3.36	2.39E+00	1.22E+01	2.92E+01	USEPA (2007a)	4.40E+00	1.05E+01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Phenanthrene	4.55	2.00E+02	Regression[a]	2.27E+01	USEPA (2007a)	1.72E+00	3.45E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
LMW PAHs											

Table H21-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North Percolation Pond Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	3.11E+02	Regression[a]	2.02E+00	USEPA (2007a)	1.59E+00	4.94E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	3.40E+02	Regression[a]	3.74E+01	USEPA (2007a)	1.33E+00	4.52E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	5.22E+02	3.10E-01	1.62E+02	USEPA (2007a)	2.60E+00	1.36E+03	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	2.46E+02	Regression[a]	2.65E+02	USEPA (2007a)	2.94E+00	7.23E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	3.44E+02	Regression[a]	1.75E+01	USEPA (2007a)	2.60E+00	8.93E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Chrysene	5.7	3.58E+02	Regression[a]	2.20E+00	USEPA (2007a)	2.29E+00	8.21E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	1.17E+02	1.30E-01	1.53E+01	USEPA (2007a)	2.31E+00	2.71E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	2.25E+02	1.10E-01	2.48E+01	USEPA (2007a)	2.86E+00	6.44E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Pyrene	4.88	5.21E+02	7.20E-01	3.75E+02	USEPA (2007a)	1.75E+00	9.11E+02	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
HMW PAHs											
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	4.58E+00	2.38E-02	1.09E-01	USEPA (2007a)	5.44E+01	2.49E+02	USEPA (2007a)	7.79E-01	3.56E+00	LANL (2015)
Butylbenzylphthalate	4.84	0.00E+00	6.54E-01	0.00E+00	USEPA (2007a)	1.14E+01	0.00E+00	USEPA (2007a)	1.22E-01	0.00E+00	LANL (2015)
Dibenzofuran	3.71	4.72E+00	1.88E+00	8.87E+00	USEPA (2007a)	6.96E+00	3.28E+01	USEPA (2007a)	5.60E-02	2.64E-01	Calculated[j]
Di-n-butyl phthalate	4.61	ND	8.14E-01	0	USEPA (2007a)	1.03E+01	0	USEPA (2007a)	4.49E-01	0	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)

Table H21-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North Percolation Pond Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H21-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - North Percolation Pond Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	9.38E-01	USEPA (2007)
Beryllium	-0.5361	7.35E-01	USEPA (2007)
Cadmium	-0.475	5.46E-01	Bechtel-Jacobs (1998)
Copper	0.668	3.94E-01	Bechtel-Jacobs (1998)
Lead	-1.328	5.61E-01	Bechtel-Jacobs (1998)
Mercury	-0.996	5.44E-01	Bechtel-Jacobs (1998)
Nickel	-2.223	7.48E-01	Bechtel-Jacobs (1998)
Selenium	-0.677	1.10E+00	Bechtel-Jacobs (1998)
Zinc	1.575	5.54E-01	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-8.56E-01	USEPA (2007)
Acenaphthylene	-1.144	7.91E-01	USEPA (2007)
Anthracene	-0.9887	7.78E-01	USEPA (2007)
Benzo(a)anthracene	-2.7078	5.94E-01	USEPA (2007)
Benzo(a)pyrene	-2.0615	9.75E-01	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.18E+00	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	8.60E-01	USEPA (2007)
Chrysene	-2.7078	5.94E-01	USEPA (2007)
Fluorene	-5.562	-8.56E-01	USEPA (2007)
Phenanthrene	-0.1665	6.20E-01	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	7.06E-01	Sample et al. (1999)
Cadmium	2.114	7.95E-01	Sample et al. (1999)
Lead	-0.218	8.07E-01	Sample et al. (1999)
Manganese	-0.809	6.82E-01	Sample et al. (1999)
Selenium	-0.075	7.33E-01	Sample et al. (1999)
Zinc	4.449	3.28E-01	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.18E+00	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	8.19E-01	Sample et al. (1998b)
Cadmium	-1.2571	4.72E-01	Sample et al. (1998b)
Chromium	-1.4599	7.34E-01	Sample et al. (1998b)
Cobalt	-4.4669	1.31E+00	Sample et al. (1998b)
Copper	2.042	1.44E-01	Sample et al. (1998b)
Lead	0.0761	4.42E-01	Sample et al. (1998b)
Nickel	-0.2462	4.66E-01	Sample et al. (1998b)
Selenium	-0.4158	3.76E-01	Sample et al. (1998b)
Zinc	4.3632	7.06E-02	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.10E+00	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H21-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - North Percolation Pond
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Metals								
Aluminum	NA	8.63E+00	0.00E+00	NA	7.40E-02	---	0.00E+00	Stanley et al. (2010)
Antimony	NA	0.00E+00	9.30E-01	NA	5.75E-01	---	5.35E-01	Dovick et al. (2015)
Arsenic	NA	0.00E+00	1.35E+01	NA	3.73E-01	---	5.05E+00	Bechtel-Jacobs (1998b)[c]
Barium	NA	2.34E-01	2.45E+02	NA	2.82E+00	---	6.90E+02	Hamilton et al. (2002)
Beryllium	NA	7.10E-04	3.99E+00	NA	1.67E-01	---	6.67E-01	Hamilton et al. (2002)
Cadmium	NA	3.00E-03	3.62E+00	NA	4.59E-01	---	1.66E+00	Bechtel-Jacobs (1998b)[c]
Chromium	NA	0.00E+00	2.87E+01	NA	8.30E-02	---	2.38E+00	Bechtel-Jacobs (1998b)[c]
Cobalt		0.00E+00	0.00E+00					
Copper	NA	1.65E-02	4.43E+01	NA	6.61E-01	---	2.93E+01	Bechtel-Jacobs (1998b)[c]
Lead	NA	7.60E-03	1.11E+02	NA	8.00E-02	---	8.85E+00	Bechtel-Jacobs (1998b)[c]
Manganese		0.00E+00	0.00E+00					
Mercury	NA	0.00E+00	0.00E+00	NA	2.84E+00	---	0.00E+00	Bechtel-Jacobs (1998c)[c]
Nickel	NA	5.59E-02	3.60E+02	NA	1.34E-01	---	4.82E+01	Bechtel-Jacobs (1998b)[c]
Selenium	NA	0.00E+00	1.83E+00	NA	3.75E+00	---	6.85E+00	Hamilton et al. (2002)
Silver	NA	0.00E+00	0.00E+00	NA	1.80E-01	---	0.00E+00	Hirsch (1998)
Thallium	NA	0.00E+00	1.89E+00	NA	2.00E-02	---	3.78E-02	Turner et al. (2013)
Vanadium	NA	1.80E-02	1.10E+02	NA	2.50E-01	---	2.76E+01	Hamilton and Buhl (2002)
Zinc	NA	5.37E-01	3.42E+02	NA	8.40E-01	---	2.88E+02	Bechtel-Jacobs (1998b)[c]
Inorganics - Other Inorganics								
Cyanide	NA	7.60E-03	4.12E+01	NA	0.00E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	2.24E+01	0.00E+00	NA	---	Regression	1.37E+02	Derived based on Aguirre-Sierra et al. (2013)
Polychlorinated Biphenyls (PCBs)								
Aroclor 1248	6.34	0.00E+00	0.00E+00	5.74E-01	0.00E+00	---	0.00E+00	DiToro and McGrath (2000)
Aroclor 1254	6.98	0.00E+00	0.00E+00	5.43E-01	0.00E+00	---	0.00E+00	DiToro and McGrath (2000)
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)								
Low Molecular Weight (LMW) PAHs:								
Acenaphthene	4.01	0.00E+00	8.19E+01	7.04E-01	4.58E+00	---	3.75E+02	DiToro and McGrath (2000)
Acenaphthylene	3.22	0.00E+00	3.20E-01	7.54E-01	4.90E+00	---	1.57E+00	DiToro and McGrath (2000)
Anthracene	4.53	0.00E+00	1.13E+02	6.73E-01	4.37E+00	---	4.94E+02	DiToro and McGrath (2000)
Fluoranthene	5.08	9.30E-03	2.24E+03	6.41E-01	4.17E+00	---	9.32E+03	DiToro and McGrath (2000)

Table H21-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - North Percolation Pond
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Fluorene	4.21	0.00E+00	2.57E+01	6.92E-01	4.50E+00	---	1.16E+02	DiToro and McGrath (2000)
Naphthalene	3.36	0.00E+00	3.65E+00	7.45E-01	4.84E+00	---	1.77E+01	DiToro and McGrath (2000)
Phenanthrene	4.57	0.00E+00	2.85E+02	6.70E-01	4.36E+00	---	1.24E+03	DiToro and McGrath (2000)
Total LMW PAHs							1.16E+04	
High Molecular Weight (HMW) PAHs:								
Benzo(a)anthracene	6.71	3.00E-03	1.12E+03	5.56E-01	3.61E+00	---	4.04E+03	DiToro and McGrath (2000)
Benzo[A]Pyrene	6.11	3.90E+00	1.27E+03	5.86E-01	3.81E+00	---	4.83E+03	DiToro and McGrath (2000)
Benzo(b)fluoranthene	6.27	1.00E-02	1.00E+03	5.78E-01	3.76E+00	---	3.77E+03	DiToro and McGrath (2000)
Benzo(g,h,i)perylene	6.51	3.90E-03	6.99E+02	5.66E-01	3.68E+00	---	2.57E+03	DiToro and McGrath (2000)
Benzo(k)fluoranthene	6.29	0.00E+00	7.20E+02	5.77E-01	3.75E+00	---	2.70E+03	DiToro and McGrath (2000)
Chrysene	5.71	7.60E-03	1.17E+03	6.07E-01	3.94E+00	---	4.60E+03	DiToro and McGrath (2000)
Dibenz(A,H)Anthracene	6.71	0.00E+00	2.37E+02	5.56E-01	3.61E+00	---	8.55E+02	DiToro and McGrath (2000)
Indeno (1,2,3-CD) Pyrene	6.72	3.10E-03	6.43E+02	5.55E-01	3.61E+00	---	2.32E+03	DiToro and McGrath (2000)
Pyrene	4.92	7.00E-03	1.96E+03	6.50E-01	4.23E+00	---	8.30E+03	DiToro and McGrath (2000)
Total HMW PAHs							3.40E+04	
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs								
1,2,4,5-Tetrachlorobenzene		0.00E+00	0.00E+00					
2,3,4,6-Tetrachlorophenol	4.09	0.00E+00	0.00E+00	6.99E-01	4.54E+00	---	0.00E+00	DiToro and McGrath (2000)
2-Chloronaphthalene	3.81	0.00E+00	0.00E+00	7.16E-01	4.66E+00	---	0.00E+00	DiToro and McGrath (2000)
Biphenyl (Diphenyl)	3.76	0.00E+00	0.00E+00	7.20E-01	4.68E+00	---	0.00E+00	DiToro and McGrath (2000)
Bis(2-ethylhexyl)phthalate	8.39	0.00E+00	0.00E+00	4.80E-01	3.12E+00	---	0.00E+00	DiToro and McGrath (2000)
Butylbenzylphthalate		0.00E+00	0.00E+00					
Dibenzofuran	3.71	0.00E+00	0.00E+00	7.23E-01	4.70E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	6.68E-01	4.34E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-octyl phthalate	8.54	0.00E+00	0.00E+00	4.74E-01	3.08E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobenzene	5.86	0.00E+00	0.00E+00	5.99E-01	3.89E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobutadiene	4.72	0.00E+00	0.00E+00	6.62E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachloroethane		0.00E+00	0.00E+00					
Pentachlorophenol	4.74	0.00E+00	0.00E+00	6.61E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)
Volatile Organic Compounds (VOCs)								
Methylcyclohexane		0.00E+00	0.00E+00					

Table H21-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - North Percolation Pond
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Dioxin/Furans								
2,3,7,8-TCDD		0.00E+00	0.00E+00					
1,2,3,7,8-PeCDD		0.00E+00	0.00E+00					
1,2,3,4,7,8-HxCDD		0.00E+00	0.00E+00					
1,2,3,6,7,8-HxCDD		0.00E+00	0.00E+00					
1,2,3,7,8,9-HxCDD		0.00E+00	0.00E+00					
1,2,3,4,6,7,8-HpCDD		0.00E+00	0.00E+00					
OCDD		0.00E+00	0.00E+00					
2,3,7,8-TCDF		0.00E+00	0.00E+00					
1,2,3,7,8-PeCDF		0.00E+00	0.00E+00					
2,3,4,7,8-PeCDF		0.00E+00	0.00E+00					
1,2,3,4,7,8-HxCDF		0.00E+00	0.00E+00					
1,2,3,6,7,8-HxCDF		0.00E+00	0.00E+00					
2,3,4,6,7,8-HxCDF		0.00E+00	0.00E+00					
1,2,3,7,8,9-HxCDF		0.00E+00	0.00E+00					
1,2,3,4,6,7,8-HpCDF		0.00E+00	0.00E+00					
1,2,3,4,7,8,9-HpCDF		0.00E+00	0.00E+00					
OCDF		0.00E+00	0.00E+00					

Notes:
NA, Normalized BSAF was not applicable for metals
a, Normalized BSAF (kg OC / kg lipid) calculated based on K_{ow}, where BSAF = $K_{ow}^{-0.038}$ (DiToro and McGrath 2000)
b, For non-ionic organic constituents, dry weight BSAF calculated from sediment organic carbon and lipid normalized BSAF as follows:

$$BSAF_{dry\ weight} = BSAF_{norm} \times f_{lip;id} \times \frac{1}{f_{oc}}$$

where: $BSAF_{norm}$ = Normalized BSAF (kg OC/kg lipid)
f_{lipid} = Fraction of lipids in prey item expressed on a dry weight basis (0.065, invertebrates; 0.08, fish)
f_{oc} = Fraction of sediment organic carbon expressed on a dry weight basis (0.01 or 1%)
c, Median BSAF for non-depurated invertebrates determined by Bechtel-Jacobs (1998b)

Table H21-3
Refined Exposure Evaluation - American Dipper
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	1.43E+00	0.00E+00	1.43E+00	1.10E+02	<1	1.10E+03	<1
Antimony	9.30E-01	0.00E+00	8.87E-02	0.00E+00	8.87E-02	0.00E+00	3.09E-03	9.18E-02	No TRV	--	No TRV	--
Arsenic	1.35E+01	0.00E+00	8.39E-01	0.00E+00	8.39E-01	0.00E+00	4.50E-02	8.84E-01	2.24E+00	<1	4.51E+00	<1
Barium	2.45E+02	2.34E-01	1.14E+02	0.00E+00	1.14E+02	3.88E-02	8.12E-01	1.15E+02	7.35E+01	**1.57E+00**	1.31E+02	<1
Beryllium	3.99E+00	7.10E-04	1.11E-01	0.00E+00	1.11E-01	1.18E-04	1.33E-02	1.24E-01	No TRV	--	No TRV	--
Cadmium	3.62E+00	3.00E-03	2.76E-01	0.00E+00	2.76E-01	4.98E-04	1.20E-02	2.88E-01	1.47E+00	<1	6.35E+00	<1
Chromium	2.87E+01	0.00E+00	3.95E-01	0.00E+00	3.95E-01	0.00E+00	9.53E-02	4.91E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	4.43E+01	1.65E-02	4.86E+00	0.00E+00	4.86E+00	2.74E-03	1.47E-01	5.01E+00	4.05E+00	**1.24E+00**	3.48E+01	<1
Lead	1.11E+02	7.60E-03	1.47E+00	0.00E+00	1.47E+00	1.26E-03	3.67E-01	1.84E+00	1.63E+00	**1.13E+00**	4.46E+01	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E+02	--	3.77E+02	--
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	3.60E+02	5.59E-02	8.00E+00	0.00E+00	8.00E+00	9.28E-03	1.19E+00	9.20E+00	6.71E+00	**1.37E+00**	1.86E+01	<1
Selenium	1.83E+00	0.00E+00	1.14E+00	0.00E+00	1.14E+00	0.00E+00	6.06E-03	1.14E+00	2.90E-01	**3.94E+00**	8.20E-01	**1.39E+00**
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.89E+00	0.00E+00	6.27E-03	0.00E+00	6.27E-03	0.00E+00	6.27E-03	1.25E-02	3.50E-01	<1	3.50E+00	<1
Vanadium	1.10E+02	1.80E-02	4.58E+00	0.00E+00	4.58E+00	2.99E-03	3.66E-01	4.95E+00	3.44E-01	**1.44E+01**	1.70E+00	**2.91E+00**
Zinc	3.42E+02	5.37E-01	4.77E+01	0.00E+00	4.77E+01	8.91E-02	1.14E+00	4.89E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics												
Cyanide	4.12E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	1.26E-03	1.37E-01	1.38E-01	4.00E-02	**3.45E+00**	4.00E-01	<1
Fluoride	0.00E+00	2.24E+01	2.27E+01	0.00E+00	2.27E+01	3.72E+00	0.00E+00	2.65E+01	1.22E+01	**2.17E+00**	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	8.19E+01	0.00E+00	6.22E+01	0.00E+00	6.22E+01	0.00E+00	2.72E-01	6.25E+01				
Acenaphthylene	3.20E-01	0.00E+00	2.60E-01	0.00E+00	2.60E-01	0.00E+00	1.06E-03	2.61E-01				
Anthracene	1.13E+02	0.00E+00	8.20E+01	0.00E+00	8.20E+01	0.00E+00	3.75E-01	8.24E+01				
Fluoranthene	2.24E+03	9.30E-03	1.55E+03	0.00E+00	1.55E+03	1.54E-03	7.42E+00	1.55E+03				
Fluorene	2.57E+01	0.00E+00	1.92E+01	0.00E+00	1.92E+01	0.00E+00	8.53E-02	1.93E+01				
Naphthalene	3.65E+00	0.00E+00	2.93E+00	0.00E+00	2.93E+00	0.00E+00	1.21E-02	2.95E+00				
Phenanthrene	2.85E+02	0.00E+00	2.06E+02	0.00E+00	2.06E+02	0.00E+00	9.46E-01	2.07E+02				
Total LMW PAHs					1.92E+03	1.54E-03	9.11E+00	1.93E+03	1.61E+01	**1.20E+02**	1.61E+02	**1.20E+01**
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	1.12E+03	3.00E-03	6.71E+02	0.00E+00	6.71E+02	4.98E-04	3.71E+00	6.75E+02				
Benzo[A]Pyrene	1.27E+03	3.90E+00	8.02E+02	0.00E+00	8.02E+02	6.47E-01	4.21E+00	8.07E+02				
Benzo(b)fluoranthene	1.00E+03	1.00E-02	6.26E+02	0.00E+00	6.26E+02	1.66E-03	3.33E+00	6.29E+02				
Benzo(g,h,i)perylene	6.99E+02	3.90E-03	4.27E+02	0.00E+00	4.27E+02	6.47E-04	2.32E+00	4.29E+02				
Benzo(k)fluoranthene	7.20E+02	0.00E+00	4.48E+02	0.00E+00	4.48E+02	0.00E+00	2.39E+00	4.50E+02				
Chrysene	1.17E+03	7.60E-03	7.63E+02	0.00E+00	7.63E+02	1.26E-03	3.87E+00	7.67E+02				
Dibenz(A,H)Anthracene	2.37E+02	0.00E+00	1.42E+02	0.00E+00	1.42E+02	0.00E+00	7.85E-01	1.43E+02				
Indeno (1,2,3-CD) Pyrene	6.43E+02	3.10E-03	3.85E+02	0.00E+00	3.85E+02	5.14E-04	2.13E+00	3.87E+02				
Pyrene	1.96E+03	7.00E-03	1.38E+03	0.00E+00	1.38E+03	1.16E-03	6.52E+00	1.38E+03				
Total HMW PAHs					5.64E+03	6.53E-01	2.93E+01	5.67E+03	2.00E+00	**2.84E+03**	2.00E+01	**2.84E+02**
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H21-3
Refined Exposure Evaluation - American Dipper
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H21-4
Refined Exposure Evaluation - American Woodcock
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E+00	0.00E+00	1.01E+00	1.10E+02	<1	1.10E+03	<1
Antimony	9.30E-01	0.00E+00	4.33E-04	9.84E-02	0.00E+00	9.88E-02	0.00E+00	8.20E-03	1.07E-01	No TRV	--	No TRV	--
Arsenic	1.35E+01	0.00E+00	5.97E-03	1.61E-01	0.00E+00	1.67E-01	0.00E+00	1.19E-01	2.86E-01	2.24E+00	<1	4.51E+00	<1
Barium	2.45E+02	2.34E-01	4.48E-01	2.35E+00	0.00E+00	2.80E+00	2.75E-02	2.15E+00	4.98E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	3.99E+00	7.10E-04	1.90E-02	1.90E-02	0.00E+00	3.80E-02	8.34E-05	3.52E-02	7.33E-02	No TRV	--	No TRV	--
Cadmium	3.62E+00	3.00E-03	1.47E-02	2.43E+00	0.00E+00	2.45E+00	3.52E-04	3.19E-02	2.48E+00	1.47E+00	**1.69E+00**	6.35E+00	<1
Chromium	2.87E+01	0.00E+00	1.38E-02	9.29E-01	0.00E+00	9.43E-01	0.00E+00	2.53E-01	1.20E+00	2.66E+00	<1	1.56E+01	<1
Cobalt	9.47E+00	0.00E+00	8.35E-04	1.22E-01	0.00E+00	1.23E-01	0.00E+00	8.35E-02	2.06E-01	7.61E+00	<1	2.02E+01	<1
Copper	4.43E+01	1.65E-02	1.02E-01	2.41E+00	0.00E+00	2.52E+00	1.94E-03	3.91E-01	2.91E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.11E+02	7.60E-03	4.36E-02	3.79E+00	0.00E+00	3.84E+00	8.93E-04	9.75E-01	4.81E+00	1.63E+00	**2.95E+00**	4.46E+01	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E+02	--	3.77E+02	--
Mercury	6.31E-02	0.00E+00	9.66E-04	2.62E-02	0.00E+00	2.72E-02	0.00E+00	5.56E-04	2.78E-02	4.50E-01	<1	9.10E-01	<1
Nickel	3.60E+02	5.59E-02	1.04E-01	2.96E+01	0.00E+00	2.97E+01	6.57E-03	3.17E+00	3.29E+01	6.71E+00	**4.90E+00**	1.86E+01	**1.77E+00**
Selenium	1.83E+00	0.00E+00	1.16E-02	1.52E-01	0.00E+00	1.64E-01	0.00E+00	1.61E-02	1.80E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.89E+00	0.00E+00	8.89E-05	1.08E-02	0.00E+00	1.09E-02	0.00E+00	1.67E-02	2.76E-02	3.50E-01	<1	3.50E+00	<1
Vanadium	1.10E+02	1.80E-02	6.29E-03	4.90E-01	0.00E+00	4.96E-01	2.11E-03	9.72E-01	1.47E+00	3.44E-01	**4.28E+00**	1.70E+00	<1
Zinc	3.42E+02	5.37E-01	1.44E+00	6.13E+01	0.00E+00	6.28E+01	6.31E-02	3.02E+00	6.59E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.12E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.93E-04	3.63E-01	3.63E-01	4.00E-02	**9.09E+00**	4.00E-01	<1
Fluoride	1.47E+02	2.24E+01	1.03E-01	1.92E+00	0.00E+00	2.03E+00	2.63E+00	1.29E+00	5.95E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	8.19E+01	0.00E+00	1.04E-06	1.27E+01	0.00E+00	1.27E+01	0.00E+00	7.21E-01	1.34E+01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	1.13E+02	0.00E+00	1.73E-01	2.89E+01	0.00E+00	2.91E+01	0.00E+00	9.96E-01	3.01E+01				
Fluoranthene	2.24E+03	9.30E-03	1.31E+01	7.19E+02	0.00E+00	7.32E+02	1.09E-03	1.97E+01	7.51E+02				
Fluorene	2.57E+01	0.00E+00	2.81E-06	2.60E+01	0.00E+00	2.60E+01	0.00E+00	2.26E-01	2.62E+01				
Naphthalene	3.65E+00	0.00E+00	5.23E-01	1.70E+00	0.00E+00	2.22E+00	0.00E+00	3.22E-02	2.25E+00				
Phenanthrene	2.85E+02	0.00E+00	3.32E-01	5.19E+01	0.00E+00	5.22E+01	0.00E+00	2.51E+00	5.47E+01				
Total LMW PAHs						8.54E+02	1.09E-03	2.42E+01	8.78E+02	1.61E+01	**5.45E+01**	1.61E+02	**5.45E+00**
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.12E+03	3.00E-03	5.08E-02	1.88E+02	0.00E+00	1.88E+02	3.52E-04	9.86E+00	1.98E+02				
Benzo[A]Pyrene	1.27E+03	3.90E+00	1.59E+00	1.78E+02	0.00E+00	1.80E+02	4.58E-01	1.12E+01	1.92E+02				
Benzo(b)fluoranthene	1.00E+03	1.00E-02	3.66E+00	2.76E+02	0.00E+00	2.80E+02	1.17E-03	8.85E+00	2.89E+02				
Benzo(g,h,i)perylene	6.99E+02	3.90E-03	1.07E+01	2.17E+02	0.00E+00	2.28E+02	4.58E-04	6.16E+00	2.34E+02				
Benzo(k)fluoranthene	7.20E+02	0.00E+00	3.88E-01	1.98E+02	0.00E+00	1.98E+02	0.00E+00	6.35E+00	2.05E+02				
Chrysene	1.17E+03	7.60E-03	5.21E-02	2.82E+02	0.00E+00	2.82E+02	8.93E-04	1.03E+01	2.93E+02				
Dibenz(A,H)Anthracene	2.37E+02	0.00E+00	3.61E-01	5.78E+01	0.00E+00	5.82E+01	0.00E+00	2.08E+00	6.02E+01				
Indeno (1,2,3-CD) Pyrene	6.43E+02	3.10E-03	8.31E-01	1.94E+02	0.00E+00	1.95E+02	3.64E-04	5.67E+00	2.01E+02				
Pyrene	1.96E+03	7.00E-03	1.66E+01	3.64E+02	0.00E+00	3.80E+02	8.22E-04	1.73E+01	3.97E+02				
Total HMW PAHs						1.99E+03	4.62E-01	7.77E+01	2.07E+03	2.00E+00	**1.03E+03**	2.00E+01	**1.03E+02**
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.80E-01	0.00E+00	5.03E-05	1.04E+00	0.00E+00	1.04E+00	0.00E+00	1.59E-03	1.04E+00	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	7.70E+00	0.00E+00	1.70E-01	5.67E+00	0.00E+00	5.84E+00	0.00E+00	6.79E-02	5.90E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	ND	--	--	--	0.00E+00	--	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H21-4
Refined Exposure Evaluation - American Woodcock
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H21-5
Refined Exposure Evaluation - Belted Kingfisher
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	1.36E+00	0.00E+00	1.36E+00	1.10E+02	<1	1.10E+03	<1
Antimony	9.30E-01	0.00E+00	8.43E-03	0.00E+00	8.43E-03	0.00E+00	0.00E+00	8.43E-03	No TRV	--	No TRV	--
Arsenic	1.35E+01	0.00E+00	7.96E-02	0.00E+00	7.96E-02	0.00E+00	0.00E+00	7.96E-02	2.24E+00	<1	4.51E+00	<1
Barium	2.45E+02	2.34E-01	1.09E+01	0.00E+00	1.09E+01	3.69E-02	0.00E+00	1.09E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	3.99E+00	7.10E-04	1.05E-02	0.00E+00	1.05E-02	1.12E-04	0.00E+00	1.06E-02	No TRV	--	No TRV	--
Cadmium	3.62E+00	3.00E-03	2.62E-02	0.00E+00	2.62E-02	4.73E-04	0.00E+00	2.67E-02	1.47E+00	<1	6.35E+00	<1
Chromium	2.87E+01	0.00E+00	3.76E-02	0.00E+00	3.76E-02	0.00E+00	0.00E+00	3.76E-02	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	4.43E+01	1.65E-02	4.62E-01	0.00E+00	4.62E-01	2.60E-03	0.00E+00	4.64E-01	4.05E+00	<1	3.48E+01	<1
Lead	1.11E+02	7.60E-03	1.40E-01	0.00E+00	1.40E-01	1.20E-03	0.00E+00	1.41E-01	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E+02	--	3.77E+02	--
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	3.60E+02	5.59E-02	7.60E-01	0.00E+00	7.60E-01	8.81E-03	0.00E+00	7.69E-01	6.71E+00	<1	1.86E+01	<1
Selenium	1.83E+00	0.00E+00	1.08E-01	0.00E+00	1.08E-01	0.00E+00	0.00E+00	1.08E-01	2.90E-01	<1	8.20E-01	<1
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.89E+00	0.00E+00	5.96E-04	0.00E+00	5.96E-04	0.00E+00	0.00E+00	5.96E-04	3.50E-01	<1	3.50E+00	<1
Vanadium	1.10E+02	1.80E-02	4.35E-01	0.00E+00	4.35E-01	2.84E-03	0.00E+00	4.38E-01	3.44E-01	**1.27E+00**	1.70E+00	<1
Zinc	3.42E+02	5.37E-01	4.53E+00	0.00E+00	4.53E+00	8.46E-02	0.00E+00	4.62E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics												
Cyanide	4.12E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	1.20E-03	0.00E+00	1.20E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	0.00E+00	2.24E+01	2.16E+00	0.00E+00	2.16E+00	3.53E+00	0.00E+00	5.69E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	8.19E+01	0.00E+00	5.91E+00	0.00E+00	5.91E+00	0.00E+00	0.00E+00	5.91E+00				
Acenaphthylene	3.20E-01	0.00E+00	2.47E-02	0.00E+00	2.47E-02	0.00E+00	0.00E+00	2.47E-02				
Anthracene	1.13E+02	0.00E+00	7.79E+00	0.00E+00	7.79E+00	0.00E+00	0.00E+00	7.79E+00				
Fluoranthene	2.24E+03	9.30E-03	1.47E+02	0.00E+00	1.47E+02	1.47E-03	0.00E+00	1.47E+02				
Fluorene	2.57E+01	0.00E+00	1.82E+00	0.00E+00	1.82E+00	0.00E+00	0.00E+00	1.82E+00				
Naphthalene	3.65E+00	0.00E+00	2.79E-01	0.00E+00	2.79E-01	0.00E+00	0.00E+00	2.79E-01				
Phenanthrene	2.85E+02	0.00E+00	1.96E+01	0.00E+00	1.96E+01	0.00E+00	0.00E+00	1.96E+01				
Total LMW PAHs					1.82E+02	1.47E-03	0.00E+00	1.82E+02	1.61E+01	**1.13E+01**	3.56E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	1.12E+03	3.00E-03	6.37E+01	0.00E+00	6.37E+01	4.73E-04	0.00E+00	6.37E+01				
Benzo[A]Pyrene	1.27E+03	3.90E+00	7.62E+01	0.00E+00	7.62E+01	6.15E-01	0.00E+00	7.68E+01				
Benzo(b)fluoranthene	1.00E+03	1.00E-02	5.94E+01	0.00E+00	5.94E+01	1.58E-03	0.00E+00	5.94E+01				
Benzo(g,h,i)perylene	6.99E+02	3.90E-03	4.05E+01	0.00E+00	4.05E+01	6.15E-04	0.00E+00	4.05E+01				
Benzo(k)fluoranthene	7.20E+02	0.00E+00	4.25E+01	0.00E+00	4.25E+01	0.00E+00	0.00E+00	4.25E+01				
Chrysene	1.17E+03	7.60E-03	7.25E+01	0.00E+00	7.25E+01	1.20E-03	0.00E+00	7.25E+01				
Dibenz(A,H)Anthracene	2.37E+02	0.00E+00	1.35E+01	0.00E+00	1.35E+01	0.00E+00	0.00E+00	1.35E+01				
Indeno (1,2,3-CD) Pyrene	6.43E+02	3.10E-03	3.66E+01	0.00E+00	3.66E+01	4.89E-04	0.00E+00	3.66E+01				
Pyrene	1.96E+03	7.00E-03	1.31E+02	0.00E+00	1.31E+02	1.10E-03	0.00E+00	1.31E+02				
Total HMW PAHs					5.36E+02	6.20E-01	0.00E+00	5.36E+02	2.00E+00	**2.68E+02**	2.00E+01	**2.68E+01**
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H21-5
Refined Exposure Evaluation - Belted Kingfisher
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H21-6
Refined Exposure Evaluation - Mourning Dove
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.85E-01	0.00E+00	9.85E-01	1.10E+02	<1	1.10E+03	<1
Antimony	9.30E-01	0.00E+00	4.21E-03	0.00E+00	0.00E+00	4.21E-03	0.00E+00	7.22E-03	1.14E-02	No TRV	--	No TRV	--
Arsenic	1.35E+01	0.00E+00	5.80E-02	0.00E+00	0.00E+00	5.80E-02	0.00E+00	1.05E-01	1.63E-01	2.24E+00	<1	4.51E+00	<1
Barium	2.45E+02	2.34E-01	4.35E+00	0.00E+00	0.00E+00	4.35E+00	2.67E-02	1.90E+00	6.28E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	3.99E+00	7.10E-04	1.85E-01	0.00E+00	0.00E+00	1.85E-01	8.10E-05	3.10E-02	2.16E-01	No TRV	--	No TRV	--
Cadmium	3.62E+00	3.00E-03	1.43E-01	0.00E+00	0.00E+00	1.43E-01	3.42E-04	2.81E-02	1.72E-01	1.47E+00	<1	6.35E+00	<1
Chromium	2.87E+01	0.00E+00	1.34E-01	0.00E+00	0.00E+00	1.34E-01	0.00E+00	2.23E-01	3.57E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	9.47E+00	0.00E+00	8.11E-03	0.00E+00	0.00E+00	8.11E-03	0.00E+00	7.35E-02	8.16E-02	7.61E+00	<1	2.02E+01	<1
Copper	4.43E+01	1.65E-02	9.92E-01	0.00E+00	0.00E+00	9.92E-01	1.88E-03	3.44E-01	1.34E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.11E+02	7.60E-03	4.24E-01	0.00E+00	0.00E+00	4.24E-01	8.67E-04	8.59E-01	1.28E+00	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E+02	--	3.77E+02	--
Mercury	6.31E-02	0.00E+00	9.38E-03	0.00E+00	0.00E+00	9.38E-03	0.00E+00	4.90E-04	9.87E-03	4.50E-01	<1	9.10E-01	<1
Nickel	3.60E+02	5.59E-02	1.01E+00	0.00E+00	0.00E+00	1.01E+00	6.38E-03	2.79E+00	3.81E+00	6.71E+00	<1	1.86E+01	<1
Selenium	1.83E+00	0.00E+00	1.13E-01	0.00E+00	0.00E+00	1.13E-01	0.00E+00	1.42E-02	1.27E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.89E+00	0.00E+00	8.63E-04	0.00E+00	0.00E+00	8.63E-04	0.00E+00	1.47E-02	1.55E-02	3.50E-01	<1	3.50E+00	<1
Vanadium	1.10E+02	1.80E-02	6.11E-02	0.00E+00	0.00E+00	6.11E-02	2.05E-03	8.57E-01	9.20E-01	3.44E-01	**2.67E+00**	1.70E+00	<1
Zinc	3.42E+02	5.37E-01	1.40E+01	0.00E+00	0.00E+00	1.40E+01	6.13E-02	2.66E+00	1.67E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.12E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.67E-04	3.19E-01	3.20E-01	4.00E-02	**8.01E+00**	4.00E-01	<1
Fluoride	1.47E+02	2.24E+01	1.00E+00	0.00E+00	0.00E+00	1.00E+00	2.56E+00	1.14E+00	4.70E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	8.19E+01	0.00E+00	1.01E-05	0.00E+00	0.00E+00	1.01E-05	0.00E+00	6.36E-01	6.36E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	1.13E+02	0.00E+00	1.68E+00	0.00E+00	0.00E+00	1.68E+00	0.00E+00	8.77E-01	2.56E+00				
Fluoranthene	2.24E+03	9.30E-03	1.28E+02	0.00E+00	0.00E+00	1.28E+02	1.06E-03	1.73E+01	1.45E+02				
Fluorene	2.57E+01	0.00E+00	2.73E-05	0.00E+00	0.00E+00	2.73E-05	0.00E+00	1.99E-01	1.99E-01				
Naphthalene	3.65E+00	0.00E+00	5.08E+00	0.00E+00	0.00E+00	5.08E+00	0.00E+00	2.83E-02	5.11E+00				
Phenanthrene	2.85E+02	0.00E+00	3.22E+00	0.00E+00	0.00E+00	3.22E+00	0.00E+00	2.21E+00	5.44E+00				
Total LMW PAHs						1.38E+02	1.06E-03	2.13E+01	1.59E+02	1.61E+01	**9.87E+00**	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.12E+03	3.00E-03	4.94E-01	0.00E+00	0.00E+00	4.94E-01	3.42E-04	8.69E+00	9.18E+00				
Benzo[A]Pyrene	1.27E+03	3.90E+00	1.54E+01	0.00E+00	0.00E+00	1.54E+01	4.45E-01	9.85E+00	2.57E+01				
Benzo(b)fluoranthene	1.00E+03	1.00E-02	3.55E+01	0.00E+00	0.00E+00	3.55E+01	1.14E-03	7.79E+00	4.33E+01				
Benzo(g,h,i)perylene	6.99E+02	3.90E-03	1.04E+02	0.00E+00	0.00E+00	1.04E+02	4.45E-04	5.43E+00	1.10E+02				
Benzo(k)fluoranthene	7.20E+02	0.00E+00	3.77E+00	0.00E+00	0.00E+00	3.77E+00	0.00E+00	5.59E+00	9.36E+00				
Chrysene	1.17E+03	7.60E-03	5.06E-01	0.00E+00	0.00E+00	5.06E-01	8.67E-04	9.05E+00	9.56E+00				
Dibenz(A,H)Anthracene	2.37E+02	0.00E+00	3.51E+00	0.00E+00	0.00E+00	3.51E+00	0.00E+00	1.84E+00	5.35E+00				
Indeno (1,2,3-CD) Pyrene	6.43E+02	3.10E-03	8.07E+00	0.00E+00	0.00E+00	8.07E+00	3.54E-04	4.99E+00	1.31E+01				
Pyrene	1.96E+03	7.00E-03	1.61E+02	0.00E+00	0.00E+00	1.61E+02	7.99E-04	1.52E+01	1.77E+02				
Total HMW PAHs						3.33E+02	4.49E-01	6.85E+01	4.02E+02	2.00E+00	**2.01E+02**	2.00E+01	**2.01E+01**

Table H21-6
Refined Exposure Evaluation - Mourning Dove
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.80E-01	0.00E+00	4.89E-04	0.00E+00	0.00E+00	4.89E-04	0.00E+00	1.40E-03	1.89E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	7.70E+00	0.00E+00	1.65E+00	0.00E+00	0.00E+00	1.65E+00	0.00E+00	5.98E-02	1.71E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H21-7
Refined Exposure Evaluation - Red-tailed Hawk
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.08E-01	0.00E+00	7.08E-01	1.10E+02	<1	1.10E+03	<1
Antimony	9.30E-01	0.00E+00	0.00E+00	0.00E+00	3.81E-03	3.81E-03	0.00E+00	1.98E-03	5.80E-03	No TRV	--	No TRV	--
Arsenic	1.35E+01	0.00E+00	0.00E+00	0.00E+00	5.44E-03	5.44E-03	0.00E+00	2.89E-02	3.43E-02	2.24E+00	<1	4.51E+00	<1
Barium	2.45E+02	2.34E-01	0.00E+00	0.00E+00	1.37E-02	1.37E-02	1.92E-02	5.21E-01	5.54E-01	7.35E+01	<1	1.31E+02	<1
Beryllium	3.99E+00	7.10E-04	0.00E+00	0.00E+00	7.37E-04	7.37E-04	5.82E-05	8.52E-03	9.31E-03	No TRV	--	No TRV	--
Cadmium	3.62E+00	3.00E-03	0.00E+00	0.00E+00	4.28E-02	4.28E-02	2.46E-04	7.72E-03	5.08E-02	1.47E+00	<1	6.35E+00	<1
Chromium	2.87E+01	0.00E+00	0.00E+00	0.00E+00	2.24E-01	2.24E-01	0.00E+00	6.12E-02	2.85E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	9.47E+00	0.00E+00	0.00E+00	0.00E+00	1.78E-02	1.78E-02	0.00E+00	2.02E-02	3.80E-02	7.61E+00	<1	2.02E+01	<1
Copper	4.43E+01	1.65E-02	0.00E+00	0.00E+00	1.09E+00	1.09E+00	1.35E-03	9.45E-02	1.19E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.11E+02	7.60E-03	0.00E+00	0.00E+00	7.09E-01	7.09E-01	6.23E-04	2.36E-01	9.46E-01	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E+02	--	3.77E+02	--
Mercury	6.31E-02	0.00E+00	0.00E+00	0.00E+00	1.97E-03	1.97E-03	0.00E+00	1.35E-04	2.11E-03	4.50E-01	<1	9.10E-01	<1
Nickel	3.60E+02	5.59E-02	0.00E+00	0.00E+00	9.94E-01	9.94E-01	4.58E-03	7.67E-01	1.77E+00	6.71E+00	<1	1.86E+01	<1
Selenium	1.83E+00	0.00E+00	0.00E+00	0.00E+00	6.79E-02	6.79E-02	0.00E+00	3.89E-03	7.18E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.89E+00	0.00E+00	0.00E+00	0.00E+00	1.68E-02	1.68E-02	0.00E+00	4.03E-03	2.08E-02	3.50E-01	<1	3.50E+00	<1
Vanadium	1.10E+02	1.80E-02	0.00E+00	0.00E+00	1.11E-01	1.11E-01	1.48E-03	2.35E-01	3.48E-01	3.44E-01	**1.01E+00**	1.70E+00	<1
Zinc	3.42E+02	5.37E-01	0.00E+00	0.00E+00	9.72E+00	9.72E+00	4.40E-02	7.30E-01	1.05E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.12E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.23E-04	8.77E-02	8.84E-02	4.00E-02	**2.21E+00**	4.00E-01	<1
Fluoride	1.47E+02	2.24E+01	0.00E+00	0.00E+00	1.92E-01	1.92E-01	1.84E+00	3.13E-01	2.34E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	8.19E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-01	1.75E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	1.13E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.41E-01	2.41E-01				
Fluoranthene	2.24E+03	9.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.63E-04	4.77E+00	4.77E+00				
Fluorene	2.57E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.48E-02	5.48E-02				
Naphthalene	3.65E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.78E-03	7.78E-03				
Phenanthrene	2.85E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.08E-01	6.08E-01				
Total LMW PAHs						0.00E+00	7.63E-04	5.85E+00	5.85E+00	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.12E+03	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.46E-04	2.39E+00	2.39E+00				
Benzo[A]Pyrene	1.27E+03	3.90E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.20E-01	2.71E+00	3.03E+00				
Benzo(b)fluoranthene	1.00E+03	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.20E-04	2.14E+00	2.14E+00				
Benzo(g,h,i)perylene	6.99E+02	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.20E-04	1.49E+00	1.49E+00				
Benzo(k)fluoranthene	7.20E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E+00	1.54E+00				
Chrysene	1.17E+03	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.23E-04	2.49E+00	2.49E+00				
Dibenz(A,H)Anthracene	2.37E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.05E-01	5.05E-01				
Indeno (1,2,3-CD) Pyrene	6.43E+02	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.54E-04	1.37E+00	1.37E+00				
Pyrene	1.96E+03	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.74E-04	4.19E+00	4.19E+00				
Total HMW PAHs						0.00E+00	3.23E-01	1.88E+01	1.91E+01	2.00E+00	**9.57E+00**	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.80E-01	0.00E+00	0.00E+00	0.00E+00	1.15E-02	1.15E-02	0.00E+00	3.84E-04	1.19E-02	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	7.70E+00	0.00E+00	0.00E+00	0.00E+00	3.54E-02	3.54E-02	0.00E+00	1.64E-02	5.18E-02	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H21-7
Refined Exposure Evaluation - Red-tailed Hawk
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H21-8
Refined Exposure Evaluation - Yellow-billed Cuckoo
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E+00	0.00E+00	1.37E+00	1.10E+02	<1	1.10E+03	<1
Antimony	9.30E-01	0.00E+00	0.00E+00	1.47E-01	0.00E+00	1.47E-01	0.00E+00	0.00E+00	1.47E-01	No TRV	--	No TRV	--
Arsenic	1.35E+01	0.00E+00	0.00E+00	2.41E-01	0.00E+00	2.41E-01	0.00E+00	0.00E+00	2.41E-01	2.24E+00	<1	4.51E+00	<1
Barium	2.45E+02	2.34E-01	0.00E+00	3.52E+00	0.00E+00	3.52E+00	3.70E-02	0.00E+00	3.56E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	3.99E+00	7.10E-04	0.00E+00	2.85E-02	0.00E+00	2.85E-02	1.12E-04	0.00E+00	2.86E-02	No TRV	--	No TRV	--
Cadmium	3.62E+00	3.00E-03	0.00E+00	3.65E+00	0.00E+00	3.65E+00	4.75E-04	0.00E+00	3.65E+00	1.47E+00	**2.48E+00**	6.35E+00	<1
Chromium	2.87E+01	0.00E+00	0.00E+00	1.39E+00	0.00E+00	1.39E+00	0.00E+00	0.00E+00	1.39E+00	2.66E+00	<1	1.56E+01	<1
Cobalt	9.47E+00	0.00E+00	0.00E+00	1.83E-01	0.00E+00	1.83E-01	0.00E+00	0.00E+00	1.83E-01	7.61E+00	<1	2.02E+01	<1
Copper	4.43E+01	1.65E-02	0.00E+00	3.61E+00	0.00E+00	3.61E+00	2.61E-03	0.00E+00	3.62E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.11E+02	7.60E-03	0.00E+00	5.68E+00	0.00E+00	5.68E+00	1.20E-03	0.00E+00	5.68E+00	1.63E+00	**3.49E+00**	4.46E+01	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E+02	--	3.77E+02	--
Mercury	6.31E-02	0.00E+00	0.00E+00	3.93E-02	0.00E+00	3.93E-02	0.00E+00	0.00E+00	3.93E-02	4.50E-01	<1	9.10E-01	<1
Nickel	3.60E+02	5.59E-02	0.00E+00	4.43E+01	0.00E+00	4.43E+01	8.85E-03	0.00E+00	4.43E+01	6.71E+00	**6.61E+00**	1.86E+01	**2.38E+00**
Selenium	1.83E+00	0.00E+00	0.00E+00	2.28E-01	0.00E+00	2.28E-01	0.00E+00	0.00E+00	2.28E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	1.89E+00	0.00E+00	0.00E+00	1.62E-02	0.00E+00	1.62E-02	0.00E+00	0.00E+00	1.62E-02	3.50E-01	<1	3.50E+00	<1
Vanadium	1.10E+02	1.80E-02	0.00E+00	7.34E-01	0.00E+00	7.34E-01	2.85E-03	0.00E+00	7.37E-01	3.44E-01	**2.14E+00**	1.70E+00	<1
Zinc	3.42E+02	5.37E-01	0.00E+00	9.18E+01	0.00E+00	9.18E+01	8.50E-02	0.00E+00	9.19E+01	6.61E+01	**1.39E+00**	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.12E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-03	0.00E+00	1.20E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	1.47E+02	2.24E+01	0.00E+00	2.88E+00	0.00E+00	2.88E+00	3.55E+00	0.00E+00	6.43E+00	1.22E+01	<1	1.22E+02	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	8.19E+01	0.00E+00	0.00E+00	1.91E+01	0.00E+00	1.91E+01	0.00E+00	0.00E+00	1.91E+01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	1.13E+02	0.00E+00	0.00E+00	4.33E+01	0.00E+00	4.33E+01	0.00E+00	0.00E+00	4.33E+01				
Fluoranthene	2.24E+03	9.30E-03	0.00E+00	1.08E+03	0.00E+00	1.08E+03	1.47E-03	0.00E+00	1.08E+03				
Fluorene	2.57E+01	0.00E+00	0.00E+00	3.89E+01	0.00E+00	3.89E+01	0.00E+00	0.00E+00	3.89E+01				
Naphthalene	3.65E+00	0.00E+00	0.00E+00	2.54E+00	0.00E+00	2.54E+00	0.00E+00	0.00E+00	2.54E+00				
Phenanthrene	2.85E+02	0.00E+00	0.00E+00	7.77E+01	0.00E+00	7.77E+01	0.00E+00	0.00E+00	7.77E+01				
Total LMW PAHs						1.26E+03	1.47E-03	0.00E+00	1.26E+03	1.61E+01	**7.81E+01**	1.61E+02	**7.81E+00**
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.12E+03	3.00E-03	0.00E+00	2.82E+02	0.00E+00	2.82E+02	4.75E-04	0.00E+00	2.82E+02				
Benzo[A]Pyrene	1.27E+03	3.90E+00	0.00E+00	2.67E+02	0.00E+00	2.67E+02	6.17E-01	0.00E+00	2.68E+02				
Benzo(b)fluoranthene	1.00E+03	1.00E-02	0.00E+00	4.13E+02	0.00E+00	4.13E+02	1.58E-03	0.00E+00	4.13E+02				
Benzo(g,h,i)perylene	6.99E+02	3.90E-03	0.00E+00	3.26E+02	0.00E+00	3.26E+02	6.17E-04	0.00E+00	3.26E+02				
Benzo(k)fluoranthene	7.20E+02	0.00E+00	0.00E+00	2.96E+02	0.00E+00	2.96E+02	0.00E+00	0.00E+00	2.96E+02				
Chrysene	1.17E+03	7.60E-03	0.00E+00	4.23E+02	0.00E+00	4.23E+02	1.20E-03	0.00E+00	4.23E+02				
Dibenz(A,H)Anthracene	2.37E+02	0.00E+00	0.00E+00	8.65E+01	0.00E+00	8.65E+01	0.00E+00	0.00E+00	8.65E+01				
Indeno (1,2,3-CD) Pyrene	6.43E+02	3.10E-03	0.00E+00	2.91E+02	0.00E+00	2.91E+02	4.91E-04	0.00E+00	2.91E+02				
Pyrene	1.96E+03	7.00E-03	0.00E+00	5.44E+02	0.00E+00	5.44E+02	1.11E-03	0.00E+00	5.44E+02				
Total HMW PAHs						2.93E+03	6.23E-01	0.00E+00	2.93E+03	2.00E+00	**1.46E+03**	2.00E+01	**1.46E+02**
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.80E-01	0.00E+00	0.00E+00	1.55E+00	0.00E+00	1.55E+00	0.00E+00	0.00E+00	1.55E+00	1.10E+00	**1.41E+00**	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	7.70E+00	0.00E+00	0.00E+00	8.49E+00	0.00E+00	8.49E+00	0.00E+00	0.00E+00	8.49E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H21-8
Refined Exposure Evaluation - Yellow-billed Cuckoo
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H21-9
Refined Exposure Evaluation - Canada Lynx
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.70E-01	0.00E+00	2.70E-01	No TRV	--	No TRV	--
Antimony	9.30E-01	0.00E+00	0.00E+00	0.00E+00	1.45E-03	1.45E-03	0.00E+00	8.14E-04	2.27E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	1.35E+01	0.00E+00	0.00E+00	0.00E+00	2.07E-03	2.07E-03	0.00E+00	1.19E-02	1.39E-02	1.04E+00	<1	4.55E+00	<1
Barium	2.45E+02	2.34E-01	0.00E+00	0.00E+00	5.22E-03	5.22E-03	7.31E-03	2.14E-01	2.26E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	3.99E+00	7.10E-04	0.00E+00	0.00E+00	2.81E-04	2.81E-04	2.22E-05	3.49E-03	3.80E-03	5.32E-01	<1	6.70E-01	<1
Cadmium	3.62E+00	3.00E-03	0.00E+00	0.00E+00	1.63E-02	1.63E-02	9.37E-05	3.17E-03	1.96E-02	7.70E-01	<1	6.87E+00	<1
Chromium	2.87E+01	0.00E+00	0.00E+00	0.00E+00	8.52E-02	8.52E-02	0.00E+00	2.51E-02	1.10E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	9.47E+00	0.00E+00	0.00E+00	0.00E+00	6.78E-03	6.78E-03	0.00E+00	8.29E-03	1.51E-02	7.33E+00	<1	1.89E+01	<1
Copper	4.43E+01	1.65E-02	0.00E+00	0.00E+00	4.16E-01	4.16E-01	5.16E-04	3.88E-02	4.56E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.11E+02	7.60E-03	0.00E+00	0.00E+00	2.70E-01	2.70E-01	2.37E-04	9.68E-02	3.67E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E+01	--	1.46E+02	--
Mercury	6.31E-02	0.00E+00	0.00E+00	0.00E+00	7.52E-04	7.52E-04	0.00E+00	5.52E-05	8.07E-04	1.41E+00	<1	1.41E+01	<1
Nickel	3.60E+02	5.59E-02	0.00E+00	0.00E+00	3.79E-01	3.79E-01	1.75E-03	3.15E-01	6.95E-01	1.70E+00	<1	1.48E+01	<1
Selenium	1.83E+00	0.00E+00	0.00E+00	0.00E+00	2.59E-02	2.59E-02	0.00E+00	1.60E-03	2.75E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.89E+00	0.00E+00	0.00E+00	0.00E+00	6.39E-03	6.39E-03	0.00E+00	1.65E-03	8.05E-03	4.80E-01	<1	1.43E+00	<1
Vanadium	1.10E+02	1.80E-02	0.00E+00	0.00E+00	4.24E-02	4.24E-02	5.62E-04	9.65E-02	1.40E-01	4.16E+00	<1	9.44E+00	<1
Zinc	3.42E+02	5.37E-01	0.00E+00	0.00E+00	3.70E+00	3.70E+00	1.68E-02	3.00E-01	4.02E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.12E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.37E-04	3.60E-02	3.62E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	1.47E+02	2.24E+01	0.00E+00	0.00E+00	7.33E-02	7.33E-02	7.00E-01	1.28E-01	9.01E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	8.19E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.16E-02	7.16E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	1.13E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.89E-02	9.89E-02				
Fluoranthene	2.24E+03	9.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.91E-04	1.96E+00	1.96E+00				
Fluorene	2.57E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.25E-02	2.25E-02				
Naphthalene	3.65E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.19E-03	3.19E-03				
Phenanthrene	2.85E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.50E-01	2.50E-01				
Total LMW PAHs						0.00E+00	2.91E-04	2.40E+00	2.40E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	1.12E+03	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.37E-05	9.79E-01	9.79E-01				
Benzo[A]Pyrene	1.27E+03	3.90E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-01	1.11E+00	1.23E+00				
Benzo(b)fluoranthene	1.00E+03	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.12E-04	8.78E-01	8.79E-01				
Benzo(g,h,i)perylene	6.99E+02	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-04	6.12E-01	6.12E-01				
Benzo(k)fluoranthene	7.20E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.30E-01	6.30E-01				
Chrysene	1.17E+03	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.37E-04	1.02E+00	1.02E+00				
Dibenz(A,H)Anthracene	2.37E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.07E-01	2.07E-01				
Indeno (1,2,3-CD) Pyrene	6.43E+02	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.69E-05	5.63E-01	5.63E-01				
Pyrene	1.96E+03	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-04	1.72E+00	1.72E+00				
Total HMW PAHs						0.00E+00	1.23E-01	7.72E+00	7.84E+00	6.15E-01	**1.28E+01**	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.80E-01	0.00E+00	0.00E+00	0.00E+00	4.38E-03	4.38E-03	0.00E+00	1.57E-04	4.54E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	7.70E+00	0.00E+00	0.00E+00	0.00E+00	1.35E-02	1.35E-02	0.00E+00	6.74E-03	2.02E-02	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H21-9
Refined Exposure Evaluation - Canada Lynx
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H21-10
Refined Exposure Evaluation - Grizzly Bear
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate						
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.86E-01	0.00E+00	1.86E-01	No TRV	--	No TRV	--
Antimony	9.30E-01	0.00E+00	5.17E-04	3.01E-03	1.00E-04	0.00E+00	3.63E-03	0.00E+00	5.62E-04	4.19E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	1.35E+01	0.00E+00	7.14E-03	4.93E-03	1.43E-04	0.00E+00	1.22E-02	0.00E+00	8.19E-03	2.04E-02	1.04E+00	<1	4.55E+00	<1
Barium	2.45E+02	2.34E-01	5.36E-01	7.21E-02	3.60E-04	0.00E+00	6.08E-01	5.05E-03	1.48E-01	7.61E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	3.99E+00	7.10E-04	2.27E-02	5.82E-04	1.94E-05	0.00E+00	2.33E-02	1.53E-05	2.42E-03	2.57E-02	5.32E-01	<1	6.70E-01	<1
Cadmium	3.62E+00	3.00E-03	1.76E-02	7.46E-02	1.13E-03	0.00E+00	9.33E-02	6.48E-05	2.19E-03	9.56E-02	7.70E-01	<1	6.87E+00	<1
Chromium	2.87E+01	0.00E+00	1.65E-02	2.85E-02	5.89E-03	0.00E+00	5.09E-02	0.00E+00	1.74E-02	6.82E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	9.47E+00	0.00E+00	9.97E-04	3.74E-03	4.68E-04	0.00E+00	5.21E-03	0.00E+00	5.73E-03	1.09E-02	7.33E+00	<1	1.89E+01	<1
Copper	4.43E+01	1.65E-02	1.22E-01	7.39E-02	2.88E-02	0.00E+00	2.25E-01	3.56E-04	2.68E-02	2.52E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.11E+02	7.60E-03	5.22E-02	1.16E-01	1.87E-02	0.00E+00	1.87E-01	1.64E-04	6.69E-02	2.54E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E+01	--	1.46E+02	--
Mercury	6.31E-02	0.00E+00	1.15E-03	8.04E-04	5.19E-05	0.00E+00	2.01E-03	0.00E+00	3.82E-05	2.05E-03	1.41E+00	<1	1.41E+01	<1
Nickel	3.60E+02	5.59E-02	1.24E-01	9.07E-01	2.62E-02	0.00E+00	1.06E+00	1.21E-03	2.18E-01	1.28E+00	1.70E+00	<1	1.48E+01	<1
Selenium	1.83E+00	0.00E+00	1.39E-02	4.67E-03	1.79E-03	0.00E+00	2.03E-02	0.00E+00	1.10E-03	2.14E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.89E+00	0.00E+00	1.06E-04	3.31E-04	4.42E-04	0.00E+00	8.79E-04	0.00E+00	1.14E-03	2.02E-03	4.80E-01	<1	1.43E+00	<1
Vanadium	1.10E+02	1.80E-02	7.51E-03	1.50E-02	2.93E-03	0.00E+00	2.55E-02	3.89E-04	6.67E-02	9.26E-02	4.16E+00	<1	9.44E+00	<1
Zinc	3.42E+02	5.37E-01	1.72E+00	1.88E+00	2.56E-01	0.00E+00	3.85E+00	1.16E-02	2.07E-01	4.07E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	4.12E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.64E-04	2.49E-02	2.50E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	1.47E+02	2.24E+01	1.24E-01	5.89E-02	5.07E-03	0.00E+00	1.87E-01	4.84E-01	8.87E-02	7.60E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	8.19E+01	0.00E+00	1.24E-06	3.90E-01	0.00E+00	0.00E+00	3.90E-01	0.00E+00	4.95E-02	4.39E-01				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	1.13E+02	0.00E+00	2.07E-01	8.86E-01	0.00E+00	0.00E+00	1.09E+00	0.00E+00	6.83E-02	1.16E+00				
Fluoranthene	2.24E+03	9.30E-03	1.57E+01	2.20E+01	0.00E+00	0.00E+00	3.77E+01	2.01E-04	1.35E+00	3.91E+01				
Fluorene	2.57E+01	0.00E+00	3.35E-06	7.97E-01	0.00E+00	0.00E+00	7.97E-01	0.00E+00	1.55E-02	8.12E-01				
Naphthalene	3.65E+00	0.00E+00	6.25E-01	5.20E-02	0.00E+00	0.00E+00	6.77E-01	0.00E+00	2.21E-03	6.79E-01				
Phenanthrene	2.85E+02	0.00E+00	3.96E-01	1.59E+00	0.00E+00	0.00E+00	1.99E+00	0.00E+00	1.72E-01	2.16E+00				
Total LMW PAHs							4.26E+01	2.01E-04	1.66E+00	4.43E+01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	1.12E+03	3.00E-03	6.08E-02	5.76E+00	0.00E+00	0.00E+00	5.83E+00	6.48E-05	6.77E-01	6.50E+00				
Benzo[A]Pyrene	1.27E+03	3.90E+00	1.90E+00	5.47E+00	0.00E+00	0.00E+00	7.36E+00	8.42E-02	7.67E-01	8.22E+00				
Benzo(b)fluoranthene	1.00E+03	1.00E-02	4.37E+00	8.46E+00	0.00E+00	0.00E+00	1.28E+01	2.16E-04	6.07E-01	1.34E+01				
Benzo(g,h,i)perylene	6.99E+02	3.90E-03	1.28E+01	6.66E+00	0.00E+00	0.00E+00	1.95E+01	8.42E-05	4.23E-01	1.99E+01				
Benzo(k)fluoranthene	7.20E+02	0.00E+00	4.64E-01	6.07E+00	0.00E+00	0.00E+00	6.53E+00	0.00E+00	4.35E-01	6.96E+00				
Chrysene	1.17E+03	7.60E-03	6.23E-02	8.65E+00	0.00E+00	0.00E+00	8.71E+00	1.64E-04	7.05E-01	9.42E+00				
Dibenz(A,H)Anthracene	2.37E+02	0.00E+00	4.32E-01	1.77E+00	0.00E+00	0.00E+00	2.20E+00	0.00E+00	1.43E-01	2.35E+00				
Indeno (1,2,3-CD) Pyrene	6.43E+02	3.10E-03	9.93E-01	5.96E+00	0.00E+00	0.00E+00	6.95E+00	6.69E-05	3.89E-01	7.34E+00				
Pyrene	1.96E+03	7.00E-03	1.99E+01	1.11E+01	0.00E+00	0.00E+00	3.10E+01	1.51E-04	1.19E+00	3.22E+01				
Total HMW PAHs							1.01E+02	8.50E-02	5.33E+00	1.06E+02	6.15E-01	1.73E+02	3.84E+01	2.77E+00
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.80E-01	0.00E+00	6.01E-05	3.17E-02	3.03E-04	0.00E+00	3.21E-02	0.00E+00	1.09E-04	3.22E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	7.70E+00	0.00E+00	2.03E-01	1.74E-01	9.32E-04	0.00E+00	3.78E-01	0.00E+00	4.66E-03	3.82E-01	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H21-10
Refined Exposure Evaluation - Grizzly Bear
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)											
			Diet					Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans							0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H21-11
Refined Exposure Evaluation - Long-tailed Weasel
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{Low}	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.44E-01	0.00E+00	4.44E-01	No TRV	--	No TRV	--
Antimony	6.04E-01	0.00E+00	0.00E+00	0.00E+00	1.56E-03	1.56E-03	0.00E+00	4.98E-04	2.05E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	1.46E+01	0.00E+00	0.00E+00	0.00E+00	3.62E-03	3.62E-03	0.00E+00	1.20E-02	1.56E-02	1.04E+00	<1	4.55E+00	<1
Barium	4.73E+02	2.34E-01	0.00E+00	0.00E+00	1.66E-02	1.66E-02	1.20E-02	3.90E-01	4.18E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	6.46E+00	7.10E-04	0.00E+00	0.00E+00	7.48E-04	7.48E-04	3.65E-05	5.32E-03	6.11E-03	5.32E-01	<1	6.70E-01	<1
Cadmium	3.05E+00	3.00E-03	0.00E+00	0.00E+00	2.48E-02	2.48E-02	1.54E-04	2.51E-03	2.74E-02	7.70E-01	<1	6.87E+00	<1
Chromium	2.32E+01	0.00E+00	0.00E+00	0.00E+00	1.20E-01	1.20E-01	0.00E+00	1.91E-02	1.39E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	7.37E+00	0.00E+00	0.00E+00	0.00E+00	8.05E-03	8.05E-03	0.00E+00	6.07E-03	1.41E-02	7.33E+00	<1	1.89E+01	<1
Copper	2.66E+01	1.65E-02	0.00E+00	0.00E+00	6.37E-01	6.37E-01	8.49E-04	2.19E-02	6.60E-01	5.60E+00	<1	8.27E+01	<1
Lead	9.67E+01	7.60E-03	0.00E+00	0.00E+00	4.19E-01	4.19E-01	3.91E-04	7.96E-02	4.99E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E+01	--	1.46E+02	--
Mercury	3.13E-02	0.00E+00	0.00E+00	0.00E+00	6.13E-04	6.13E-04	0.00E+00	2.58E-05	6.39E-04	1.41E+00	<1	1.41E+01	<1
Nickel	3.26E+02	5.59E-02	0.00E+00	0.00E+00	5.96E-01	5.96E-01	2.88E-03	2.69E-01	8.68E-01	1.70E+00	<1	1.48E+01	<1
Selenium	1.13E+00	0.00E+00	0.00E+00	0.00E+00	3.55E-02	3.55E-02	0.00E+00	9.30E-04	3.65E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.99E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-02	1.11E-02	0.00E+00	1.64E-03	1.27E-02	4.80E-01	<1	1.43E+00	<1
Vanadium	7.64E+01	1.80E-02	0.00E+00	0.00E+00	4.84E-02	4.84E-02	9.26E-04	6.29E-02	1.12E-01	4.16E+00	<1	9.44E+00	<1
Zinc	2.45E+02	5.37E-01	0.00E+00	0.00E+00	5.96E+00	5.96E+00	2.76E-02	2.02E-01	6.19E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.45E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.91E-04	3.66E-02	3.70E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	1.10E+02	2.24E+01	0.00E+00	0.00E+00	9.04E-02	9.04E-02	1.15E+00	9.04E-02	1.33E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.49E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.05E-02	2.05E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.90E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.04E-02	4.04E-02				
Fluoranthene	6.10E+02	9.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.79E-04	5.02E-01	5.02E-01				
Fluorene	1.30E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-02	1.07E-02				
Naphthalene	2.39E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.97E-03	1.97E-03				
Phenanthrene	2.00E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.65E-01	1.65E-01				
Total LMW PAHs						0.00E+00	4.79E-04	7.41E-01	7.41E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	3.11E+02	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-04	2.56E-01	2.56E-01				
Benzo[A]Pyrene	3.40E+02	3.90E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E-01	2.80E-01	4.81E-01				
Benzo(b)fluoranthene	5.22E+02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E-04	4.30E-01	4.30E-01				
Benzo(g,h,i)perylene	2.46E+02	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E-04	2.02E-01	2.03E-01				
Benzo(k)fluoranthene	3.44E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.83E-01	2.83E-01				
Chrysene	3.58E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.91E-04	2.95E-01	2.95E-01				
Dibenz(A,H)Anthracene	1.17E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.66E-02	9.66E-02				
Indeno (1,2,3-CD) Pyrene	2.25E+02	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.60E-04	1.85E-01	1.86E-01				
Pyrene	5.21E+02	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-04	4.29E-01	4.29E-01				
Total HMW PAHs						0.00E+00	2.02E-01	2.46E+00	2.66E+00	6.15E-01	**4.32E+00**	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.58E+00	0.00E+00	0.00E+00	0.00E+00	1.83E-01	1.83E-01	0.00E+00	3.77E-03	1.87E-01	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	4.72E+00	0.00E+00	0.00E+00	0.00E+00	1.36E-02	1.36E-02	0.00E+00	3.88E-03	1.75E-02	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H21-11
Refined Exposure Evaluation - Long-tailed Weasel
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{Low}	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H21-12
Refined Exposure Evaluation - Meadow Vole
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E+00	0.00E+00	1.30E+00	No TRV	--	No TRV	--
Antimony	6.04E-01	0.00E+00	3.69E-03	0.00E+00	0.00E+00	3.69E-03	0.00E+00	1.18E-03	4.88E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	1.46E+01	0.00E+00	8.21E-02	0.00E+00	0.00E+00	8.21E-02	0.00E+00	2.85E-02	1.11E-01	1.04E+00	<1	4.55E+00	<1
Barium	4.73E+02	2.34E-01	1.11E+01	0.00E+00	0.00E+00	1.11E+01	3.52E-02	9.24E-01	1.20E+01	5.18E+01	<1	8.27E+01	<1
Beryllium	6.46E+00	7.10E-04	3.46E-01	0.00E+00	0.00E+00	3.46E-01	1.07E-04	1.26E-02	3.59E-01	5.32E-01	<1	6.70E-01	<1
Cadmium	3.05E+00	3.00E-03	1.72E-01	0.00E+00	0.00E+00	1.72E-01	4.51E-04	5.95E-03	1.78E-01	7.70E-01	<1	6.87E+00	<1
Chromium	2.32E+01	0.00E+00	1.43E-01	0.00E+00	0.00E+00	1.43E-01	0.00E+00	4.53E-02	1.88E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	7.37E+00	0.00E+00	8.31E-03	0.00E+00	0.00E+00	8.31E-03	0.00E+00	1.44E-02	2.27E-02	7.33E+00	<1	1.89E+01	<1
Copper	2.66E+01	1.65E-02	1.07E+00	0.00E+00	0.00E+00	1.07E+00	2.48E-03	5.20E-02	1.12E+00	5.60E+00	<1	8.27E+01	<1
Lead	9.67E+01	7.60E-03	5.17E-01	0.00E+00	0.00E+00	5.17E-01	1.14E-03	1.89E-01	7.07E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E+01	--	1.46E+02	--
Mercury	3.13E-02	0.00E+00	8.43E-03	0.00E+00	0.00E+00	8.43E-03	0.00E+00	6.11E-05	8.49E-03	1.41E+00	<1	1.41E+01	<1
Nickel	3.26E+02	5.59E-02	1.24E+00	0.00E+00	0.00E+00	1.24E+00	8.40E-03	6.38E-01	1.88E+00	1.70E+00	**1.11E+00**	1.48E+01	<1
Selenium	1.13E+00	0.00E+00	8.73E-02	0.00E+00	0.00E+00	8.73E-02	0.00E+00	2.21E-03	8.95E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.99E+00	0.00E+00	1.19E-03	0.00E+00	0.00E+00	1.19E-03	0.00E+00	3.88E-03	5.07E-03	4.80E-01	<1	1.43E+00	<1
Vanadium	7.64E+01	1.80E-02	5.57E-02	0.00E+00	0.00E+00	5.57E-02	2.70E-03	1.49E-01	2.08E-01	4.16E+00	<1	9.44E+00	<1
Zinc	2.45E+02	5.37E-01	1.53E+01	0.00E+00	0.00E+00	1.53E+01	8.07E-02	4.79E-01	1.59E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.45E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-03	8.69E-02	8.81E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	1.10E+02	2.24E+01	9.90E-01	0.00E+00	0.00E+00	9.90E-01	3.37E+00	2.14E-01	4.57E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.49E+01	0.00E+00	3.68E-05	0.00E+00	0.00E+00	3.68E-05	0.00E+00	4.87E-02	4.87E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.90E+01	0.00E+00	1.16E+00	0.00E+00	0.00E+00	1.16E+00	0.00E+00	9.58E-02	1.25E+00				
Fluoranthene	6.10E+02	9.30E-03	4.58E+01	0.00E+00	0.00E+00	4.58E+01	1.40E-03	1.19E+00	4.70E+01				
Fluorene	1.30E+01	0.00E+00	6.42E-05	0.00E+00	0.00E+00	6.42E-05	0.00E+00	2.54E-02	2.55E-02				
Naphthalene	2.39E+00	0.00E+00	4.38E+00	0.00E+00	0.00E+00	4.38E+00	0.00E+00	4.67E-03	4.39E+00				
Phenanthrene	2.00E+02	0.00E+00	3.41E+00	0.00E+00	0.00E+00	3.41E+00	0.00E+00	3.91E-01	3.80E+00				
Total LMW PAHs						5.47E+01	1.40E-03	1.76E+00	5.65E+01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	3.11E+02	3.00E-03	3.04E-01	0.00E+00	0.00E+00	3.04E-01	4.51E-04	6.07E-01	9.11E-01				
Benzo[A]Pyrene	3.40E+02	3.90E+00	5.62E+00	0.00E+00	0.00E+00	5.62E+00	5.86E-01	6.64E-01	6.87E+00				
Benzo(b)fluoranthene	5.22E+02	1.00E-02	2.43E+01	0.00E+00	0.00E+00	2.43E+01	1.50E-03	1.02E+00	2.53E+01				
Benzo(g,h,i)perylene	2.46E+02	3.90E-03	3.98E+01	0.00E+00	0.00E+00	3.98E+01	5.86E-04	4.80E-01	4.03E+01				
Benzo(k)fluoranthene	3.44E+02	0.00E+00	2.63E+00	0.00E+00	0.00E+00	2.63E+00	0.00E+00	6.71E-01	3.30E+00				
Chrysene	3.58E+02	7.60E-03	3.30E-01	0.00E+00	0.00E+00	3.30E-01	1.14E-03	7.00E-01	1.03E+00				
Dibenz(A,H)Anthracene	1.17E+02	0.00E+00	2.29E+00	0.00E+00	0.00E+00	2.29E+00	0.00E+00	2.29E-01	2.52E+00				
Indeno (1,2,3-CD) Pyrene	2.25E+02	3.10E-03	3.72E+00	0.00E+00	0.00E+00	3.72E+00	4.66E-04	4.40E-01	4.16E+00				
Pyrene	5.21E+02	7.00E-03	5.63E+01	0.00E+00	0.00E+00	5.63E+01	1.05E-03	1.02E+00	5.73E+01				
Total HMW PAHs						1.35E+02	5.91E-01	5.83E+00	1.42E+02	6.15E-01	**2.31E+02**	3.84E+01	**3.692155648**
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.58E+00	0.00E+00	1.64E-02	0.00E+00	0.00E+00	1.64E-02	0.00E+00	8.94E-03	2.53E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	4.72E+00	0.00E+00	1.33E+00	0.00E+00	0.00E+00	1.33E+00	0.00E+00	9.21E-03	1.34E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H21-12
Refined Exposure Evaluation - Meadow Vole
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H21-13
Refined Exposure Evaluation - Mink
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	3.73E-01	0.00E+00	3.73E-01	No TRV	--	No TRV	--
Antimony	9.30E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	1.35E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	2.45E+02	2.34E-01	0.00E+00	0.00E+00	0.00E+00	1.01E-02	0.00E+00	1.01E-02	5.18E+01	<1	8.27E+01	<1
Beryllium	3.99E+00	7.10E-04	0.00E+00	0.00E+00	0.00E+00	3.07E-05	0.00E+00	3.07E-05	5.32E-01	<1	6.70E-01	<1
Cadmium	3.62E+00	3.00E-03	0.00E+00	0.00E+00	0.00E+00	1.30E-04	0.00E+00	1.30E-04	7.70E-01	<1	6.87E+00	<1
Chromium	2.87E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	4.43E+01	1.65E-02	0.00E+00	0.00E+00	0.00E+00	7.14E-04	0.00E+00	7.14E-04	5.60E+00	<1	8.27E+01	<1
Lead	1.11E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	3.29E-04	0.00E+00	3.29E-04	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E+01	--	1.46E+02	--
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	3.60E+02	5.59E-02	0.00E+00	0.00E+00	0.00E+00	2.42E-03	0.00E+00	2.42E-03	1.70E+00	<1	1.48E+01	<1
Selenium	1.83E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-01	--	6.60E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.89E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.10E+02	1.80E-02	0.00E+00	0.00E+00	0.00E+00	7.78E-04	0.00E+00	7.78E-04	4.16E+00	<1	9.44E+00	<1
Zinc	3.42E+02	5.37E-01	0.00E+00	0.00E+00	0.00E+00	2.32E-02	0.00E+00	2.32E-02	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics												
Cyanide	4.12E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	3.29E-04	0.00E+00	3.29E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	0.00E+00	2.24E+01	0.00E+00	0.00E+00	0.00E+00	9.69E-01	0.00E+00	9.69E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	8.19E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Acenaphthylene	3.20E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	1.13E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluoranthene	2.24E+03	9.30E-03	0.00E+00	0.00E+00	0.00E+00	4.02E-04	0.00E+00	4.02E-04				
Fluorene	2.57E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	3.65E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	2.85E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total LMW PAHs					0.00E+00	4.02E-04	0.00E+00	4.02E-04	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	1.12E+03	3.00E-03	0.00E+00	0.00E+00	0.00E+00	1.30E-04	0.00E+00	1.30E-04				
Benzo[A]Pyrene	1.27E+03	3.90E+00	0.00E+00	0.00E+00	0.00E+00	1.69E-01	0.00E+00	1.69E-01				
Benzo(b)fluoranthene	1.00E+03	1.00E-02	0.00E+00	0.00E+00	0.00E+00	4.32E-04	0.00E+00	4.32E-04				
Benzo(g,h,i)perylene	6.99E+02	3.90E-03	0.00E+00	0.00E+00	0.00E+00	1.69E-04	0.00E+00	1.69E-04				
Benzo(k)fluoranthene	7.20E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Chrysene	1.17E+03	7.60E-03	0.00E+00	0.00E+00	0.00E+00	3.29E-04	0.00E+00	3.29E-04				
Dibenz(A,H)Anthracene	2.37E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Indeno (1,2,3-CD) Pyrene	6.43E+02	3.10E-03	0.00E+00	0.00E+00	0.00E+00	1.34E-04	0.00E+00	1.34E-04				
Pyrene	1.96E+03	7.00E-03	0.00E+00	0.00E+00	0.00E+00	3.03E-04	0.00E+00	3.03E-04				
Total HMW PAHs					0.00E+00	1.70E-01	0.00E+00	1.70E-01	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H21-13
Refined Exposure Evaluation - Mink
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H21-14
Refined Exposure Evaluation - North American Wolverine
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.59E-01	0.00E+00	2.59E-01	No TRV	--	No TRV	--
Antimony	6.04E-01	0.00E+00	0.00E+00	0.00E+00	9.08E-04	9.08E-04	0.00E+00	5.08E-04	1.42E-03	5.90E-02	<1	2.76E+00	<1
Arsenic	1.46E+01	0.00E+00	0.00E+00	0.00E+00	2.12E-03	2.12E-03	0.00E+00	1.23E-02	1.44E-02	1.04E+00	<1	4.55E+00	<1
Barium	4.73E+02	2.34E-01	0.00E+00	0.00E+00	9.70E-03	9.70E-03	7.03E-03	3.98E-01	4.15E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	6.46E+00	7.10E-04	0.00E+00	0.00E+00	4.37E-04	4.37E-04	2.13E-05	5.44E-03	5.90E-03	5.32E-01	<1	6.70E-01	<1
Cadmium	3.05E+00	3.00E-03	0.00E+00	0.00E+00	1.45E-02	1.45E-02	9.01E-05	2.56E-03	1.71E-02	7.70E-01	<1	6.87E+00	<1
Chromium	2.32E+01	0.00E+00	0.00E+00	0.00E+00	7.01E-02	7.01E-02	0.00E+00	1.95E-02	8.96E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	7.37E+00	0.00E+00	0.00E+00	0.00E+00	4.70E-03	4.70E-03	0.00E+00	6.20E-03	1.09E-02	7.33E+00	<1	1.89E+01	<1
Copper	2.66E+01	1.65E-02	0.00E+00	0.00E+00	3.72E-01	3.72E-01	4.96E-04	2.24E-02	3.95E-01	5.60E+00	<1	8.27E+01	<1
Lead	9.67E+01	7.60E-03	0.00E+00	0.00E+00	2.45E-01	2.45E-01	2.28E-04	8.13E-02	3.26E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E+01	--	1.46E+02	--
Mercury	3.13E-02	0.00E+00	0.00E+00	0.00E+00	3.58E-04	3.58E-04	0.00E+00	2.63E-05	3.84E-04	1.41E+00	<1	1.41E+01	<1
Nickel	3.26E+02	5.59E-02	0.00E+00	0.00E+00	3.48E-01	3.48E-01	1.68E-03	2.75E-01	6.24E-01	1.70E+00	<1	1.48E+01	<1
Selenium	1.13E+00	0.00E+00	0.00E+00	0.00E+00	2.08E-02	2.08E-02	0.00E+00	9.50E-04	2.17E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.99E+00	0.00E+00	0.00E+00	0.00E+00	6.46E-03	6.46E-03	0.00E+00	1.67E-03	8.13E-03	4.80E-01	<1	1.43E+00	<1
Vanadium	7.64E+01	1.80E-02	0.00E+00	0.00E+00	2.82E-02	2.82E-02	5.41E-04	6.43E-02	9.30E-02	4.16E+00	<1	9.44E+00	<1
Zinc	2.45E+02	5.37E-01	0.00E+00	0.00E+00	3.48E+00	3.48E+00	1.61E-02	2.06E-01	3.70E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.45E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.28E-04	3.74E-02	3.77E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	1.10E+02	2.24E+01	0.00E+00	0.00E+00	5.28E-02	5.28E-02	6.73E-01	9.24E-02	8.18E-01	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.49E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-02	2.10E-02				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.90E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.13E-02	4.13E-02				
Fluoranthene	6.10E+02	9.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.79E-04	5.13E-01	5.13E-01				
Fluorene	1.30E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-02	1.10E-02				
Naphthalene	2.39E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E-03	2.01E-03				
Phenanthrene	2.00E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.69E-01	1.69E-01				
Total LMW PAHs						0.00E+00	2.79E-04	7.57E-01	7.57E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	3.11E+02	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.01E-05	2.61E-01	2.61E-01				
Benzo[A]Pyrene	3.40E+02	3.90E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-01	2.86E-01	4.03E-01				
Benzo(b)fluoranthene	5.22E+02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-04	4.39E-01	4.39E-01				
Benzo(g,h,i)perylene	2.46E+02	3.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-04	2.07E-01	2.07E-01				
Benzo(k)fluoranthene	3.44E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.89E-01	2.89E-01				
Chrysene	3.58E+02	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.28E-04	3.01E-01	3.02E-01				
Dibenz(A,H)Anthracene	1.17E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.87E-02	9.87E-02				
Indeno (1,2,3-CD) Pyrene	2.25E+02	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.31E-05	1.89E-01	1.90E-01				
Pyrene	5.21E+02	7.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-04	4.38E-01	4.38E-01				
Total HMW PAHs						0.00E+00	1.18E-01	2.51E+00	2.63E+00	6.15E-01	**4.27E+00**	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.58E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-01	1.07E-01	0.00E+00	3.85E-03	1.11E-01	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	4.72E+00	0.00E+00	0.00E+00	0.00E+00	7.94E-03	7.94E-03	0.00E+00	3.97E-03	1.19E-02	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H21-14
Refined Exposure Evaluation - North American Wolverine
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H21-15
Refined Exposure Evaluation - Short-tailed Shrew
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	8.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.16E+00	0.00E+00	1.16E+00	No TRV	--	No TRV	--
Antimony	6.04E-01	0.00E+00	0.00E+00	8.10E-02	0.00E+00	8.10E-02	0.00E+00	8.91E-04	8.19E-02	5.90E-02	**1.39E+00**	2.76E+00	<1
Arsenic	1.46E+01	0.00E+00	0.00E+00	2.15E-01	0.00E+00	2.15E-01	0.00E+00	2.15E-02	2.36E-01	1.04E+00	<1	4.55E+00	<1
Barium	4.73E+02	2.34E-01	0.00E+00	5.77E+00	0.00E+00	5.77E+00	3.14E-02	6.97E-01	6.50E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	6.46E+00	7.10E-04	0.00E+00	3.90E-02	0.00E+00	3.90E-02	9.51E-05	9.53E-03	4.86E-02	5.32E-01	<1	6.70E-01	<1
Cadmium	3.05E+00	3.00E-03	0.00E+00	2.69E+00	0.00E+00	2.69E+00	4.02E-04	4.49E-03	2.70E+00	7.70E-01	**3.50E+00**	6.87E+00	<1
Chromium	2.32E+01	0.00E+00	0.00E+00	9.51E-01	0.00E+00	9.51E-01	0.00E+00	3.42E-02	9.85E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	7.37E+00	0.00E+00	0.00E+00	1.21E-01	0.00E+00	1.21E-01	0.00E+00	1.09E-02	1.31E-01	7.33E+00	<1	1.89E+01	<1
Copper	2.66E+01	1.65E-02	0.00E+00	1.84E+00	0.00E+00	1.84E+00	2.21E-03	3.93E-02	1.88E+00	5.60E+00	<1	8.27E+01	<1
Lead	9.67E+01	7.60E-03	0.00E+00	4.31E+00	0.00E+00	4.31E+00	1.02E-03	1.42E-01	4.45E+00	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E+01	--	1.46E+02	--
Mercury	3.13E-02	0.00E+00	0.00E+00	1.65E-02	0.00E+00	1.65E-02	0.00E+00	4.61E-05	1.65E-02	1.41E+00	<1	1.41E+01	<1
Nickel	3.26E+02	5.59E-02	0.00E+00	3.40E+01	0.00E+00	3.40E+01	7.49E-03	4.81E-01	3.45E+01	1.70E+00	**2.03E+01**	1.48E+01	**2.33E+00**
Selenium	1.13E+00	0.00E+00	0.00E+00	1.36E-01	0.00E+00	1.36E-01	0.00E+00	1.66E-03	1.38E-01	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	1.99E+00	0.00E+00	0.00E+00	1.44E-02	0.00E+00	1.44E-02	0.00E+00	2.93E-03	1.73E-02	4.80E-01	<1	1.43E+00	<1
Vanadium	7.64E+01	1.80E-02	0.00E+00	4.30E-01	0.00E+00	4.30E-01	2.41E-03	1.13E-01	5.45E-01	4.16E+00	<1	9.44E+00	<1
Zinc	2.45E+02	5.37E-01	0.00E+00	6.97E+01	0.00E+00	6.97E+01	7.20E-02	3.62E-01	7.01E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.45E+01	7.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-03	6.56E-02	6.66E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	1.10E+02	2.24E+01	0.00E+00	1.82E+00	0.00E+00	1.82E+00	3.00E+00	1.62E-01	4.99E+00	2.66E+01	<1	4.90E+01	<1
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	2.49E+01	0.00E+00	0.00E+00	4.91E+00	0.00E+00	4.91E+00	0.00E+00	3.68E-02	4.95E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	4.90E+01	0.00E+00	0.00E+00	1.59E+01	0.00E+00	1.59E+01	0.00E+00	7.23E-02	1.60E+01				
Fluoranthene	6.10E+02	9.30E-03	0.00E+00	2.48E+02	0.00E+00	2.48E+02	1.25E-03	8.99E-01	2.49E+02				
Fluorene	1.30E+01	0.00E+00	0.00E+00	1.67E+01	0.00E+00	1.67E+01	0.00E+00	1.92E-02	1.67E+01				
Naphthalene	2.39E+00	0.00E+00	0.00E+00	1.41E+00	0.00E+00	1.41E+00	0.00E+00	3.53E-03	1.41E+00				
Phenanthrene	2.00E+02	0.00E+00	0.00E+00	4.62E+01	0.00E+00	4.62E+01	0.00E+00	2.95E-01	4.65E+01				
Total LMW PAHs						3.33E+02	1.25E-03	1.33E+00	3.35E+02	6.56E+01	**5.10E+00**	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	3.11E+02	3.00E-03	0.00E+00	6.62E+01	0.00E+00	6.62E+01	4.02E-04	4.58E-01	6.67E+01				
Benzo[A]Pyrene	3.40E+02	3.90E+00	0.00E+00	6.06E+01	0.00E+00	6.06E+01	5.23E-01	5.02E-01	6.17E+01				
Benzo(b)fluoranthene	5.22E+02	1.00E-02	0.00E+00	1.82E+02	0.00E+00	1.82E+02	1.34E-03	7.69E-01	1.83E+02				
Benzo(g,h,i)perylene	2.46E+02	3.90E-03	0.00E+00	9.69E+01	0.00E+00	9.69E+01	5.23E-04	3.63E-01	9.73E+01				
Benzo(k)fluoranthene	3.44E+02	0.00E+00	0.00E+00	1.20E+02	0.00E+00	1.20E+02	0.00E+00	5.06E-01	1.20E+02				
Chrysene	3.58E+02	7.60E-03	0.00E+00	1.10E+02	0.00E+00	1.10E+02	1.02E-03	5.28E-01	1.11E+02				
Dibenz(A,H)Anthracene	1.17E+02	0.00E+00	0.00E+00	3.63E+01	0.00E+00	3.63E+01	0.00E+00	1.73E-01	3.65E+01				
Indeno (1,2,3-CD) Pyrene	2.25E+02	3.10E-03	0.00E+00	8.63E+01	0.00E+00	8.63E+01	4.15E-04	3.32E-01	8.66E+01				
Pyrene	5.21E+02	7.00E-03	0.00E+00	1.22E+02	0.00E+00	1.22E+02	9.38E-04	7.68E-01	1.23E+02				
Total HMW PAHs						8.80E+02	5.27E-01	4.40E+00	8.85E+02	6.15E-01	**1.44E+03**	3.84E+01	**2.30E+01**
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.58E+00	0.00E+00	0.00E+00	3.34E+01	0.00E+00	3.34E+01	0.00E+00	6.74E-03	3.34E+01	1.83E+01	**1.82E+00**	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	4.72E+00	0.00E+00	0.00E+00	4.40E+00	0.00E+00	4.40E+00	0.00E+00	6.96E-03	4.41E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H21-15
Refined Exposure Evaluation - Short-tailed Shrew
North Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H22-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - South Percolation Pond Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	1.00E+00	0.00E+00	Assumption[c]	5.00E-02	0.00E+00	Baes et al. (1984)[e]
Arsenic	NA	ND	3.75E-02	0	Bechtel-Jacobs (1998a)[g]	Regression[d]	0	Sample et al. (1999)	Regression[f]	0	Sample et al. (1998b)
Barium	NA	6.40E+02	1.56E-01	9.99E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	5.82E+01	Sample et al. (1998a)	6.83E-04	4.37E-01	Baes et al. (1984)[e]
Beryllium	NA	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	2.50E+00	Regression[a]	1.03E+00	Bechtel-Jacobs (1998a)	Regression[d]	1.72E+01	Sample et al. (1999)	Regression[f]	4.39E-01	Sample et al. (1998b)
Chromium	NA	1.14E+01	4.10E-02	4.66E-01	Bechtel-Jacobs (1998a)[g]	3.06E-01	3.48E+00	Sample et al. (1998a)	Regression[f]	1.38E+00	Sample et al. (1998b)
Cobalt	NA	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	2.03E+02	Regression[a]	1.58E+01	Bechtel-Jacobs (1998a)	5.15E-01	1.05E+02	Sample et al. (1998a)	Regression[f]	1.66E+01	Sample et al. (1998b)
Lead	NA	3.44E+01	Regression[a]	1.93E+00	Bechtel-Jacobs (1998a)	Regression[d]	1.40E+01	Sample et al. (1999)	Regression[f]	5.16E+00	Sample et al. (1998b)
Manganese	NA	0.00E+00	7.90E-02	0.00E+00	Bechtel-Jacobs (1998a)[g]	Regression[d]	0.00E+00	Sample et al. (1999)	2.05E-02	0.00E+00	Sample et al. (1998b)[i]
Mercury	NA	3.49E-01	Regression[a]	2.08E-01	Bechtel-Jacobs (1998a)	3.93E+00	1.37E+00	Sample et al. (1998a)	3.81E-01	1.33E-01	LANL (2015)
Nickel	NA	1.90E+01	Regression[a]	9.78E-01	Bechtel-Jacobs (1998a)	7.78E-01	1.48E+01	Sample et al. (1998a)	Regression[f]	3.08E+00	Sample et al. (1998b)
Selenium	NA	5.72E-01	Regression[a]	2.74E-01	Bechtel-Jacobs (1998a)	Regression[d]	6.16E-01	Sample et al. (1998a)	Regression[f]	5.35E-01	Sample et al. (1998b)
Silver		2.35E+01	1.40E-02	1.66E+01	Bechtel-Jacobs (1998a)m	2.05E+00	9.38E+00	Sample et al. (1998a)	4.00E-03	2.17E+00	Sample et al. (1998b)
Thallium	NA	0.00E+00	4.00E-03	0.00E+00	Baes et al. (1984)	5.41E-02	0.00E+00	USCHPPM (2004)	1.08E-01	0.00E+00	Baes et al. (1984)[e]
Vanadium	NA	0.00E+00	4.85E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	4.20E-02	0.00E+00	Sample et al. (1998a)	1.23E-02	0.00E+00	Sample et al. (1998b)[i]
Zinc	NA	1.16E+02	Regression[a]	6.71E+01	Bechtel-Jacobs (1998a)	Regression[d]	4.06E+02	Sample et al. (1998a)	Regression[f]	1.10E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	4.43E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Phenanthrene	4.55	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs											

Table H22-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - South Percolation Pond Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	2.46E-01	Regression[a]	2.90E-02	USEPA (2007a)	1.59E+00	3.92E-01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	8.21E-01	Regression[a]	1.05E-01	USEPA (2007a)	1.33E+00	1.09E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs											
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	2.20E+00	2.38E-02	5.23E-02	USEPA (2007a)	5.44E+01	1.20E+02	USEPA (2007a)	7.79E-01	1.71E+00	LANL (2015)
Butylbenzylphthalate	4.84	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	5.80E-02	8.14E-01	4.72E-02	USEPA (2007a)	1.03E+01	5.98E-01	USEPA (2007a)	4.49E-01	2.60E-02	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H22-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - South Percolation Pond Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[j]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[j]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[j]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[j]
OCDF	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[j]

Table H22-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - South Percolation Pond Area (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	9.38E-01	USEPA (2007)
Beryllium	-0.5361	7.35E-01	USEPA (2007)
Cadmium	-0.475	5.46E-01	Bechtel-Jacobs (1998)
Copper	0.668	3.94E-01	Bechtel-Jacobs (1998)
Lead	-1.328	5.61E-01	Bechtel-Jacobs (1998)
Mercury	-0.996	5.44E-01	Bechtel-Jacobs (1998)
Nickel	-2.223	7.48E-01	Bechtel-Jacobs (1998)
Selenium	-0.677	1.10E+00	Bechtel-Jacobs (1998)
Zinc	1.575	5.54E-01	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-8.56E-01	USEPA (2007)
Acenaphthylene	-1.144	7.91E-01	USEPA (2007)
Anthracene	-0.9887	7.78E-01	USEPA (2007)
Benzo(a)anthracene	-2.7078	5.94E-01	USEPA (2007)
Benzo(a)pyrene	-2.0615	9.75E-01	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.18E+00	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	8.60E-01	USEPA (2007)
Chrysene	-2.7078	5.94E-01	USEPA (2007)
Fluorene	-5.562	-8.56E-01	USEPA (2007)
Phenanthrene	-0.1665	6.20E-01	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	7.06E-01	Sample et al. (1999)
Cadmium	2.114	7.95E-01	Sample et al. (1999)
Lead	-0.218	8.07E-01	Sample et al. (1999)
Manganese	-0.809	6.82E-01	Sample et al. (1999)
Selenium	-0.075	7.33E-01	Sample et al. (1999)
Zinc	4.449	3.28E-01	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.18E+00	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	8.19E-01	Sample et al. (1998b)
Cadmium	-1.2571	4.72E-01	Sample et al. (1998b)
Chromium	-1.4599	7.34E-01	Sample et al. (1998b)
Cobalt	-4.4669	1.31E+00	Sample et al. (1998b)
Copper	2.042	1.44E-01	Sample et al. (1998b)
Lead	0.0761	4.42E-01	Sample et al. (1998b)
Nickel	-0.2462	4.66E-01	Sample et al. (1998b)
Selenium	-0.4158	3.76E-01	Sample et al. (1998b)
Zinc	4.3632	7.06E-02	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.10E+00	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H22-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - South Percolation Pond Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	1.00E+00	0.00E+00	Assumption[c]	5.00E-02	0.00E+00	Baes et al. (1984)[e]
Arsenic	NA	ND	3.75E-02	0	Bechtel-Jacobs (1998a)[g]	Regression[d]	0	Sample et al. (1999)	Regression[f]	0	Sample et al. (1998b)
Barium	NA	3.19E+02	1.56E-01	4.98E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	2.91E+01	Sample et al. (1998a)	6.83E-04	2.18E-01	Baes et al. (1984)[e]
Beryllium	NA	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	1.75E+00	Regression[a]	8.44E-01	Bechtel-Jacobs (1998a)	Regression[d]	1.29E+01	Sample et al. (1999)	Regression[f]	3.71E-01	Sample et al. (1998b)
Chromium	NA	1.10E+01	4.10E-02	4.52E-01	Bechtel-Jacobs (1998a)[g]	3.06E-01	3.37E+00	Sample et al. (1998a)	Regression[f]	1.35E+00	Sample et al. (1998b)
Cobalt	NA	4.65E+00	7.50E-03	3.49E-02	Bechtel-Jacobs (1998a)[g]	1.22E-01	5.67E-01	Sample et al. (1998a)	Regression[f]	8.56E-02	Sample et al. (1998b)
Copper	NA	1.93E+02	Regression[a]	1.55E+01	Bechtel-Jacobs (1998a)	5.15E-01	9.93E+01	Sample et al. (1998a)	Regression[f]	1.65E+01	Sample et al. (1998b)
Lead	NA	4.30E+01	Regression[a]	2.19E+00	Bechtel-Jacobs (1998a)	Regression[d]	1.67E+01	Sample et al. (1999)	Regression[f]	5.69E+00	Sample et al. (1998b)
Manganese	NA	9.88E+01	7.90E-02	7.81E+00	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.02E+01	Sample et al. (1999)	2.05E-02	2.03E+00	Sample et al. (1998b)[i]
Mercury	NA	4.90E-01	Regression[a]	2.51E-01	Bechtel-Jacobs (1998a)	3.93E+00	1.93E+00	Sample et al. (1998a)	3.81E-01	1.87E-01	LANL (2015)
Nickel	NA	1.64E+01	Regression[a]	8.78E-01	Bechtel-Jacobs (1998a)	7.78E-01	1.28E+01	Sample et al. (1998a)	Regression[f]	2.88E+00	Sample et al. (1998b)
Selenium	NA	7.83E-01	Regression[a]	3.88E-01	Bechtel-Jacobs (1998a)	Regression[d]	7.75E-01	Sample et al. (1998a)	Regression[f]	6.02E-01	Sample et al. (1998b)
Silver		9.03E+00	1.40E-02	5.76E+00	Bechtel-Jacobs (1998a)m	2.05E+00	4.65E+00	Sample et al. (1998a)	4.00E-03	1.51E+00	Sample et al. (1998b)
Thallium	NA	0.00E+00	4.00E-03	0.00E+00	Baes et al. (1984)	5.41E-02	0.00E+00	USCHPPM (2004)	1.08E-01	0.00E+00	Baes et al. (1984)[e]
Vanadium	NA	0.00E+00	4.85E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	4.20E-02	0.00E+00	Sample et al. (1998a)	1.23E-02	0.00E+00	Sample et al. (1998b)[i]
Zinc	NA	1.20E+02	Regression[a]	6.86E+01	Bechtel-Jacobs (1998a)	Regression[d]	4.12E+02	Sample et al. (1998a)	Regression[f]	1.10E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	2.25E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]

Table H22-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - South Percolation Pond Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Phenanthrene	4.55	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs											
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	3.29E-01	Regression[a]	3.45E-02	USEPA (2007a)	1.59E+00	5.24E-01	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	1.71E+00	Regression[a]	2.15E-01	USEPA (2007a)	1.33E+00	2.28E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs											
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	1.68E+00	2.38E-02	3.99E-02	USEPA (2007a)	5.44E+01	9.13E+01	USEPA (2007a)	7.79E-01	1.31E+00	LANL (2015)
Butylbenzylphthalate	4.84	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	2.26E-02	8.14E-01	1.84E-02	USEPA (2007a)	1.03E+01	2.33E-01	USEPA (2007a)	4.49E-01	1.01E-02	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)

Table H22-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - South Percolation Pond Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H22-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - South Percolation Pond Area (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	9.38E-01	USEPA (2007)
Beryllium	-0.5361	7.35E-01	USEPA (2007)
Cadmium	-0.475	5.46E-01	Bechtel-Jacobs (1998)
Copper	0.668	3.94E-01	Bechtel-Jacobs (1998)
Lead	-1.328	5.61E-01	Bechtel-Jacobs (1998)
Mercury	-0.996	5.44E-01	Bechtel-Jacobs (1998)
Nickel	-2.223	7.48E-01	Bechtel-Jacobs (1998)
Selenium	-0.677	1.10E+00	Bechtel-Jacobs (1998)
Zinc	1.575	5.54E-01	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-8.56E-01	USEPA (2007)
Acenaphthylene	-1.144	7.91E-01	USEPA (2007)
Anthracene	-0.9887	7.78E-01	USEPA (2007)
Benzo(a)anthracene	-2.7078	5.94E-01	USEPA (2007)
Benzo(a)pyrene	-2.0615	9.75E-01	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.18E+00	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	8.60E-01	USEPA (2007)
Chrysene	-2.7078	5.94E-01	USEPA (2007)
Fluorene	-5.562	-8.56E-01	USEPA (2007)
Phenanthrene	-0.1665	6.20E-01	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	7.06E-01	Sample et al. (1999)
Cadmium	2.114	7.95E-01	Sample et al. (1999)
Lead	-0.218	8.07E-01	Sample et al. (1999)
Manganese	-0.809	6.82E-01	Sample et al. (1999)
Selenium	-0.075	7.33E-01	Sample et al. (1999)
Zinc	4.449	3.28E-01	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.18E+00	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	8.19E-01	Sample et al. (1998b)
Cadmium	-1.2571	4.72E-01	Sample et al. (1998b)
Chromium	-1.4599	7.34E-01	Sample et al. (1998b)
Cobalt	-4.4669	1.31E+00	Sample et al. (1998b)
Copper	2.042	1.44E-01	Sample et al. (1998b)
Lead	0.0761	4.42E-01	Sample et al. (1998b)
Nickel	-0.2462	4.66E-01	Sample et al. (1998b)
Selenium	-0.4158	3.76E-01	Sample et al. (1998b)
Zinc	4.3632	7.06E-02	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.10E+00	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H22-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Metals								
Aluminum	NA	6.02E+00	0.00E+00	NA	7.40E-02	---	0.00E+00	Stanley et al. (2010)
Antimony	NA	0.00E+00	0.00E+00	NA	5.75E-01	---	0.00E+00	Dovick et al. (2015)
Arsenic	NA	0.00E+00	0.00E+00	NA	3.73E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Barium	NA	7.88E-01	6.40E+02	NA	2.82E+00	---	1.81E+03	Hamilton et al. (2002)
Beryllium	NA	0.00E+00	0.00E+00	NA	1.67E-01	---	0.00E+00	Hamilton et al. (2002)
Cadmium	NA	0.00E+00	0.00E+00	NA	4.59E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Chromium	NA	0.00E+00	0.00E+00	NA	8.30E-02	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Cobalt		0.00E+00	0.00E+00					
Copper	NA	4.69E-02	2.03E+02	NA	6.61E-01	---	1.34E+02	Bechtel-Jacobs (1998b)[c]
Lead	NA	0.00E+00	3.44E+01	NA	8.00E-02	---	2.75E+00	Bechtel-Jacobs (1998b)[c]
Manganese		8.87E-02	0.00E+00					
Mercury	NA	0.00E+00	3.49E-01	NA	2.84E+00	---	9.91E-01	Bechtel-Jacobs (1998c)[c]
Nickel	NA	0.00E+00	1.90E+01	NA	1.34E-01	---	2.54E+00	Bechtel-Jacobs (1998b)[c]
Selenium	NA	0.00E+00	0.00E+00	NA	3.75E+00	---	0.00E+00	Hamilton et al. (2002)
Silver	NA	0.00E+00	0.00E+00	NA	1.80E-01	---	0.00E+00	Hirsch (1998)
Thallium	NA	0.00E+00	0.00E+00	NA	2.00E-02	---	0.00E+00	Turner et al. (2013)
Vanadium	NA	6.61E-03	1.18E+01	NA	2.50E-01	---	2.95E+00	Hamilton and Buhl (2002)
Zinc	NA	0.00E+00	1.16E+02	NA	8.40E-01	---	9.71E+01	Bechtel-Jacobs (1998b)[c]
Inorganics - Other Inorganics								
Cyanide	NA	4.28E-02	4.43E+00	NA	0.00E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	0.00E+00	0.00E+00	NA	---	Regression	0.00E+00	Derived based on Aquirre-Sierra et al. (2013)
Polychlorinated Biphenyls (PCBs)								
Aroclor 1248	6.34	0.00E+00	0.00E+00	5.74E-01	0.00E+00	---	0.00E+00	DiToro and McGrath (2000)
Aroclor 1254	6.98	0.00E+00	0.00E+00	5.43E-01	0.00E+00	---	0.00E+00	DiToro and McGrath (2000)
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)								
Low Molecular Weight (LMW) PAHs:								
Acenaphthene	4.01	0.00E+00	0.00E+00	7.04E-01	4.58E+00	---	0.00E+00	DiToro and McGrath (2000)
Acenaphthylene	3.22	0.00E+00	0.00E+00	7.54E-01	4.90E+00	---	0.00E+00	DiToro and McGrath (2000)
Anthracene	4.53	0.00E+00	3.59E-02	6.73E-01	4.37E+00	---	1.57E-01	DiToro and McGrath (2000)
Fluoranthene	5.08	0.00E+00	6.17E-01	6.41E-01	4.17E+00	---	2.57E+00	DiToro and McGrath (2000)

Table H22-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Fluorene	4.21	0.00E+00	0.00E+00	6.92E-01	4.50E+00	---	0.00E+00	DiToro and McGrath (2000)
Naphthalene	3.36	0.00E+00	0.00E+00	7.45E-01	4.84E+00	---	0.00E+00	DiToro and McGrath (2000)
Phenanthrene	4.57	0.00E+00	2.01E-01	6.70E-01	4.36E+00	---	8.75E-01	DiToro and McGrath (2000)
Total LMW PAHs							3.60E+00	

Table H22-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
High Molecular Weight (HMW) PAHs:								
Benzo(a)anthracene	6.71	0.00E+00	2.46E-01	5.56E-01	3.61E+00	---	8.91E-01	DiToro and McGrath (2000)
Benzo[A]Pyrene	6.11	0.00E+00	8.21E-01	5.86E-01	3.81E+00	---	3.13E+00	DiToro and McGrath (2000)
Benzo(b)fluoranthene	6.27	0.00E+00	0.00E+00	5.78E-01	3.76E+00	---	0.00E+00	DiToro and McGrath (2000)
Benzo(g,h,i)perylene	6.51	0.00E+00	7.26E-01	5.66E-01	3.68E+00	---	2.67E+00	DiToro and McGrath (2000)
Benzo(k)fluoranthene	6.29	0.00E+00	2.34E-01	5.77E-01	3.75E+00	---	8.79E-01	DiToro and McGrath (2000)
Chrysene	5.71	0.00E+00	9.12E-01	6.07E-01	3.94E+00	---	3.60E+00	DiToro and McGrath (2000)
Dibenz(A,H)Anthracene	6.71	0.00E+00	1.32E-01	5.56E-01	3.61E+00	---	4.78E-01	DiToro and McGrath (2000)
Indeno (1,2,3-CD) Pyrene	6.72	2.80E-04	9.84E-01	5.55E-01	3.61E+00	---	3.55E+00	DiToro and McGrath (2000)
Pyrene	4.92	0.00E+00	5.16E-01	6.50E-01	4.23E+00	---	2.18E+00	DiToro and McGrath (2000)
Total HMW PAHs							1.74E+01	
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs								
1,2,4,5-Tetrachlorobenzene		0.00E+00	0.00E+00					
2,3,4,6-Tetrachlorophenol	4.09	0.00E+00	0.00E+00	6.99E-01	4.54E+00	---	0.00E+00	DiToro and McGrath (2000)
2-Chloronaphthalene	3.81	0.00E+00	0.00E+00	7.16E-01	4.66E+00	---	0.00E+00	DiToro and McGrath (2000)
Biphenyl (Diphenyl)	3.76	0.00E+00	0.00E+00	7.20E-01	4.68E+00	---	0.00E+00	DiToro and McGrath (2000)
Bis(2-ethylhexyl)phthalate	8.39	0.00E+00	0.00E+00	4.80E-01	3.12E+00	---	0.00E+00	DiToro and McGrath (2000)
Butylbenzylphthalate		0.00E+00	0.00E+00					
Dibenzofuran	3.71	0.00E+00	0.00E+00	7.23E-01	4.70E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	6.68E-01	4.34E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-octyl phthalate	8.54	0.00E+00	0.00E+00	4.74E-01	3.08E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobenzene	5.86	0.00E+00	0.00E+00	5.99E-01	3.89E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobutadiene	4.72	0.00E+00	0.00E+00	6.62E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachloroethane		0.00E+00	0.00E+00					
Pentachlorophenol	4.74	0.00E+00	0.00E+00	6.61E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)
Volatile Organic Compounds (VOCs)								
Methylcyclohexane		0.00E+00	0.00E+00					

Table H22-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Dioxin/Furans								
2,3,7,8-TCDD		0.00E+00	0.00E+00					
1,2,3,7,8-PeCDD		0.00E+00	0.00E+00					
1,2,3,4,7,8-HxCDD		0.00E+00	0.00E+00					
1,2,3,6,7,8-HxCDD		0.00E+00	0.00E+00					
1,2,3,7,8,9-HxCDD		0.00E+00	0.00E+00					
1,2,3,4,6,7,8-HpCDD		0.00E+00	0.00E+00					
OCDD		0.00E+00	0.00E+00					
2,3,7,8-TCDF		0.00E+00	0.00E+00					
1,2,3,7,8-PeCDF		0.00E+00	0.00E+00					
2,3,4,7,8-PeCDF		0.00E+00	0.00E+00					
1,2,3,4,7,8-HxCDF		0.00E+00	0.00E+00					
1,2,3,6,7,8-HxCDF		0.00E+00	0.00E+00					
2,3,4,6,7,8-HxCDF		0.00E+00	0.00E+00					
1,2,3,7,8,9-HxCDF		0.00E+00	0.00E+00					
1,2,3,4,6,7,8-HpCDF		0.00E+00	0.00E+00					
1,2,3,4,7,8,9-HpCDF		0.00E+00	0.00E+00					
OCDF		0.00E+00	0.00E+00					

Notes:
NA, Normalized BSAF was not applicable for metals
a, Normalized BSAF (kg OC / kg lipid) calculated based on K_{ow}, where BSAF = $K_{ow}^{-0.038}$ (DiToro and McGrath 2000)
b, For non-ionic organic constituents, dry weight BSAF calculated from sediment organic carbon and lipid normalized BSAF as follows:

$$BSAF_{dry\ weight} = BSAF_{norm} \times f_{lip;id} \times \frac{1}{f_{oc}}$$

where: $BSAF_{norm}$ = Normalized BSAF (kg OC/kg lipid)
f_{lipid} = Fraction of lipids in prey item expressed on a dry weight basis (0.065, invertebrates; 0.08, fish)
f_{oc} = Fraction of sediment organic carbon expressed on a dry weight basis (0.01 or 1%)
c, Median BSAF for non-depurated invertebrates determined by Bechtel-Jacobs (1998b)

Table H22-3
Refined Exposure Evaluation - American Dipper
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	6.02E+00	0.00E+00	0.00E+00	0.00E+00	9.99E-01	0.00E+00	9.99E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	6.40E+02	7.88E-01	3.00E+02	0.00E+00	3.00E+02	1.31E-01	2.12E+00	3.02E+02	7.35E+01	**4.11E+00**	1.31E+02	**2.30E+00**
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.03E+02	4.69E-02	2.23E+01	0.00E+00	2.23E+01	7.78E-03	6.74E-01	2.29E+01	4.05E+00	**5.66E+00**	3.48E+01	<1
Lead	3.44E+01	0.00E+00	4.57E-01	0.00E+00	4.57E-01	0.00E+00	1.14E-01	5.71E-01	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	8.87E-02	0.00E+00	0.00E+00	0.00E+00	1.47E-02	0.00E+00	1.47E-02	1.79E+02	<1	3.77E+02	<1
Mercury	3.49E-01	0.00E+00	1.65E-01	0.00E+00	1.65E-01	0.00E+00	1.16E-03	1.66E-01	4.50E-01	<1	9.10E-01	<1
Nickel	1.90E+01	0.00E+00	4.22E-01	0.00E+00	4.22E-01	0.00E+00	6.29E-02	4.85E-01	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-01	--	8.20E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.18E+01	6.61E-03	4.90E-01	0.00E+00	4.90E-01	1.10E-03	3.92E-02	5.30E-01	3.44E-01	**1.54E+00**	1.70E+00	<1
Zinc	1.16E+02	0.00E+00	1.61E+01	0.00E+00	1.61E+01	0.00E+00	3.84E-01	1.65E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics												
Cyanide	4.43E+00	4.28E-02	0.00E+00	0.00E+00	0.00E+00	7.11E-03	1.47E-02	2.18E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	3.59E-02	0.00E+00	2.60E-02	0.00E+00	2.60E-02	0.00E+00	1.19E-04	2.62E-02				
Fluoranthene	6.17E-01	0.00E+00	4.27E-01	0.00E+00	4.27E-01	0.00E+00	2.05E-03	4.29E-01				
Fluorene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	2.01E-01	0.00E+00	1.45E-01	0.00E+00	1.45E-01	0.00E+00	6.66E-04	1.46E-01				
Total LMW PAHs					5.98E-01	0.00E+00	2.83E-03	6.01E-01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	2.46E-01	0.00E+00	1.48E-01	0.00E+00	1.48E-01	0.00E+00	8.18E-04	1.49E-01				
Benzo[A]Pyrene	8.21E-01	0.00E+00	5.19E-01	0.00E+00	5.19E-01	0.00E+00	2.72E-03	5.21E-01				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	7.26E-01	0.00E+00	4.43E-01	0.00E+00	4.43E-01	0.00E+00	2.41E-03	4.45E-01				
Benzo(k)fluoranthene	2.34E-01	0.00E+00	1.46E-01	0.00E+00	1.46E-01	0.00E+00	7.78E-04	1.47E-01				
Chrysene	9.12E-01	0.00E+00	5.97E-01	0.00E+00	5.97E-01	0.00E+00	3.03E-03	6.00E-01				
Dibenz(A,H)Anthracene	1.32E-01	0.00E+00	7.93E-02	0.00E+00	7.93E-02	0.00E+00	4.39E-04	7.98E-02				
Indeno (1,2,3-CD) Pyrene	9.84E-01	2.80E-04	5.90E-01	0.00E+00	5.90E-01	4.65E-05	3.27E-03	5.93E-01				
Pyrene	5.16E-01	0.00E+00	3.62E-01	0.00E+00	3.62E-01	0.00E+00	1.71E-03	3.64E-01				
Total HMW PAHs					2.88E+00	4.65E-05	1.52E-02	2.90E+00	2.00E+00	**1.45E+00**	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H22-3
Refined Exposure Evaluation - American Dipper
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H22-4
Refined Exposure Evaluation - American Woodcock
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	6.02E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.07E-01	0.00E+00	7.07E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	6.40E+02	7.88E-01	1.17E+00	6.16E+00	0.00E+00	7.33E+00	9.26E-02	5.64E+00	1.31E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Cadmium	2.50E+00	0.00E+00	1.20E-02	1.81E+00	0.00E+00	1.83E+00	0.00E+00	2.20E-02	1.85E+00	1.47E+00	**1.26E+00**	6.35E+00	<1
Chromium	1.14E+01	0.00E+00	5.47E-03	3.68E-01	0.00E+00	3.73E-01	0.00E+00	1.00E-01	4.73E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.03E+02	4.69E-02	1.86E-01	1.11E+01	0.00E+00	1.12E+01	5.51E-03	1.79E+00	1.30E+01	4.05E+00	**3.22E+00**	3.48E+01	<1
Lead	3.44E+01	0.00E+00	2.27E-02	1.48E+00	0.00E+00	1.50E+00	0.00E+00	3.03E-01	1.80E+00	1.63E+00	**1.11E+00**	4.46E+01	<1
Manganese	0.00E+00	8.87E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-02	0.00E+00	1.04E-02	1.79E+02	<1	3.77E+02	<1
Mercury	3.49E-01	0.00E+00	2.45E-03	1.45E-01	0.00E+00	1.48E-01	0.00E+00	3.08E-03	1.51E-01	4.50E-01	<1	9.10E-01	<1
Nickel	1.90E+01	0.00E+00	1.15E-02	1.56E+00	0.00E+00	1.57E+00	0.00E+00	1.67E-01	1.74E+00	6.71E+00	<1	1.86E+01	<1
Selenium	5.72E-01	0.00E+00	3.22E-03	6.51E-02	0.00E+00	6.83E-02	0.00E+00	5.04E-03	7.34E-02	2.90E-01	<1	8.20E-01	<1
Silver	2.35E+01	0.00E+00	1.95E-01	9.92E-01	0.00E+00	1.19E+00	0.00E+00	2.07E-01	1.39E+00	2.02E+00	<1	6.05E+01	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	0.00E+00	6.61E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.76E-04	0.00E+00	7.76E-04	3.44E-01	<1	1.70E+00	<1
Zinc	1.16E+02	0.00E+00	7.89E-01	4.30E+01	0.00E+00	4.37E+01	0.00E+00	1.02E+00	4.48E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.43E+00	4.28E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.03E-03	3.90E-02	4.41E-02	4.00E-02	**1.10E+00**	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	2.46E-01	0.00E+00	3.41E-04	4.14E-02	0.00E+00	4.18E-02	0.00E+00	2.17E-03	4.39E-02				
Benzo[A]Pyrene	8.21E-01	0.00E+00	1.23E-03	1.15E-01	0.00E+00	1.17E-01	0.00E+00	7.23E-03	1.24E-01				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	3.29E-05	--	3.29E-05				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						1.58E-01	3.29E-05	9.40E-03	1.68E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.20E+00	0.00E+00	6.15E-04	1.27E+01	0.00E+00	1.27E+01	0.00E+00	1.94E-02	1.27E+01	1.10E+00	**1.15E+01**	1.10E+01	**1.152496213**
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.80E-02	ND	5.55E-04	6.32E-02	0.00E+00	6.38E-02	--	5.11E-04	6.43E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H22-4
Refined Exposure Evaluation - American Woodcock
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H22-5
Refined Exposure Evaluation - Belted Kingfisher
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals												
Aluminum	0.00E+00	6.02E+00	0.00E+00	0.00E+00	0.00E+00	9.48E-01	0.00E+00	9.48E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	6.40E+02	7.88E-01	2.84E+01	0.00E+00	2.84E+01	1.24E-01	0.00E+00	2.86E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.03E+02	4.69E-02	2.11E+00	0.00E+00	2.11E+00	7.39E-03	0.00E+00	2.12E+00	4.05E+00	<1	3.48E+01	<1
Lead	3.44E+01	0.00E+00	4.34E-02	0.00E+00	4.34E-02	0.00E+00	0.00E+00	4.34E-02	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	8.87E-02	0.00E+00	0.00E+00	0.00E+00	1.40E-02	0.00E+00	1.40E-02	1.79E+02	<1	3.77E+02	<1
Mercury	3.49E-01	0.00E+00	1.56E-02	0.00E+00	1.56E-02	0.00E+00	0.00E+00	1.56E-02	4.50E-01	<1	9.10E-01	<1
Nickel	1.90E+01	0.00E+00	4.00E-02	0.00E+00	4.00E-02	0.00E+00	0.00E+00	4.00E-02	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-01	--	8.20E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.18E+01	6.61E-03	4.65E-02	0.00E+00	4.65E-02	1.04E-03	0.00E+00	4.75E-02	3.44E-01	<1	1.70E+00	<1
Zinc	1.16E+02	0.00E+00	1.53E+00	0.00E+00	1.53E+00	0.00E+00	0.00E+00	1.53E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics												
Cyanide	4.43E+00	4.28E-02	0.00E+00	0.00E+00	0.00E+00	6.75E-03	0.00E+00	6.75E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	3.59E-02	0.00E+00	2.47E-03	0.00E+00	2.47E-03	0.00E+00	0.00E+00	2.47E-03				
Fluoranthene	6.17E-01	0.00E+00	4.06E-02	0.00E+00	4.06E-02	0.00E+00	0.00E+00	4.06E-02				
Fluorene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	2.01E-01	0.00E+00	1.38E-02	0.00E+00	1.38E-02	0.00E+00	0.00E+00	1.38E-02				
Total LMW PAHs					5.68E-02	0.00E+00	0.00E+00	5.68E-02	1.61E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	2.46E-01	0.00E+00	1.40E-02	0.00E+00	1.40E-02	0.00E+00	0.00E+00	1.40E-02				
Benzo[A]Pyrene	8.21E-01	0.00E+00	4.93E-02	0.00E+00	4.93E-02	0.00E+00	0.00E+00	4.93E-02				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	7.26E-01	0.00E+00	4.20E-02	0.00E+00	4.20E-02	0.00E+00	0.00E+00	4.20E-02				
Benzo(k)fluoranthene	2.34E-01	0.00E+00	1.38E-02	0.00E+00	1.38E-02	0.00E+00	0.00E+00	1.38E-02				
Chrysene	9.12E-01	0.00E+00	5.67E-02	0.00E+00	5.67E-02	0.00E+00	0.00E+00	5.67E-02				
Dibenz(A,H)Anthracene	1.32E-01	0.00E+00	7.53E-03	0.00E+00	7.53E-03	0.00E+00	0.00E+00	7.53E-03				
Indeno (1,2,3-CD) Pyrene	9.84E-01	2.80E-04	5.60E-02	0.00E+00	5.60E-02	4.41E-05	0.00E+00	5.61E-02				
Pyrene	5.16E-01	0.00E+00	3.44E-02	0.00E+00	3.44E-02	0.00E+00	0.00E+00	3.44E-02				
Total HMW PAHs					2.74E-01	4.41E-05	0.00E+00	2.74E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H22-5
Refined Exposure Evaluation - Belted Kingfisher
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H22-6
Refined Exposure Evaluation - Mourning Dove
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	6.02E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.87E-01	0.00E+00	6.87E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	6.40E+02	7.88E-01	1.14E+01	0.00E+00	0.00E+00	1.14E+01	8.99E-02	4.97E+00	1.65E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Cadmium	2.50E+00	0.00E+00	1.17E-01	0.00E+00	0.00E+00	1.17E-01	0.00E+00	1.94E-02	1.36E-01	1.47E+00	<1	6.35E+00	<1
Chromium	1.14E+01	0.00E+00	5.32E-02	0.00E+00	0.00E+00	5.32E-02	0.00E+00	8.82E-02	1.41E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.03E+02	4.69E-02	1.81E+00	0.00E+00	0.00E+00	1.81E+00	5.35E-03	1.58E+00	3.39E+00	4.05E+00	<1	3.48E+01	<1
Lead	3.44E+01	0.00E+00	2.20E-01	0.00E+00	0.00E+00	2.20E-01	0.00E+00	2.67E-01	4.87E-01	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	8.87E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-02	0.00E+00	1.01E-02	1.79E+02	<1	3.77E+02	<1
Mercury	3.49E-01	0.00E+00	2.38E-02	0.00E+00	0.00E+00	2.38E-02	0.00E+00	2.71E-03	2.65E-02	4.50E-01	<1	9.10E-01	<1
Nickel	1.90E+01	0.00E+00	1.12E-01	0.00E+00	0.00E+00	1.12E-01	0.00E+00	1.47E-01	2.59E-01	6.71E+00	<1	1.86E+01	<1
Selenium	5.72E-01	0.00E+00	3.13E-02	0.00E+00	0.00E+00	3.13E-02	0.00E+00	4.44E-03	3.57E-02	2.90E-01	<1	8.20E-01	<1
Silver	2.35E+01	0.00E+00	1.89E+00	0.00E+00	0.00E+00	1.89E+00	0.00E+00	1.82E-01	2.08E+00	2.02E+00	**1.03E+00**	6.05E+01	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	0.00E+00	6.61E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.54E-04	0.00E+00	7.54E-04	3.44E-01	<1	1.70E+00	<1
Zinc	1.16E+02	0.00E+00	7.66E+00	0.00E+00	0.00E+00	7.66E+00	0.00E+00	8.97E-01	8.56E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.43E+00	4.28E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.89E-03	3.44E-02	3.93E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	2.46E-01	0.00E+00	3.31E-03	0.00E+00	0.00E+00	3.31E-03	0.00E+00	1.91E-03	5.22E-03				
Benzo[A]Pyrene	8.21E-01	0.00E+00	1.20E-02	0.00E+00	0.00E+00	1.20E-02	0.00E+00	6.37E-03	1.84E-02				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	3.20E-05	--	3.20E-05				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						1.53E-02	3.20E-05	8.28E-03	2.36E-02	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.20E+00	0.00E+00	5.97E-03	0.00E+00	0.00E+00	5.97E-03	0.00E+00	1.71E-02	2.30E-02	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.80E-02	0.00E+00	5.39E-03	0.00E+00	0.00E+00	5.39E-03	0.00E+00	4.50E-04	5.84E-03	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H22-6
Refined Exposure Evaluation - Mourning Dove
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H22-7
Refined Exposure Evaluation - Red-tailed Hawk
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	6.02E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.94E-01	0.00E+00	4.94E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	6.40E+02	7.88E-01	0.00E+00	0.00E+00	3.58E-02	3.58E-02	6.46E-02	1.36E+00	1.47E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Cadmium	2.50E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-02	3.60E-02	0.00E+00	5.33E-03	4.13E-02	1.47E+00	<1	6.35E+00	<1
Chromium	1.14E+01	0.00E+00	0.00E+00	0.00E+00	1.13E-01	1.13E-01	0.00E+00	2.42E-02	1.38E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.03E+02	4.69E-02	0.00E+00	0.00E+00	1.36E+00	1.36E+00	3.85E-03	4.33E-01	1.80E+00	4.05E+00	<1	3.48E+01	<1
Lead	3.44E+01	0.00E+00	0.00E+00	0.00E+00	4.23E-01	4.23E-01	0.00E+00	7.34E-02	4.96E-01	1.63E+00	<1	4.46E+01	<1
Manganese	0.00E+00	8.87E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.28E-03	0.00E+00	7.28E-03	1.79E+02	<1	3.77E+02	<1
Mercury	3.49E-01	0.00E+00	0.00E+00	0.00E+00	1.09E-02	1.09E-02	0.00E+00	7.45E-04	1.17E-02	4.50E-01	<1	9.10E-01	<1
Nickel	1.90E+01	0.00E+00	0.00E+00	0.00E+00	2.52E-01	2.52E-01	0.00E+00	4.04E-02	2.93E-01	6.71E+00	<1	1.86E+01	<1
Selenium	5.72E-01	0.00E+00	0.00E+00	0.00E+00	4.38E-02	4.38E-02	0.00E+00	1.22E-03	4.51E-02	2.90E-01	<1	8.20E-01	<1
Silver	2.35E+01	0.00E+00	0.00E+00	0.00E+00	1.78E-01	1.78E-01	0.00E+00	5.01E-02	2.28E-01	2.02E+00	<1	6.05E+01	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	0.00E+00	6.61E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.42E-04	0.00E+00	5.42E-04	3.44E-01	<1	1.70E+00	<1
Zinc	1.16E+02	0.00E+00	0.00E+00	0.00E+00	9.00E+00	9.00E+00	0.00E+00	2.47E-01	9.25E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.43E+00	4.28E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.51E-03	9.44E-03	1.30E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	2.46E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.25E-04	5.25E-04				
Benzo[A]Pyrene	8.21E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-03	1.75E-03				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	2.30E-05	--	2.30E-05				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	2.30E-05	2.28E-03	2.30E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.20E+00	0.00E+00	0.00E+00	0.00E+00	1.41E-01	1.41E-01	0.00E+00	4.69E-03	1.45E-01	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.80E-02	0.00E+00	0.00E+00	0.00E+00	2.14E-03	2.14E-03	0.00E+00	1.24E-04	2.26E-03	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H22-7
Refined Exposure Evaluation - Red-tailed Hawk
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H22-8
Refined Exposure Evaluation - Yellow-billed Cuckoo
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	6.02E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.53E-01	0.00E+00	9.53E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	6.40E+02	7.88E-01	0.00E+00	9.22E+00	0.00E+00	9.22E+00	1.25E-01	0.00E+00	9.35E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Cadmium	2.50E+00	0.00E+00	0.00E+00	2.72E+00	0.00E+00	2.72E+00	0.00E+00	0.00E+00	2.72E+00	1.47E+00	**1.85E+00**	6.35E+00	<1
Chromium	1.14E+01	0.00E+00	0.00E+00	5.51E-01	0.00E+00	5.51E-01	0.00E+00	0.00E+00	5.51E-01	2.66E+00	<1	1.56E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.03E+02	4.69E-02	0.00E+00	1.66E+01	0.00E+00	1.66E+01	7.43E-03	0.00E+00	1.66E+01	4.05E+00	**4.09E+00**	3.48E+01	<1
Lead	3.44E+01	0.00E+00	0.00E+00	2.21E+00	0.00E+00	2.21E+00	0.00E+00	0.00E+00	2.21E+00	1.63E+00	**1.36E+00**	4.46E+01	<1
Manganese	0.00E+00	8.87E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E-02	0.00E+00	1.41E-02	1.79E+02	<1	3.77E+02	<1
Mercury	3.49E-01	0.00E+00	0.00E+00	2.17E-01	0.00E+00	2.17E-01	0.00E+00	0.00E+00	2.17E-01	4.50E-01	<1	9.10E-01	<1
Nickel	1.90E+01	0.00E+00	0.00E+00	2.34E+00	0.00E+00	2.34E+00	0.00E+00	0.00E+00	2.34E+00	6.71E+00	<1	1.86E+01	<1
Selenium	5.72E-01	0.00E+00	0.00E+00	9.75E-02	0.00E+00	9.75E-02	0.00E+00	0.00E+00	9.75E-02	2.90E-01	<1	8.20E-01	<1
Silver	2.35E+01	0.00E+00	0.00E+00	1.49E+00	0.00E+00	1.49E+00	0.00E+00	0.00E+00	1.49E+00	2.02E+00	<1	6.05E+01	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	0.00E+00	6.61E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-03	0.00E+00	1.05E-03	3.44E-01	<1	1.70E+00	<1
Zinc	1.16E+02	0.00E+00	0.00E+00	6.43E+01	0.00E+00	6.43E+01	0.00E+00	0.00E+00	6.43E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.43E+00	4.28E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.78E-03	0.00E+00	6.78E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	2.46E-01	0.00E+00	0.00E+00	6.20E-02	0.00E+00	6.20E-02	0.00E+00	0.00E+00	6.20E-02				
Benzo[A]Pyrene	8.21E-01	0.00E+00	0.00E+00	1.73E-01	0.00E+00	1.73E-01	0.00E+00	0.00E+00	1.73E-01				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	4.43E-05	--	4.43E-05				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						2.35E-01	4.43E-05	0.00E+00	2.35E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.20E+00	0.00E+00	0.00E+00	1.90E+01	0.00E+00	1.90E+01	0.00E+00	0.00E+00	1.90E+01	1.10E+00	**1.72E+01**	1.10E+01	**1.72E+00**
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.80E-02	0.00E+00	0.00E+00	9.47E-02	0.00E+00	9.47E-02	0.00E+00	0.00E+00	9.47E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H22-8
Refined Exposure Evaluation - Yellow-billed Cuckoo
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H22-9
Refined Exposure Evaluation - Canada Lynx
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	6.02E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.88E-01	0.00E+00	1.88E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	6.40E+02	7.88E-01	0.00E+00	0.00E+00	1.36E-02	1.36E-02	2.46E-02	5.60E-01	5.98E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	2.50E+00	0.00E+00	0.00E+00	0.00E+00	1.37E-02	1.37E-02	0.00E+00	2.19E-03	1.59E-02	7.70E-01	<1	6.87E+00	<1
Chromium	1.14E+01	0.00E+00	0.00E+00	0.00E+00	4.32E-02	4.32E-02	0.00E+00	9.94E-03	5.31E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.03E+02	4.69E-02	0.00E+00	0.00E+00	5.19E-01	5.19E-01	1.47E-03	1.78E-01	6.98E-01	5.60E+00	<1	8.27E+01	<1
Lead	3.44E+01	0.00E+00	0.00E+00	0.00E+00	1.61E-01	1.61E-01	0.00E+00	3.01E-02	1.91E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	8.87E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.77E-03	0.00E+00	2.77E-03	5.15E+01	<1	1.46E+02	<1
Mercury	3.49E-01	0.00E+00	0.00E+00	0.00E+00	4.16E-03	4.16E-03	0.00E+00	3.06E-04	4.47E-03	1.41E+00	<1	1.41E+01	<1
Nickel	1.90E+01	0.00E+00	0.00E+00	0.00E+00	9.62E-02	9.62E-02	0.00E+00	1.66E-02	1.13E-01	1.70E+00	<1	1.48E+01	<1
Selenium	5.72E-01	0.00E+00	0.00E+00	0.00E+00	1.67E-02	1.67E-02	0.00E+00	5.00E-04	1.72E-02	1.43E-01	<1	6.60E-01	<1
Silver	2.35E+01	0.00E+00	0.00E+00	0.00E+00	6.76E-02	6.76E-02	0.00E+00	2.06E-02	8.82E-02	6.02E+00	<1	1.19E+02	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	0.00E+00	6.61E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E-04	0.00E+00	2.06E-04	4.16E+00	<1	9.44E+00	<1
Zinc	1.16E+02	0.00E+00	0.00E+00	0.00E+00	3.43E+00	3.43E+00	0.00E+00	1.01E-01	3.53E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.43E+00	4.28E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-03	3.87E-03	5.21E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	2.46E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.16E-04	2.16E-04				
Benzo[A]Pyrene	8.21E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.18E-04	7.18E-04				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	8.75E-06	--	8.75E-06				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	8.75E-06	9.34E-04	9.43E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.20E+00	0.00E+00	0.00E+00	0.00E+00	5.35E-02	5.35E-02	0.00E+00	1.92E-03	5.55E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.80E-02	0.00E+00	0.00E+00	0.00E+00	8.14E-04	8.14E-04	0.00E+00	5.07E-05	8.64E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H22-9
Refined Exposure Evaluation - Canada Lynx
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H22-10
Refined Exposure Evaluation - Grizzly Bear
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate						
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	6.02E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-01	0.00E+00	1.30E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	6.40E+02	7.88E-01	1.40E+00	1.89E-01	9.43E-04	0.00E+00	1.59E+00	1.70E-02	3.87E-01	2.00E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	2.50E+00	0.00E+00	1.44E-02	5.56E-02	9.47E-04	0.00E+00	7.09E-02	0.00E+00	1.51E-03	7.24E-02	7.70E-01	<1	6.87E+00	<1
Chromium	1.14E+01	0.00E+00	6.54E-03	1.13E-02	2.98E-03	0.00E+00	2.08E-02	0.00E+00	6.87E-03	2.77E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.03E+02	4.69E-02	2.22E-01	3.39E-01	3.58E-02	0.00E+00	5.97E-01	1.01E-03	1.23E-01	7.20E-01	5.60E+00	<1	8.27E+01	<1
Lead	3.44E+01	0.00E+00	2.71E-02	4.53E-02	1.11E-02	0.00E+00	8.35E-02	0.00E+00	2.08E-02	1.04E-01	4.70E+00	<1	1.86E+02	<1
Manganese	0.00E+00	8.87E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.92E-03	0.00E+00	1.92E-03	5.15E+01	<1	1.46E+02	<1
Mercury	3.49E-01	0.00E+00	2.93E-03	4.45E-03	2.88E-04	0.00E+00	7.66E-03	0.00E+00	2.11E-04	7.87E-03	1.41E+00	<1	1.41E+01	<1
Nickel	1.90E+01	0.00E+00	1.37E-02	4.78E-02	6.65E-03	0.00E+00	6.82E-02	0.00E+00	1.15E-02	7.96E-02	1.70E+00	<1	1.48E+01	<1
Selenium	5.72E-01	0.00E+00	3.85E-03	1.99E-03	1.15E-03	0.00E+00	7.00E-03	0.00E+00	3.46E-04	7.34E-03	1.43E-01	<1	6.60E-01	<1
Silver	2.35E+01	0.00E+00	2.33E-01	3.04E-02	4.68E-03	0.00E+00	2.68E-01	0.00E+00	1.42E-02	2.82E-01	6.02E+00	<1	1.19E+02	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	0.00E+00	6.61E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-04	0.00E+00	1.43E-04	4.16E+00	<1	9.44E+00	<1
Zinc	1.16E+02	0.00E+00	9.42E-01	1.32E+00	2.37E-01	0.00E+00	2.50E+00	0.00E+00	6.99E-02	2.57E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	4.43E+00	4.28E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.25E-04	2.68E-03	3.60E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs							0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	2.46E-01	0.00E+00	4.07E-04	1.27E-03	0.00E+00	0.00E+00	1.68E-03	0.00E+00	1.49E-04	1.83E-03				
Benzo[A]Pyrene	8.21E-01	0.00E+00	1.47E-03	3.54E-03	0.00E+00	0.00E+00	5.01E-03	0.00E+00	4.96E-04	5.51E-03				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	0.00E+00	6.05E-06	--	6.05E-06				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs							6.69E-03	6.05E-06	6.45E-04	7.34E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	2.20E+00	0.00E+00	7.35E-04	3.88E-01	3.70E-03	0.00E+00	3.92E-01	0.00E+00	1.33E-03	3.94E-01	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	5.80E-02	0.00E+00	6.63E-04	1.94E-03	5.62E-05	0.00E+00	2.66E-03	0.00E+00	3.51E-05	2.69E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H22-10
Refined Exposure Evaluation - Grizzly Bear
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)											
			Diet					Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans							0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H22-11
Refined Exposure Evaluation - Long-tailed Weasel
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{Low}	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	6.02E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.10E-01	0.00E+00	3.10E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	3.19E+02	7.88E-01	0.00E+00	0.00E+00	1.12E-02	1.12E-02	4.05E-02	2.63E-01	3.15E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	1.75E+00	0.00E+00	0.00E+00	0.00E+00	1.91E-02	1.91E-02	0.00E+00	1.44E-03	2.05E-02	7.70E-01	<1	6.87E+00	<1
Chromium	1.10E+01	0.00E+00	0.00E+00	0.00E+00	6.95E-02	6.95E-02	0.00E+00	9.07E-03	7.86E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	4.65E+00	0.00E+00	0.00E+00	0.00E+00	4.40E-03	4.40E-03	0.00E+00	3.83E-03	8.23E-03	7.33E+00	<1	1.89E+01	<1
Copper	1.93E+02	4.69E-02	0.00E+00	0.00E+00	8.48E-01	8.48E-01	2.41E-03	1.59E-01	1.01E+00	5.60E+00	<1	8.27E+01	<1
Lead	4.30E+01	0.00E+00	0.00E+00	0.00E+00	2.93E-01	2.93E-01	0.00E+00	3.54E-02	3.28E-01	4.70E+00	<1	1.86E+02	<1
Manganese	9.88E+01	8.87E-02	0.00E+00	0.00E+00	1.04E-01	1.04E-01	4.57E-03	8.14E-02	1.90E-01	5.15E+01	<1	1.46E+02	<1
Mercury	4.90E-01	0.00E+00	0.00E+00	0.00E+00	9.61E-03	9.61E-03	0.00E+00	4.03E-04	1.00E-02	1.41E+00	<1	1.41E+01	<1
Nickel	1.64E+01	0.00E+00	0.00E+00	0.00E+00	1.48E-01	1.48E-01	0.00E+00	1.35E-02	1.62E-01	1.70E+00	<1	1.48E+01	<1
Selenium	7.83E-01	0.00E+00	0.00E+00	0.00E+00	3.10E-02	3.10E-02	0.00E+00	6.44E-04	3.16E-02	1.43E-01	<1	6.60E-01	<1
Silver	9.03E+00	0.00E+00	0.00E+00	0.00E+00	7.77E-02	7.77E-02	0.00E+00	7.43E-03	8.52E-02	6.02E+00	<1	1.19E+02	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	0.00E+00	6.61E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.40E-04	0.00E+00	3.40E-04	4.16E+00	<1	9.44E+00	<1
Zinc	1.20E+02	0.00E+00	0.00E+00	0.00E+00	5.67E+00	5.67E+00	0.00E+00	9.90E-02	5.76E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.25E+00	4.28E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.20E-03	1.85E-03	4.06E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	3.29E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.71E-04	2.71E-04				
Benzo[A]Pyrene	1.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E-03	1.41E-03				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	1.44E-05	--	1.44E-05				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	1.44E-05	1.68E-03	1.69E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.68E+00	0.00E+00	0.00E+00	0.00E+00	6.73E-02	6.73E-02	0.00E+00	1.38E-03	6.87E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	2.26E-02	0.00E+00	0.00E+00	0.00E+00	5.21E-04	5.21E-04	0.00E+00	1.86E-05	5.40E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H22-11
Refined Exposure Evaluation - Long-tailed Weasel
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{Low}	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H22-12
Refined Exposure Evaluation - Meadow Vole
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	6.02E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.04E-01	0.00E+00	9.04E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	3.19E+02	7.88E-01	7.48E+00	0.00E+00	0.00E+00	7.48E+00	1.18E-01	6.24E-01	8.23E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	1.75E+00	0.00E+00	1.27E-01	0.00E+00	0.00E+00	1.27E-01	0.00E+00	3.42E-03	1.30E-01	7.70E-01	<1	6.87E+00	<1
Chromium	1.10E+01	0.00E+00	6.78E-02	0.00E+00	0.00E+00	6.78E-02	0.00E+00	2.15E-02	8.93E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	4.65E+00	0.00E+00	5.24E-03	0.00E+00	0.00E+00	5.24E-03	0.00E+00	9.08E-03	1.43E-02	7.33E+00	<1	1.89E+01	<1
Copper	1.93E+02	4.69E-02	2.33E+00	0.00E+00	0.00E+00	2.33E+00	7.05E-03	3.77E-01	2.71E+00	5.60E+00	<1	8.27E+01	<1
Lead	4.30E+01	0.00E+00	3.28E-01	0.00E+00	0.00E+00	3.28E-01	0.00E+00	8.40E-02	4.12E-01	4.70E+00	<1	1.86E+02	<1
Manganese	9.88E+01	8.87E-02	1.17E+00	0.00E+00	0.00E+00	1.17E+00	1.33E-02	1.93E-01	1.38E+00	5.15E+01	<1	1.46E+02	<1
Mercury	4.90E-01	0.00E+00	3.76E-02	0.00E+00	0.00E+00	3.76E-02	0.00E+00	9.57E-04	3.86E-02	1.41E+00	<1	1.41E+01	<1
Nickel	1.64E+01	0.00E+00	1.32E-01	0.00E+00	0.00E+00	1.32E-01	0.00E+00	3.20E-02	1.64E-01	1.70E+00	<1	1.48E+01	<1
Selenium	7.83E-01	0.00E+00	5.82E-02	0.00E+00	0.00E+00	5.82E-02	0.00E+00	1.53E-03	5.98E-02	1.43E-01	<1	6.60E-01	<1
Silver	9.03E+00	0.00E+00	8.66E-01	0.00E+00	0.00E+00	8.66E-01	0.00E+00	1.76E-02	8.84E-01	6.02E+00	<1	1.19E+02	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	0.00E+00	6.61E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.93E-04	0.00E+00	9.93E-04	4.16E+00	<1	9.44E+00	<1
Zinc	1.20E+02	0.00E+00	1.03E+01	0.00E+00	0.00E+00	1.03E+01	0.00E+00	2.35E-01	1.05E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.25E+00	4.28E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.44E-03	4.40E-03	1.08E-02	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	3.29E-01	0.00E+00	5.18E-03	0.00E+00	0.00E+00	5.18E-03	0.00E+00	6.43E-04	5.82E-03				
Benzo[A]Pyrene	1.71E+00	0.00E+00	3.23E-02	0.00E+00	0.00E+00	3.23E-02	0.00E+00	3.34E-03	3.56E-02				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	4.21E-05	--	4.21E-05				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						3.75E-02	4.21E-05	3.99E-03	4.15E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.68E+00	0.00E+00	6.00E-03	0.00E+00	0.00E+00	6.00E-03	0.00E+00	3.28E-03	9.28E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	2.26E-02	0.00E+00	2.76E-03	0.00E+00	0.00E+00	2.76E-03	0.00E+00	4.41E-05	2.80E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H22-12
Refined Exposure Evaluation - Meadow Vole
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H22-13
Refined Exposure Evaluation - Mink
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals												
Aluminum	0.00E+00	6.02E+00	0.00E+00	0.00E+00	0.00E+00	2.60E-01	0.00E+00	2.60E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	6.40E+02	7.88E-01	0.00E+00	0.00E+00	0.00E+00	3.41E-02	0.00E+00	3.41E-02	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.03E+02	4.69E-02	0.00E+00	0.00E+00	0.00E+00	2.03E-03	0.00E+00	2.03E-03	5.60E+00	<1	8.27E+01	<1
Lead	3.44E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.70E+00	--	1.86E+02	--
Manganese	0.00E+00	8.87E-02	0.00E+00	0.00E+00	0.00E+00	3.84E-03	0.00E+00	3.84E-03	5.15E+01	<1	1.46E+02	<1
Mercury	3.49E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	1.90E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-01	--	6.60E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.18E+01	6.61E-03	0.00E+00	0.00E+00	0.00E+00	2.86E-04	0.00E+00	2.86E-04	4.16E+00	<1	9.44E+00	<1
Zinc	1.16E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.54E+01	--	2.98E+02	--
Inorganics - Other Inorganics												
Cyanide	4.43E+00	4.28E-02	0.00E+00	0.00E+00	0.00E+00	1.85E-03	0.00E+00	1.85E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	3.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluoranthene	6.17E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluorene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	2.01E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total LMW PAHs					0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	2.46E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo[A]Pyrene	8.21E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	7.26E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(k)fluoranthene	2.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Chrysene	9.12E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Dibenz(A,H)Anthracene	1.32E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Indeno (1,2,3-CD) Pyrene	9.84E-01	2.80E-04	0.00E+00	0.00E+00	0.00E+00	1.21E-05	0.00E+00	1.21E-05				
Pyrene	5.16E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total HMW PAHs					0.00E+00	1.21E-05	0.00E+00	1.21E-05	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H22-13
Refined Exposure Evaluation - Mink
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H22-14
Refined Exposure Evaluation - North American Wolverine
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	6.02E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.81E-01	0.00E+00	1.81E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	3.19E+02	7.88E-01	0.00E+00	0.00E+00	6.55E-03	6.55E-03	2.37E-02	2.69E-01	2.99E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	1.75E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-02	1.11E-02	0.00E+00	1.47E-03	1.26E-02	7.70E-01	<1	6.87E+00	<1
Chromium	1.10E+01	0.00E+00	0.00E+00	0.00E+00	4.06E-02	4.06E-02	0.00E+00	9.27E-03	4.98E-02	2.40E+00	<1	5.82E+01	<1
Cobalt	4.65E+00	0.00E+00	0.00E+00	0.00E+00	2.57E-03	2.57E-03	0.00E+00	3.91E-03	6.48E-03	7.33E+00	<1	1.89E+01	<1
Copper	1.93E+02	4.69E-02	0.00E+00	0.00E+00	4.95E-01	4.95E-01	1.41E-03	1.62E-01	6.59E-01	5.60E+00	<1	8.27E+01	<1
Lead	4.30E+01	0.00E+00	0.00E+00	0.00E+00	1.71E-01	1.71E-01	0.00E+00	3.62E-02	2.07E-01	4.70E+00	<1	1.86E+02	<1
Manganese	9.88E+01	8.87E-02	0.00E+00	0.00E+00	6.09E-02	6.09E-02	2.67E-03	8.32E-02	1.47E-01	5.15E+01	<1	1.46E+02	<1
Mercury	4.90E-01	0.00E+00	0.00E+00	0.00E+00	5.61E-03	5.61E-03	0.00E+00	4.12E-04	6.02E-03	1.41E+00	<1	1.41E+01	<1
Nickel	1.64E+01	0.00E+00	0.00E+00	0.00E+00	8.65E-02	8.65E-02	0.00E+00	1.38E-02	1.00E-01	1.70E+00	<1	1.48E+01	<1
Selenium	7.83E-01	0.00E+00	0.00E+00	0.00E+00	1.81E-02	1.81E-02	0.00E+00	6.58E-04	1.87E-02	1.43E-01	<1	6.60E-01	<1
Silver	9.03E+00	0.00E+00	0.00E+00	0.00E+00	4.54E-02	4.54E-02	0.00E+00	7.59E-03	5.30E-02	6.02E+00	<1	1.19E+02	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	0.00E+00	6.61E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.99E-04	0.00E+00	1.99E-04	4.16E+00	<1	9.44E+00	<1
Zinc	1.20E+02	0.00E+00	0.00E+00	0.00E+00	3.31E+00	3.31E+00	0.00E+00	1.01E-01	3.41E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.25E+00	4.28E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E-03	1.89E-03	3.18E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	3.29E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.77E-04	2.77E-04				
Benzo[A]Pyrene	1.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.44E-03	1.44E-03				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	8.41E-06	--	8.41E-06				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	8.41E-06	1.72E-03	1.73E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.68E+00	0.00E+00	0.00E+00	0.00E+00	3.93E-02	3.93E-02	0.00E+00	1.41E-03	4.07E-02	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	2.26E-02	0.00E+00	0.00E+00	0.00E+00	3.04E-04	3.04E-04	0.00E+00	1.90E-05	3.23E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H22-14
Refined Exposure Evaluation - North American Wolverine
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H22-15
Refined Exposure Evaluation - Short-tailed Shrew
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	6.02E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.06E-01	0.00E+00	8.06E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	3.19E+02	7.88E-01	0.00E+00	3.89E+00	0.00E+00	3.89E+00	1.06E-01	4.71E-01	4.47E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	1.75E+00	0.00E+00	0.00E+00	1.73E+00	0.00E+00	1.73E+00	0.00E+00	2.58E-03	1.73E+00	7.70E-01	**2.25E+00**	6.87E+00	<1
Chromium	1.10E+01	0.00E+00	0.00E+00	4.52E-01	0.00E+00	4.52E-01	0.00E+00	1.62E-02	4.68E-01	2.40E+00	<1	5.82E+01	<1
Cobalt	4.65E+00	0.00E+00	0.00E+00	7.60E-02	0.00E+00	7.60E-02	0.00E+00	6.85E-03	8.29E-02	7.33E+00	<1	1.89E+01	<1
Copper	1.93E+02	4.69E-02	0.00E+00	1.33E+01	0.00E+00	1.33E+01	6.29E-03	2.84E-01	1.36E+01	5.60E+00	**2.43E+00**	8.27E+01	<1
Lead	4.30E+01	0.00E+00	0.00E+00	2.24E+00	0.00E+00	2.24E+00	0.00E+00	6.34E-02	2.31E+00	4.70E+00	<1	1.86E+02	<1
Manganese	9.88E+01	8.87E-02	0.00E+00	1.37E+00	0.00E+00	1.37E+00	1.19E-02	1.46E-01	1.53E+00	5.15E+01	<1	1.46E+02	<1
Mercury	4.90E-01	0.00E+00	0.00E+00	2.58E-01	0.00E+00	2.58E-01	0.00E+00	7.22E-04	2.59E-01	1.41E+00	<1	1.41E+01	<1
Nickel	1.64E+01	0.00E+00	0.00E+00	1.71E+00	0.00E+00	1.71E+00	0.00E+00	2.42E-02	1.73E+00	1.70E+00	**1.02E+00**	1.48E+01	<1
Selenium	7.83E-01	0.00E+00	0.00E+00	1.04E-01	0.00E+00	1.04E-01	0.00E+00	1.15E-03	1.05E-01	1.43E-01	<1	6.60E-01	<1
Silver	9.03E+00	0.00E+00	0.00E+00	6.24E-01	0.00E+00	6.24E-01	0.00E+00	1.33E-02	6.37E-01	6.02E+00	<1	1.19E+02	<1
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	0.00E+00	6.61E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.86E-04	0.00E+00	8.86E-04	4.16E+00	<1	9.44E+00	<1
Zinc	1.20E+02	0.00E+00	0.00E+00	5.51E+01	0.00E+00	5.51E+01	0.00E+00	1.77E-01	5.53E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	2.25E+00	4.28E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.74E-03	3.32E-03	9.06E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	3.29E-01	0.00E+00	0.00E+00	7.02E-02	0.00E+00	7.02E-02	0.00E+00	4.85E-04	7.07E-02				
Benzo[A]Pyrene	1.71E+00	0.00E+00	0.00E+00	3.05E-01	0.00E+00	3.05E-01	0.00E+00	2.52E-03	3.08E-01				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	2.80E-04	--	--	--	0.00E+00	3.75E-05	--	3.75E-05				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						3.75E-01	3.75E-05	3.01E-03	3.78E-01	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	1.68E+00	0.00E+00	0.00E+00	1.22E+01	0.00E+00	1.22E+01	0.00E+00	2.47E-03	1.22E+01	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	2.26E-02	0.00E+00	0.00E+00	3.12E-02	0.00E+00	3.12E-02	0.00E+00	3.33E-05	3.12E-02	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H22-15
Refined Exposure Evaluation - Short-tailed Shrew
South Percolation Pond Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H23-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Cedar Creek Reservoir Overflow Ditch (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	6.83E+00	3.75E-02	2.56E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	9.37E-01	Sample et al. (1999)	Regression[f]	3.78E-02	Sample et al. (1998b)
Barium	NA	2.74E+02	1.56E-01	4.28E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	2.49E+01	Sample et al. (1998a)	6.83E-04	1.87E-01	Baes et al. (1984)[e]
Beryllium	NA	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	Regression[d]	0	Sample et al. (1999)	Regression[f]	0	Sample et al. (1998b)
Chromium	NA	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	2.41E+01	Regression[a]	6.83E+00	Bechtel-Jacobs (1998a)	5.15E-01	1.24E+01	Sample et al. (1998a)	Regression[f]	1.22E+01	Sample et al. (1998b)
Lead	NA	1.71E+01	Regression[a]	1.30E+00	Bechtel-Jacobs (1998a)	Regression[d]	7.96E+00	Sample et al. (1999)	Regression[f]	3.79E+00	Sample et al. (1998b)
Manganese	NA	1.35E+03	7.90E-02	1.07E+02	Bechtel-Jacobs (1998a)[g]	Regression[d]	6.07E+01	Sample et al. (1999)	2.05E-02	2.77E+01	Sample et al. (1998b)[i]
Mercury	NA	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	3.23E+01	Regression[a]	1.46E+00	Bechtel-Jacobs (1998a)	7.78E-01	2.51E+01	Sample et al. (1998a)	Regression[f]	3.95E+00	Sample et al. (1998b)
Selenium	NA	7.88E-01	Regression[a]	3.91E-01	Bechtel-Jacobs (1998a)	Regression[d]	7.79E-01	Sample et al. (1998a)	Regression[f]	6.03E-01	Sample et al. (1998b)
Silver		ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	ND	4.00E-03	0	Baes et al. (1984)	5.41E-02	0	USCHPPM (2004)	1.08E-01	0	Baes et al. (1984)[e]
Vanadium	NA	1.49E+01	4.85E-03	7.24E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	6.27E-01	Sample et al. (1998a)	1.23E-02	1.84E-01	Sample et al. (1998b)[i]
Zinc	NA	1.10E+02	Regression[a]	6.53E+01	Bechtel-Jacobs (1998a)	Regression[d]	4.00E+02	Sample et al. (1998a)	Regression[f]	1.09E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	8.32E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Phenanthrene	4.55	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs											

Table H23-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Cedar Creek Reservoir Overflow Ditch (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	7.81E-01	Regression[a]	5.76E-02	USEPA (2007a)	1.59E+00	1.24E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs											
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	4.50E-02	2.38E-02	1.07E-03	USEPA (2007a)	5.44E+01	2.45E+00	USEPA (2007a)	7.79E-01	3.51E-02	LANL (2015)
Butylbenzylphthalate	4.84	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	3.90E-02	8.14E-01	3.18E-02	USEPA (2007a)	1.03E+01	4.02E-01	USEPA (2007a)	4.49E-01	1.75E-02	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)

Table H23-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Cedar Creek Reservoir Overflow Ditch (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H23-1a
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Cedar Creek Reservoir Overflow Ditch (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	9.38E-01	USEPA (2007)
Beryllium	-0.5361	7.35E-01	USEPA (2007)
Cadmium	-0.475	5.46E-01	Bechtel-Jacobs (1998)
Copper	0.668	3.94E-01	Bechtel-Jacobs (1998)
Lead	-1.328	5.61E-01	Bechtel-Jacobs (1998)
Mercury	-0.996	5.44E-01	Bechtel-Jacobs (1998)
Nickel	-2.223	7.48E-01	Bechtel-Jacobs (1998)
Selenium	-0.677	1.10E+00	Bechtel-Jacobs (1998)
Zinc	1.575	5.54E-01	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-8.56E-01	USEPA (2007)
Acenaphthylene	-1.144	7.91E-01	USEPA (2007)
Anthracene	-0.9887	7.78E-01	USEPA (2007)
Benzo(a)anthracene	-2.7078	5.94E-01	USEPA (2007)
Benzo(a)pyrene	-2.0615	9.75E-01	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.18E+00	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	8.60E-01	USEPA (2007)
Chrysene	-2.7078	5.94E-01	USEPA (2007)
Fluorene	-5.562	-8.56E-01	USEPA (2007)
Phenanthrene	-0.1665	6.20E-01	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	7.06E-01	Sample et al. (1999)
Cadmium	2.114	7.95E-01	Sample et al. (1999)
Lead	-0.218	8.07E-01	Sample et al. (1999)
Manganese	-0.809	6.82E-01	Sample et al. (1999)
Selenium	-0.075	7.33E-01	Sample et al. (1999)
Zinc	4.449	3.28E-01	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.18E+00	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	8.19E-01	Sample et al. (1998b)
Cadmium	-1.2571	4.72E-01	Sample et al. (1998b)
Chromium	-1.4599	7.34E-01	Sample et al. (1998b)
Cobalt	-4.4669	1.31E+00	Sample et al. (1998b)
Copper	2.042	1.44E-01	Sample et al. (1998b)
Lead	0.0761	4.42E-01	Sample et al. (1998b)
Nickel	-0.2462	4.66E-01	Sample et al. (1998b)
Selenium	-0.4158	3.76E-01	Sample et al. (1998b)
Zinc	4.3632	7.06E-02	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.10E+00	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([diet$_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H23-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Cedar Creek Reservoir Overflow Ditch (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	6.83E+00	3.75E-02	2.56E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	9.37E-01	Sample et al. (1999)	Regression[f]	3.78E-02	Sample et al. (1998b)
Barium	NA	2.74E+02	1.56E-01	4.28E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	2.49E+01	Sample et al. (1998a)	6.83E-04	1.87E-01	Baes et al. (1984)[e]
Beryllium	NA	ND	Regression[a]	0	USEPA (2007)	4.50E-02	0	Sample et al. (1998a)	2.25E-03	0	Baes et al. (1984)[e]
Cadmium	NA	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	Regression[d]	0	Sample et al. (1999)	Regression[f]	0	Sample et al. (1998b)
Chromium	NA	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	2.41E+01	Regression[a]	6.83E+00	Bechtel-Jacobs (1998a)	5.15E-01	1.24E+01	Sample et al. (1998a)	Regression[f]	1.22E+01	Sample et al. (1998b)
Lead	NA	1.71E+01	Regression[a]	1.30E+00	Bechtel-Jacobs (1998a)	Regression[d]	7.96E+00	Sample et al. (1999)	Regression[f]	3.79E+00	Sample et al. (1998b)
Manganese	NA	1.35E+03	7.90E-02	1.07E+02	Bechtel-Jacobs (1998a)[g]	Regression[d]	6.07E+01	Sample et al. (1999)	2.05E-02	2.77E+01	Sample et al. (1998b)[i]
Mercury	NA	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	3.23E+01	Regression[a]	1.46E+00	Bechtel-Jacobs (1998a)	7.78E-01	2.51E+01	Sample et al. (1998a)	Regression[f]	3.95E+00	Sample et al. (1998b)
Selenium	NA	7.88E-01	Regression[a]	3.91E-01	Bechtel-Jacobs (1998a)	Regression[d]	7.79E-01	Sample et al. (1998a)	Regression[f]	6.03E-01	Sample et al. (1998b)
Silver		ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	ND	4.00E-03	0	Baes et al. (1984)	5.41E-02	0	USCHPPM (2004)	1.08E-01	0	Baes et al. (1984)[e]
Vanadium	NA	1.49E+01	4.85E-03	7.24E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	6.27E-01	Sample et al. (1998a)	1.23E-02	1.84E-01	Sample et al. (1998b)[i]
Zinc	NA	1.10E+02	Regression[a]	6.53E+01	Bechtel-Jacobs (1998a)	Regression[d]	4.00E+02	Sample et al. (1998a)	Regression[f]	1.09E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	8.32E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]

Table H23-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Cedar Creek Reservoir Overflow Ditch (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Naphthalene	3.36	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Phenanthrene	4.55	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs											
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	7.81E-01	Regression[a]	5.76E-02	USEPA (2007a)	1.59E+00	1.24E+00	USEPA (2007a)	0.00E+00	0.00E+00	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs											
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	4.50E-02	2.38E-02	1.07E-03	USEPA (2007a)	5.44E+01	2.45E+00	USEPA (2007a)	7.79E-01	3.51E-02	LANL (2015)
Butylbenzylphthalate	4.84	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	3.90E-02	8.14E-01	3.18E-02	USEPA (2007a)	1.03E+01	4.02E-01	USEPA (2007a)	4.49E-01	1.75E-02	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)

Table H23-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Cedar Creek Reservoir Overflow Ditch (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Soil (0-2') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H23-1b
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Cedar Creek Reservoir Overflow Ditch (0 - 2' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	9.38E-01	USEPA (2007)
Beryllium	-0.5361	7.35E-01	USEPA (2007)
Cadmium	-0.475	5.46E-01	Bechtel-Jacobs (1998)
Copper	0.668	3.94E-01	Bechtel-Jacobs (1998)
Lead	-1.328	5.61E-01	Bechtel-Jacobs (1998)
Mercury	-0.996	5.44E-01	Bechtel-Jacobs (1998)
Nickel	-2.223	7.48E-01	Bechtel-Jacobs (1998)
Selenium	-0.677	1.10E+00	Bechtel-Jacobs (1998)
Zinc	1.575	5.54E-01	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-8.56E-01	USEPA (2007)
Acenaphthylene	-1.144	7.91E-01	USEPA (2007)
Anthracene	-0.9887	7.78E-01	USEPA (2007)
Benzo(a)anthracene	-2.7078	5.94E-01	USEPA (2007)
Benzo(a)pyrene	-2.0615	9.75E-01	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.18E+00	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	8.60E-01	USEPA (2007)
Chrysene	-2.7078	5.94E-01	USEPA (2007)
Fluorene	-5.562	-8.56E-01	USEPA (2007)
Phenanthrene	-0.1665	6.20E-01	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	7.06E-01	Sample et al. (1999)
Cadmium	2.114	7.95E-01	Sample et al. (1999)
Lead	-0.218	8.07E-01	Sample et al. (1999)
Manganese	-0.809	6.82E-01	Sample et al. (1999)
Selenium	-0.075	7.33E-01	Sample et al. (1999)
Zinc	4.449	3.28E-01	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.18E+00	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	8.19E-01	Sample et al. (1998b)
Cadmium	-1.2571	4.72E-01	Sample et al. (1998b)
Chromium	-1.4599	7.34E-01	Sample et al. (1998b)
Cobalt	-4.4669	1.31E+00	Sample et al. (1998b)
Copper	2.042	1.44E-01	Sample et al. (1998b)
Lead	0.0761	4.42E-01	Sample et al. (1998b)
Nickel	-0.2462	4.66E-01	Sample et al. (1998b)
Selenium	-0.4158	3.76E-01	Sample et al. (1998b)
Zinc	4.3632	7.06E-02	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.10E+00	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H23-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Metals								
Aluminum	NA	3.69E-01	0.00E+00	NA	7.40E-02	---	0.00E+00	Stanley et al. (2010)
Antimony	NA	0.00E+00	0.00E+00	NA	5.75E-01	---	0.00E+00	Dovick et al. (2015)
Arsenic	NA	0.00E+00	0.00E+00	NA	3.73E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Barium	NA	1.01E-01	2.74E+02	NA	2.82E+00	---	7.73E+02	Hamilton et al. (2002)
Beryllium	NA	0.00E+00	8.74E-01	NA	1.67E-01	---	1.46E-01	Hamilton et al. (2002)
Cadmium	NA	0.00E+00	0.00E+00	NA	4.59E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Chromium	NA	0.00E+00	0.00E+00	NA	8.30E-02	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Cobalt		0.00E+00	0.00E+00					
Copper	NA	0.00E+00	0.00E+00	NA	6.61E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Lead	NA	0.00E+00	0.00E+00	NA	8.00E-02	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Manganese		7.49E-01	1.35E+03					
Mercury	NA	0.00E+00	0.00E+00	NA	2.84E+00	---	0.00E+00	Bechtel-Jacobs (1998c)[c]
Nickel	NA	0.00E+00	3.23E+01	NA	1.34E-01	---	4.33E+00	Bechtel-Jacobs (1998b)[c]
Selenium	NA	0.00E+00	0.00E+00	NA	3.75E+00	---	0.00E+00	Hamilton et al. (2002)
Silver	NA	0.00E+00	0.00E+00	NA	1.80E-01	---	0.00E+00	Hirsch (1998)
Thallium	NA	0.00E+00	0.00E+00	NA	2.00E-02	---	0.00E+00	Turner et al. (2013)
Vanadium	NA	1.52E-03	1.49E+01	NA	2.50E-01	---	3.73E+00	Hamilton and Buhl (2002)
Zinc	NA	0.00E+00	1.10E+02	NA	8.40E-01	---	9.25E+01	Bechtel-Jacobs (1998b)[c]
Inorganics - Other Inorganics								
Cyanide	NA	0.00E+00	8.32E-01	NA	0.00E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	0.00E+00	0.00E+00	NA	---	Regression	0.00E+00	Derived based on Aguirre-Sierra et al. (2013)
Polychlorinated Biphenyls (PCBs)								
Aroclor 1248	6.34	0.00E+00	0.00E+00	5.74E-01	0.00E+00	---	0.00E+00	DiToro and McGrath (2000)
Aroclor 1254	6.98	0.00E+00	0.00E+00	5.43E-01	0.00E+00	---	0.00E+00	DiToro and McGrath (2000)
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)								
Low Molecular Weight (LMW) PAHs:								
Acenaphthene	4.01	0.00E+00	6.12E-02	7.04E-01	4.58E+00	---	2.80E-01	DiToro and McGrath (2000)
Acenaphthylene	3.22	0.00E+00	0.00E+00	7.54E-01	4.90E+00	---	0.00E+00	DiToro and McGrath (2000)
Anthracene	4.53	0.00E+00	1.18E-01	6.73E-01	4.37E+00	---	5.18E-01	DiToro and McGrath (2000)
Fluoranthene	5.08	0.00E+00	1.30E+00	6.41E-01	4.17E+00	---	5.42E+00	DiToro and McGrath (2000)

Table H23-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Fluorene	4.21	0.00E+00	3.93E-02	6.92E-01	4.50E+00	---	1.77E-01	DiToro and McGrath (2000)
Naphthalene	3.36	0.00E+00	2.76E-02	7.45E-01	4.84E+00	---	1.34E-01	DiToro and McGrath (2000)
Phenanthrene	4.57	0.00E+00	6.59E-01	6.70E-01	4.36E+00	---	2.87E+00	DiToro and McGrath (2000)
Total LMW PAHs							9.40E+00	
High Molecular Weight (HMW) PAHs:								
Benzo(a)anthracene	6.71	0.00E+00	7.81E-01	5.56E-01	3.61E+00	---	2.82E+00	DiToro and McGrath (2000)
Benzo[A]Pyrene	6.11	0.00E+00	1.05E+00	5.86E-01	3.81E+00	---	3.99E+00	DiToro and McGrath (2000)
Benzo(b)fluoranthene	6.27	0.00E+00	0.00E+00	5.78E-01	3.76E+00	---	0.00E+00	DiToro and McGrath (2000)
Benzo(g,h,i)perylene	6.51	0.00E+00	1.05E+00	5.66E-01	3.68E+00	---	3.85E+00	DiToro and McGrath (2000)
Benzo(k)fluoranthene	6.29	0.00E+00	5.38E-01	5.77E-01	3.75E+00	---	2.02E+00	DiToro and McGrath (2000)
Chrysene	5.71	0.00E+00	1.12E+00	6.07E-01	3.94E+00	---	4.40E+00	DiToro and McGrath (2000)
Dibenz(A,H)Anthracene	6.71	0.00E+00	2.26E-01	5.56E-01	3.61E+00	---	8.18E-01	DiToro and McGrath (2000)
Indeno (1,2,3-CD) Pyrene	6.72	0.00E+00	9.71E-01	5.55E-01	3.61E+00	---	3.51E+00	DiToro and McGrath (2000)
Pyrene	4.92	0.00E+00	1.34E+00	6.50E-01	4.23E+00	---	5.67E+00	DiToro and McGrath (2000)
Total HMW PAHs							2.71E+01	
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs								
1,2,4,5-Tetrachlorobenzene		0.00E+00	0.00E+00					
2,3,4,6-Tetrachlorophenol	4.09	0.00E+00	0.00E+00	6.99E-01	4.54E+00	---	0.00E+00	DiToro and McGrath (2000)
2-Chloronaphthalene	3.81	0.00E+00	0.00E+00	7.16E-01	4.66E+00	---	0.00E+00	DiToro and McGrath (2000)
Biphenyl (Diphenyl)	3.76	0.00E+00	0.00E+00	7.20E-01	4.68E+00	---	0.00E+00	DiToro and McGrath (2000)
Bis(2-ethylhexyl)phthalate	8.39	0.00E+00	0.00E+00	4.80E-01	3.12E+00	---	0.00E+00	DiToro and McGrath (2000)
Butylbenzylphthalate		0.00E+00	0.00E+00					
Dibenzofuran	3.71	0.00E+00	0.00E+00	7.23E-01	4.70E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	6.68E-01	4.34E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-octyl phthalate	8.54	0.00E+00	0.00E+00	4.74E-01	3.08E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobenzene	5.86	0.00E+00	0.00E+00	5.99E-01	3.89E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobutadiene	4.72	0.00E+00	0.00E+00	6.62E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachloroethane		0.00E+00	0.00E+00					
Pentachlorophenol	4.74	0.00E+00	0.00E+00	6.61E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)
Volatile Organic Compounds (VOCs)								
Methylcyclohexane		0.00E+00	0.00E+00					

Table H23-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Dioxin/Furans								
2,3,7,8-TCDD		0.00E+00	0.00E+00					
1,2,3,7,8-PeCDD		0.00E+00	0.00E+00					
1,2,3,4,7,8-HxCDD		0.00E+00	0.00E+00					
1,2,3,6,7,8-HxCDD		0.00E+00	0.00E+00					
1,2,3,7,8,9-HxCDD		0.00E+00	0.00E+00					
1,2,3,4,6,7,8-HpCDD		0.00E+00	0.00E+00					
OCDD		0.00E+00	0.00E+00					
2,3,7,8-TCDF		0.00E+00	0.00E+00					
1,2,3,7,8-PeCDF		0.00E+00	0.00E+00					
2,3,4,7,8-PeCDF		0.00E+00	0.00E+00					
1,2,3,4,7,8-HxCDF		0.00E+00	0.00E+00					
1,2,3,6,7,8-HxCDF		0.00E+00	0.00E+00					
2,3,4,6,7,8-HxCDF		0.00E+00	0.00E+00					
1,2,3,7,8,9-HxCDF		0.00E+00	0.00E+00					
1,2,3,4,6,7,8-HpCDF		0.00E+00	0.00E+00					
1,2,3,4,7,8,9-HpCDF		0.00E+00	0.00E+00					
OCDF		0.00E+00	0.00E+00					

Notes:
NA, Normalized BSAF was not applicable for metals
a, Normalized BSAF (kg OC / kg lipid) calculated based on K_{ow}, where BSAF = $K_{ow}^{-0.038}$ (DiToro and McGrath 2000)
b, For non-ionic organic constituents, dry weight BSAF calculated from sediment organic carbon and lipid normalized BSAF as follows:

$$BSAF_{dry\ weight} = BSAF_{norm} \times f_{lip;id} \times \frac{1}{f_{oc}}$$

where: $BSAF_{norm}$ = Normalized BSAF (kg OC/kg lipid)
f_{lipid} = Fraction of lipids in prey item expressed on a dry weight basis (0.065, invertebrates; 0.08, fish)
f_{oc} = Fraction of sediment organic carbon expressed on a dry weight basis (0.01 or 1%)
c, Median BSAF for non-depurated invertebrates determined by Bechtel-Jacobs (1998b)

Table H23-3
Refined Exposure Evaluation - American Dipper
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	3.69E-01	0.00E+00	0.00E+00	0.00E+00	6.13E-02	0.00E+00	6.13E-02	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	2.74E+02	1.01E-01	1.28E+02	0.00E+00	1.28E+02	1.68E-02	9.10E-01	1.29E+02	7.35E+01	**1.76E+00**	1.31E+02	<1
Beryllium	8.74E-01	0.00E+00	2.42E-02	0.00E+00	2.42E-02	0.00E+00	2.90E-03	2.71E-02	No TRV	--	No TRV	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.05E+00	--	3.48E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+00	--	4.46E+01	--
Manganese	1.35E+03	7.49E-01	0.00E+00	0.00E+00	0.00E+00	1.24E-01	4.48E+00	4.60E+00	1.79E+02	<1	3.77E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	3.23E+01	0.00E+00	7.19E-01	0.00E+00	7.19E-01	0.00E+00	1.07E-01	8.26E-01	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-01	--	8.20E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.49E+01	1.52E-03	6.19E-01	0.00E+00	6.19E-01	2.52E-04	4.95E-02	6.69E-01	3.44E-01	**1.94E+00**	1.70E+00	<1
Zinc	1.10E+02	0.00E+00	1.53E+01	0.00E+00	1.53E+01	0.00E+00	3.65E-01	1.57E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics												
Cyanide	8.32E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.76E-03	2.76E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	6.12E-02	0.00E+00	4.65E-02	0.00E+00	4.65E-02	0.00E+00	2.03E-04	4.67E-02				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	1.18E-01	0.00E+00	8.59E-02	0.00E+00	8.59E-02	0.00E+00	3.93E-04	8.63E-02				
Fluoranthene	1.30E+00	0.00E+00	8.99E-01	0.00E+00	8.99E-01	0.00E+00	4.32E-03	9.04E-01				
Fluorene	3.93E-02	0.00E+00	2.93E-02	0.00E+00	2.93E-02	0.00E+00	1.30E-04	2.95E-02				
Naphthalene	2.76E-02	0.00E+00	2.22E-02	0.00E+00	2.22E-02	0.00E+00	9.15E-05	2.23E-02				
Phenanthrene	6.59E-01	0.00E+00	4.77E-01	0.00E+00	4.77E-01	0.00E+00	2.19E-03	4.79E-01				
Total LMW PAHs					1.56E+00	0.00E+00	7.32E-03	1.57E+00	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	7.81E-01	0.00E+00	4.68E-01	0.00E+00	4.68E-01	0.00E+00	2.59E-03	4.71E-01				
Benzo[A]Pyrene	1.05E+00	0.00E+00	6.61E-01	0.00E+00	6.61E-01	0.00E+00	3.47E-03	6.65E-01				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	1.05E+00	0.00E+00	6.39E-01	0.00E+00	6.39E-01	0.00E+00	3.48E-03	6.42E-01				
Benzo(k)fluoranthene	5.38E-01	0.00E+00	3.34E-01	0.00E+00	3.34E-01	0.00E+00	1.78E-03	3.36E-01				
Chrysene	1.12E+00	0.00E+00	7.30E-01	0.00E+00	7.30E-01	0.00E+00	3.70E-03	7.34E-01				
Dibenz(A,H)Anthracene	2.26E-01	0.00E+00	1.36E-01	0.00E+00	1.36E-01	0.00E+00	7.51E-04	1.37E-01				
Indeno (1,2,3-CD) Pyrene	9.71E-01	0.00E+00	5.82E-01	0.00E+00	5.82E-01	0.00E+00	3.22E-03	5.85E-01				
Pyrene	1.34E+00	0.00E+00	9.40E-01	0.00E+00	9.40E-01	0.00E+00	4.45E-03	9.45E-01				
Total HMW PAHs					4.49E+00	0.00E+00	2.35E-02	4.51E+00	2.00E+00	**2.26E+00**	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H23-3
Refined Exposure Evaluation - American Dipper
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H23-4
Refined Exposure Evaluation - American Woodcock
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	3.69E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.34E-02	0.00E+00	4.34E-02	1.10E+02	<1	1.10E+03	<1
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Arsenic	6.83E+00	0.00E+00	3.01E-03	9.91E-02	0.00E+00	1.02E-01	0.00E+00	6.02E-02	1.62E-01	2.24E+00	<1	4.51E+00	<1
Barium	2.74E+02	1.01E-01	5.02E-01	2.64E+00	0.00E+00	3.14E+00	1.19E-02	2.42E+00	5.57E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.41E+01	0.00E+00	8.03E-02	1.31E+00	0.00E+00	1.39E+00	0.00E+00	2.12E-01	1.61E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.71E+01	0.00E+00	1.53E-02	8.41E-01	0.00E+00	8.57E-01	0.00E+00	1.51E-01	1.01E+00	1.63E+00	<1	4.46E+01	<1
Manganese	1.35E+03	7.49E-01	1.25E+00	6.42E+00	0.00E+00	7.67E+00	8.80E-02	1.19E+01	1.96E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	3.23E+01	0.00E+00	1.71E-02	2.66E+00	0.00E+00	2.68E+00	0.00E+00	2.85E-01	2.96E+00	6.71E+00	<1	1.86E+01	<1
Selenium	7.88E-01	0.00E+00	4.59E-03	8.24E-02	0.00E+00	8.69E-02	0.00E+00	6.94E-03	9.39E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.49E+01	1.52E-03	8.50E-04	6.63E-02	0.00E+00	6.71E-02	1.78E-04	1.32E-01	1.99E-01	3.44E-01	<1	1.70E+00	<1
Zinc	1.10E+02	0.00E+00	7.67E-01	4.23E+01	0.00E+00	4.30E+01	0.00E+00	9.70E-01	4.40E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.32E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E-03	7.33E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	7.81E-01	0.00E+00	6.76E-04	1.31E-01	0.00E+00	1.32E-01	0.00E+00	6.88E-03	1.39E-01				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						1.32E-01	0.00E+00	6.88E-03	1.39E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	1.26E-05	2.59E-01	0.00E+00	2.59E-01	0.00E+00	3.96E-04	2.59E-01	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	ND	3.73E-04	4.25E-02	0.00E+00	4.29E-02	--	3.44E-04	4.32E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H23-4
Refined Exposure Evaluation - American Woodcock
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H23-5
Refined Exposure Evaluation - Belted Kingfisher
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	3.69E-01	0.00E+00	0.00E+00	0.00E+00	5.82E-02	0.00E+00	5.82E-02	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	2.74E+02	1.01E-01	1.22E+01	0.00E+00	1.22E+01	1.60E-02	0.00E+00	1.22E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	8.74E-01	0.00E+00	2.30E-03	0.00E+00	2.30E-03	0.00E+00	0.00E+00	2.30E-03	No TRV	--	No TRV	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.05E+00	--	3.48E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+00	--	4.46E+01	--
Manganese	1.35E+03	7.49E-01	0.00E+00	0.00E+00	0.00E+00	1.18E-01	0.00E+00	1.18E-01	1.79E+02	<1	3.77E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	3.23E+01	0.00E+00	6.83E-02	0.00E+00	6.83E-02	0.00E+00	0.00E+00	6.83E-02	6.71E+00	<1	1.86E+01	<1
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-01	--	8.20E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.49E+01	1.52E-03	5.88E-02	0.00E+00	5.88E-02	2.39E-04	0.00E+00	5.90E-02	3.44E-01	<1	1.70E+00	<1
Zinc	1.10E+02	0.00E+00	1.46E+00	0.00E+00	1.46E+00	0.00E+00	0.00E+00	1.46E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics												
Cyanide	8.32E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.00E-02	--	4.00E-01	--
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	6.12E-02	0.00E+00	4.41E-03	0.00E+00	4.41E-03	0.00E+00	0.00E+00	4.41E-03				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	1.18E-01	0.00E+00	8.16E-03	0.00E+00	8.16E-03	0.00E+00	0.00E+00	8.16E-03				
Fluoranthene	1.30E+00	0.00E+00	8.54E-02	0.00E+00	8.54E-02	0.00E+00	0.00E+00	8.54E-02				
Fluorene	3.93E-02	0.00E+00	2.79E-03	0.00E+00	2.79E-03	0.00E+00	0.00E+00	2.79E-03				
Naphthalene	2.76E-02	0.00E+00	2.10E-03	0.00E+00	2.10E-03	0.00E+00	0.00E+00	2.10E-03				
Phenanthrene	6.59E-01	0.00E+00	4.53E-02	0.00E+00	4.53E-02	0.00E+00	0.00E+00	4.53E-02				
Total LMW PAHs					1.48E-01	0.00E+00	0.00E+00	1.48E-01	1.61E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	7.81E-01	0.00E+00	4.45E-02	0.00E+00	4.45E-02	0.00E+00	0.00E+00	4.45E-02				
Benzo[A]Pyrene	1.05E+00	0.00E+00	6.28E-02	0.00E+00	6.28E-02	0.00E+00	0.00E+00	6.28E-02				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	1.05E+00	0.00E+00	6.07E-02	0.00E+00	6.07E-02	0.00E+00	0.00E+00	6.07E-02				
Benzo(k)fluoranthene	5.38E-01	0.00E+00	3.18E-02	0.00E+00	3.18E-02	0.00E+00	0.00E+00	3.18E-02				
Chrysene	1.12E+00	0.00E+00	6.94E-02	0.00E+00	6.94E-02	0.00E+00	0.00E+00	6.94E-02				
Dibenz(A,H)Anthracene	2.26E-01	0.00E+00	1.29E-02	0.00E+00	1.29E-02	0.00E+00	0.00E+00	1.29E-02				
Indeno (1,2,3-CD) Pyrene	9.71E-01	0.00E+00	5.52E-02	0.00E+00	5.52E-02	0.00E+00	0.00E+00	5.52E-02				
Pyrene	1.34E+00	0.00E+00	8.93E-02	0.00E+00	8.93E-02	0.00E+00	0.00E+00	8.93E-02				
Total HMW PAHs					4.27E-01	0.00E+00	0.00E+00	4.27E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H23-5
Refined Exposure Evaluation - Belted Kingfisher
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H23-6
Refined Exposure Evaluation - Mourning Dove
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	3.69E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.21E-02	0.00E+00	4.21E-02	1.10E+02	<1	1.10E+03	<1
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Arsenic	6.83E+00	0.00E+00	2.92E-02	0.00E+00	0.00E+00	2.92E-02	0.00E+00	5.30E-02	8.22E-02	2.24E+00	<1	4.51E+00	<1
Barium	2.74E+02	1.01E-01	4.88E+00	0.00E+00	0.00E+00	4.88E+00	1.16E-02	2.13E+00	7.02E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.41E+01	0.00E+00	7.80E-01	0.00E+00	0.00E+00	7.80E-01	0.00E+00	1.87E-01	9.67E-01	4.05E+00	<1	3.48E+01	<1
Lead	1.71E+01	0.00E+00	1.49E-01	0.00E+00	0.00E+00	1.49E-01	0.00E+00	1.33E-01	2.82E-01	1.63E+00	<1	4.46E+01	<1
Manganese	1.35E+03	7.49E-01	1.22E+01	0.00E+00	0.00E+00	1.22E+01	8.55E-02	1.05E+01	2.27E+01	1.79E+02	<1	3.77E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	3.23E+01	0.00E+00	1.66E-01	0.00E+00	0.00E+00	1.66E-01	0.00E+00	2.51E-01	4.17E-01	6.71E+00	<1	1.86E+01	<1
Selenium	7.88E-01	0.00E+00	4.46E-02	0.00E+00	0.00E+00	4.46E-02	0.00E+00	6.11E-03	5.07E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.49E+01	1.52E-03	8.26E-03	0.00E+00	0.00E+00	8.26E-03	1.73E-04	1.16E-01	1.24E-01	3.44E-01	<1	1.70E+00	<1
Zinc	1.10E+02	0.00E+00	7.46E+00	0.00E+00	0.00E+00	7.46E+00	0.00E+00	8.54E-01	8.31E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.32E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.46E-03	6.46E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	7.81E-01	0.00E+00	6.57E-03	0.00E+00	0.00E+00	6.57E-03	0.00E+00	6.06E-03	1.26E-02				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						6.57E-03	0.00E+00	6.06E-03	1.26E-02	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	1.22E-04	0.00E+00	0.00E+00	1.22E-04	0.00E+00	3.49E-04	4.71E-04	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	3.62E-03	0.00E+00	0.00E+00	3.62E-03	0.00E+00	3.03E-04	3.93E-03	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H23-6
Refined Exposure Evaluation - Mourning Dove
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H23-7
Refined Exposure Evaluation - Red-tailed Hawk
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	3.69E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.03E-02	0.00E+00	3.03E-02	1.10E+02	<1	1.10E+03	<1
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Arsenic	6.83E+00	0.00E+00	0.00E+00	0.00E+00	3.10E-03	3.10E-03	0.00E+00	1.46E-02	1.77E-02	2.24E+00	<1	4.51E+00	<1
Barium	2.74E+02	1.01E-01	0.00E+00	0.00E+00	1.53E-02	1.53E-02	8.32E-03	5.84E-01	6.08E-01	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.41E+01	0.00E+00	0.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	5.14E-02	1.05E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.71E+01	0.00E+00	0.00E+00	0.00E+00	3.11E-01	3.11E-01	0.00E+00	3.65E-02	3.47E-01	1.63E+00	<1	4.46E+01	<1
Manganese	1.35E+03	7.49E-01	0.00E+00	0.00E+00	2.27E+00	2.27E+00	6.15E-02	2.88E+00	5.21E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	3.23E+01	0.00E+00	0.00E+00	0.00E+00	3.24E-01	3.24E-01	0.00E+00	6.89E-02	3.93E-01	6.71E+00	<1	1.86E+01	<1
Selenium	7.88E-01	0.00E+00	0.00E+00	0.00E+00	4.95E-02	4.95E-02	0.00E+00	1.68E-03	5.11E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.49E+01	1.52E-03	0.00E+00	0.00E+00	1.51E-02	1.51E-02	1.24E-04	3.18E-02	4.70E-02	3.44E-01	<1	1.70E+00	<1
Zinc	1.10E+02	0.00E+00	0.00E+00	0.00E+00	8.97E+00	8.97E+00	0.00E+00	2.35E-01	9.21E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.32E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-03	1.77E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	7.81E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E-03	1.66E-03				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	1.66E-03	1.66E-03	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	0.00E+00	0.00E+00	2.87E-03	2.87E-03	0.00E+00	9.60E-05	2.97E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	0.00E+00	0.00E+00	1.44E-03	1.44E-03	0.00E+00	8.32E-05	1.52E-03	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H23-7
Refined Exposure Evaluation - Red-tailed Hawk
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H23-8
Refined Exposure Evaluation - Yellow-billed Cuckoo
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	3.69E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.85E-02	0.00E+00	5.85E-02	1.10E+02	<1	1.10E+03	<1
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Arsenic	6.83E+00	0.00E+00	0.00E+00	1.48E-01	0.00E+00	1.48E-01	0.00E+00	0.00E+00	1.48E-01	2.24E+00	<1	4.51E+00	<1
Barium	2.74E+02	1.01E-01	0.00E+00	3.95E+00	0.00E+00	3.95E+00	1.61E-02	0.00E+00	3.97E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.41E+01	0.00E+00	0.00E+00	1.97E+00	0.00E+00	1.97E+00	0.00E+00	0.00E+00	1.97E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.71E+01	0.00E+00	0.00E+00	1.26E+00	0.00E+00	1.26E+00	0.00E+00	0.00E+00	1.26E+00	1.63E+00	<1	4.46E+01	<1
Manganese	1.35E+03	7.49E-01	0.00E+00	9.61E+00	0.00E+00	9.61E+00	1.19E-01	0.00E+00	9.73E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	3.23E+01	0.00E+00	0.00E+00	3.98E+00	0.00E+00	3.98E+00	0.00E+00	0.00E+00	3.98E+00	6.71E+00	<1	1.86E+01	<1
Selenium	7.88E-01	0.00E+00	0.00E+00	1.23E-01	0.00E+00	1.23E-01	0.00E+00	0.00E+00	1.23E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.49E+01	1.52E-03	0.00E+00	9.93E-02	0.00E+00	9.93E-02	2.40E-04	0.00E+00	9.95E-02	3.44E-01	<1	1.70E+00	<1
Zinc	1.10E+02	0.00E+00	0.00E+00	6.33E+01	0.00E+00	6.33E+01	0.00E+00	0.00E+00	6.33E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.32E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.00E-02	--	4.00E-01	--
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	7.81E-01	0.00E+00	0.00E+00	1.97E-01	0.00E+00	1.97E-01	0.00E+00	0.00E+00	1.97E-01				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						1.97E-01	0.00E+00	0.00E+00	1.97E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	0.00E+00	3.88E-01	0.00E+00	3.88E-01	0.00E+00	0.00E+00	3.88E-01	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	0.00E+00	6.37E-02	0.00E+00	6.37E-02	0.00E+00	0.00E+00	6.37E-02	1.10E-01	<1	1.10E+00	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H23-8
Refined Exposure Evaluation - Yellow-billed Cuckoo
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H23-9
Refined Exposure Evaluation - Canada Lynx
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	3.69E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-02	0.00E+00	1.15E-02	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	6.83E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-03	1.18E-03	0.00E+00	5.97E-03	7.16E-03	1.04E+00	<1	4.55E+00	<1
Barium	2.74E+02	1.01E-01	0.00E+00	0.00E+00	5.84E-03	5.84E-03	3.17E-03	2.40E-01	2.49E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.41E+01	0.00E+00	0.00E+00	0.00E+00	3.81E-01	3.81E-01	0.00E+00	2.11E-02	4.02E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.71E+01	0.00E+00	0.00E+00	0.00E+00	1.18E-01	1.18E-01	0.00E+00	1.50E-02	1.33E-01	4.70E+00	<1	1.86E+02	<1
Manganese	1.35E+03	7.49E-01	0.00E+00	0.00E+00	8.64E-01	8.64E-01	2.34E-02	1.18E+00	2.07E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	3.23E+01	0.00E+00	0.00E+00	0.00E+00	1.23E-01	1.23E-01	0.00E+00	2.83E-02	1.52E-01	1.70E+00	<1	1.48E+01	<1
Selenium	7.88E-01	0.00E+00	0.00E+00	0.00E+00	1.88E-02	1.88E-02	0.00E+00	6.89E-04	1.95E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.49E+01	1.52E-03	0.00E+00	0.00E+00	5.74E-03	5.74E-03	4.74E-05	1.31E-02	1.88E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.10E+02	0.00E+00	0.00E+00	0.00E+00	3.42E+00	3.42E+00	0.00E+00	9.63E-02	3.51E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.32E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.28E-04	7.28E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	7.81E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.83E-04	6.83E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	6.83E-04	6.83E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	0.00E+00	0.00E+00	1.10E-03	1.10E-03	0.00E+00	3.94E-05	1.13E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	0.00E+00	0.00E+00	5.47E-04	5.47E-04	0.00E+00	3.41E-05	5.81E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H23-9
Refined Exposure Evaluation - Canada Lynx
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H23-10
Refined Exposure Evaluation - Grizzly Bear
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate						
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	3.69E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.97E-03	0.00E+00	7.97E-03	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	6.83E+00	0.00E+00	3.60E-03	3.04E-03	8.17E-05	0.00E+00	6.71E-03	0.00E+00	4.13E-03	1.08E-02	1.04E+00	<1	4.55E+00	<1
Barium	2.74E+02	1.01E-01	6.00E-01	8.08E-02	4.04E-04	0.00E+00	6.81E-01	2.19E-03	1.66E-01	8.49E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.41E+01	0.00E+00	9.59E-02	4.02E-02	2.63E-02	0.00E+00	1.62E-01	0.00E+00	1.46E-02	1.77E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.71E+01	0.00E+00	1.83E-02	2.58E-02	8.18E-03	0.00E+00	5.23E-02	0.00E+00	1.03E-02	6.26E-02	4.70E+00	<1	1.86E+02	<1
Manganese	1.35E+03	7.49E-01	1.50E+00	1.97E-01	5.97E-02	0.00E+00	1.75E+00	1.62E-02	8.16E-01	2.58E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	3.23E+01	0.00E+00	2.05E-02	8.15E-02	8.52E-03	0.00E+00	1.10E-01	0.00E+00	1.96E-02	1.30E-01	1.70E+00	<1	1.48E+01	<1
Selenium	7.88E-01	0.00E+00	5.48E-03	2.52E-03	1.30E-03	0.00E+00	9.31E-03	0.00E+00	4.76E-04	9.78E-03	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.49E+01	1.52E-03	1.02E-03	2.03E-03	3.96E-04	0.00E+00	3.44E-03	3.28E-05	9.03E-03	1.25E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.10E+02	0.00E+00	9.17E-01	1.30E+00	2.36E-01	0.00E+00	2.45E+00	0.00E+00	6.66E-02	2.51E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	8.32E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.03E-04	5.03E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs							0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	7.81E-01	0.00E+00	8.08E-04	4.02E-03	0.00E+00	0.00E+00	4.83E-03	0.00E+00	4.72E-04	5.30E-03				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs							4.83E-03	0.00E+00	4.72E-04	5.30E-03	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	1.50E-05	7.93E-03	7.57E-05	0.00E+00	8.02E-03	0.00E+00	2.72E-05	8.05E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	4.46E-04	1.30E-03	3.78E-05	0.00E+00	1.79E-03	0.00E+00	2.36E-05	1.81E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H23-10
Refined Exposure Evaluation - Grizzly Bear
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)											
			Diet					Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)														
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans														
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans							0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H23-11
Refined Exposure Evaluation - Long-tailed Weasel
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{Low}	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	3.69E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.90E-02	0.00E+00	1.90E-02	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	6.83E+00	0.00E+00	0.00E+00	0.00E+00	1.95E-03	1.95E-03	0.00E+00	5.62E-03	7.57E-03	1.04E+00	<1	4.55E+00	<1
Barium	2.74E+02	1.01E-01	0.00E+00	0.00E+00	9.63E-03	9.63E-03	5.22E-03	2.26E-01	2.41E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.41E+01	0.00E+00	0.00E+00	0.00E+00	6.28E-01	6.28E-01	0.00E+00	1.98E-02	6.48E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.71E+01	0.00E+00	0.00E+00	0.00E+00	1.95E-01	1.95E-01	0.00E+00	1.41E-02	2.09E-01	4.70E+00	<1	1.86E+02	<1
Manganese	1.35E+03	7.49E-01	0.00E+00	0.00E+00	1.42E+00	1.42E+00	3.86E-02	1.11E+00	2.57E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	3.23E+01	0.00E+00	0.00E+00	0.00E+00	2.03E-01	2.03E-01	0.00E+00	2.66E-02	2.30E-01	1.70E+00	<1	1.48E+01	<1
Selenium	7.88E-01	0.00E+00	0.00E+00	0.00E+00	3.10E-02	3.10E-02	0.00E+00	6.49E-04	3.17E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.49E+01	1.52E-03	0.00E+00	0.00E+00	9.45E-03	9.45E-03	7.81E-05	1.23E-02	2.18E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.10E+02	0.00E+00	0.00E+00	0.00E+00	5.63E+00	5.63E+00	0.00E+00	9.06E-02	5.72E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.32E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.85E-04	6.85E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	7.81E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.43E-04	6.43E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	6.43E-04	6.43E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	0.00E+00	0.00E+00	1.80E-03	1.80E-03	0.00E+00	3.71E-05	1.84E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	0.00E+00	0.00E+00	9.01E-04	9.01E-04	0.00E+00	3.21E-05	9.33E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H23-11
Refined Exposure Evaluation - Long-tailed Weasel
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{Low}	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H23-12
Refined Exposure Evaluation - Meadow Vole
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	3.69E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.55E-02	0.00E+00	5.55E-02	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	6.83E+00	0.00E+00	3.85E-02	0.00E+00	0.00E+00	3.85E-02	0.00E+00	1.33E-02	5.18E-02	1.04E+00	<1	4.55E+00	<1
Barium	2.74E+02	1.01E-01	6.42E+00	0.00E+00	0.00E+00	6.42E+00	1.52E-02	5.35E-01	6.97E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.41E+01	0.00E+00	1.03E+00	0.00E+00	0.00E+00	1.03E+00	0.00E+00	4.71E-02	1.07E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.71E+01	0.00E+00	1.96E-01	0.00E+00	0.00E+00	1.96E-01	0.00E+00	3.34E-02	2.29E-01	4.70E+00	<1	1.86E+02	<1
Manganese	1.35E+03	7.49E-01	1.60E+01	0.00E+00	0.00E+00	1.60E+01	1.13E-01	2.63E+00	1.88E+01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	3.23E+01	0.00E+00	2.19E-01	0.00E+00	0.00E+00	2.19E-01	0.00E+00	6.32E-02	2.82E-01	1.70E+00	<1	1.48E+01	<1
Selenium	7.88E-01	0.00E+00	5.87E-02	0.00E+00	0.00E+00	5.87E-02	0.00E+00	1.54E-03	6.02E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.49E+01	1.52E-03	1.09E-02	0.00E+00	0.00E+00	1.09E-02	2.28E-04	2.92E-02	4.03E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.10E+02	0.00E+00	9.81E+00	0.00E+00	0.00E+00	9.81E+00	0.00E+00	2.15E-01	1.00E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.32E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E-03	1.63E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	7.81E-01	0.00E+00	8.65E-03	0.00E+00	0.00E+00	8.65E-03	0.00E+00	1.53E-03	1.02E-02				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						8.65E-03	0.00E+00	1.53E-03	1.02E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	1.61E-04	0.00E+00	0.00E+00	1.61E-04	0.00E+00	8.79E-05	2.49E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	4.77E-03	0.00E+00	0.00E+00	4.77E-03	0.00E+00	7.62E-05	4.85E-03	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H23-12
Refined Exposure Evaluation - Meadow Vole
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H23-13
Refined Exposure Evaluation - Mink
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals												
Aluminum	0.00E+00	3.69E-01	0.00E+00	0.00E+00	0.00E+00	1.60E-02	0.00E+00	1.60E-02	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	2.74E+02	1.01E-01	0.00E+00	0.00E+00	0.00E+00	4.39E-03	0.00E+00	4.39E-03	5.18E+01	<1	8.27E+01	<1
Beryllium	8.74E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.60E+00	--	8.27E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.70E+00	--	1.86E+02	--
Manganese	1.35E+03	7.49E-01	0.00E+00	0.00E+00	0.00E+00	3.24E-02	0.00E+00	3.24E-02	5.15E+01	<1	1.46E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	3.23E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-01	--	6.60E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.49E+01	1.52E-03	0.00E+00	0.00E+00	0.00E+00	6.56E-05	0.00E+00	6.56E-05	4.16E+00	<1	9.44E+00	<1
Zinc	1.10E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.54E+01	--	2.98E+02	--
Inorganics - Other Inorganics												
Cyanide	8.32E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.87E+01	--	6.87E+02	--
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	6.12E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	1.18E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluoranthene	1.30E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluorene	3.93E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	2.76E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	6.59E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total LMW PAHs					0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	7.81E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo[A]Pyrene	1.05E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	1.05E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(k)fluoranthene	5.38E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Chrysene	1.12E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Dibenz(A,H)Anthracene	2.26E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Indeno (1,2,3-CD) Pyrene	9.71E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Pyrene	1.34E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total HMW PAHs					0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-01	--	3.84E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H23-13
Refined Exposure Evaluation - Mink
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H23-14
Refined Exposure Evaluation - North American Wolverine
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	3.69E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-02	0.00E+00	1.11E-02	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	6.83E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-03	1.14E-03	0.00E+00	5.74E-03	6.88E-03	1.04E+00	<1	4.55E+00	<1
Barium	2.74E+02	1.01E-01	0.00E+00	0.00E+00	5.62E-03	5.62E-03	3.05E-03	2.31E-01	2.39E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.41E+01	0.00E+00	0.00E+00	0.00E+00	3.67E-01	3.67E-01	0.00E+00	2.03E-02	3.87E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.71E+01	0.00E+00	0.00E+00	0.00E+00	1.14E-01	1.14E-01	0.00E+00	1.44E-02	1.28E-01	4.70E+00	<1	1.86E+02	<1
Manganese	1.35E+03	7.49E-01	0.00E+00	0.00E+00	8.31E-01	8.31E-01	2.25E-02	1.13E+00	1.99E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	3.23E+01	0.00E+00	0.00E+00	0.00E+00	1.19E-01	1.19E-01	0.00E+00	2.72E-02	1.46E-01	1.70E+00	<1	1.48E+01	<1
Selenium	7.88E-01	0.00E+00	0.00E+00	0.00E+00	1.81E-02	1.81E-02	0.00E+00	6.63E-04	1.88E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.49E+01	1.52E-03	0.00E+00	0.00E+00	5.52E-03	5.52E-03	4.56E-05	1.26E-02	1.81E-02	4.16E+00	<1	9.44E+00	<1
Zinc	1.10E+02	0.00E+00	0.00E+00	0.00E+00	3.29E+00	3.29E+00	0.00E+00	9.26E-02	3.38E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.32E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.00E-04	7.00E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	7.81E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.57E-04	6.57E-04				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	6.57E-04	6.57E-04	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	0.00E+00	0.00E+00	1.05E-03	1.05E-03	0.00E+00	3.79E-05	1.09E-03	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	0.00E+00	0.00E+00	5.26E-04	5.26E-04	0.00E+00	3.28E-05	5.59E-04	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H23-14
Refined Exposure Evaluation - North American Wolverine
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H23-15
Refined Exposure Evaluation - Short-tailed Shrew
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	3.69E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.95E-02	0.00E+00	4.95E-02	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	6.83E+00	0.00E+00	0.00E+00	1.26E-01	0.00E+00	1.26E-01	0.00E+00	1.01E-02	1.36E-01	1.04E+00	<1	4.55E+00	<1
Barium	2.74E+02	1.01E-01	0.00E+00	3.34E+00	0.00E+00	3.34E+00	1.36E-02	4.04E-01	3.76E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.41E+01	0.00E+00	0.00E+00	1.66E+00	0.00E+00	1.66E+00	0.00E+00	3.55E-02	1.70E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.71E+01	0.00E+00	0.00E+00	1.07E+00	0.00E+00	1.07E+00	0.00E+00	2.52E-02	1.09E+00	4.70E+00	<1	1.86E+02	<1
Manganese	1.35E+03	7.49E-01	0.00E+00	8.14E+00	0.00E+00	8.14E+00	1.00E-01	1.99E+00	1.02E+01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	3.23E+01	0.00E+00	0.00E+00	3.37E+00	0.00E+00	3.37E+00	0.00E+00	4.77E-02	3.42E+00	1.70E+00	**2.01E+00**	1.48E+01	<1
Selenium	7.88E-01	0.00E+00	0.00E+00	1.04E-01	0.00E+00	1.04E-01	0.00E+00	1.16E-03	1.06E-01	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.49E+01	1.52E-03	0.00E+00	8.40E-02	0.00E+00	8.40E-02	2.03E-04	2.20E-02	1.06E-01	4.16E+00	<1	9.44E+00	<1
Zinc	1.10E+02	0.00E+00	0.00E+00	5.36E+01	0.00E+00	5.36E+01	0.00E+00	1.62E-01	5.37E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	8.32E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-03	1.23E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	7.81E-01	0.00E+00	0.00E+00	1.66E-01	0.00E+00	1.66E-01	0.00E+00	1.15E-03	1.68E-01				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						1.66E-01	0.00E+00	1.15E-03	1.68E-01	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	4.50E-02	0.00E+00	0.00E+00	3.28E-01	0.00E+00	3.28E-01	0.00E+00	6.63E-05	3.28E-01	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	3.90E-02	0.00E+00	0.00E+00	5.39E-02	0.00E+00	5.39E-02	0.00E+00	5.75E-05	5.40E-02	5.50E+02	<1	1.83E+03	<1
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H23-15
Refined Exposure Evaluation - Short-tailed Shrew
Cedar Creek Reservoir Overflow Ditch
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H24-1
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Northern Surface Water Feature (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals											
Aluminum	NA	0.00E+00	8.00E-04	0.00E+00	Baes et al. (1984)	5.30E-02	0.00E+00	Sample et al. (1998a)	6.00E-06	0.00E+00	Baes et al. (1984)[e]
Antimony	NA	ND	Regression[a]	0	USEPA (2007)	1.00E+00	0	Assumption[c]	5.00E-02	0	Baes et al. (1984)[e]
Arsenic	NA	9.33E+00	3.75E-02	3.50E-01	Bechtel-Jacobs (1998a)[g]	Regression[d]	1.17E+00	Sample et al. (1999)	Regression[f]	4.89E-02	Sample et al. (1998b)
Barium	NA	5.86E+02	1.56E-01	9.15E+01	Bechtel-Jacobs (1998a)[g]	9.10E-02	5.34E+01	Sample et al. (1998a)	6.83E-04	4.00E-01	Baes et al. (1984)[e]
Beryllium	NA	0.00E+00	Regression[a]	0.00E+00	USEPA (2007)	4.50E-02	0.00E+00	Sample et al. (1998a)	2.25E-03	0.00E+00	Baes et al. (1984)[e]
Cadmium	NA	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	Regression[d]	0	Sample et al. (1999)	Regression[f]	0	Sample et al. (1998b)
Chromium	NA	ND	4.10E-02	0	Bechtel-Jacobs (1998a)[g]	3.06E-01	0	Sample et al. (1998a)	Regression[f]	0	Sample et al. (1998b)
Cobalt	NA	0.00E+00	7.50E-03	0.00E+00	Bechtel-Jacobs (1998a)[g]	1.22E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Copper	NA	2.61E+01	Regression[a]	7.05E+00	Bechtel-Jacobs (1998a)	5.15E-01	1.34E+01	Sample et al. (1998a)	Regression[f]	1.23E+01	Sample et al. (1998b)
Lead	NA	1.35E+01	Regression[a]	1.14E+00	Bechtel-Jacobs (1998a)	Regression[d]	6.56E+00	Sample et al. (1999)	Regression[f]	3.41E+00	Sample et al. (1998b)
Manganese	NA	4.80E+02	7.90E-02	3.79E+01	Bechtel-Jacobs (1998a)[g]	Regression[d]	3.00E+01	Sample et al. (1999)	2.05E-02	9.84E+00	Sample et al. (1998b)[i]
Mercury	NA	ND	Regression[a]	0	Bechtel-Jacobs (1998a)	3.93E+00	0	Sample et al. (1998a)	3.81E-01	0	LANL (2015)
Nickel	NA	0.00E+00	Regression[a]	0.00E+00	Bechtel-Jacobs (1998a)	7.78E-01	0.00E+00	Sample et al. (1998a)	Regression[f]	0.00E+00	Sample et al. (1998b)
Selenium	NA	1.62E+00	Regression[a]	8.64E-01	Bechtel-Jacobs (1998a)	Regression[d]	1.32E+00	Sample et al. (1998a)	Regression[f]	7.91E-01	Sample et al. (1998b)
Silver		ND	1.40E-02	0	Bechtel-Jacobs (1998a)m	2.05E+00	0	Sample et al. (1998a)	4.00E-03	0	Sample et al. (1998b)
Thallium	NA	ND	4.00E-03	0	Baes et al. (1984)	5.41E-02	0	USCHPPM (2004)	1.08E-01	0	Baes et al. (1984)[e]
Vanadium	NA	1.29E+01	4.85E-03	6.28E-02	Bechtel-Jacobs (1998a)[g]	4.20E-02	5.44E-01	Sample et al. (1998a)	1.23E-02	1.59E-01	Sample et al. (1998b)[i]
Zinc	NA	4.31E+01	Regression[a]	3.89E+01	Bechtel-Jacobs (1998a)	Regression[d]	2.94E+02	Sample et al. (1998a)	Regression[f]	1.02E+02	Sample et al. (1998b)
Inorganics - Other Inorganics											
Cyanide	NA	4.11E-01	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	ND	6.00E-02	0	Baes et al. (1984)	1.24E-01	0	USCHPPM (2004)	1.60E-02	0	LANL (2015)
Polychlorinated Biphenyls (PCBs)											
Aroclor 1248	6.34	ND	1.62E-01	0	USEPA (2007a)	2.21E+01	0	USEPA (2007a)	2.76E-01	0	Calculated[j]
Aroclor 1254	6.98	ND	8.90E-02	0	USEPA (2007a)	2.92E+01	0	USEPA (2007a)	2.53E-01	0	Calculated[j]
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)											
Low Molecular Weight (LMW) PAHs:											
Acenaphthene	3.92	ND	Regression[a]	0	USEPA (2007a)	1.47E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Acenaphthylene	4.07	ND	Regression[a]	0	USEPA (2007a)	2.29E+01	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Anthracene	4.55	ND	Regression[a]	0	USEPA (2007a)	2.42E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluoranthene	4.95	ND	5.00E-01	0	USEPA (2007a)	3.04E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Fluorene	4.18	ND	Regression[a]	0	USEPA (2007a)	9.57E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Naphthalene	3.36	ND	1.22E+01	0	USEPA (2007a)	4.40E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Phenanthrene	4.55	ND	Regression[a]	0	USEPA (2007a)	1.72E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
LMW PAHs											

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Analyte	log K_{ow}	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
High Molecular Weight (HMW) PAHs:											
Benzo(a)anthracene	5.7	ND	Regression[a]	0	USEPA (2007a)	1.59E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo[A]Pyrene	6.11	ND	Regression[a]	0	USEPA (2007a)	1.33E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(b)fluoranthene	6.2	ND	3.10E-01	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(g,h,i)perylene	6.7	ND	Regression[a]	0	USEPA (2007a)	2.94E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Benzo(k)fluoranthene	6.2	ND	Regression[a]	0	USEPA (2007a)	2.60E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Chrysene	5.7	ND	Regression[a]	0	USEPA (2007a)	2.29E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Dibenz(a,h)anthracene	6.69	ND	1.30E-01	0	USEPA (2007a)	2.31E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Indeno (1,2,3-CD) Pyrene	6.58	ND	1.10E-01	0	USEPA (2007a)	2.86E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
Pyrene	4.88	ND	7.20E-01	0	USEPA (2007a)	1.75E+00	0	USEPA (2007a)	0.00E+00	0	USEPA (2007a)[h]
HMW PAHs											
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs											
1,2,4,5-Tetrachlorobenzene	4.57	ND	8.44E-01	0	USEPA (2007a)	1.01E+01	0	USEPA (2007a)	1.33E-01	0	Calculated[j]
2,3,4,6-Tetrachlorophenol		ND									
2-Chloronaphthalene	3.81	ND	1.71E+00	0	USEPA (2007a)	7.27E+00	0	USEPA (2007a)	6.32E-02	0	Calculated[j]
Biphenyl (Diphenyl)	3.76	ND	1.80E+00	0	USEPA (2007a)	7.10E+00	0	USEPA (2007a)	5.93E-02	0	Calculated[j]
Bis(2-ethylhexyl)phthalate	8.39	ND	2.38E-02	0	USEPA (2007a)	5.44E+01	0	USEPA (2007a)	7.79E-01	0	LANL (2015)
Butylbenzylphthalate	4.84	ND	6.54E-01	0	USEPA (2007a)	1.14E+01	0	USEPA (2007a)	1.22E-01	0	LANL (2015)
Dibenzofuran	3.71	ND	1.88E+00	0	USEPA (2007a)	6.96E+00	0	USEPA (2007a)	5.60E-02	0	Calculated[j]
Di-n-butyl phthalate	4.61	ND	8.14E-01	0	USEPA (2007a)	1.03E+01	0	USEPA (2007a)	4.49E-01	0	LANL (2015)
Di-n-octyl phthalate	8.54	ND	2.07E-02	0	USEPA (2007a)	5.81E+01	0	USEPA (2007a)	1.03E+00	0	LANL (2015)
Hexachlorobenzene	5.86	ND	2.53E-01	0	USEPA (2007a)	1.79E+01	0	USEPA (2007a)	2.65E+00	0	LANL (2015)
Hexachlorobutadiene	4.72	ND	7.37E-01	0	USEPA (2007a)	1.08E+01	0	USEPA (2007a)	1.49E-01	0	Calculated[j]
Hexachloroethane	4.03	ND	1.39E+00	0	USEPA (2007a)	8.01E+00	0	USEPA (2007a)	8.07E-02	0	Calculated[j]
Pentachlorophenol	4.74	ND	5.93E+00	0	USEPA (2007a)	1.09E+01	0	USEPA (2007a)	Regression[g]	0	USEPA (2007a)
Volatile Organic Compounds (VOCs)											
Methylcyclohexane	3.59	ND	2.11E+00	0	USEPA (2007a)	6.59E+00	0	USEPA (2007a)	4.82E-02	0	LANL (2015)

Table H24-1
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Northern Surface Water Feature (0 - 0.5' Interval)
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Columbia Falls, Montana

Analyte	log K_{ow}	Refined Shallow Soil (0-0.5') Exposure Point Concentration (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Plants			Soil Invertebrates			Small Mammals		
			Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference	Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Dioxin/Furans											
2,3,7,8-TCDD	6.92	ND	9.41E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8-PeCDD	7.56	ND	5.17E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,6,7,8-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,7,8,9-HxCDD	8.21	ND	2.82E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
1,2,3,4,6,7,8-HpCDD	8.85	ND	1.55E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
OCDD	9.50	ND	8.45E-03	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	Regression[h]	0	Sample et al. (1998b)
2,3,7,8-TCDF	6.29	ND	1.69E-01	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,7,8-PeCDF	6.94	ND	9.24E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
2,3,4,6,7,8-HxCDF	7.92	ND	3.70E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,7,8,9-HxCDF	7.58	ND	5.08E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,6,7,8-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
1,2,3,4,7,8,9-HpCDF	8.23	ND	2.77E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]
OCDF	8.87	ND	1.52E-02	0	USEPA (2007a)[b]	Regression[d]	0	Sample et al. (1998a)	1.25E-01	0	Sample et al. (1998b)[i]

Table H24-1
Estimated Concentrations in Dietary Items of Terrestrial Receptors - Northern Surface Water Feature (0 - 0.5' Interval)
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Antimony	-3.233	9.38E-01	USEPA (2007)
Beryllium	-0.5361	7.35E-01	USEPA (2007)
Cadmium	-0.475	5.46E-01	Bechtel-Jacobs (1998)
Copper	0.668	3.94E-01	Bechtel-Jacobs (1998)
Lead	-1.328	5.61E-01	Bechtel-Jacobs (1998)
Mercury	-0.996	5.44E-01	Bechtel-Jacobs (1998)
Nickel	-2.223	7.48E-01	Bechtel-Jacobs (1998)
Selenium	-0.677	1.10E+00	Bechtel-Jacobs (1998)
Zinc	1.575	5.54E-01	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	-8.56E-01	USEPA (2007)
Acenaphthylene	-1.144	7.91E-01	USEPA (2007)
Anthracene	-0.9887	7.78E-01	USEPA (2007)
Benzo(a)anthracene	-2.7078	5.94E-01	USEPA (2007)
Benzo(a)pyrene	-2.0615	9.75E-01	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	1.18E+00	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	8.60E-01	USEPA (2007)
Chrysene	-2.7078	5.94E-01	USEPA (2007)
Fluorene	-5.562	-8.56E-01	USEPA (2007)
Phenanthrene	-0.1665	6.20E-01	USEPA (2007)

b, Soil-to-plant BAF based on K_{ow} model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log K_{ow}) + 1.781; log K_{ow} values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

c, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assumed.

d, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-1.421	7.06E-01	Sample et al. (1999)
Cadmium	2.114	7.95E-01	Sample et al. (1999)
Lead	-0.218	8.07E-01	Sample et al. (1999)
Manganese	-0.809	6.82E-01	Sample et al. (1999)
Selenium	-0.075	7.33E-01	Sample et al. (1999)
Zinc	4.449	3.28E-01	Sample et al. (1999)
2,3,7,8-TCDD	3.533	1.18E+00	Sample et al. (1998a)

e, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

f, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]) and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	B1	Data Source
Arsenic	-4.8471	8.19E-01	Sample et al. (1998b)
Cadmium	-1.2571	4.72E-01	Sample et al. (1998b)
Chromium	-1.4599	7.34E-01	Sample et al. (1998b)
Cobalt	-4.4669	1.31E+00	Sample et al. (1998b)
Copper	2.042	1.44E-01	Sample et al. (1998b)
Lead	0.0761	4.42E-01	Sample et al. (1998b)
Nickel	-0.2462	4.66E-01	Sample et al. (1998b)
Selenium	-0.4158	3.76E-01	Sample et al. (1998b)
Zinc	4.3632	7.06E-02	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	1.10E+00	Sample et al. (1998b)

g, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([$diet_{invertebrate}$])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H24-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Metals								
Aluminum	NA	2.71E+00	0.00E+00	NA	7.40E-02	---	0.00E+00	Stanley et al. (2010)
Antimony	NA	0.00E+00	0.00E+00	NA	5.75E-01	---	0.00E+00	Dovick et al. (2015)
Arsenic	NA	0.00E+00	9.33E+00	NA	3.73E-01	---	3.48E+00	Bechtel-Jacobs (1998b)[c]
Barium	NA	1.47E-01	5.86E+02	NA	2.82E+00	---	1.65E+03	Hamilton et al. (2002)
Beryllium	NA	0.00E+00	7.63E-01	NA	1.67E-01	---	1.27E-01	Hamilton et al. (2002)
Cadmium	NA	0.00E+00	0.00E+00	NA	4.59E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Chromium	NA	0.00E+00	0.00E+00	NA	8.30E-02	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Cobalt		0.00E+00	0.00E+00					
Copper	NA	0.00E+00	2.61E+01	NA	6.61E-01	---	1.72E+01	Bechtel-Jacobs (1998b)[c]
Lead	NA	0.00E+00	0.00E+00	NA	8.00E-02	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Manganese		5.21E-02	4.80E+02					
Mercury	NA	0.00E+00	0.00E+00	NA	2.84E+00	---	0.00E+00	Bechtel-Jacobs (1998c)[c]
Nickel	NA	0.00E+00	0.00E+00	NA	1.34E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Selenium	NA	0.00E+00	1.62E+00	NA	3.75E+00	---	6.06E+00	Hamilton et al. (2002)
Silver	NA	0.00E+00	0.00E+00	NA	1.80E-01	---	0.00E+00	Hirsch (1998)
Thallium	NA	0.00E+00	0.00E+00	NA	2.00E-02	---	0.00E+00	Turner et al. (2013)
Vanadium	NA	2.20E-03	1.29E+01	NA	2.50E-01	---	3.24E+00	Hamilton and Buhl (2002)
Zinc	NA	0.00E+00	0.00E+00	NA	8.40E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]
Inorganics - Other Inorganics								
Cyanide	NA	0.00E+00	4.11E-01	NA	0.00E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	0.00E+00	0.00E+00	NA	---	Regression	0.00E+00	Derived based on Aguirre-Sierra et al. (2013)
Polychlorinated Biphenyls (PCBs)								
Aroclor 1248	6.34	0.00E+00	0.00E+00	5.74E-01	0.00E+00	---	0.00E+00	DiToro and McGrath (2000)
Aroclor 1254	6.98	0.00E+00	0.00E+00	5.43E-01	0.00E+00	---	0.00E+00	DiToro and McGrath (2000)
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)								
Low Molecular Weight (LMW) PAHs:								
Acenaphthene	4.01	0.00E+00	0.00E+00	7.04E-01	4.58E+00	---	0.00E+00	DiToro and McGrath (2000)
Acenaphthylene	3.22	0.00E+00	0.00E+00	7.54E-01	4.90E+00	---	0.00E+00	DiToro and McGrath (2000)
Anthracene	4.53	0.00E+00	0.00E+00	6.73E-01	4.37E+00	---	0.00E+00	DiToro and McGrath (2000)
Fluoranthene	5.08	0.00E+00	9.30E-02	6.41E-01	4.17E+00	---	3.88E-01	DiToro and McGrath (2000)

Table H24-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Fluorene	4.21	0.00E+00	0.00E+00	6.92E-01	4.50E+00	---	0.00E+00	DiToro and McGrath (2000)
Naphthalene	3.36	0.00E+00	0.00E+00	7.45E-01	4.84E+00	---	0.00E+00	DiToro and McGrath (2000)
Phenanthrene	4.57	0.00E+00	5.19E-02	6.70E-01	4.36E+00	---	2.26E-01	DiToro and McGrath (2000)
Total LMW PAHs							6.14E-01	
High Molecular Weight (HMW) PAHs:								
Benzo(a)anthracene	6.71	0.00E+00	4.94E-02	5.56E-01	3.61E+00	---	1.78E-01	DiToro and McGrath (2000)
Benzo[A]Pyrene	6.11	0.00E+00	6.36E-02	5.86E-01	3.81E+00	---	2.42E-01	DiToro and McGrath (2000)
Benzo(b)fluoranthene	6.27	0.00E+00	0.00E+00	5.78E-01	3.76E+00	---	0.00E+00	DiToro and McGrath (2000)
Benzo(g,h,i)perylene	6.51	0.00E+00	6.50E-02	5.66E-01	3.68E+00	---	2.39E-01	DiToro and McGrath (2000)
Benzo(k)fluoranthene	6.29	0.00E+00	0.00E+00	5.77E-01	3.75E+00	---	0.00E+00	DiToro and McGrath (2000)
Chrysene	5.71	0.00E+00	9.77E-02	6.07E-01	3.94E+00	---	3.85E-01	DiToro and McGrath (2000)
Dibenz(A,H)Anthracene	6.71	0.00E+00	1.31E-02	5.56E-01	3.61E+00	---	4.74E-02	DiToro and McGrath (2000)
Indeno (1,2,3-CD) Pyrene	6.72	0.00E+00	5.23E-02	5.55E-01	3.61E+00	---	1.89E-01	DiToro and McGrath (2000)
Pyrene	4.92	0.00E+00	8.06E-02	6.50E-01	4.23E+00	---	3.41E-01	DiToro and McGrath (2000)
Total HMW PAHs							1.62E+00	
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs								
1,2,4,5-Tetrachlorobenzene		0.00E+00	0.00E+00					
2,3,4,6-Tetrachlorophenol	4.09	0.00E+00	0.00E+00	6.99E-01	4.54E+00	---	0.00E+00	DiToro and McGrath (2000)
2-Chloronaphthalene	3.81	0.00E+00	0.00E+00	7.16E-01	4.66E+00	---	0.00E+00	DiToro and McGrath (2000)
Biphenyl (Diphenyl)	3.76	0.00E+00	0.00E+00	7.20E-01	4.68E+00	---	0.00E+00	DiToro and McGrath (2000)
Bis(2-ethylhexyl)phthalate	8.39	0.00E+00	0.00E+00	4.80E-01	3.12E+00	---	0.00E+00	DiToro and McGrath (2000)
Butylbenzylphthalate		0.00E+00	0.00E+00					
Dibenzofuran	3.71	0.00E+00	0.00E+00	7.23E-01	4.70E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	6.68E-01	4.34E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-octyl phthalate	8.54	0.00E+00	0.00E+00	4.74E-01	3.08E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobenzene	5.86	0.00E+00	0.00E+00	5.99E-01	3.89E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobutadiene	4.72	0.00E+00	0.00E+00	6.62E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachloroethane		0.00E+00	0.00E+00					
Pentachlorophenol	4.74	0.00E+00	0.00E+00	6.61E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)
Volatile Organic Compounds (VOCs)								
Methylcyclohexane		0.00E+00	0.00E+00					

Table H24-2
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)			
					Aquatic Life Stage Benthic Invertebrates			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference
Dioxin/Furans								
2,3,7,8-TCDD		0.00E+00	0.00E+00					
1,2,3,7,8-PeCDD		0.00E+00	0.00E+00					
1,2,3,4,7,8-HxCDD		0.00E+00	0.00E+00					
1,2,3,6,7,8-HxCDD		0.00E+00	0.00E+00					
1,2,3,7,8,9-HxCDD		0.00E+00	0.00E+00					
1,2,3,4,6,7,8-HpCDD		0.00E+00	0.00E+00					
OCDD		0.00E+00	0.00E+00					
2,3,7,8-TCDF		0.00E+00	0.00E+00					
1,2,3,7,8-PeCDF		0.00E+00	0.00E+00					
2,3,4,7,8-PeCDF		0.00E+00	0.00E+00					
1,2,3,4,7,8-HxCDF		0.00E+00	0.00E+00					
1,2,3,6,7,8-HxCDF		0.00E+00	0.00E+00					
2,3,4,6,7,8-HxCDF		0.00E+00	0.00E+00					
1,2,3,7,8,9-HxCDF		0.00E+00	0.00E+00					
1,2,3,4,6,7,8-HpCDF		0.00E+00	0.00E+00					
1,2,3,4,7,8,9-HpCDF		0.00E+00	0.00E+00					
OCDF		0.00E+00	0.00E+00					

Notes:
NA, Normalized BSAF was not applicable for metals
a, Normalized BSAF (kg OC / kg lipid) calculated based on K_{ow}, where BSAF = $K_{ow}^{-0.038}$ (DiToro and McGrath 2000)
b, For non-ionic organic constituents, dry weight BSAF calculated from sediment organic carbon and lipid normalized BSAF as follows:

$$BSAF_{dry\ weight} = BSAF_{norm} \times f_{lip;id} \times \frac{1}{f_{oc}}$$

where: $BSAF_{norm}$ = Normalized BSAF (kg OC/kg lipid)
f_{lipid} = Fraction of lipids in prey item expressed on a dry weight basis (0.065, invertebrates; 0.08, fish)
f_{oc} = Fraction of sediment organic carbon expressed on a dry weight basis (0.01 or 1%)
c, Median BSAF for non-depurated invertebrates determined by Bechtel-Jacobs (1998b)

Table H24-3
Refined Exposure Evaluation - American Dipper
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	0.00E+00	4.50E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	9.33E+00	0.00E+00	5.78E-01	0.00E+00	5.78E-01	0.00E+00	3.10E-02	6.09E-01	2.24E+00	<1	4.51E+00	<1
Barium	5.86E+02	1.47E-01	2.74E+02	0.00E+00	2.74E+02	2.43E-02	1.95E+00	2.76E+02	7.35E+01	**3.76E+00**	1.31E+02	**2.11E+00**
Beryllium	7.63E-01	0.00E+00	2.12E-02	0.00E+00	2.12E-02	0.00E+00	2.53E-03	2.37E-02	No TRV	--	No TRV	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.61E+01	0.00E+00	2.86E+00	0.00E+00	2.86E+00	0.00E+00	8.65E-02	2.95E+00	4.05E+00	<1	3.48E+01	<1
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+00	--	4.46E+01	--
Manganese	4.80E+02	5.21E-02	0.00E+00	0.00E+00	0.00E+00	8.64E-03	1.59E+00	1.60E+00	1.79E+02	<1	3.77E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	1.62E+00	0.00E+00	1.01E+00	0.00E+00	1.01E+00	0.00E+00	5.37E-03	1.01E+00	2.90E-01	**3.49E+00**	8.20E-01	**1.23E+00**
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.29E+01	2.20E-03	5.37E-01	0.00E+00	5.37E-01	3.65E-04	4.30E-02	5.80E-01	3.44E-01	**1.69E+00**	1.70E+00	<1
Zinc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.61E+01	--	1.71E+02	--
Inorganics - Other Inorganics												
Cyanide	4.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.36E-03	1.36E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluoranthene	9.30E-02	0.00E+00	6.43E-02	0.00E+00	6.43E-02	0.00E+00	3.09E-04	6.46E-02				
Fluorene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	5.19E-02	0.00E+00	3.75E-02	0.00E+00	3.75E-02	0.00E+00	1.72E-04	3.77E-02				
Total LMW PAHs					1.02E-01	0.00E+00	4.81E-04	1.02E-01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	4.94E-02	0.00E+00	2.96E-02	0.00E+00	2.96E-02	0.00E+00	1.64E-04	2.98E-02				
Benzo[A]Pyrene	6.36E-02	0.00E+00	4.02E-02	0.00E+00	4.02E-02	0.00E+00	2.11E-04	4.04E-02				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	6.50E-02	0.00E+00	3.97E-02	0.00E+00	3.97E-02	0.00E+00	2.16E-04	3.99E-02				
Benzo(k)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Chrysene	9.77E-02	0.00E+00	6.39E-02	0.00E+00	6.39E-02	0.00E+00	3.24E-04	6.43E-02				
Dibenz(A,H)Anthracene	1.31E-02	0.00E+00	7.87E-03	0.00E+00	7.87E-03	0.00E+00	4.36E-05	7.91E-03				
Indeno (1,2,3-CD) Pyrene	5.23E-02	0.00E+00	3.14E-02	0.00E+00	3.14E-02	0.00E+00	1.74E-04	3.15E-02				
Pyrene	8.06E-02	0.00E+00	5.65E-02	0.00E+00	5.65E-02	0.00E+00	2.67E-04	5.68E-02				
Total HMW PAHs					2.69E-01	0.00E+00	1.40E-03	2.71E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H24-3
Refined Exposure Evaluation - American Dipper
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H24-4
Refined Exposure Evaluation - American Woodcock
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.19E-01	0.00E+00	3.19E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Arsenic	9.33E+00	0.00E+00	4.11E-03	1.24E-01	0.00E+00	1.28E-01	0.00E+00	8.22E-02	2.10E-01	2.24E+00	<1	4.51E+00	<1
Barium	5.86E+02	1.47E-01	1.07E+00	5.64E+00	0.00E+00	6.72E+00	1.72E-02	5.17E+00	1.19E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.61E+01	0.00E+00	8.28E-02	1.42E+00	0.00E+00	1.50E+00	0.00E+00	2.30E-01	1.73E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.35E+01	0.00E+00	1.34E-02	6.94E-01	0.00E+00	7.07E-01	0.00E+00	1.19E-01	8.26E-01	1.63E+00	<1	4.46E+01	<1
Manganese	4.80E+02	5.21E-02	4.45E-01	3.17E+00	0.00E+00	3.62E+00	6.12E-03	4.23E+00	7.85E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	1.62E+00	0.00E+00	1.01E-02	1.40E-01	0.00E+00	1.50E-01	0.00E+00	1.42E-02	1.64E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.29E+01	2.20E-03	7.38E-04	5.75E-02	0.00E+00	5.82E-02	2.58E-04	1.14E-01	1.73E-01	3.44E-01	<1	1.70E+00	<1
Zinc	4.31E+01	0.00E+00	4.57E-01	3.11E+01	0.00E+00	3.15E+01	0.00E+00	3.80E-01	3.19E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.62E-03	3.62E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+00	--	2.00E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	ND	--	--	--	0.00E+00	--	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H24-4
Refined Exposure Evaluation - American Woodcock
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Woodcock Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H24-5
Refined Exposure Evaluation - Belted Kingfisher
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	4.27E-01	0.00E+00	4.27E-01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	9.33E+00	0.00E+00	5.49E-02	0.00E+00	5.49E-02	0.00E+00	0.00E+00	5.49E-02	2.24E+00	<1	4.51E+00	<1
Barium	5.86E+02	1.47E-01	2.61E+01	0.00E+00	2.61E+01	2.31E-02	0.00E+00	2.61E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	7.63E-01	0.00E+00	2.01E-03	0.00E+00	2.01E-03	0.00E+00	0.00E+00	2.01E-03	No TRV	--	No TRV	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.61E+01	0.00E+00	2.72E-01	0.00E+00	2.72E-01	0.00E+00	0.00E+00	2.72E-01	4.05E+00	<1	3.48E+01	<1
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+00	--	4.46E+01	--
Manganese	4.80E+02	5.21E-02	0.00E+00	0.00E+00	0.00E+00	8.21E-03	0.00E+00	8.21E-03	1.79E+02	<1	3.77E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	1.62E+00	0.00E+00	9.56E-02	0.00E+00	9.56E-02	0.00E+00	0.00E+00	9.56E-02	2.90E-01	<1	8.20E-01	<1
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.29E+01	2.20E-03	5.10E-02	0.00E+00	5.10E-02	3.47E-04	0.00E+00	5.14E-02	3.44E-01	<1	1.70E+00	<1
Zinc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.61E+01	--	1.71E+02	--
Inorganics - Other Inorganics												
Cyanide	4.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.00E-02	--	4.00E-01	--
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluoranthene	9.30E-02	0.00E+00	6.11E-03	0.00E+00	6.11E-03	0.00E+00	0.00E+00	6.11E-03				
Fluorene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	5.19E-02	0.00E+00	3.56E-03	0.00E+00	3.56E-03	0.00E+00	0.00E+00	3.56E-03				
Total LMW PAHs					9.67E-03	0.00E+00	0.00E+00	9.67E-03	1.61E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	4.94E-02	0.00E+00	2.81E-03	0.00E+00	2.81E-03	0.00E+00	0.00E+00	2.81E-03				
Benzo[A]Pyrene	6.36E-02	0.00E+00	3.82E-03	0.00E+00	3.82E-03	0.00E+00	0.00E+00	3.82E-03				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	6.50E-02	0.00E+00	3.77E-03	0.00E+00	3.77E-03	0.00E+00	0.00E+00	3.77E-03				
Benzo(k)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Chrysene	9.77E-02	0.00E+00	6.07E-03	0.00E+00	6.07E-03	0.00E+00	0.00E+00	6.07E-03				
Dibenz(A,H)Anthracene	1.31E-02	0.00E+00	7.47E-04	0.00E+00	7.47E-04	0.00E+00	0.00E+00	7.47E-04				
Indeno (1,2,3-CD) Pyrene	5.23E-02	0.00E+00	2.98E-03	0.00E+00	2.98E-03	0.00E+00	0.00E+00	2.98E-03				
Pyrene	8.06E-02	0.00E+00	5.37E-03	0.00E+00	5.37E-03	0.00E+00	0.00E+00	5.37E-03				
Total HMW PAHs					2.56E-02	0.00E+00	0.00E+00	2.56E-02	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H24-5
Refined Exposure Evaluation - Belted Kingfisher
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H24-6
Refined Exposure Evaluation - Mourning Dove
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.10E-01	0.00E+00	3.10E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Arsenic	9.33E+00	0.00E+00	4.00E-02	0.00E+00	0.00E+00	4.00E-02	0.00E+00	7.24E-02	1.12E-01	2.24E+00	<1	4.51E+00	<1
Barium	5.86E+02	1.47E-01	1.04E+01	0.00E+00	0.00E+00	1.04E+01	1.67E-02	4.55E+00	1.50E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.61E+01	0.00E+00	8.05E-01	0.00E+00	0.00E+00	8.05E-01	0.00E+00	2.02E-01	1.01E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.35E+01	0.00E+00	1.30E-01	0.00E+00	0.00E+00	1.30E-01	0.00E+00	1.05E-01	2.35E-01	1.63E+00	<1	4.46E+01	<1
Manganese	4.80E+02	5.21E-02	4.33E+00	0.00E+00	0.00E+00	4.33E+00	5.94E-03	3.72E+00	8.06E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	1.62E+00	0.00E+00	9.86E-02	0.00E+00	0.00E+00	9.86E-02	0.00E+00	1.25E-02	1.11E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.29E+01	2.20E-03	7.17E-03	0.00E+00	0.00E+00	7.17E-03	2.51E-04	1.01E-01	1.08E-01	3.44E-01	<1	1.70E+00	<1
Zinc	4.31E+01	0.00E+00	4.44E+00	0.00E+00	0.00E+00	4.44E+00	0.00E+00	3.35E-01	4.77E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.19E-03	3.19E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+00	--	2.00E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H24-6
Refined Exposure Evaluation - Mourning Dove
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mourning Dove Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H24-7
Refined Exposure Evaluation - Red-tailed Hawk
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.22E-01	0.00E+00	2.22E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Arsenic	9.33E+00	0.00E+00	0.00E+00	0.00E+00	4.01E-03	4.01E-03	0.00E+00	1.99E-02	2.39E-02	2.24E+00	<1	4.51E+00	<1
Barium	5.86E+02	1.47E-01	0.00E+00	0.00E+00	3.28E-02	3.28E-02	1.20E-02	1.25E+00	1.30E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.61E+01	0.00E+00	0.00E+00	0.00E+00	1.01E+00	1.01E+00	0.00E+00	5.56E-02	1.07E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.35E+01	0.00E+00	0.00E+00	0.00E+00	2.80E-01	2.80E-01	0.00E+00	2.88E-02	3.08E-01	1.63E+00	<1	4.46E+01	<1
Manganese	4.80E+02	5.21E-02	0.00E+00	0.00E+00	8.07E-01	8.07E-01	4.27E-03	1.02E+00	1.83E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	1.62E+00	0.00E+00	0.00E+00	0.00E+00	6.48E-02	6.48E-02	0.00E+00	3.45E-03	6.83E-02	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.29E+01	2.20E-03	0.00E+00	0.00E+00	1.31E-02	1.31E-02	1.80E-04	2.76E-02	4.09E-02	3.44E-01	<1	1.70E+00	<1
Zinc	4.31E+01	0.00E+00	0.00E+00	0.00E+00	8.40E+00	8.40E+00	0.00E+00	9.20E-02	8.49E+00	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.77E-04	8.77E-04	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+00	--	2.00E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H24-7
Refined Exposure Evaluation - Red-tailed Hawk
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Red-tailed Hawk Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H24-8
Refined Exposure Evaluation - Yellow-billed Cuckoo
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.29E-01	0.00E+00	4.29E-01	1.10E+02	<1	1.10E+03	<1
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Arsenic	9.33E+00	0.00E+00	0.00E+00	1.85E-01	0.00E+00	1.85E-01	0.00E+00	0.00E+00	1.85E-01	2.24E+00	<1	4.51E+00	<1
Barium	5.86E+02	1.47E-01	0.00E+00	8.45E+00	0.00E+00	8.45E+00	2.32E-02	0.00E+00	8.47E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	2.61E+01	0.00E+00	0.00E+00	2.13E+00	0.00E+00	2.13E+00	0.00E+00	0.00E+00	2.13E+00	4.05E+00	<1	3.48E+01	<1
Lead	1.35E+01	0.00E+00	0.00E+00	1.04E+00	0.00E+00	1.04E+00	0.00E+00	0.00E+00	1.04E+00	1.63E+00	<1	4.46E+01	<1
Manganese	4.80E+02	5.21E-02	0.00E+00	4.75E+00	0.00E+00	4.75E+00	8.25E-03	0.00E+00	4.76E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	1.62E+00	0.00E+00	0.00E+00	2.09E-01	0.00E+00	2.09E-01	0.00E+00	0.00E+00	2.09E-01	2.90E-01	<1	8.20E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.29E+01	2.20E-03	0.00E+00	8.61E-02	0.00E+00	8.61E-02	3.48E-04	0.00E+00	8.65E-02	3.44E-01	<1	1.70E+00	<1
Zinc	4.31E+01	0.00E+00	0.00E+00	4.66E+01	0.00E+00	4.66E+01	0.00E+00	0.00E+00	4.66E+01	6.61E+01	<1	1.71E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.00E-02	--	4.00E-01	--
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	--	1.61E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+00	--	2.00E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H24-8
Refined Exposure Evaluation - Yellow-billed Cuckoo
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Yellow-billed Cuckoo Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H24-9
Refined Exposure Evaluation - Canada Lynx
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.48E-02	0.00E+00	8.48E-02	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	9.33E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-03	1.53E-03	0.00E+00	8.17E-03	9.69E-03	1.04E+00	<1	4.55E+00	<1
Barium	5.86E+02	1.47E-01	0.00E+00	0.00E+00	1.25E-02	1.25E-02	4.58E-03	5.13E-01	5.30E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.61E+01	0.00E+00	0.00E+00	0.00E+00	3.86E-01	3.86E-01	0.00E+00	2.28E-02	4.08E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.35E+01	0.00E+00	0.00E+00	0.00E+00	1.07E-01	1.07E-01	0.00E+00	1.18E-02	1.18E-01	4.70E+00	<1	1.86E+02	<1
Manganese	4.80E+02	5.21E-02	0.00E+00	0.00E+00	3.07E-01	3.07E-01	1.63E-03	4.20E-01	7.29E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	1.62E+00	0.00E+00	0.00E+00	0.00E+00	2.47E-02	2.47E-02	0.00E+00	1.41E-03	2.61E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.29E+01	2.20E-03	0.00E+00	0.00E+00	4.98E-03	4.98E-03	6.87E-05	1.13E-02	1.64E-02	4.16E+00	<1	9.44E+00	<1
Zinc	4.31E+01	0.00E+00	0.00E+00	0.00E+00	3.20E+00	3.20E+00	0.00E+00	3.77E-02	3.24E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-04	3.60E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-01	--	3.84E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H24-9
Refined Exposure Evaluation - Canada Lynx
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Canada Lynx Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H24-10
Refined Exposure Evaluation - Grizzly Bear
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate						
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals														
Aluminum	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.86E-02	0.00E+00	5.86E-02	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	9.33E+00	0.00E+00	4.92E-03	3.79E-03	1.06E-04	0.00E+00	8.81E-03	0.00E+00	5.64E-03	1.45E-02	1.04E+00	<1	4.55E+00	<1
Barium	5.86E+02	1.47E-01	1.28E+00	1.73E-01	8.64E-04	0.00E+00	1.46E+00	3.16E-03	3.55E-01	1.82E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.61E+01	0.00E+00	9.89E-02	4.35E-02	2.67E-02	0.00E+00	1.69E-01	0.00E+00	1.58E-02	1.85E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.35E+01	0.00E+00	1.60E-02	2.13E-02	7.36E-03	0.00E+00	4.46E-02	0.00E+00	8.16E-03	5.28E-02	4.70E+00	<1	1.86E+02	<1
Manganese	4.80E+02	5.21E-02	5.32E-01	9.72E-02	2.12E-02	0.00E+00	6.51E-01	1.12E-03	2.90E-01	9.42E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	1.62E+00	0.00E+00	1.21E-02	4.27E-03	1.71E-03	0.00E+00	1.81E-02	0.00E+00	9.78E-04	1.91E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.29E+01	2.20E-03	8.82E-04	1.76E-03	3.44E-04	0.00E+00	2.99E-03	4.75E-05	7.83E-03	1.09E-02	4.16E+00	<1	9.44E+00	<1
Zinc	4.31E+01	0.00E+00	5.46E-01	9.52E-01	2.21E-01	0.00E+00	1.72E+00	0.00E+00	2.61E-02	1.75E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics														
Cyanide	4.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.49E-04	2.49E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)														
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight (LMW) PAHs:														
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs							0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:														
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs							0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs														
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H24-10
Refined Exposure Evaluation - Grizzly Bear
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Grizzly Bear Dose (mg/kg bw-day)												
			Diet					Water	Substrate						
	Refined Shallow Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)															
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans															
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans							0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H24-11
Refined Exposure Evaluation - Long-tailed Weasel
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals													
Aluminum	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.40E-01	0.00E+00	1.40E-01	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	9.33E+00	0.00E+00	0.00E+00	0.00E+00	2.52E-03	2.52E-03	0.00E+00	7.69E-03	1.02E-02	1.04E+00	<1	4.55E+00	<1
Barium	5.86E+02	1.47E-01	0.00E+00	0.00E+00	2.06E-02	2.06E-02	7.54E-03	4.83E-01	5.11E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.61E+01	0.00E+00	0.00E+00	0.00E+00	6.35E-01	6.35E-01	0.00E+00	2.15E-02	6.57E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.35E+01	0.00E+00	0.00E+00	0.00E+00	1.75E-01	1.75E-01	0.00E+00	1.11E-02	1.87E-01	4.70E+00	<1	1.86E+02	<1
Manganese	4.80E+02	5.21E-02	0.00E+00	0.00E+00	5.06E-01	5.06E-01	2.68E-03	3.95E-01	9.04E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	1.62E+00	0.00E+00	0.00E+00	0.00E+00	4.07E-02	4.07E-02	0.00E+00	1.33E-03	4.20E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.29E+01	2.20E-03	0.00E+00	0.00E+00	8.20E-03	8.20E-03	1.13E-04	1.07E-02	1.90E-02	4.16E+00	<1	9.44E+00	<1
Zinc	4.31E+01	0.00E+00	0.00E+00	0.00E+00	5.27E+00	5.27E+00	0.00E+00	3.55E-02	5.31E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.39E-04	3.39E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-01	--	3.84E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H24-11
Refined Exposure Evaluation - Long-tailed Weasel
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Long-tailed Weasel Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H24-12
Refined Exposure Evaluation - Meadow Vole
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.08E-01	0.00E+00	4.08E-01	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	9.33E+00	0.00E+00	5.26E-02	0.00E+00	0.00E+00	5.26E-02	0.00E+00	1.82E-02	7.08E-02	1.04E+00	<1	4.55E+00	<1
Barium	5.86E+02	1.47E-01	1.37E+01	0.00E+00	0.00E+00	1.37E+01	2.20E-02	1.15E+00	1.49E+01	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.61E+01	0.00E+00	1.06E+00	0.00E+00	0.00E+00	1.06E+00	0.00E+00	5.09E-02	1.11E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.35E+01	0.00E+00	1.71E-01	0.00E+00	0.00E+00	1.71E-01	0.00E+00	2.63E-02	1.98E-01	4.70E+00	<1	1.86E+02	<1
Manganese	4.80E+02	5.21E-02	5.70E+00	0.00E+00	0.00E+00	5.70E+00	7.82E-03	9.37E-01	6.64E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	1.62E+00	0.00E+00	1.30E-01	0.00E+00	0.00E+00	1.30E-01	0.00E+00	3.16E-03	1.33E-01	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.29E+01	2.20E-03	9.44E-03	0.00E+00	0.00E+00	9.44E-03	3.31E-04	2.53E-02	3.51E-02	4.16E+00	<1	9.44E+00	<1
Zinc	4.31E+01	0.00E+00	5.84E+00	0.00E+00	0.00E+00	5.84E+00	0.00E+00	8.42E-02	5.92E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.03E-04	8.03E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-01	--	3.84E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H24-12
Refined Exposure Evaluation - Meadow Vole
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Meadow Vole Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H24-13
Refined Exposure Evaluation - Mink
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals												
Aluminum	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-01	0.00E+00	1.17E-01	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	9.33E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	5.86E+02	1.47E-01	0.00E+00	0.00E+00	0.00E+00	6.34E-03	0.00E+00	6.34E-03	5.18E+01	<1	8.27E+01	<1
Beryllium	7.63E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.61E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.60E+00	--	8.27E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.70E+00	--	1.86E+02	--
Manganese	4.80E+02	5.21E-02	0.00E+00	0.00E+00	0.00E+00	2.25E-03	0.00E+00	2.25E-03	5.15E+01	<1	1.46E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	1.62E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-01	--	6.60E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.29E+01	2.20E-03	0.00E+00	0.00E+00	0.00E+00	9.51E-05	0.00E+00	9.51E-05	4.16E+00	<1	9.44E+00	<1
Zinc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.54E+01	--	2.98E+02	--
Inorganics - Other Inorganics												
Cyanide	4.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.87E+01	--	6.87E+02	--
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluoranthene	9.30E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluorene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	5.19E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total LMW PAHs					0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	--	3.56E+02	--
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	4.94E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo[A]Pyrene	6.36E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	6.50E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(k)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Chrysene	9.77E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Dibenz(A,H)Anthracene	1.31E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Indeno (1,2,3-CD) Pyrene	5.23E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Pyrene	8.06E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total HMW PAHs					0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-01	--	3.84E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H24-13
Refined Exposure Evaluation - Mink
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H24-14
Refined Exposure Evaluation - North American Wolverine
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.15E-02	0.00E+00	8.15E-02	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	9.33E+00	0.00E+00	0.00E+00	0.00E+00	1.47E-03	1.47E-03	0.00E+00	7.85E-03	9.32E-03	1.04E+00	<1	4.55E+00	<1
Barium	5.86E+02	1.47E-01	0.00E+00	0.00E+00	1.20E-02	1.20E-02	4.40E-03	4.93E-01	5.10E-01	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.61E+01	0.00E+00	0.00E+00	0.00E+00	3.71E-01	3.71E-01	0.00E+00	2.19E-02	3.93E-01	5.60E+00	<1	8.27E+01	<1
Lead	1.35E+01	0.00E+00	0.00E+00	0.00E+00	1.02E-01	1.02E-01	0.00E+00	1.13E-02	1.14E-01	4.70E+00	<1	1.86E+02	<1
Manganese	4.80E+02	5.21E-02	0.00E+00	0.00E+00	2.96E-01	2.96E-01	1.56E-03	4.04E-01	7.01E-01	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	1.62E+00	0.00E+00	0.00E+00	0.00E+00	2.38E-02	2.38E-02	0.00E+00	1.36E-03	2.51E-02	1.43E-01	<1	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.29E+01	2.20E-03	0.00E+00	0.00E+00	4.79E-03	4.79E-03	6.61E-05	1.09E-02	1.57E-02	4.16E+00	<1	9.44E+00	<1
Zinc	4.31E+01	0.00E+00	0.00E+00	0.00E+00	3.08E+00	3.08E+00	0.00E+00	3.63E-02	3.11E+00	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.46E-04	3.46E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-01	--	3.84E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H24-14
Refined Exposure Evaluation - North American Wolverine
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		North American Wolverine Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Refined Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H24-15
Refined Exposure Evaluation - Short-tailed Shrew
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate					
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals													
Aluminum	0.00E+00	2.71E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.64E-01	0.00E+00	3.64E-01	No TRV	--	No TRV	--
Antimony	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	9.33E+00	0.00E+00	0.00E+00	1.57E-01	0.00E+00	1.57E-01	0.00E+00	1.38E-02	1.70E-01	1.04E+00	<1	4.55E+00	<1
Barium	5.86E+02	1.47E-01	0.00E+00	7.15E+00	0.00E+00	7.15E+00	1.96E-02	8.64E-01	8.04E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	2.61E+01	0.00E+00	0.00E+00	1.80E+00	0.00E+00	1.80E+00	0.00E+00	3.84E-02	1.84E+00	5.60E+00	<1	8.27E+01	<1
Lead	1.35E+01	0.00E+00	0.00E+00	8.80E-01	0.00E+00	8.80E-01	0.00E+00	1.99E-02	9.00E-01	4.70E+00	<1	1.86E+02	<1
Manganese	4.80E+02	5.21E-02	0.00E+00	4.02E+00	0.00E+00	4.02E+00	6.98E-03	7.07E-01	4.74E+00	5.15E+01	<1	1.46E+02	<1
Mercury	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	1.62E+00	0.00E+00	0.00E+00	1.77E-01	0.00E+00	1.77E-01	0.00E+00	2.38E-03	1.79E-01	1.43E-01	**1.25E+00**	6.60E-01	<1
Silver	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.29E+01	2.20E-03	0.00E+00	7.29E-02	0.00E+00	7.29E-02	2.95E-04	1.91E-02	9.23E-02	4.16E+00	<1	9.44E+00	<1
Zinc	4.31E+01	0.00E+00	0.00E+00	3.94E+01	0.00E+00	3.94E+01	0.00E+00	6.36E-02	3.95E+01	7.54E+01	<1	2.98E+02	<1
Inorganics - Other Inorganics													
Cyanide	4.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.06E-04	6.06E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)													
Aroclor 1248	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)													
Low Molecular Weight (LMW) PAHs:													
Acenaphthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Acenaphthylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Fluorene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Naphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total LMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:													
Benzo(a)anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo[A]Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(b)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(k)fluoranthene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Pyrene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total HMW PAHs						0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-01	--	3.84E+01	--
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs													
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	8.42E+00	--	2.27E+01	--

Table H24-15
Refined Exposure Evaluation - Short-tailed Shrew
Northern Surface Water Feature
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Short-tailed Shrew Dose (mg/kg bw-day)										
			Diet				Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Maximum Surface Soil Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Plants	Invertebrates	Small Mammals	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)													
Methylcyclohexane	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans													
2,3,7,8-TCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	--	--	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans						0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H25-1
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)							
					Aquatic Life Stage Benthic Invertebrates				Fish			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference	BSAF	BCF	Estimated Concentration	BSAF/BCF Reference
Metals												
Aluminum	NA	4.86E-01	0.00E+00	NA	7.40E-02	---	0.00E+00	Stanley et al. (2010)	---	9.24E+02	4.49E+02	Sample et al. (1996)
Antimony	NA	0.00E+00	0.00E+00	NA	5.75E-01	---	0.00E+00	Dovick et al. (2015)	---	4.00E+00	0.00E+00	Sample et al. (1996)
Arsenic	NA	0.00E+00	0.00E+00	NA	3.73E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	6.80E+01	0.00E+00	Sample et al. (1996)
Barium	NA	1.17E-01	1.00E+02	NA	2.82E+00	---	2.83E+02	Hamilton et al. (2002)	---	2.98E+02	3.48E+01	Nakamoto and Hassler (1992)
Beryllium	NA	0.00E+00	4.16E-01	NA	1.67E-01	---	6.95E-02	Hamilton et al. (2002)	---	7.60E+01	0.00E+00	Sample et al. (1996)
Cadmium	NA	0.00E+00	0.00E+00	NA	4.59E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	4.96E+04	0.00E+00	Sample et al. (1996)
Chromium	NA	0.00E+00	0.00E+00	NA	8.30E-02	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	1.20E+01	0.00E+00	Sample et al. (1996)
Cobalt		0.00E+00	0.00E+00									
Copper	NA	0.00E+00	0.00E+00	NA	6.61E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	1.16E+03	0.00E+00	Sample et al. (1996)
Lead	NA	0.00E+00	0.00E+00	NA	8.00E-02	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	1.80E+02	0.00E+00	Sample et al. (1996)
Manganese		2.84E-02	0.00E+00									
Mercury	NA	0.00E+00	0.00E+00	NA	2.84E+00	---	0.00E+00	Bechtel-Jacobs (1998c)[c]	---	1.92E+02	0.00E+00	DTSC (2000)
Nickel	NA	0.00E+00	0.00E+00	NA	1.34E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	4.24E+02	0.00E+00	Sample et al. (1996)
Selenium	NA	0.00E+00	0.00E+00	NA	3.75E+00	---	0.00E+00	Hamilton et al. (2002)	---	1.04E+04	0.00E+00	Sample et al. (1996)
Silver	NA	0.00E+00	0.00E+00	NA	1.80E-01	---	0.00E+00	Hirsch (1998)	---	4.24E+02	0.00E+00	Laplace et al. (1992)
Thallium	NA	0.00E+00	0.00E+00	NA	2.00E-02	---	0.00E+00	Turner et al. (2013)	---	1.36E+02	0.00E+00	Sample et al. (1996)
Vanadium	NA	1.24E-03	1.56E+01	NA	2.50E-01	---	3.90E+00	Hamilton and Buhl (2002)	---	2.52E+03	3.11E+00	CECBP (2008)
Zinc	NA	0.00E+00	0.00E+00	NA	8.40E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	3.86E+03	0.00E+00	Sample et al. (1996)
Inorganics - Other Inorganics												
Cyanide	NA	8.50E-02	1.69E+00	NA	0.00E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	0.00E+00	0.00E+00	NA	---	Regression	0.00E+00	Derived based on Aguirre-Sierra et al. (2013)	---	Regression	0.00E+00	Derived based on Shi et al. (2009)
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	6.34	0.00E+00	0.00E+00	5.74E-01	0.00E+00	---	0.00E+00	DiToro and McGrath (2000)	0.00E+00	---	0.00E+00	DiToro and McGrath (2000)
Aroclor 1254	6.98	0.00E+00	0.00E+00	5.43E-01	0.00E+00	---	0.00E+00	DiToro and McGrath (2000)	0.00E+00	---	0.00E+00	DiToro and McGrath (2000)
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	4.01	0.00E+00	5.40E-03	7.04E-01	4.58E+00	---	2.47E-02	DiToro and McGrath (2000)	5.63E+00	---	3.04E-02	DiToro and McGrath (2000)
Acenaphthylene	3.22	0.00E+00	0.00E+00	7.54E-01	4.90E+00	---	0.00E+00	DiToro and McGrath (2000)	6.04E+00	---	0.00E+00	DiToro and McGrath (2000)
Anthracene	4.53	0.00E+00	3.65E-02	6.73E-01	4.37E+00	---	1.60E-01	DiToro and McGrath (2000)	5.38E+00	---	1.96E-01	DiToro and McGrath (2000)
Fluoranthene	5.08	0.00E+00	1.38E+00	6.41E-01	4.17E+00	---	5.76E+00	DiToro and McGrath (2000)	5.13E+00	---	7.09E+00	DiToro and McGrath (2000)

Table H25-1
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)							
					Aquatic Life Stage Benthic Invertebrates				Fish			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference	BSAF	BCF	Estimated Concentration	BSAF/BCF Reference
Fluorene	4.21	0.00E+00	0.00E+00	6.92E-01	4.50E+00	---	0.00E+00	DiToro and McGrath (2000)	5.53E+00	---	0.00E+00	DiToro and McGrath (2000)
Naphthalene	3.36	0.00E+00	0.00E+00	7.45E-01	4.84E+00	---	0.00E+00	DiToro and McGrath (2000)	5.96E+00	---	0.00E+00	DiToro and McGrath (2000)
Phenanthrene	4.57	0.00E+00	2.39E-01	6.70E-01	4.36E+00	---	1.04E+00	DiToro and McGrath (2000)	5.36E+00	---	1.28E+00	DiToro and McGrath (2000)
Total LMW PAHs							6.99E+00				8.60E+00	
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	6.71	0.00E+00	4.56E-01	5.56E-01	3.61E+00	---	1.65E+00	DiToro and McGrath (2000)	4.45E+00	---	2.03E+00	DiToro and McGrath (2000)
Benzo[A]Pyrene	6.11	0.00E+00	1.94E-01	5.86E-01	3.81E+00	---	7.41E-01	DiToro and McGrath (2000)	4.69E+00	---	9.12E-01	DiToro and McGrath (2000)
Benzo(b)fluoranthene	6.27	0.00E+00	0.00E+00	5.78E-01	3.76E+00	---	0.00E+00	DiToro and McGrath (2000)	4.62E+00	---	0.00E+00	DiToro and McGrath (2000)
Benzo(g,h,i)perylene	6.51	0.00E+00	2.59E-01	5.66E-01	3.68E+00	---	9.52E-01	DiToro and McGrath (2000)	4.53E+00	---	1.17E+00	DiToro and McGrath (2000)
Benzo(k)fluoranthene	6.29	0.00E+00	4.19E-01	5.77E-01	3.75E+00	---	1.57E+00	DiToro and McGrath (2000)	4.61E+00	---	1.93E+00	DiToro and McGrath (2000)
Chrysene	5.71	0.00E+00	1.21E+00	6.07E-01	3.94E+00	---	4.76E+00	DiToro and McGrath (2000)	4.85E+00	---	5.86E+00	DiToro and McGrath (2000)
Dibenz(A,H)Anthracene	6.71	0.00E+00	8.80E-02	5.56E-01	3.61E+00	---	3.18E-01	DiToro and McGrath (2000)	4.45E+00	---	3.91E-01	DiToro and McGrath (2000)
Indeno (1,2,3-CD) Pyrene	6.72	0.00E+00	3.03E-01	5.55E-01	3.61E+00	---	1.10E+00	DiToro and McGrath (2000)	4.44E+00	---	1.35E+00	DiToro and McGrath (2000)
Pyrene	4.92	0.00E+00	1.36E+00	6.50E-01	4.23E+00	---	5.77E+00	DiToro and McGrath (2000)	5.20E+00	---	7.10E+00	DiToro and McGrath (2000)
Total HMW PAHs							1.69E+01				2.07E+01	
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene		0.00E+00	0.00E+00									
2,3,4,6-Tetrachlorophenol	4.09	0.00E+00	0.00E+00	6.99E-01	4.54E+00	---	0.00E+00	DiToro and McGrath (2000)	5.59E+00	---	0.00E+00	DiToro and McGrath (2000)
2-Chloronaphthalene	3.81	0.00E+00	0.00E+00	7.16E-01	4.66E+00	---	0.00E+00	DiToro and McGrath (2000)	5.73E+00	---	0.00E+00	DiToro and McGrath (2000)
Biphenyl (Diphenyl)	3.76	0.00E+00	0.00E+00	7.20E-01	4.68E+00	---	0.00E+00	DiToro and McGrath (2000)	5.76E+00	---	0.00E+00	DiToro and McGrath (2000)
Bis(2-ethylhexyl)phthalate	8.39	7.71E-03	0.00E+00	4.80E-01	3.12E+00	---	0.00E+00	DiToro and McGrath (2000)	3.84E+00	---	0.00E+00	DiToro and McGrath (2000)
Butylbenzylphthalate		0.00E+00	0.00E+00									
Dibenzofuran	3.71	0.00E+00	0.00E+00	7.23E-01	4.70E+00	---	0.00E+00	DiToro and McGrath (2000)	5.78E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	6.68E-01	4.34E+00	---	0.00E+00	DiToro and McGrath (2000)	5.34E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-octyl phthalate	8.54	0.00E+00	0.00E+00	4.74E-01	3.08E+00	---	0.00E+00	DiToro and McGrath (2000)	3.79E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobenzene	5.86	0.00E+00	0.00E+00	5.99E-01	3.89E+00	---	0.00E+00	DiToro and McGrath (2000)	4.79E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobutadiene	4.72	0.00E+00	0.00E+00	6.62E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)	5.29E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachloroethane		0.00E+00	0.00E+00									
Pentachlorophenol	4.74	0.00E+00	0.00E+00	6.61E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)	5.29E+00	---	0.00E+00	DiToro and McGrath (2000)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane		0.00E+00	0.00E+00									

Table H25-1
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)							
					Aquatic Life Stage Benthic Invertebrates				Fish			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference	BSAF	BCF	Estimated Concentration	BSAF/BCF Reference
Dioxin/Furans												
2,3,7,8-TCDD		0.00E+00	0.00E+00									
1,2,3,7,8-PeCDD		0.00E+00	0.00E+00									
1,2,3,4,7,8-HxCDD		0.00E+00	0.00E+00									
1,2,3,6,7,8-HxCDD		0.00E+00	0.00E+00									
1,2,3,7,8,9-HxCDD		0.00E+00	0.00E+00									
1,2,3,4,6,7,8-HpCDD		0.00E+00	0.00E+00									
OCDD		0.00E+00	0.00E+00									
2,3,7,8-TCDF		0.00E+00	0.00E+00									
1,2,3,7,8-PeCDF		0.00E+00	0.00E+00									
2,3,4,7,8-PeCDF		0.00E+00	0.00E+00									
1,2,3,4,7,8-HxCDF		0.00E+00	0.00E+00									
1,2,3,6,7,8-HxCDF		0.00E+00	0.00E+00									
1,2,3,4,7,8-HxCDF		0.00E+00	0.00E+00									
1,2,3,6,7,8-HxCDF		0.00E+00	0.00E+00									
2,3,4,6,7,8-HxCDF		0.00E+00	0.00E+00									
1,2,3,7,8,9-HxCDF		0.00E+00	0.00E+00									
1,2,3,4,6,7,8-HpCDF		0.00E+00	0.00E+00									
1,2,3,4,7,8,9-HpCDF		0.00E+00	0.00E+00									
OCDF		0.00E+00	0.00E+00									

Notes:
NA, Normalized BSAF was not applicable for metals
a, Normalized BSAF (kg OC / kg lipid) calculated based on K_{ow}, where BSAF = $K_{ow}^{-0.038}$ (DiToro and McGrath 2000)
b, For non-ionic organic constituents, dry weight BSAF calculated from sediment organic carbon and lipid normalized BSAF as follows:

$$BSAF_{dry\ weight} = BSAF_{norm} \times f_{lip;id} \times \frac{1}{f_{oc}}$$

where: $BSAF_{norm}$ = Normalized BSAF (kg OC/kg lipid)
f_{lipid} = Fraction of lipids in prey item expressed on a dry weight basis (0.065, invertebrates; 0.08, fish)
f_{oc} = Fraction of sediment organic carbon expressed on a dry weight basis (0.01 or 1%)
c, Median BSAF for non-depurated invertebrates determined by Bechtel-Jacobs (1998b)

Table H25-2
Refined Exposure Evaluation - American Dipper
Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	4.86E-01	0.00E+00	0.00E+00	0.00E+00	8.07E-02	0.00E+00	8.07E-02	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	1.00E+02	1.17E-01	4.69E+01	0.00E+00	4.69E+01	1.94E-02	3.33E-01	4.72E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	4.16E-01	0.00E+00	1.15E-02	0.00E+00	1.15E-02	0.00E+00	1.38E-03	1.29E-02	No TRV	--	No TRV	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.05E+00	--	3.48E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+00	--	4.46E+01	--
Manganese	0.00E+00	2.84E-02	0.00E+00	0.00E+00	0.00E+00	4.72E-03	0.00E+00	4.72E-03	1.79E+02	<1	3.77E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-01	--	8.20E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.56E+01	1.24E-03	6.47E-01	0.00E+00	6.47E-01	2.05E-04	5.17E-02	6.99E-01	3.44E-01	**2.03E+00**	1.70E+00	<1
Zinc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.61E+01	--	1.71E+02	--
Inorganics - Other Inorganics												
Cyanide	1.69E+00	8.50E-02	0.00E+00	0.00E+00	0.00E+00	1.41E-02	5.60E-03	1.97E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	5.40E-03	0.00E+00	4.10E-03	0.00E+00	4.10E-03	0.00E+00	1.79E-05	4.12E-03				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	3.65E-02	0.00E+00	2.65E-02	0.00E+00	2.65E-02	0.00E+00	1.21E-04	2.66E-02				
Fluoranthene	1.38E+00	0.00E+00	9.56E-01	0.00E+00	9.56E-01	0.00E+00	4.59E-03	9.61E-01				
Fluorene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	2.39E-01	0.00E+00	1.73E-01	0.00E+00	1.73E-01	0.00E+00	7.94E-04	1.74E-01				
Total LMW PAHs					1.16E+00	0.00E+00	5.52E-03	1.17E+00	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	4.56E-01	0.00E+00	2.73E-01	0.00E+00	2.73E-01	0.00E+00	1.51E-03	2.75E-01				
Benzo[A]Pyrene	1.94E-01	0.00E+00	1.23E-01	0.00E+00	1.23E-01	0.00E+00	6.45E-04	1.24E-01				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	2.59E-01	0.00E+00	1.58E-01	0.00E+00	1.58E-01	0.00E+00	8.59E-04	1.59E-01				
Benzo(k)fluoranthene	4.19E-01	0.00E+00	2.60E-01	0.00E+00	2.60E-01	0.00E+00	1.39E-03	2.62E-01				
Chrysene	1.21E+00	0.00E+00	7.90E-01	0.00E+00	7.90E-01	0.00E+00	4.01E-03	7.94E-01				
Dibenz(A,H)Anthracene	8.80E-02	0.00E+00	5.28E-02	0.00E+00	5.28E-02	0.00E+00	2.92E-04	5.31E-02				
Indeno (1,2,3-CD) Pyrene	3.03E-01	0.00E+00	1.82E-01	0.00E+00	1.82E-01	0.00E+00	1.01E-03	1.83E-01				
Pyrene	1.36E+00	0.00E+00	9.57E-01	0.00E+00	9.57E-01	0.00E+00	4.53E-03	9.61E-01				
Total HMW PAHs					2.80E+00	0.00E+00	1.42E-02	2.81E+00	2.00E+00	**1.41E+00**	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	7.71E-03	0.00E+00	0.00E+00	0.00E+00	1.28E-03	0.00E+00	1.28E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H25-2
Refined Exposure Evaluation - American Dipper
Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	= Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	= Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	= Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	= Dietary fraction of food item i (proportion of food type in the diet)
AUF	= Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	= Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	= Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	= Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	= COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H25-3
Refined Exposure Evaluation - Belted Kingfisher
Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	4.86E-01	0.00E+00	6.37E+01	6.37E+01	7.66E-02	0.00E+00	6.38E+01	1.10E+02	<1	1.10E+03	<1
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	1.00E+02	1.17E-01	4.45E+00	4.93E+00	9.38E+00	1.84E-02	0.00E+00	9.40E+00	7.35E+01	<1	1.31E+02	<1
Beryllium	4.16E-01	0.00E+00	1.10E-03	0.00E+00	1.10E-03	0.00E+00	0.00E+00	1.10E-03	No TRV	--	No TRV	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.05E+00	--	3.48E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+00	--	4.46E+01	--
Manganese	0.00E+00	2.84E-02	0.00E+00	0.00E+00	0.00E+00	4.48E-03	0.00E+00	4.48E-03	1.79E+02	<1	3.77E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-01	--	8.20E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	1.56E+01	1.24E-03	6.14E-02	4.42E-01	5.03E-01	1.95E-04	0.00E+00	5.03E-01	3.44E-01	**1.46E+00**	1.70E+00	<1
Zinc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.61E+01	--	1.71E+02	--
Inorganics - Other Inorganics												
Cyanide	1.69E+00	8.50E-02	0.00E+00	0.00E+00	0.00E+00	1.34E-02	0.00E+00	1.34E-02	4.00E-02	<1	4.00E-01	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	5.40E-03	0.00E+00	3.90E-04	4.32E-03	4.71E-03	0.00E+00	0.00E+00	4.71E-03				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	3.65E-02	0.00E+00	2.52E-03	2.79E-02	3.04E-02	0.00E+00	0.00E+00	3.04E-02				
Fluoranthene	1.38E+00	0.00E+00	9.08E-02	1.01E+00	1.10E+00	0.00E+00	0.00E+00	1.10E+00				
Fluorene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	2.39E-01	0.00E+00	1.64E-02	1.82E-01	1.98E-01	0.00E+00	0.00E+00	1.98E-01				
Total LMW PAHs					1.33E+00	0.00E+00	0.00E+00	1.33E+00	1.61E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	4.56E-01	0.00E+00	2.59E-02	2.87E-01	3.13E-01	0.00E+00	0.00E+00	3.13E-01				
Benzo[A]Pyrene	1.94E-01	0.00E+00	1.17E-02	1.29E-01	1.41E-01	0.00E+00	0.00E+00	1.41E-01				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	2.59E-01	0.00E+00	1.50E-02	1.66E-01	1.81E-01	0.00E+00	0.00E+00	1.81E-01				
Benzo(k)fluoranthene	4.19E-01	0.00E+00	2.47E-02	2.74E-01	2.99E-01	0.00E+00	0.00E+00	2.99E-01				
Chrysene	1.21E+00	0.00E+00	7.50E-02	8.31E-01	9.06E-01	0.00E+00	0.00E+00	9.06E-01				
Dibenz(A,H)Anthracene	8.80E-02	0.00E+00	5.01E-03	5.55E-02	6.05E-02	0.00E+00	0.00E+00	6.05E-02				
Indeno (1,2,3-CD) Pyrene	3.03E-01	0.00E+00	1.73E-02	1.91E-01	2.08E-01	0.00E+00	0.00E+00	2.08E-01				
Pyrene	1.36E+00	0.00E+00	9.09E-02	1.01E+00	1.10E+00	0.00E+00	0.00E+00	1.10E+00				
Total HMW PAHs					3.21E+00	0.00E+00	0.00E+00	3.21E+00	2.00E+00	**1.60E+00**	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	7.71E-03	0.00E+00	0.00E+00	0.00E+00	1.22E-03	0.00E+00	1.22E-03	1.10E+00	<1	1.10E+01	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H25-3
Refined Exposure Evaluation - Belted Kingfisher
Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H25-4
Refined Exposure Evaluation - Mink
Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals												
Aluminum	0.00E+00	4.86E-01	0.00E+00	1.94E+01	1.94E+01	2.10E-02	0.00E+00	1.94E+01	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	1.00E+02	1.17E-01	0.00E+00	1.50E+00	1.50E+00	5.05E-03	0.00E+00	1.51E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	4.16E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.60E+00	--	8.27E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.70E+00	--	1.86E+02	--
Manganese	0.00E+00	2.84E-02	0.00E+00	0.00E+00	0.00E+00	1.23E-03	0.00E+00	1.23E-03	5.15E+01	<1	1.46E+02	<1
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-01	--	6.60E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	1.56E+01	1.24E-03	0.00E+00	1.35E-01	1.35E-01	5.34E-05	0.00E+00	1.35E-01	4.16E+00	<1	9.44E+00	<1
Zinc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.54E+01	--	2.98E+02	--
Inorganics - Other Inorganics												
Cyanide	1.69E+00	8.50E-02	0.00E+00	0.00E+00	0.00E+00	3.68E-03	0.00E+00	3.68E-03	6.87E+01	<1	6.87E+02	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	5.40E-03	0.00E+00	0.00E+00	1.32E-03	1.32E-03	0.00E+00	0.00E+00	1.32E-03				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	3.65E-02	0.00E+00	0.00E+00	8.49E-03	8.49E-03	0.00E+00	0.00E+00	8.49E-03				
Fluoranthene	1.38E+00	0.00E+00	0.00E+00	3.07E-01	3.07E-01	0.00E+00	0.00E+00	3.07E-01				
Fluorene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	2.39E-01	0.00E+00	0.00E+00	5.55E-02	5.55E-02	0.00E+00	0.00E+00	5.55E-02				
Total LMW PAHs					3.72E-01	0.00E+00	0.00E+00	3.72E-01	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	4.56E-01	0.00E+00	0.00E+00	8.76E-02	8.76E-02	0.00E+00	0.00E+00	8.76E-02				
Benzo[A]Pyrene	1.94E-01	0.00E+00	0.00E+00	3.94E-02	3.94E-02	0.00E+00	0.00E+00	3.94E-02				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	2.59E-01	0.00E+00	0.00E+00	5.07E-02	5.07E-02	0.00E+00	0.00E+00	5.07E-02				
Benzo(k)fluoranthene	4.19E-01	0.00E+00	0.00E+00	8.35E-02	8.35E-02	0.00E+00	0.00E+00	8.35E-02				
Chrysene	1.21E+00	0.00E+00	0.00E+00	2.53E-01	2.53E-01	0.00E+00	0.00E+00	2.53E-01				
Dibenz(A,H)Anthracene	8.80E-02	0.00E+00	0.00E+00	1.69E-02	1.69E-02	0.00E+00	0.00E+00	1.69E-02				
Indeno (1,2,3-CD) Pyrene	3.03E-01	0.00E+00	0.00E+00	5.83E-02	5.83E-02	0.00E+00	0.00E+00	5.83E-02				
Pyrene	1.36E+00	0.00E+00	0.00E+00	3.07E-01	3.07E-01	0.00E+00	0.00E+00	3.07E-01				
Total HMW PAHs					8.97E-01	0.00E+00	0.00E+00	8.97E-01	6.15E-01	**1.46E+00**	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	7.71E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-04	0.00E+00	3.34E-04	1.83E+01	<1	1.83E+02	<1
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H25-4
Refined Exposure Evaluation - Mink
Flathead River
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H26-1
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Cedar Creek
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)							
					Aquatic Life Stage Benthic Invertebrates				Fish			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference	BSAF	BCF	Estimated Concentration	BSAF/BCF Reference
Metals												
Aluminum	NA	0.00E+00	0.00E+00	NA	7.40E-02	---	0.00E+00	Stanley et al. (2010)	---	9.24E+02	0.00E+00	Sample et al. (1996)
Antimony	NA	0.00E+00	0.00E+00	NA	5.75E-01	---	0.00E+00	Dovick et al. (2015)	---	4.00E+00	0.00E+00	Sample et al. (1996)
Arsenic	NA	0.00E+00	0.00E+00	NA	3.73E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	6.80E+01	0.00E+00	Sample et al. (1996)
Barium	NA	1.08E-01	1.65E+02	NA	2.82E+00	---	4.65E+02	Hamilton et al. (2002)	---	2.98E+02	3.22E+01	Nakamoto and Hassler (1992)
Beryllium	NA	0.00E+00	0.00E+00	NA	1.67E-01	---	0.00E+00	Hamilton et al. (2002)	---	7.60E+01	0.00E+00	Sample et al. (1996)
Cadmium	NA	0.00E+00	0.00E+00	NA	4.59E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	4.96E+04	0.00E+00	Sample et al. (1996)
Chromium	NA	0.00E+00	0.00E+00	NA	8.30E-02	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	1.20E+01	0.00E+00	Sample et al. (1996)
Cobalt		0.00E+00	0.00E+00									
Copper	NA	0.00E+00	0.00E+00	NA	6.61E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	1.16E+03	0.00E+00	Sample et al. (1996)
Lead	NA	0.00E+00	0.00E+00	NA	8.00E-02	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	1.80E+02	0.00E+00	Sample et al. (1996)
Manganese		0.00E+00	3.49E+02									
Mercury	NA	0.00E+00	0.00E+00	NA	2.84E+00	---	0.00E+00	Bechtel-Jacobs (1998c)[c]	---	1.92E+02	0.00E+00	DTSC (2000)
Nickel	NA	0.00E+00	0.00E+00	NA	1.34E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	4.24E+02	0.00E+00	Sample et al. (1996)
Selenium	NA	0.00E+00	0.00E+00	NA	3.75E+00	---	0.00E+00	Hamilton et al. (2002)	---	1.04E+04	0.00E+00	Sample et al. (1996)
Silver	NA	0.00E+00	0.00E+00	NA	1.80E-01	---	0.00E+00	Hirsch (1998)	---	4.24E+02	0.00E+00	Laplace et al. (1992)
Thallium	NA	0.00E+00	0.00E+00	NA	2.00E-02	---	0.00E+00	Turner et al. (2013)	---	1.36E+02	0.00E+00	Sample et al. (1996)
Vanadium	NA	0.00E+00	0.00E+00	NA	2.50E-01	---	0.00E+00	Hamilton and Buhl (2002)	---	2.52E+03	0.00E+00	CECBP (2008)
Zinc	NA	0.00E+00	0.00E+00	NA	8.40E-01	---	0.00E+00	Bechtel-Jacobs (1998b)[c]	---	3.86E+03	0.00E+00	Sample et al. (1996)
Inorganics - Other Inorganics												
Cyanide	NA	5.01E-03	1.60E-01	NA	0.00E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)	0.00E+00	0.00E+00	0.00E+00	Lanno and Menzie (2005)
Fluoride	NA	0.00E+00	0.00E+00	NA	---	Regression	0.00E+00	Derived based on Aguirre-Sierra et al. (2013)	---	Regression	0.00E+00	Derived based on Shi et al. (2009)
Polychlorinated Biphenyls (PCBs)		**0.00E+00**										
Aroclor 1248	6.34	0.00E+00	0.00E+00	5.74E-01	0.00E+00	---	0.00E+00	DiToro and McGrath (2000)	0.00E+00	---	0.00E+00	DiToro and McGrath (2000)
Aroclor 1254	6.98	0.00E+00	0.00E+00	5.43E-01	0.00E+00	---	0.00E+00	DiToro and McGrath (2000)	0.00E+00	---	0.00E+00	DiToro and McGrath (2000)
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	4.01	0.00E+00	0.00E+00	7.04E-01	4.58E+00	---	0.00E+00	DiToro and McGrath (2000)	5.63E+00	---	0.00E+00	DiToro and McGrath (2000)
Acenaphthylene	3.22	0.00E+00	0.00E+00	7.54E-01	4.90E+00	---	0.00E+00	DiToro and McGrath (2000)	6.04E+00	---	0.00E+00	DiToro and McGrath (2000)
Anthracene	4.53	0.00E+00	0.00E+00	6.73E-01	4.37E+00	---	0.00E+00	DiToro and McGrath (2000)	5.38E+00	---	0.00E+00	DiToro and McGrath (2000)
Fluoranthene	5.08	0.00E+00	1.29E-01	6.41E-01	4.17E+00	---	5.37E-01	DiToro and McGrath (2000)	5.13E+00	---	6.61E-01	DiToro and McGrath (2000)

Table H26-1
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Cedar Creek
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)							
					Aquatic Life Stage Benthic Invertebrates				Fish			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference	BSAF	BCF	Estimated Concentration	BSAF/BCF Reference
Fluorene	4.21	0.00E+00	0.00E+00	6.92E-01	4.50E+00	---	0.00E+00	DiToro and McGrath (2000)	5.53E+00	---	0.00E+00	DiToro and McGrath (2000)
Naphthalene	3.36	0.00E+00	0.00E+00	7.45E-01	4.84E+00	---	0.00E+00	DiToro and McGrath (2000)	5.96E+00	---	0.00E+00	DiToro and McGrath (2000)
Phenanthrene	4.57	0.00E+00	1.40E-01	6.70E-01	4.36E+00	---	6.12E-01	DiToro and McGrath (2000)	5.36E+00	---	7.53E-01	DiToro and McGrath (2000)
Total LMW PAHs							1.15E+00				1.41E+00	
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	6.71	0.00E+00	7.29E-02	5.56E-01	3.61E+00	---	2.63E-01	DiToro and McGrath (2000)	4.45E+00	---	3.24E-01	DiToro and McGrath (2000)
Benzo[A]Pyrene	6.11	0.00E+00	6.15E-02	5.86E-01	3.81E+00	---	2.34E-01	DiToro and McGrath (2000)	4.69E+00	---	2.88E-01	DiToro and McGrath (2000)
Benzo(b)fluoranthene	6.27	0.00E+00	0.00E+00	5.78E-01	3.76E+00	---	0.00E+00	DiToro and McGrath (2000)	4.62E+00	---	0.00E+00	DiToro and McGrath (2000)
Benzo(g,h,i)perylene	6.51	0.00E+00	5.22E-02	5.66E-01	3.68E+00	---	1.92E-01	DiToro and McGrath (2000)	4.53E+00	---	2.36E-01	DiToro and McGrath (2000)
Benzo(k)fluoranthene	6.29	0.00E+00	0.00E+00	5.77E-01	3.75E+00	---	0.00E+00	DiToro and McGrath (2000)	4.61E+00	---	0.00E+00	DiToro and McGrath (2000)
Chrysene	5.71	0.00E+00	8.71E-02	6.07E-01	3.94E+00	---	3.43E-01	DiToro and McGrath (2000)	4.85E+00	---	4.23E-01	DiToro and McGrath (2000)
Dibenz(A,H)Anthracene	6.71	0.00E+00	0.00E+00	5.56E-01	3.61E+00	---	0.00E+00	DiToro and McGrath (2000)	4.45E+00	---	0.00E+00	DiToro and McGrath (2000)
Indeno (1,2,3-CD) Pyrene	6.72	0.00E+00	4.86E-02	5.55E-01	3.61E+00	---	1.76E-01	DiToro and McGrath (2000)	4.44E+00	---	2.16E-01	DiToro and McGrath (2000)
Pyrene	4.92	0.00E+00	1.10E-01	6.50E-01	4.23E+00	---	4.66E-01	DiToro and McGrath (2000)	5.20E+00	---	5.73E-01	DiToro and McGrath (2000)
Total HMW PAHs							1.67E+00				2.06E+00	
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene		0.00E+00	0.00E+00									
2,3,4,6-Tetrachlorophenol	4.09	0.00E+00	0.00E+00	6.99E-01	4.54E+00	---	0.00E+00	DiToro and McGrath (2000)	5.59E+00	---	0.00E+00	DiToro and McGrath (2000)
2-Chloronaphthalene	3.81	0.00E+00	0.00E+00	7.16E-01	4.66E+00	---	0.00E+00	DiToro and McGrath (2000)	5.73E+00	---	0.00E+00	DiToro and McGrath (2000)
Biphenyl (Diphenyl)	3.76	0.00E+00	0.00E+00	7.20E-01	4.68E+00	---	0.00E+00	DiToro and McGrath (2000)	5.76E+00	---	0.00E+00	DiToro and McGrath (2000)
Bis(2-ethylhexyl)phthalate	8.39	0.00E+00	0.00E+00	4.80E-01	3.12E+00	---	0.00E+00	DiToro and McGrath (2000)	3.84E+00	---	0.00E+00	DiToro and McGrath (2000)
Butylbenzylphthalate		0.00E+00	0.00E+00									
Dibenzofuran	3.71	0.00E+00	0.00E+00	7.23E-01	4.70E+00	---	0.00E+00	DiToro and McGrath (2000)	5.78E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-butyl phthalate	4.61	0.00E+00	0.00E+00	6.68E-01	4.34E+00	---	0.00E+00	DiToro and McGrath (2000)	5.34E+00	---	0.00E+00	DiToro and McGrath (2000)
Di-n-octyl phthalate	8.54	0.00E+00	0.00E+00	4.74E-01	3.08E+00	---	0.00E+00	DiToro and McGrath (2000)	3.79E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobenzene	5.86	0.00E+00	0.00E+00	5.99E-01	3.89E+00	---	0.00E+00	DiToro and McGrath (2000)	4.79E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachlorobutadiene	4.72	0.00E+00	0.00E+00	6.62E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)	5.29E+00	---	0.00E+00	DiToro and McGrath (2000)
Hexachloroethane		0.00E+00	0.00E+00									
Pentachlorophenol	4.74	0.00E+00	0.00E+00	6.61E-01	4.30E+00	---	0.00E+00	DiToro and McGrath (2000)	5.29E+00	---	0.00E+00	DiToro and McGrath (2000)
Volatile Organic Compounds (VOCs)												
Methylcyclohexane		0.00E+00	0.00E+00									

Table H26-1
Estimated Aquatic Prey Concentrations - Screening-Level Exposure Evaluation - Cedar Creek
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log K_{ow}	Refined Surface Water Concentration (mg/L)	Refined Sediment Concentration (mg/kg, dry weight)	Normalized BSAF (kg OC/kg lipid)[a]	Estimated Concentrations in Dietary Items of Aquatic Receptors (mg/kg, dry weight)							
					Aquatic Life Stage Benthic Invertebrates				Fish			
					BSAF[b]	BCF	Estimated Concentration	BSAF/BCF Reference	BSAF	BCF	Estimated Concentration	BSAF/BCF Reference
Dioxin/Furans												
2,3,7,8-TCDD		0.00E+00	0.00E+00									
1,2,3,7,8-PeCDD		0.00E+00	0.00E+00									
1,2,3,4,7,8-HxCDD		0.00E+00	0.00E+00									
1,2,3,6,7,8-HxCDD		0.00E+00	0.00E+00									
1,2,3,7,8,9-HxCDD		0.00E+00	0.00E+00									
1,2,3,4,6,7,8-HpCDD		0.00E+00	0.00E+00									
OCDD		0.00E+00	0.00E+00									
2,3,7,8-TCDF		0.00E+00	0.00E+00									
1,2,3,7,8-PeCDF		0.00E+00	0.00E+00									
2,3,4,7,8-PeCDF		0.00E+00	0.00E+00									
1,2,3,4,7,8-HxCDF		0.00E+00	0.00E+00									
1,2,3,6,7,8-HxCDF		0.00E+00	0.00E+00									
1,2,3,4,7,8-HxCDF		0.00E+00	0.00E+00									
1,2,3,6,7,8-HxCDF		0.00E+00	0.00E+00									
2,3,4,6,7,8-HxCDF		0.00E+00	0.00E+00									
1,2,3,7,8,9-HxCDF		0.00E+00	0.00E+00									
1,2,3,4,6,7,8-HpCDF		0.00E+00	0.00E+00									
1,2,3,4,7,8,9-HpCDF		0.00E+00	0.00E+00									
OCDF		0.00E+00	0.00E+00									

Notes:
NA, Normalized BSAF was not applicable for metals
a, Normalized BSAF (kg OC / kg lipid) calculated based on K_{ow}, where BSAF = $K_{ow}^{-0.038}$ (DiToro and McGrath 2000)
b, For non-ionic organic constituents, dry weight BSAF calculated from sediment organic carbon and lipid normalized BSAF as follows:

$$BSAF_{dry\ weight} = BSAF_{norm} \times f_{lip;id} \times \frac{1}{f_{oc}}$$

where: $BSAF_{norm}$ = Normalized BSAF (kg OC/kg lipid)
f_{lipid} = Fraction of lipids in prey item expressed on a dry weight basis (0.065, invertebrates; 0.08, fish)
f_{oc} = Fraction of sediment organic carbon expressed on a dry weight basis (0.01 or 1%)
c, Median BSAF for non-depurated invertebrates determined by Bechtel-Jacobs (1998b)

Table H26-2
Refined Exposure Evaluation - American Dipper
Cedar Creek
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals												
Aluminum	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.10E+02	--	1.10E+03	--
Antimony	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Arsenic	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	1.65E+02	1.08E-01	7.72E+01	0.00E+00	7.72E+01	1.80E-02	5.48E-01	7.78E+01	7.35E+01	**1.06E+00**	1.31E+02	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Cadmium	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	4.05E+00	--	3.48E+01	--
Lead	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.63E+00	--	4.46E+01	--
Manganese	3.49E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.16E+00	1.16E+00	1.79E+02	<1	3.77E+02	<1
Mercury	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.90E-01	--	8.20E-01	--
Silver	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.44E-01	--	1.70E+00	--
Zinc	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.61E+01	--	1.71E+02	--
Inorganics - Other Inorganics												
Cyanide	1.60E-01	5.01E-03	0.00E+00	0.00E+00	0.00E+00	8.31E-04	5.30E-04	1.36E-03	4.00E-02	<1	4.00E-01	<1
Fluoride	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluoranthene	1.29E-01	0.00E+00	8.91E-02	0.00E+00	8.91E-02	0.00E+00	4.27E-04	8.95E-02				
Fluorene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Phenanthrene	1.40E-01	0.00E+00	1.02E-01	0.00E+00	1.02E-01	0.00E+00	4.66E-04	1.02E-01				
Total LMW PAHs					1.91E-01	0.00E+00	8.93E-04	1.91E-01	1.61E+01	<1	1.61E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	7.29E-02	0.00E+00	4.37E-02	0.00E+00	4.37E-02	0.00E+00	2.42E-04	4.39E-02				
Benzo[A]Pyrene	6.15E-02	0.00E+00	3.89E-02	0.00E+00	3.89E-02	0.00E+00	2.04E-04	3.91E-02				
Benzo(b)fluoranthene	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Benzo(g,h,i)perylene	5.22E-02	0.00E+00	3.19E-02	0.00E+00	3.19E-02	0.00E+00	1.73E-04	3.20E-02				
Benzo(k)fluoranthene	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Chrysene	8.71E-02	0.00E+00	5.70E-02	0.00E+00	5.70E-02	0.00E+00	2.89E-04	5.73E-02				
Dibenz(A,H)Anthracene	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Indeno (1,2,3-CD) Pyrene	4.86E-02	0.00E+00	2.91E-02	0.00E+00	2.91E-02	0.00E+00	1.61E-04	2.93E-02				
Pyrene	1.10E-01	0.00E+00	7.72E-02	0.00E+00	7.72E-02	0.00E+00	3.66E-04	7.76E-02				
Total HMW PAHs					2.78E-01	0.00E+00	1.44E-03	2.79E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	6.73E+00	--	5.20E+01	--

Table H26-2
Refined Exposure Evaluation - American Dipper
Cedar Creek
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		American Dipper Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDD	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDD	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDD	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDD	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDD	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDD	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,7,8-TCDF	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8-PeCDF	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,7,8-PeCDF	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8-HxCDF	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,6,7,8-HxCDF	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
2,3,4,6,7,8-HxCDF	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,7,8,9-HxCDF	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,6,7,8-HpCDF	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
1,2,3,4,7,8,9-HpCDF	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
OCDF	ND	0.00E+00	--	0.00E+00	0.00E+00	0.00E+00	--	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H26-3
Refined Exposure Evaluation - Belted Kingfisher
Cedar Creek
Baseline Ecological Screening Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Inorganics - Metals												
Aluminum	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+02	--	1.10E+03	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+00	--	4.51E+00	--
Barium	1.65E+02	1.08E-01	7.33E+00	4.57E+00	1.19E+01	1.71E-02	0.00E+00	1.19E+01	7.35E+01	<1	1.31E+02	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E+00	--	6.35E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+00	--	1.56E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.61E+00	--	2.02E+01	--
Copper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.05E+00	--	3.48E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+00	--	4.46E+01	--
Manganese	3.49E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E+02	--	3.77E+02	--
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-01	--	9.10E-01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E+00	--	1.86E+01	--
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-01	--	8.20E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+00	--	6.05E+01	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-01	--	3.50E+00	--
Vanadium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.44E-01	--	1.70E+00	--
Zinc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.61E+01	--	1.71E+02	--
Inorganics - Other Inorganics												
Cyanide	1.60E-01	5.01E-03	0.00E+00	0.00E+00	0.00E+00	7.89E-04	0.00E+00	7.89E-04	4.00E-02	<1	4.00E-01	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+01	--	1.22E+02	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-01	--	1.80E+00	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluoranthene	1.29E-01	0.00E+00	8.46E-03	9.37E-02	1.02E-01	0.00E+00	0.00E+00	1.02E-01				
Fluorene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	1.40E-01	0.00E+00	9.64E-03	1.07E-01	1.16E-01	0.00E+00	0.00E+00	1.16E-01				
Total LMW PAHs					2.19E-01	0.00E+00	0.00E+00	2.19E-01	1.61E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	7.29E-02	0.00E+00	4.15E-03	4.60E-02	5.01E-02	0.00E+00	0.00E+00	5.01E-02				
Benzo[A]Pyrene	6.15E-02	0.00E+00	3.69E-03	4.09E-02	4.46E-02	0.00E+00	0.00E+00	4.46E-02				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	5.22E-02	0.00E+00	3.03E-03	3.35E-02	3.66E-02	0.00E+00	0.00E+00	3.66E-02				
Benzo(k)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Chrysene	8.71E-02	0.00E+00	5.41E-03	5.99E-02	6.54E-02	0.00E+00	0.00E+00	6.54E-02				
Dibenz(A,H)Anthracene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Indeno (1,2,3-CD) Pyrene	4.86E-02	0.00E+00	2.77E-03	3.06E-02	3.34E-02	0.00E+00	0.00E+00	3.34E-02				
Pyrene	1.10E-01	0.00E+00	7.34E-03	8.13E-02	8.86E-02	0.00E+00	0.00E+00	8.86E-02				
Total HMW PAHs					3.19E-01	0.00E+00	0.00E+00	3.19E-01	2.00E+00	<1	2.00E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+00	--	1.10E+01	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-01	--	1.10E+00	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+00	--	5.00E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E+00	--	5.20E+01	--

Table H26-3
Refined Exposure Evaluation - Belted Kingfisher
Cedar Creek
Baseline Ecological Screening Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Belted Kingfisher Dose (mg/kg bw-day)									
			Diet			Water	Substrate					
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06	--	1.75E-05	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table H26-4
Refined Exposure Evaluation - Mink
Cedar Creek
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Inorganics - Metals												
Aluminum	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-02	--	2.76E+00	--
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E+00	--	4.55E+00	--
Barium	1.65E+02	1.08E-01	0.00E+00	1.39E+00	1.39E+00	4.68E-03	0.00E+00	1.40E+00	5.18E+01	<1	8.27E+01	<1
Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-01	--	6.70E-01	--
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.70E-01	--	6.87E+00	--
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.40E+00	--	5.82E+01	--
Cobalt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E+00	--	1.89E+01	--
Copper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.60E+00	--	8.27E+01	--
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.70E+00	--	1.86E+02	--
Manganese	3.49E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E+01	--	1.46E+02	--
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E+00	--	1.41E+01	--
Nickel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E+00	--	1.48E+01	--
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-01	--	6.60E-01	--
Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.02E+00	--	1.19E+02	--
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	--	1.43E+00	--
Vanadium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.16E+00	--	9.44E+00	--
Zinc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.54E+01	--	2.98E+02	--
Inorganics - Other Inorganics												
Cyanide	1.60E-01	5.01E-03	0.00E+00	0.00E+00	0.00E+00	2.17E-04	0.00E+00	2.17E-04	6.87E+01	<1	6.87E+02	<1
Fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+01	--	4.90E+01	--
Polychlorinated Biphenyls (PCBs)												
Aroclor 1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Aroclor 1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-02	--	6.80E-01	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
Low Molecular Weight (LMW) PAHs:												
Acenaphthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Anthracene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Fluoranthene	1.29E-01	0.00E+00	0.00E+00	2.86E-02	2.86E-02	0.00E+00	0.00E+00	2.86E-02				
Fluorene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Phenanthrene	1.40E-01	0.00E+00	0.00E+00	3.26E-02	3.26E-02	0.00E+00	0.00E+00	3.26E-02				
Total LMW PAHs					6.11E-02	0.00E+00	0.00E+00	6.11E-02	6.56E+01	<1	3.56E+02	<1
High Molecular Weight (HMW) PAHs:												
Benzo(a)anthracene	7.29E-02	0.00E+00	0.00E+00	1.40E-02	1.40E-02	0.00E+00	0.00E+00	1.40E-02				
Benzo[A]Pyrene	6.15E-02	0.00E+00	0.00E+00	1.25E-02	1.25E-02	0.00E+00	0.00E+00	1.25E-02				
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Benzo(g,h,i)perylene	5.22E-02	0.00E+00	0.00E+00	1.02E-02	1.02E-02	0.00E+00	0.00E+00	1.02E-02				
Benzo(k)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Chrysene	8.71E-02	0.00E+00	0.00E+00	1.83E-02	1.83E-02	0.00E+00	0.00E+00	1.83E-02				
Dibenz(A,H)Anthracene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Indeno (1,2,3-CD) Pyrene	4.86E-02	0.00E+00	0.00E+00	9.34E-03	9.34E-03	0.00E+00	0.00E+00	9.34E-03				
Pyrene	1.10E-01	0.00E+00	0.00E+00	2.48E-02	2.48E-02	0.00E+00	0.00E+00	2.48E-02				
Total HMW PAHs					8.91E-02	0.00E+00	0.00E+00	8.91E-02	6.15E-01	<1	3.84E+01	<1
Semi-volatile Organic Compounds (SVOCs) - Non-PAH SVOCs												
1,2,4,5-Tetrachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2,3,4,6-Tetrachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
2-Chloronaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Biphenyl (Diphenyl)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Bis(2-ethylhexyl)phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E+01	--	1.83E+02	--
Butylbenzylphthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+02	--	1.59E+03	--
Dibenzofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Di-n-butyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E+02	--	1.83E+03	--
Di-n-octyl phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.51E+01	--	6.51E+02	--
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+00	--	7.10E+01	--
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+02	--	2.00E+03	--
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E+00	--	2.27E+01	--

Table H26-4
Refined Exposure Evaluation - Mink
Cedar Creek
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	Exposure Point Concentrations (EPCs)		Mink Dose (mg/kg bw-day)									
			Diet			Water	Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
	Refined Sediment Concentration (mg/kg, dw)	Refined Surface Water Concentration[a] (mg/L)	Invertebrates	Fish	$Dose_{diet}$	$Dose_{water}$	$Dose_{substrate}$					
Volatile Organic Compounds (VOCs)												
Methylcyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No TRV	--	No TRV	--
Dioxin/Furans												
2,3,7,8-TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,7,8-TCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,7,8-PeCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
2,3,4,6,7,8-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,7,8,9-HxCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,6,7,8-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
1,2,3,4,7,8,9-HpCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
OCDF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Total Dioxins/Furans					0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E-07	--	3.76E-06	--

Notes:

a, Dietary dose calculated as:

$$ADD_{diet} = \frac{IR_{diet} \times \sum (B[S]AF \times C_{substrate} \times DF_i) \times AUF}{BW}$$

b, Substrate dose calculated as:

$$ADD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

c, Total dose calculated as:

$$ADD_{total} = ADD_{diet} + ADD_{water} + ADD_{substrate}$$

--, HQ could not be calculated because TRV was not available.

where:

ADD_{diet}	=	Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet}	=	Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF	=	Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)
DF_i	=	Dietary fraction of food item i (proportion of food type in the diet)
AUF	=	Area use factor includes seasonal use rates , area use rates, COPEC assimilation rate
BW	=	Body weight of the receptor, wet weight (kg)
$ADD_{substrate}$	=	Dose of COPEC from incidental substrate ingestion (mg COPEC/kg body weight-day)
IR_s	=	Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$C_{substrate}$	=	COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Appendix I ProUCL Output

Table I-1
Upper Confidence Limit of the Mean Concentration (UCL_{mean})
Descriptions of ProUCL 5.1 Calculation Methods
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

EPA ProUCL 5.1 Software Upper Confidence Limit (UCL) Method	Description
90% Chebyshev (Mean, Sd) UCL	90% UCL based upon Chebyshev inequality
95% Adjusted Gamma UCL	95% UCL based upon adjusted gamma distribution
95% Adjusted-CLT UCL	95% UCL based upon the adjusted central limit theorem
95% Approximate Gamma UCL	95% UCL based upon chi-square approximation
95% Chebyshev (Mean, Sd) UCL	95% UCL based upon Chebyshev inequality
95% KM (Chebyshev) UCL	95% UCL based upon Kaplan-Meier estimates using Chebyshev inequality
95% KM (t) UCL	95% UCL based upon Kaplan-Meier estimates using the Student's t-distribution critical value
95% KM Adjusted Gamma UCL	95% UCL based upon Kaplan-Meier adjusted gamma distribution
95% KM Approximate Gamma UCL	95% UCL based upon Kaplan-Meier approximation
95% KM Bootstrap t UCL	95% UCL based upon Kaplan-Meier estimates using percentile bootstrap method
95% Student's-t UCL	95% UCL based upon Student's-t distribution
97.5% KM (Chebyshev) UCL	97.5% UCL based upon Kaplan-Meier estimates using Chebyshev inequality
99% KM (Chebyshev) UCL	99% UCL based upon Kaplan-Meier estimates using Chebyshev inequality
Gamma Adjusted KM-UCL	95% UCL based upon Kaplan-Meier adjusted gamma distribution

Notes:
UCL = Upper Confidence Limit

Table I-2
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Soil and Sediment Results (0-0.5 ft) by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
Main Plant Area				
TAL Metals (mg/kg)				
Aluminum	72	72	95% Student's-t UCL	15,645
Antimony	72	6	95% KM (t) UCL	0.272
Arsenic	72	72	95% Student's-t UCL	4.81
Barium	72	72	95% Student's-t UCL	121.1
Cadmium	72	13	95% KM Approximate Gamma UCL	0.354
Chromium, Hexavalent	73	72	95% KM (t) UCL	0.408
Chromium, Total	73	73	95% Student's-t UCL	15.6
Chromium, Trivalent	73	73	95% Student's-t UCL	15.2
Cobalt	72	72	95% Student's-t UCL	5.29
Copper	72	72	95% Student's-t UCL	16.4
Iron	72	72	95% Student's-t UCL	13,815
Lead	72	72	95% Chebyshev (Mean, Sd) UCL	22.0
Manganese	72	72	95% Student's-t UCL	437.4
Mercury	72	64	KM Student's t	0.021
Nickel	72	72	95% Chebyshev (Mean, Sd) UCL	31.7
Selenium	72	4	95% KM (t) UCL	0.265
Thallium	72	0	--	--
Vanadium	72	72	95% Approximate Gamma UCL	13.6
Zinc	72	72	95% Student's-t UCL	58.8
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	72	64	95% KM Chebyshev UCL	0.239
Fluoride	72	72	95% Chebyshev(Mean, Sd) UCL	118.8
Essential Nutrients (mg/kg)				
Calcium	72	72	95% Student's-t UCL	22,490
Magnesium	72	72	95% Student's-t UCL	10,300
Potassium	72	72	95% Student's-t UCL	889.3
Sodium	72	56	95% KM (Chebyshev) UCL	480.9
Dioxins and Furans (mg/kg)				
1,2,3,4,6,7,8-Heptachlorodibenzofuran	29	25	Gamma Adjusted KM-UCL	1.56E-05
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	29	27	95% KM Chebyshev UCL	1.50E-04
1,2,3,4,7,8,9-Heptachlorodibenzofuran	29	7	95% KM (t) UCL	7.12E-07
1,2,3,4,7,8-Hexachlorodibenzofuran	29	20	95% KM Chebyshev UCL	2.23E-06
1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	29	12	Gamma Adjusted KM-UCL	1.14E-06
1,2,3,6,7,8-Hexachlorodibenzofuran	29	23	Gamma Adjusted KM-UCL	1.03E-06
1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	29	24	95% KM Chebyshev UCL	5.41E-06
1,2,3,7,8,9-Hexachlorodibenzofuran	29	0	--	--
1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	29	25	95% KM Chebyshev UCL	3.08E-06
1,2,3,7,8-Pentachlorodibenzofuran	29	11	95% KM (t) UCL	6.01E-07
1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	29	16	95% KM Chebyshev UCL	5.83E-07
2,3,4,6,7,8-Hexachlorodibenzofuran	29	17	97.5% KM Chebyshev UCL	1.13E-06
2,3,4,7,8-Pentachlorodibenzofuran	29	18	95% KM Chebyshev UCL	1.07E-06
2,3,7,8-Tetrachlorodibenzofuran	29	18	95% KM (Chebyshev) UCL	2.27E-06
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	29	10	95% KM (t) UCL	1.48E-07
Octachlorodibenzofuran	29	24	Gamma Adjusted KM-UCL	4.24E-05
Octachlorodibenzo-P-Dioxin	29	27	95% KM Chebyshev UCL	0.002
TEC2,3,7,8-TCDD-Bird-1/2MDL	29	29	95% Adjusted Gamma UCL	3.86E-06
TEC2,3,7,8-TCDD-Bird-MDL	29	29	95% Adjusted Gamma UCL	4.18E-06
TEC2,3,7,8-TCDD-Bird-Zero	29	29	95% Adjusted Gamma UCL	3.86E-06
TEC2,3,7,8-TCDD-Mammal-1/2MDL	29	29	95% Adjusted Gamma UCL	3.18E-06
TEC2,3,7,8-TCDD-Mammal-MDL	29	29	95% Chebyshev(Mean, Sd) UCL	4.86E-06
TEC2,3,7,8-TCDD-Mammal-Zero	29	29	95% Adjusted Gamma UCL	3.17E-06
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1254 (Aroclor 1254)	64	3	--	--
Polychlorinated Biphenyl (PCBs)	64	3	--	--
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Acenaphthene	72	62	95% KM (Chebyshev) UCL	1.48
Anthracene	72	59	95% KM Chebyshev UCL	2.58
Benzo(A)Anthracene	72	68	95% KM Chebyshev UCL	12.8
Benzo(A)Pyrene	72	70	95% KM Chebyshev UCL	14.9
Benzo(B)Fluoranthene	72	71	95% KM Chebyshev UCL	18.3
Benzo(G,H,I)Perylene	72	71	95% KM Chebyshev UCL	12.9
Chrysene	72	71	95% KM Chebyshev UCL	15.7
Dibenz(A,H)Anthracene	72	64	95% KM Chebyshev UCL	3.29

Table I-2
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Soil and Sediment Results (0-0.5 ft) by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
Fluoranthene	72	71	95% KM Chebyshev UCL	20.5
Fluorene	72	59	95% KM (Chebyshev) UCL	1.000
Indeno(1,2,3-C,D)Pyrene	72	71	95% KM Chebyshev UCL	12.3
Naphthalene	72	51	95% KM (Chebyshev) UCL	0.524
Phenanthrene	72	71	95% KM Chebyshev UCL	13.2
Pyrene	72	71	95% KM Chebyshev UCL	25.1
Total HMW PAHs - 1/2MDL	71	71	95% Chebyshev(Mean, Sd) UCL	124.4
Total HMW PAHs - MDL	71	71	95% Chebyshev(Mean, Sd) UCL	124.4
Total HMW PAHs - Zero	71	71	95% Chebyshev(Mean, Sd) UCL	124.4
Total LMW PAHs - 1/2MDL	71	71	95% Chebyshev (Mean, Sd) UCL	39.9
Total LMW PAHs - MDL	71	71	95% Chebyshev (Mean, Sd) UCL	39.9
Total LMW PAHs - Zero	71	71	95% Chebyshev(Mean, Sd) UCL	39.8
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
3- And 4- Methylphenol (Total)	56	1	--	--
Benzaldehyde	72	4	95% KM (t) UCL	0.010
Benzyl Butyl Phthalate	72	18	95% KM Chebyshev UCL	0.591
Bis(2-Ethylhexyl) Phthalate	72	27	95% KM Chebyshev UCL	0.532
Di-N-Butyl Phthalate	72	11	95% KM (t) UCL	0.019
Hexachlorobenzene	72	0	--	--
Pentachlorophenol	72	2	--	--
Cedar Creek Area				
TAL Metals (mg/kg)				
Barium	9	9	95% Student's-t UCL	165.0
Beryllium	9	9	95% Student's-t UCL	0.446
Manganese	9	9	95% Student's-t UCL	348.9
Vanadium	9	9	95% Student's-t UCL	7.99
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	9	4	95% KM (t) UCL	0.160
Essential Nutrients (mg/kg)				
Calcium	9	9	95% Student's-t UCL	22,760
Magnesium	9	9	95% Student's-t UCL	10,857
Potassium	9	9	95% Student's-t UCL	829.5
Sodium	9	5	95% KM (t) UCL	107.5
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Acenaphthene	9	2	--	--
Acenaphthylene	9	3	--	--
Anthracene	9	3	--	--
Benzo(A)Anthracene	9	5	95% KM (t) UCL	0.073
Benzo(A)Pyrene	9	6	95% KM (t) UCL	0.062
Benzo(G,H,I)Perylene	9	4	95% KM (t) UCL	0.052
Chrysene	9	8	95% KM (t) UCL	0.087
Fluoranthene	9	9	95% Student's-t UCL	0.129
Fluorene	9	2	--	--
Indeno(1,2,3-C,D)Pyrene	9	4	95% KM (t) UCL	0.049
Phenanthrene	9	8	95% KM (t) UCL	0.140
Pyrene	9	7	95% KM (t) UCL	0.110
Total HMW PAHs - 1/2MDL	8	8	95% Student's-t UCL	0.586
Total HMW PAHs - MDL	8	8	95% Student's-t UCL	0.649
Total HMW PAHs - Zero	8	8	95% Student's-t UCL	0.539
Total LMW PAHs - 1/2MDL	9	9	95% Student's-t UCL	0.371
Total LMW PAHs - MDL	9	9	95% Student's-t UCL	0.434
Total LMW PAHs - Zero	9	9	95% Student's-t UCL	0.315
Total PAHs - 1/2MDL	9	9	95% Student's-t UCL	0.826
Total PAHs - MDL	9	9	95% Student's-t UCL	0.938
Total PAHs - Zero	9	9	95% Student's-t UCL	0.731
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
Benzaldehyde	9	3	--	--
Carbazole	9	2	--	--
Cedar Creek Reservoir Overflow Ditch Area				
TAL Metals (mg/kg)				
Aluminum	8	8	95% Student's-t UCL	19,985
Arsenic	8	8	95% Student's-t UCL	6.83
Barium	8	8	95% Student's-t UCL	274.1
Beryllium	8	8	95% Student's-t UCL	0.874
Chromium, Hexavalent	3	3	--	--

Table I-2
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Soil and Sediment Results (0-0.5 ft) by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
Chromium, Trivalent	3	3	--	--
Cobalt	8	8	95% Student's-t UCL	8.26
Copper	8	8	95% Student's-t UCL	24.1
Iron	8	8	95% Student's-t UCL	18,632
Lead	8	8	95% Student's-t UCL	17.1
Manganese	8	8	95% Student's-t UCL	1,349
Nickel	8	8	95% Student's-t UCL	32.3
Selenium	8	6	KM Student's t	0.788
Vanadium	8	8	95% Student's-t UCL	14.9
Zinc	8	8	95% Student's-t UCL	110.1
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	8	8	95% Student's-t UCL	0.832
Essential Nutrients (mg/kg)				
Calcium	8	8	95% Student's-t UCL	24,617
Magnesium	8	8	95% Student's-t UCL	11,615
Potassium	8	8	95% Student's-t UCL	1,400
Sodium	8	5	95% KM (t) UCL	115.6
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Acenaphthene	8	6	95% KM (t) UCL	0.061
Anthracene	8	6	95% KM (t) UCL	0.118
Benzo(A)Anthracene	8	8	95% Student's-t UCL	0.781
Benzo(A)Pyrene	8	8	95% Student's-t UCL	1.05
Benzo(G,H,I)Perylene	8	8	95% Student's-t UCL	1.05
Benzo(K)Fluoranthene	8	8	95% Student's-t UCL	0.538
Chrysene	8	8	95% Student's-t UCL	1.12
Dibenz(A,H)Anthracene	8	6	95% KM (t) UCL	0.226
Fluoranthene	8	8	95% Student's-t UCL	1.30
Fluorene	8	6	95% KM (t) UCL	0.039
Indeno(1,2,3-C,D)Pyrene	8	8	95% Student's-t UCL	0.971
Naphthalene	8	6	95% KM (t) UCL	0.028
Phenanthrene	8	8	95% Student's-t UCL	0.659
Pyrene	8	8	95% Student's-t UCL	1.34
Total HMW PAHs - 1/2MDL	8	8	95% Student's-t UCL	8.50
Total HMW PAHs - MDL	8	8	95% Student's-t UCL	8.50
Total HMW PAHs - Zero	8	8	95% Student's-t UCL	8.50
Total LMW PAHs - 1/2MDL	8	8	95% Student's-t UCL	2.21
Total LMW PAHs - MDL	8	8	95% Student's-t UCL	2.21
Total LMW PAHs - Zero	8	8	95% Student's-t UCL	2.20
Total PAHs - 1/2MDL	8	8	95% Student's-t UCL	9.20
Total PAHs - MDL	8	8	95% Student's-t UCL	9.20
Total PAHs - Zero	8	8	95% Student's-t UCL	9.19
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
Acetophenone	8	1	--	--
Benzaldehyde	8	2	--	--
Bis(2-Ethylhexyl) Phthalate	8	1	--	--
Carbazole	8	8	95% Student's-t UCL	0.133
Di-N-Butyl Phthalate	8	1	--	--
South Percolation Pond Area				
TAL Metals (mg/kg)				
Aluminum	26	26	95% Student's-t UCL	9,034
Antimony	26	1	--	--
Barium	26	26	95% Student's-t UCL	640.1
Beryllium	26	17	95% KM (t) UCL	0.420
Cadmium	26	3	--	--
Chromium, Hexavalent	12	12	95% Adjusted Gamma UCL	0.425
Chromium, Total	26	26	95% Adjusted Gamma UCL	11.4
Chromium, Trivalent	12	12	95% Adjusted Gamma UCL	15.4
Cobalt	26	24	95% KM (t) UCL	4.30
Copper	26	26	95% Chebyshev(Mean, Sd) UCL	203.0
Iron	26	26	95% Student's-t UCL	8,609
Lead	26	26	95% Chebyshev(Mean, Sd) UCL	34.4
Manganese	26	26	95% Student's-t UCL	111.2
Mercury	26	22	95% KM (Chebyshev) UCL	0.349
Nickel	26	26	95% Adjusted Gamma UCL	19.0
Selenium	26	6	95% KM (t) UCL	0.572

Table I-2
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Soil and Sediment Results (0-0.5 ft) by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
Silver	26	2	--	--
Thallium	26	1	--	--
Vanadium	26	26	95% Student's-t UCL	11.8
Zinc	26	26	95% Adjusted Gamma UCL	115.6
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	26	22	95% KM Chebyshev UCL	4.43
Cyanide (Free)	2	1	--	--
Essential Nutrients (mg/kg)				
Calcium	26	26	95% Student's-t UCL	196,766
Magnesium	26	26	95% Student's-t UCL	8,877
Potassium	26	26	95% Student's-t UCL	871.0
Sodium	26	22	95% KM Adjusted Gamma UCL	237.0
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Acenaphthene	26	3	--	--
Anthracene	26	5	95% KM Adjusted Gamma UCL	0.036
Benzo(A)Anthracene	26	24	95% KM Adjusted Gamma UCL	0.246
Benzo(A)Pyrene	26	23	95% KM Chebyshev UCL	0.821
Benzo(G,H,I)Perylene	26	24	95% KM Adjusted Gamma UCL	0.726
Benzo(K)Fluoranthene	26	24	95% KM Adjusted Gamma UCL	0.234
Chrysene	26	25	95% KM Chebyshev UCL	0.912
Dibenz(A,H)Anthracene	26	16	95% KM Chebyshev UCL	0.132
Fluoranthene	26	25	95% KM Chebyshev UCL	0.617
Fluorene	26	2	--	--
Indeno(1,2,3-C,D)Pyrene	26	24	95% KM Chebyshev UCL	0.984
Phenanthrene	26	25	95% KM Adjusted Gamma UCL	0.201
Pyrene	26	24	95% KM Chebyshev UCL	0.516
Total HMW PAHs - 1/2MDL	25	25	95% Adjusted Gamma UCL	4.50
Total HMW PAHs - MDL	25	25	95% Adjusted Gamma UCL	4.55
Total HMW PAHs - Zero	25	25	95% Adjusted Gamma UCL	4.46
Total LMW PAHs - 1/2MDL	25	25	95% Chebyshev(Mean, Sd) UCL	1.09
Total LMW PAHs - MDL	25	25	95% Chebyshev(Mean, Sd) UCL	1.27
Total LMW PAHs - Zero	25	25	95% Adjusted Gamma UCL	0.694
Total PAHs - 1/2MDL	25	25	95% Adjusted Gamma UCL	4.24
Total PAHs - MDL	25	25	95% Adjusted Gamma UCL	4.39
Total PAHs - Zero	25	25	95% Adjusted Gamma UCL	4.09
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
3- And 4- Methylphenol (Total)	20	1	--	--
4-Chloroaniline	26	2	--	--
Benzaldehyde	26	1	--	--
Bis(2-Ethylhexyl) Phthalate	26	2	--	--
Carbazole	26	18	95% KM Chebyshev UCL	0.244
Di-N-Butyl Phthalate	26	3	--	--
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)				
Acetone	5	5	95% Student's-t UCL	0.241
Carbon Disulfide	5	5	95% Student's-t UCL	0.009
Cyclohexane	5	2	--	--
M,P-Xylene	5	2	--	--
Methyl Acetate	5	0	--	--
Methyl Ethyl Ketone (2-Butanone)	5	5	95% Student's-t UCL	0.065
Methylcyclohexane	5	2	--	--
O-Xylene (1,2-Dimethylbenzene)	5	1	--	--
Northern Surface Water Feature Area				
TAL Metals (mg/kg)				
Aluminum	12	12	95% Adjusted Gamma UCL	25,796
Arsenic	12	12	95% Student's-t UCL	9.33
Barium	12	12	95% Student's-t UCL	586.4
Beryllium	12	10	95% KM (t) UCL	0.763
Cobalt	12	12	95% Student's-t UCL	5.55
Copper	12	12	95% Student's-t UCL	26.1
Iron	12	12	95% Student's-t UCL	16,716
Lead	12	12	95% Student's-t UCL	13.5
Manganese	12	12	95% Student's-t UCL	479.9
Nickel	12	12	95% Student's-t UCL	12.4
Selenium	12	4	95% KM (t) UCL	1.62
Vanadium	12	12	95% Student's-t UCL	12.9

Table I-2
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Soil and Sediment Results (0-0.5 ft) by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
Zinc	12	12	95% Student's-t UCL	43.1
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	12	7	95% KM (t) UCL	0.411
Essential Nutrients (mg/kg)				
Calcium	12	12	95% Student's-t UCL	10,678
Magnesium	12	12	95% Student's-t UCL	8,109
Potassium	12	12	95% Student's-t UCL	1,048
Sodium	12	11	95% KM (t) UCL	470.1
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Anthracene	12	3	--	--
Benzo(A)Anthracene	12	10	95% KM (t) UCL	0.049
Benzo(A)Pyrene	12	11	95% KM (t) UCL	0.064
Benzo(G,H,I)Perylene	12	11	95% KM (t) UCL	0.065
Chrysene	12	11	95% KM (t) UCL	0.098
Dibenz(A,H)Anthracene	12	7	95% KM (t) UCL	0.013
Fluoranthene	12	11	95% KM (t) UCL	0.093
Indeno(1,2,3-C,D)Pyrene	12	11	95% KM (t) UCL	0.052
Phenanthrene	12	11	95% KM (t) UCL	0.052
Pyrene	12	11	95% KM (t) UCL	0.081
Total HMW PAHs - 1/2MDL	11	11	95% Student's-t UCL	0.592
Total HMW PAHs - MDL	11	11	95% Student's-t UCL	0.596
Total HMW PAHs - Zero	11	11	95% Student's-t UCL	0.588
Total LMW PAHs - 1/2MDL	11	11	95% Student's-t UCL	0.185
Total LMW PAHs - MDL	11	11	95% Student's-t UCL	0.214
Total LMW PAHs - Zero	11	11	95% Student's-t UCL	0.158
Total PAHs - 1/2MDL	11	11	95% Student's-t UCL	0.664
Total PAHs - MDL	11	11	95% Student's-t UCL	0.692
Total PAHs - Zero	11	11	95% Student's-t UCL	0.638
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
Acetophenone	12	1	--	--
Benzaldehyde	12	2	--	--
Carbazole	12	9	95% KM (t) UCL	0.015
Phenol	12	1	--	--
North Percolation Pond Area				
TAL Metals (mg/kg)				
Aluminum	22	22	95% Adjusted Gamma UCL	50,414
Antimony	22	7	95% KM (t) UCL	0.930
Arsenic	22	22	95% Adjusted Gamma UCL	13.5
Barium	22	22	95% Student's-t UCL	244.6
Beryllium	22	22	95% Adjusted Gamma UCL	3.99
Cadmium	22	21	95% KM Adjusted Gamma UCL	3.62
Chromium, Hexavalent	22	20	95% KM (t) UCL	0.692
Chromium, Total	24	24	95% Student's-t UCL	28.7
Chromium, Trivalent	22	22	95% Student's-t UCL	25.4
Cobalt	22	22	95% Adjusted Gamma UCL	9.47
Copper	22	22	95% Student's-t UCL	44.3
Iron	22	22	95% Student's-t UCL	9,375
Lead	22	22	95% Chebyshev(Mean, Sd) UCL	110.7
Manganese	22	22	95% Adjusted Gamma UCL	211.1
Mercury	22	18	95% KM Chebyshev UCL	0.063
Nickel	22	22	95% Adjusted Gamma UCL	359.8
Selenium	22	16	95% KM Chebyshev UCL	1.83
Silver	22	2	--	--
Thallium	22	19	95% KM (Chebyshev) UCL	1.89
Vanadium	22	22	95% Adjusted Gamma UCL	110.4
Zinc	22	22	95% Adjusted Gamma UCL	342.4
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	22	22	95% Chebyshev (Mean, Sd) UCL	41.2
Fluoride	22	22	95% Adjusted Gamma UCL	146.6
Essential Nutrients (mg/kg)				
Calcium	22	22	95% Adjusted Gamma UCL	33,122
Magnesium	22	22	95% Student's-t UCL	6,051
Potassium	22	22	95% Student's-t UCL	852.9
Sodium	22	21	95% KM (Chebyshev) UCL	862.8
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				

Table I-2
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Soil and Sediment Results (0-0.5 ft) by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
2-Methylnaphthalene	22	18	Gamma Adjusted KM-UCL	2.16
Acenaphthene	22	22	97.5% Chebyshev (Mean, Sd) UCL	81.9
Acenaphthylene	22	6	95% KM (t) UCL	0.320
Anthracene	22	22	97.5% Chebyshev (Mean, Sd) UCL	113.0
Benzo(A)Anthracene	22	21	97.5% KM (Chebyshev) UCL	1,119
Benzo(A)Pyrene	22	21	97.5% KM (Chebyshev) UCL	1,269
Benzo(B)Fluoranthene	22	21	95% KM (Chebyshev) UCL	1,004
Benzo(G,H,I)Perylene	22	21	95% KM (Chebyshev) UCL	699.3
Benzo(K)Fluoranthene	22	21	95% KM (Chebyshev) UCL	720.2
Chrysene	22	21	97.5% KM (Chebyshev) UCL	1,166
Dibenz(A,H)Anthracene	22	21	95% KM (Chebyshev) UCL	236.6
Fluoranthene	22	22	99% Chebyshev (Mean, Sd) UCL	2,235
Fluorene	22	19	Gamma Adjusted KM-UCL	25.7
Indeno(1,2,3-C,D)Pyrene	22	21	95% KM (Chebyshev) UCL	643.0
Naphthalene	22	16	Gamma Adjusted KM-UCL	3.65
Phenanthrene	22	22	95% Adjusted Gamma UCL	285.2
Pyrene	22	22	99% Chebyshev (Mean, Sd) UCL	1,965
Total HMW PAHs - 1/2MDL	22	22	99% Chebyshev (Mean, Sd) UCL	13,433
Total HMW PAHs - MDL	22	22	97.5% Chebyshev (Mean, Sd) UCL	9,208
Total HMW PAHs - Zero	22	22	99% Chebyshev (Mean, Sd) UCL	13,433
Total LMW PAHs - 1/2MDL	22	22	97.5% Chebyshev (Mean, Sd) UCL	2,318
Total LMW PAHs - MDL	22	22	97.5% Chebyshev (Mean, Sd) UCL	2,328
Total LMW PAHs - Zero	22	22	97.5% Chebyshev (Mean, Sd) UCL	2,307
Total PAHs - 1/2MDL	22	22	97.5% Chebyshev (Mean, Sd) UCL	10,218
Total PAHs - MDL	22	22	97.5% Chebyshev (Mean, Sd) UCL	10,227
Total PAHs - Zero	22	22	97.5% Chebyshev (Mean, Sd) UCL	10,209
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
Acetophenone	22	1	--	--
Benzyl Butyl Phthalate	22	1	--	--
Bis(2-Ethylhexyl) Phthalate	22	2	--	--
Carbazole	22	21	95% KM (Chebyshev) UCL	53.7
Dibenzofuran	22	21	Gamma Adjusted KM-UCL	7.70
Central Landfills Area				
TAL Metals (mg/kg)				
Aluminum	55	55	95% Student's-t UCL	15,561
Antimony	55	2	--	--
Arsenic	55	55	95% Approximate Gamma UCL	6.57
Barium	55	55	95% Chebyshev(Mean, Sd) UCL	196.6
Beryllium	55	55	95% Approximate Gamma UCL	0.601
Cadmium	55	1	--	--
Chromium, Hexavalent	59	55	95% KM (t) UCL	0.361
Chromium, Total	59	58	95% KM (t) UCL	13.8
Chromium, Trivalent	59	58	95% KM (t) UCL	13.4
Cobalt	55	55	95% Student's-t UCL	5.72
Copper	55	55	95% Chebyshev (Mean, Sd) UCL	720.9
Iron	55	55	95% Student's-t UCL	16,333
Lead	55	55	95% Student's-t UCL	14.8
Manganese	55	55	95% Student's-t UCL	511.1
Nickel	55	55	95% Student's-t UCL	23.5
Selenium	55	10	KM Student's t	0.325
Thallium	55	7	95% KM (t) UCL	0.111
Vanadium	55	55	95% Approximate Gamma UCL	14.7
Zinc	55	55	95% Approximate Gamma UCL	56.0
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	55	41	95% KM Chebyshev UCL	1.18
Fluoride	55	55	95% Chebyshev(Mean, Sd) UCL	140.0
Essential Nutrients (mg/kg)				
Calcium	55	55	95% Approximate Gamma UCL	33,545
Magnesium	55	55	95% Student's-t UCL	10,507
Potassium	55	55	95% Student's-t UCL	1,077
Sodium	55	37	95% KM (Chebyshev) UCL	618.3
Dioxins and Furans (mg/kg)				
1,2,3,4,6,7,8-Heptachlorodibenzofuran	2	1	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2	2	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran	2	1	--	--

Table I-2
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Soil and Sediment Results (0-0.5 ft) by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
1,2,3,6,7,8-Hexachlorodibenzofuran	2	2	--	--
1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	2	1	--	--
1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2	1	--	--
1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2	1	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran	2	1	--	--
2,3,4,7,8-Pentachlorodibenzofuran	2	1	--	--
2,3,7,8-Tetrachlorodibenzofuran	2	1	--	--
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2	0	--	--
Octachlorodibenzofuran	2	1	--	--
Octachlorodibenzo-P-Dioxin	2	2	--	--
TEC2,3,7,8-TCDD-Bird-1/2MDL	2	2	--	--
TEC2,3,7,8-TCDD-Bird-MDL	2	2	--	--
TEC2,3,7,8-TCDD-Bird-Zero	2	2	--	--
TEC2,3,7,8-TCDD-Mammal-1/2MDL	2	2	--	--
TEC2,3,7,8-TCDD-Mammal-MDL	2	2	--	--
TEC2,3,7,8-TCDD-Mammal-Zero	2	2	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1254 (Aroclor 1254)	35	2	--	--
Polychlorinated Biphenyl (PCBs)	35	2	--	--
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	55	21	95% KM Approximate Gamma UCL	0.213
Acenaphthene	55	45	95% KM (Chebyshev) UCL	2.24
Anthracene	55	45	95% KM (Chebyshev) UCL	4.76
Benzo(A)Anthracene	55	53	95% KM (Chebyshev) UCL	10.7
Benzo(A)Pyrene	55	53	95% KM (Chebyshev) UCL	10.9
Benzo(B)Fluoranthene	55	53	95% KM (Chebyshev) UCL	13.4
Benzo(G,H,I)Perylene	55	53	95% KM (Chebyshev) UCL	7.33
Chrysene	55	55	95% Chebyshev (Mean, Sd) UCL	12.1
Dibenz(A,H)Anthracene	55	50	95% KM (Chebyshev) UCL	2.34
Fluoranthene	55	54	95% KM (Chebyshev) UCL	25.0
Fluorene	55	45	95% KM (Chebyshev) UCL	1.92
Indeno(1,2,3-C,D)Pyrene	55	53	95% KM (Chebyshev) UCL	8.68
Naphthalene	55	33	95% KM Chebyshev UCL	0.484
Phenanthrene	55	54	95% KM (Chebyshev) UCL	18.4
Pyrene	55	53	95% KM (Chebyshev) UCL	16.3
Total HMW PAHs - 1/2MDL	55	55	95% Chebyshev (Mean, Sd) UCL	87.2
Total HMW PAHs - MDL	55	55	95% Chebyshev (Mean, Sd) UCL	87.2
Total HMW PAHs - Zero	55	55	95% Chebyshev (Mean, Sd) UCL	87.2
Total LMW PAHs - 1/2MDL	54	54	95% Chebyshev (Mean, Sd) UCL	54.0
Total LMW PAHs - MDL	54	54	95% Chebyshev (Mean, Sd) UCL	54.0
Total LMW PAHs - Zero	54	54	95% Chebyshev (Mean, Sd) UCL	54.0
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
3- And 4- Methylphenol (Total)	27	2	--	--
Benzaldehyde	55	7	95% KM Approximate Gamma UCL	0.011
Benzyl Butyl Phthalate	55	4	95% KM Approximate Gamma UCL	0.097
Bis(2-Ethylhexyl) Phthalate	55	11	95% KM (Chebyshev) UCL	0.279
Caprolactam	55	1	--	--
Dibenzofuran	55	34	95% KM Chebyshev UCL	1.01
Di-N-Butyl Phthalate	55	4	95% KM (t) UCL	0.016
Phenol	55	3	--	--
Industrial Landfill Area				
TAL Metals (mg/kg)				
Aluminum	6	6	95% Student's-t UCL	29,605
Antimony	6	3	--	--
Arsenic	6	6	95% Chebyshev (Mean, Sd) UCL	21.8
Barium	6	6	90% Chebyshev(Mean, Sd) UCL	221.4
Beryllium	6	6	95% Chebyshev (Mean, Sd) UCL	6.49
Cadmium	6	2	--	--
Chromium, Hexavalent	6	6	95% Adjusted Gamma UCL	0.957
Chromium, Total	6	6	95% Adjusted Gamma UCL	35.8
Chromium, Trivalent	6	6	95% Adjusted Gamma UCL	34.8
Cobalt	6	6	95% Student's-t UCL	10.9
Copper	6	6	95% Adjusted Gamma UCL	50.6
Iron	6	6	95% Student's-t UCL	18,180
Lead	6	6	95% Student's-t UCL	16.7

Table I-2
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Soil and Sediment Results (0-0.5 ft) by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
Manganese	6	6	95% Student's-t UCL	421.6
Nickel	6	6	95% Chebyshev(Mean, Sd) UCL	417.8
Selenium	6	3	--	--
Thallium	6	2	--	--
Vanadium	6	6	95% Chebyshev(Mean, Sd) UCL	153.2
Zinc	6	6	95% Student's-t UCL	65.0
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	6	1	--	--
Fluoride	6	6	95% Chebyshev(Mean, Sd) UCL	357.6
Essential Nutrients (mg/kg)				
Calcium	6	6	95% Student's-t UCL	45,432
Magnesium	6	6	95% Student's-t UCL	13,268
Potassium	6	6	95% Chebyshev (Mean, Sd) UCL	6,140
Sodium	6	6	95% Chebyshev(Mean, Sd) UCL	43,952
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Acenaphthene	6	6	90% Chebyshev(Mean, Sd) UCL	2.77
Benzo(A)Anthracene	6	6	95% Chebyshev(Mean, Sd) UCL	41.7
Benzo(A)Pyrene	6	6	95% Chebyshev(Mean, Sd) UCL	51.3
Benzo(B)Fluoranthene	6	6	95% Chebyshev(Mean, Sd) UCL	57.4
Benzo(G,H,I)Perylene	6	6	95% Chebyshev(Mean, Sd) UCL	42.8
Chrysene	6	6	95% Chebyshev(Mean, Sd) UCL	49.0
Fluoranthene	6	6	95% Chebyshev(Mean, Sd) UCL	67.3
Naphthalene	6	5	95% KM Chebyshev UCL	1.64
Phenanthrene	6	6	95% Chebyshev(Mean, Sd) UCL	36.5
Pyrene	6	6	95% Chebyshev(Mean, Sd) UCL	63.6
Total HMW PAHs - 1/2MDL	6	6	95% Chebyshev(Mean, Sd) UCL	375.1
Total HMW PAHs - MDL	6	6	95% Chebyshev(Mean, Sd) UCL	375.1
Total HMW PAHs - Zero	6	6	95% Chebyshev(Mean, Sd) UCL	375.1
Total LMW PAHs - 1/2MDL	6	6	95% Chebyshev(Mean, Sd) UCL	117.4
Total LMW PAHs - MDL	6	6	95% Chebyshev(Mean, Sd) UCL	117.4
Total LMW PAHs - Zero	6	6	95% Chebyshev(Mean, Sd) UCL	117.4
Eastern Undeveloped Area				
TAL Metals (mg/kg)				
Aluminum	22	22	95% Student's-t UCL	18,806
Arsenic	22	22	95% Adjusted Gamma UCL	6.38
Barium	22	22	95% Adjusted Gamma UCL	579.4
Cadmium	22	6	95% KM (t) UCL	0.423
Chromium, Hexavalent	22	22	95% Student's-t UCL	0.255
Cobalt	22	22	95% Student's-t UCL	5.36
Copper	22	22	95% Student's-t UCL	13.3
Iron	22	22	95% Student's-t UCL	13,988
Lead	22	22	95% Student's-t UCL	18.5
Manganese	22	22	95% Adjusted Gamma UCL	1,443
Mercury	22	21	95% KM Adjusted Gamma UCL	0.046
Nickel	22	22	95% Chebyshev(Mean, Sd) UCL	40.7
Selenium	22	1	--	--
Thallium	22	4	95% KM (t) UCL	0.116
Vanadium	22	22	95% Student's-t UCL	16.5
Zinc	22	22	95% Adjusted Gamma UCL	80.4
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	22	16	95% KM Adjusted Gamma UCL	0.298
Essential Nutrients (mg/kg)				
Calcium	22	22	95% Adjusted Gamma UCL	15,670
Magnesium	22	22	95% Student's-t UCL	8,868
Potassium	22	22	95% Student's-t UCL	1,284
Sodium	22	15	95% KM (t) UCL	86.7
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Benzo(A)Anthracene	22	20	Gamma Adjusted KM-UCL	0.474
Benzo(A)Pyrene	22	22	95% Adjusted Gamma UCL	0.672
Total HMW PAHs - 1/2MDL	22	22	95% Adjusted Gamma UCL	7.20
Total HMW PAHs - MDL	22	22	95% Adjusted Gamma UCL	7.18
Total HMW PAHs - Zero	22	22	95% Adjusted Gamma UCL	7.21
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
3- And 4- Methylphenol (Total)	7	2	--	--
Benzaldehyde	22	5	Gamma Adjusted KM-UCL	0.018

Table I-2
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Soil and Sediment Results (0-0.5 ft) by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
Bis(2-Ethylhexyl) Phthalate	22	3	--	--
Di-N-Butyl Phthalate	22	1	--	--
North-Central Undeveloped Area				
TAL Metals (mg/kg)				
Aluminum	27	27	95% Student's-t UCL	17,635
Arsenic	27	27	95% Student's-t UCL	6.26
Barium	27	27	95% Student's-t UCL	295.5
Cadmium	27	2	--	--
Chromium, Hexavalent	27	27	95% Student's-t UCL	0.266
Cobalt	27	27	95% Student's-t UCL	5.83
Copper	27	27	95% Student's-t UCL	13.5
Iron	27	27	95% Student's-t UCL	16,252
Lead	27	27	95% Student's-t UCL	12.9
Manganese	27	27	95% Chebyshev(Mean, Sd) UCL	1,140
Nickel	27	27	95% Adjusted Gamma UCL	15.1
Selenium	27	4	95% KM (t) UCL	0.301
Thallium	27	1	--	--
Vanadium	27	27	95% Student's-t UCL	13.4
Zinc	27	27	95% Student's-t UCL	67.7
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	27	16	95% KM (t) UCL	0.158
Essential Nutrients (mg/kg)				
Calcium	27	27	95% Chebyshev (Mean, Sd) UCL	42,371
Magnesium	27	27	95% Student's-t UCL	8,562
Potassium	27	27	95% Student's-t UCL	1,098
Sodium	27	21	KM Student's t	63.3
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Total HMW PAHs - 1/2MDL	27	27	95% Adjusted Gamma UCL	1.14
Total HMW PAHs - MDL	27	27	95% Adjusted Gamma UCL	1.14
Total HMW PAHs - Zero	27	27	95% Adjusted Gamma UCL	1.14
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
Benzaldehyde	27	10	95% KM (t) UCL	0.009
Bis(2-Ethylhexyl) Phthalate	27	11	95% KM (t) UCL	0.121
Western Undeveloped Area				
TAL Metals (mg/kg)				
Aluminum	41	41	95% Student's-t UCL	18,989
Antimony	41	0	--	--
Arsenic	41	41	95% Adjusted Gamma UCL	5.98
Barium	41	41	95% Student's-t UCL	306.7
Beryllium	41	40	95% KM (t) UCL	0.726
Cadmium	41	2	--	--
Chromium, Hexavalent	41	41	95% Student's-t UCL	0.317
Cobalt	41	41	95% Student's-t UCL	5.76
Copper	41	41	95% Student's-t UCL	17.7
Iron	41	41	95% Student's-t UCL	15,367
Lead	41	41	95% Student's-t UCL	15.6
Manganese	41	41	95% Adjusted Gamma UCL	625.9
Nickel	41	41	95% Student's-t UCL	12.0
Selenium	41	14	95% KM (t) UCL	0.446
Thallium	41	0	--	--
Vanadium	41	41	95% Student's-t UCL	12.9
Zinc	41	41	95% Student's-t UCL	67.2
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	41	32	95% KM Chebyshev UCL	0.435
Essential Nutrients (mg/kg)				
Calcium	41	41	95% Chebyshev (Mean, Sd) UCL	30,554
Magnesium	41	41	95% Student's-t UCL	8,471
Potassium	41	41	95% Student's-t UCL	1,100
Sodium	41	34	95% KM Chebyshev UCL	158.7
Dioxins and Furans (mg/kg)				
1,2,3,4,6,7,8-Heptachlorodibenzofuran	10	3	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	10	8	95% KM (t) UCL	4.70E-06
1,2,3,4,7,8-Hexachlorodibenzofuran	10	3	--	--
1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	10	1	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran	10	4	95% KM Bootstrap t UCL	--

Table I-2
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Soil and Sediment Results (0-0.5 ft) by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	10	3	--	--
1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	10	5	95% KM Chebyshev UCL	8.62E-07
1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	10	6	95% KM (t) UCL	1.61E-07
2,3,4,6,7,8-Hexachlorodibenzofuran	10	2	--	--
2,3,4,7,8-Pentachlorodibenzofuran	10	2	--	--
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	10	2	--	--
Octachlorodibenzofuran	10	4	95% KM (t) UCL	2.82E-06
Octachlorodibenzo-P-Dioxin	10	9	95% KM (t) UCL	2.52E-05
TEC2,3,7,8-TCDD-Bird-1/2MDL	10	9	95% KM Chebyshev UCL	7.39E-07
TEC2,3,7,8-TCDD-Bird-MDL	10	9	95% KM (t) UCL	1.27E-06
TEC2,3,7,8-TCDD-Bird-Zero	10	9	95% KM Bootstrap t UCL	7.16E-07
TEC2,3,7,8-TCDD-Mammal-1/2MDL	10	9	95% KM Chebyshev UCL	7.50E-07
TEC2,3,7,8-TCDD-Mammal-MDL	10	9	95% KM Adjusted Gamma UCL	1.06E-06
TEC2,3,7,8-TCDD-Mammal-Zero	10	9	95% KM Bootstrap t UCL	7.13E-07
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Total HMW PAHs - 1/2MDL	36	36	95% Adjusted Gamma UCL	0.733
Total HMW PAHs - MDL	36	36	95% Adjusted Gamma UCL	0.738
Total HMW PAHs - Zero	36	36	95% Adjusted Gamma UCL	0.734
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
Benzaldehyde	41	5	Gamma Adjusted KM-UCL	0.008
Bis(2-Ethylhexyl) Phthalate	41	6	95% KM (t) UCL	0.049
Di-N-Butyl Phthalate	41	2	--	--
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)				
Cyclohexane	1	0	--	--
M,P-Xylene	1	0	--	--
Methyl Acetate	1	1	--	--
Methylcyclohexane	1	0	--	--
Flathead River Riparian Area				
TAL Metals (mg/kg)				
Aluminum	19	19	95% Student's-t UCL	9,480
Arsenic	19	19	95% Student's-t UCL	4.90
Barium	10	10	95% Student's-t UCL	160.9
Barium	19	19	95% Student's-t UCL	158.1
Beryllium	10	10	95% Student's-t UCL	0.567
Cobalt	19	19	95% Student's-t UCL	6.27
Copper	19	19	95% Student's-t UCL	17.1
Iron	19	19	95% Student's-t UCL	14,681
Lead	19	19	95% Student's-t UCL	10.1
Manganese	19	19	95% Student's-t UCL	362.6
Nickel	19	19	95% Student's-t UCL	14.2
Selenium	19	0	--	--
Thallium	10	1	--	--
Vanadium	10	10	95% Student's-t UCL	18.6
Vanadium	19	19	95% Student's-t UCL	14.4
Zinc	19	19	95% Student's-t UCL	47.0
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	10	10	95% Student's-t UCL	1.05
Cyanide	19	13	Gamma Adjusted KM-UCL	0.876
Essential Nutrients (mg/kg)				
Calcium	10	10	95% Adjusted Gamma UCL	26,325
Calcium	19	19	95% Student's-t UCL	21,120
Magnesium	10	10	95% Student's-t UCL	13,193
Magnesium	19	19	95% Student's-t UCL	11,399
Potassium	10	10	95% Student's-t UCL	1,240
Potassium	19	19	95% Student's-t UCL	1,036
Sodium	10	10	95% Student's-t UCL	135.1
Sodium	19	11	95% KM (t) UCL	117.4
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Benzo(A)Anthracene	10	6	95% KM Adjusted Gamma UCL	0.053
Benzo(A)Pyrene	10	8	95% KM (t) UCL	0.055
Benzo(G,H,I)Perylene	10	8	95% KM (t) UCL	0.053
Chrysene	10	10	95% Adjusted Gamma UCL	0.284
Dibenz(A,H)Anthracene	10	6	95% KM (t) UCL	0.025
Fluoranthene	10	10	95% Chebyshev (Mean, Sd) UCL	0.553
Indeno(1,2,3-C,D)Pyrene	10	8	95% KM (t) UCL	0.077

Table I-2
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Soil and Sediment Results (0-0.5 ft) by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
Naphthalene	19	3	--	--
Phenanthrene	10	8	95% KM Bootstrap t UCL	0.094
Pyrene	10	10	95% Chebyshev (Mean, Sd) UCL	0.321
Total HMW PAHs - 1/2MDL	10	10	95% Adjusted Gamma UCL	1.05
Total HMW PAHs - 1/2MDL	16	16	95% Student's-t UCL	1.32
Total HMW PAHs - MDL	10	10	95% Adjusted Gamma UCL	1.06
Total HMW PAHs - MDL	16	16	95% Adjusted Gamma UCL	1.43
Total HMW PAHs - Zero	10	10	95% Adjusted Gamma UCL	1.08
Total HMW PAHs - Zero	16	16	95% Student's-t UCL	1.31
Total LMW PAHs - 1/2MDL	10	10	95% Chebyshev(Mean, Sd) UCL	0.677
Total LMW PAHs - MDL	10	10	95% Chebyshev(Mean, Sd) UCL	0.716
Total LMW PAHs - Zero	10	10	95% Chebyshev (Mean, Sd) UCL	0.641
Total PAHs - 1/2MDL	10	10	95% Adjusted Gamma UCL	1.33
Total PAHs - MDL	10	10	95% Adjusted Gamma UCL	1.37
Total PAHs - Zero	10	10	95% Adjusted Gamma UCL	1.37
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
Acetophenone	9	1	--	--
Benzaldehyde	9	3	--	--
Benzaldehyde	19	4	95% KM (t) UCL	0.039
Caprolactam	19	0	--	--
Carbazole	9	5	95% KM (t) UCL	0.032
Di-N-Butyl Phthalate	19	1	--	--
Phenol	9	1	--	--
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)				
Acetone	5	5	95% Student's-t UCL	0.039
Carbon Disulfide	5	5	95% Student's-t UCL	0.002
Cyclohexane	5	5	95% Student's-t UCL	0.003
Methylcyclohexane	5	5	95% Student's-t UCL	0.005
Flathead River Area				
TAL Metals (mg/kg)				
Barium	32	32	95% Student's-t UCL	100.2
Beryllium	32	31	95% KM (t) UCL	0.416
Vanadium	32	32	95% Student's-t UCL	15.6
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	32	17	Gamma Adjusted KM-UCL	1.69
Essential Nutrients (mg/kg)				
Calcium	32	32	95% Student's-t UCL	17,596
Magnesium	32	32	95% Student's-t UCL	10,161
Potassium	32	32	95% Student's-t UCL	735.7
Sodium	32	15	95% KM (t) UCL	74.3
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Acenaphthene	32	5	95% KM (t) UCL	0.005
Anthracene	32	9	Gamma Adjusted KM-UCL	0.036
Benzo(A)Anthracene	32	17	Gamma Adjusted KM-UCL	0.456
Benzo(A)Pyrene	32	14	Gamma Adjusted KM-UCL	0.194
Benzo(G,H,I)Perylene	32	18	Gamma Adjusted KM-UCL	0.259
Benzo(K)Fluoranthene	32	17	Gamma Adjusted KM-UCL	0.419
Chrysene	32	22	Gamma Adjusted KM-UCL	1.21
Dibenz(A,H)Anthracene	32	9	Gamma Adjusted KM-UCL	0.088
Fluoranthene	32	22	Gamma Adjusted KM-UCL	1.38
Fluorene	32	1	--	--
Indeno(1,2,3-C,D)Pyrene	32	17	Gamma Adjusted KM-UCL	0.303
Naphthalene	32	2	--	--
Phenanthrene	32	21	95% KM (Chebyshev) UCL	0.239
Pyrene	32	21	Gamma Adjusted KM-UCL	1.36
Total HMW PAHs - 1/2MDL	22	22	95% Adjusted Gamma UCL	6.46
Total HMW PAHs - MDL	22	22	95% Adjusted Gamma UCL	6.40
Total HMW PAHs - Zero	22	22	95% Adjusted Gamma UCL	6.55
Total LMW PAHs - 1/2MDL	22	22	95% Adjusted Gamma UCL	2.00
Total LMW PAHs - MDL	22	22	95% Adjusted Gamma UCL	2.01
Total LMW PAHs - Zero	22	22	95% Adjusted Gamma UCL	2.01
Total PAHs - 1/2MDL	22	22	95% Adjusted Gamma UCL	7.27
Total PAHs - MDL	22	22	95% Adjusted Gamma UCL	7.22
Total PAHs - Zero	22	22	95% Adjusted Gamma UCL	7.38
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				

Table I-2
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Soil and Sediment Results (0-0.5 ft) by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
3- And 4- Methylphenol (Total)	15	4	95% KM (t) UCL	0.126
Benzaldehyde	27	2	--	--
Bis(2-Ethylhexyl) Phthalate	27	3	--	--
Carbazole	27	6	Gamma Adjusted KM-UCL	0.106
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)				
Acetone	6	6	95% Student's-t UCL	0.068
Carbon Disulfide	6	6	95% Student's-t UCL	0.008
Cyclohexane	6	6	95% Student's-t UCL	0.003
Methyl Acetate	6	1	--	--
Methylcyclohexane	6	6	95% Student's-t UCL	0.007

Notes:

Data from the 0.00-0.50 ft sampling interval used to calculate UCLs to keep consistent with background statistics.
--: Not enough detected observations to estimate the UCL
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List
UCL: Upper Confidence Limit of the Mean

Table I-3
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Depth-Weighted Soil Results by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
Main Plant Area				
TAL Metals (mg/kg)				
Aluminum	81	81	95% Approximate Gamma UCL	12,497
Antimony	81	8	95% KM (t) UCL	0.1480
Arsenic	81	81	95% Student's-t UCL	4.56
Barium	81	81	95% Student's-t UCL	112.0
Cadmium	81	16	95% KM Approximate Gamma UCL	0.1891
Chromium, Hexavalent	82	81	95% KM (t) UCL	0.3176
Chromium, Total	82	82	95% Student's-t UCL	12.10
Cobalt	81	81	95% Approximate Gamma UCL	5.31
Copper	81	81	95% Student's-t UCL	15.52
Lead	81	81	95% Student's-t UCL	13.72
Manganese	81	81	95% Approximate Gamma UCL	428.6
Mercury	81	74	95% KM (t) UCL	0.0251
Nickel	81	81	95% Student's-t UCL	18.44
Selenium	81	7	95% KM (t) UCL	0.1542
Thallium	81	1	--	--
Vanadium	81	81	95% Student's-t UCL	11.58
Zinc	81	81	95% Student's-t UCL	53.12
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	81	74	95% KM Chebyshev UCL	0.2757
Fluoride	81	81	95% Chebyshev(Mean, Sd) UCL	88.05
Dioxins and Furans (mg/kg)				
1,2,3,4,6,7,8-Heptachlorodibenzofuran	29	26	95% KM Chebyshev UCL	1.50E-05
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD	29	28	95% KM Chebyshev UCL	9.56E-05
1,2,3,4,7,8,9-Heptachlorodibenzofuran	29	7	95% KM (t) UCL	3.35E-07
1,2,3,4,7,8-Hexachlorodibenzofuran	29	25	95% KM Chebyshev UCL	1.92E-06
1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	29	14	Gamma Adjusted KM-UCL	6.41E-07
1,2,3,6,7,8-Hexachlorodibenzofuran	29	27	95% KM Chebyshev UCL	7.62E-07
1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	29	25	95% KM Chebyshev UCL	3.32E-06
1,2,3,7,8,9-Hexachlorodibenzofuran	29	2	--	--
1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	29	26	95% KM Chebyshev UCL	1.88E-06
1,2,3,7,8-Pentachlorodibenzofuran	29	12	95% KM Adjusted Gamma UCL	3.90E-07
1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	29	19	95% KM Chebyshev UCL	3.09E-07
2,3,4,6,7,8-Hexachlorodibenzofuran	29	21	95% KM Chebyshev UCL	8.42E-07
2,3,4,7,8-Pentachlorodibenzofuran	29	22	Gamma Adjusted KM-UCL	5.05E-07
2,3,7,8-Tetrachlorodibenzofuran	29	21	95% KM (t) UCL	7.38E-07
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	29	11	95% KM (t) UCL	6.17E-08
Octachlorodibenzofuran	29	26	95% KM Chebyshev UCL	3.25E-05
Octachlorodibenzo-P-Dioxin	29	28	95% KM (Chebyshev) UCL	0.0011
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1254 (Aroclor 1254)	73	3	--	--
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Acenaphthene	81	68	95% KM (Chebyshev) UCL	0.5931
Anthracene	81	61	95% KM Chebyshev UCL	1.12
Benzo(A)Anthracene	81	76	95% KM Chebyshev UCL	5.48
Benzo(A)Pyrene	81	80	95% KM Chebyshev UCL	5.98
Benzo(B)Fluoranthene	81	80	95% KM Chebyshev UCL	7.60
Benzo(G,H,I)Perylene	81	79	95% KM Chebyshev UCL	5.37
Chrysene	81	80	95% KM Chebyshev UCL	6.93
Dibenz(A,H)Anthracene	81	68	95% KM Chebyshev UCL	1.28
Fluoranthene	81	80	95% KM Chebyshev UCL	9.95
Fluorene	81	63	95% KM (Chebyshev) UCL	0.4101
Indeno(1,2,3-C,D)Pyrene	81	78	95% KM Chebyshev UCL	5.43
Naphthalene	81	54	95% KM Chebyshev UCL	0.2883
Phenanthrene	81	80	95% KM Chebyshev UCL	5.70
Pyrene	81	80	95% KM Chebyshev UCL	9.91
Total HMW PAHs - 1/2MDL	80	80	95% Chebyshev(Mean, Sd) UCL	51.46
Total HMW PAHs - MDL	80	80	95% Chebyshev(Mean, Sd) UCL	51.46
Total HMW PAHs - Zero	80	80	95% Chebyshev(Mean, Sd) UCL	51.45
Total LMW PAHs - 1/2MDL	80	80	95% Chebyshev(Mean, Sd) UCL	18.25
Total LMW PAHs - MDL	80	80	95% Chebyshev(Mean, Sd) UCL	18.27
Total LMW PAHs - Zero	80	80	95% Chebyshev(Mean, Sd) UCL	18.23

Table I-3
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Depth-Weighted Soil Results by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
Benzyl Butyl Phthalate	81	21	95% KM (Chebyshev) UCL	0.2207
Bis(2-Ethylhexyl) Phthalate	81	34	95% KM Chebyshev UCL	0.1520
Di-N-Butyl Phthalate	81	16	95% KM Chebyshev UCL	0.0192
Hexachlorobenzene	81	1	--	--
Pentachlorophenol	80	3	--	--
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)				
Methylcyclohexane	64	29	95% KM Approximate Gamma UCL	9.64E-04
South Percolation Pond Area				
TAL Metals (mg/kg)				
Aluminum	12	12	95% Student's-t UCL	8,513
Antimony	12	1	--	--
Barium	12	12	95% Student's-t UCL	319.3
Cadmium	12	2	--	--
Chromium, Hexavalent	12	12	95% Student's-t UCL	0.2948
Chromium, Total	12	12	95% Student's-t UCL	11.01
Cobalt	12	12	95% Student's-t UCL	4.65
Copper	12	12	95% Adjusted Gamma UCL	192.8
Lead	12	12	95% Chebyshev (Mean, Sd) UCL	43.00
Manganese	12	12	95% Student's-t UCL	98.84
Mercury	12	11	95% KM (Chebyshev) UCL	0.4900
Nickel	12	12	95% Student's-t UCL	16.41
Selenium	12	3	--	--
Silver	12	2	--	--
Thallium	12	1	--	--
Vanadium	12	12	95% Adjusted Gamma UCL	20.36
Zinc	12	12	95% Adjusted Gamma UCL	120.2
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	12	11	95% KM (Chebyshev) UCL	2.25
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Benzo(A)Anthracene	12	11	95% KM Chebyshev UCL	0.3293
Benzo(A)Pyrene	12	10	95% KM (Chebyshev) UCL	1.71
Total HMW PAHs - 1/2MDL	12	12	95% Adjusted Gamma UCL	6.11
Total HMW PAHs - MDL	12	12	95% Adjusted Gamma UCL	6.10
Total HMW PAHs - Zero	12	12	95% Adjusted Gamma UCL	6.16
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
Bis(2-Ethylhexyl) Phthalate	12	3	--	--
Di-N-Butyl Phthalate	12	4	95% KM (t) UCL	0.0226
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)				
Methylcyclohexane	12	7	95% KM Bootstrap t UCL	0.0034
North Percolation Pond Area				
TAL Metals (mg/kg)				
Aluminum	20	20	95% Chebyshev (Mean, Sd) UCL	65,539
Antimony	20	6	95% KM (t) UCL	0.6044
Arsenic	20	20	95% Adjusted Gamma UCL	14.57
Barium	20	20	95% Chebyshev(Mean, Sd) UCL	473.1
Beryllium	20	20	95% Chebyshev (Mean, Sd) UCL	6.46
Cadmium	20	20	95% Adjusted Gamma UCL	3.05
Chromium, Hexavalent	22	20	95% KM (t) UCL	0.5716
Chromium, Total	20	20	95% Student's-t UCL	23.18
Cobalt	20	20	95% Student's-t UCL	7.37
Copper	20	20	95% Student's-t UCL	26.63
Lead	20	20	95% Chebyshev(Mean, Sd) UCL	96.66
Manganese	20	20	95% Adjusted Gamma UCL	273.4
Mercury	20	17	95% KM (t) UCL	0.0313
Nickel	20	20	95% Chebyshev(Mean, Sd) UCL	326.5
Selenium	20	14	95% KM Adjusted Gamma UCL	1.13
Thallium	20	18	95% KM (Chebyshev) UCL	1.99
Vanadium	20	20	95% Adjusted Gamma UCL	76.39
Zinc	20	20	95% Adjusted Gamma UCL	245.2
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	20	20	95% Chebyshev (Mean, Sd) UCL	44.51
Fluoride	20	20	95% Student's-t UCL	109.8

Table I-3
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Depth-Weighted Soil Results by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Acenaphthene	20	20	95% Adjusted Gamma UCL	24.93
Anthracene	20	20	95% Adjusted Gamma UCL	49.04
Benzo(A)Anthracene	20	20	95% Adjusted Gamma UCL	310.7
Benzo(A)Pyrene	20	20	95% Adjusted Gamma UCL	340.2
Benzo(B)Fluoranthene	20	20	95% Chebyshev (Mean, Sd) UCL	521.7
Benzo(G,H,I)Perylene	20	20	95% Adjusted Gamma UCL	245.9
Benzo(K)Fluoranthene	20	20	95% Chebyshev (Mean, Sd) UCL	343.5
Chrysene	20	20	95% Adjusted Gamma UCL	358.4
Dibenz(A,H)Anthracene	20	20	95% Chebyshev (Mean, Sd) UCL	117.4
Fluoranthene	20	20	95% Adjusted Gamma UCL	609.6
Fluorene	20	17	Gamma Adjusted KM-UCL	13.03
Indeno(1,2,3-C,D)Pyrene	20	20	95% Adjusted Gamma UCL	225.2
Naphthalene	20	14	Gamma Adjusted KM-UCL	2.39
Phenanthrene	20	20	95% Adjusted Gamma UCL	200.4
Pyrene	20	20	95% Adjusted Gamma UCL	520.7
Total HMW PAHs - 1/2MDL	20	20	95% Adjusted Gamma UCL	2,670
Total HMW PAHs - MDL	20	20	95% Adjusted Gamma UCL	2,670
Total HMW PAHs - Zero	20	20	95% Adjusted Gamma UCL	2,670
Total LMW PAHs - 1/2MDL	20	20	95% Adjusted Gamma UCL	899.0
Total LMW PAHs - MDL	20	20	95% Adjusted Gamma UCL	900.9
Total LMW PAHs - Zero	20	20	95% Adjusted Gamma UCL	897.1
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
Benzyl Butyl Phthalate	20	1	--	--
Bis(2-Ethylhexyl) Phthalate	20	3	--	--
Dibenzofuran	20	20	95% Adjusted Gamma UCL	4.72
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)				
Methylcyclohexane	9	3	--	--
Central Landfills Area				
TAL Metals (mg/kg)				
Aluminum	55	55	95% Student's-t UCL	14,442
Antimony	55	4	95% KM (t) UCL	0.2037
Arsenic	55	55	95% Approximate Gamma UCL	6.80
Barium	55	55	95% Approximate Gamma UCL	144.3
Beryllium	55	55	95% Student's-t UCL	0.7325
Cadmium	55	5	95% KM (t) UCL	0.2101
Chromium, Hexavalent	59	55	95% KM (t) UCL	0.2912
Chromium, Total	59	59	95% Student's-t UCL	11.25
Cobalt	55	55	95% Approximate Gamma UCL	6.12
Copper	55	55	95% Chebyshev (Mean, Sd) UCL	192.9
Lead	55	55	95% Student's-t UCL	14.23
Manganese	55	55	95% Student's-t UCL	482.6
Nickel	55	55	95% Chebyshev (Mean, Sd) UCL	60.08
Selenium	55	13	95% KM Chebyshev UCL	0.4523
Thallium	55	13	95% KM (Chebyshev) UCL	0.1731
Vanadium	55	55	95% Chebyshev (Mean, Sd) UCL	25.29
Zinc	55	55	95% Student's-t UCL	51.81
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	55	44	95% KM (Chebyshev) UCL	1.41
Fluoride	55	55	95% Chebyshev(Mean, Sd) UCL	118.5
Dioxins and Furans (mg/kg)				
1,2,3,4,6,7,8-Heptachlorodibenzofuran	2	2	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD	2	2	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran	2	2	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran	2	2	--	--
1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	2	2	--	--
1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	2	2	--	--
1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	2	1	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran	2	1	--	--
2,3,4,7,8-Pentachlorodibenzofuran	2	2	--	--
2,3,7,8-Tetrachlorodibenzofuran	2	2	--	--
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	2	1	--	--
Octachlorodibenzofuran	2	2	--	--

Table I-3
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Depth-Weighted Soil Results by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
Octachlorodibenzo-P-Dioxin	2	2	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1254 (Aroclor 1254)	35	4	95% KM (t) UCL	0.1029
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Acenaphthene	55	45	95% KM (Chebyshev) UCL	2.62
Anthracene	55	46	95% KM (Chebyshev) UCL	4.73
Benzo(A)Anthracene	55	55	95% Chebyshev (Mean, Sd) UCL	9.59
Benzo(A)Pyrene	55	55	95% Chebyshev (Mean, Sd) UCL	8.52
Benzo(B)Fluoranthene	55	55	95% Chebyshev (Mean, Sd) UCL	11.76
Benzo(G,H,I)Perylene	55	55	95% Chebyshev(Mean, Sd) UCL	5.89
Chrysene	55	55	95% Chebyshev (Mean, Sd) UCL	12.78
Dibenz(A,H)Anthracene	55	53	95% KM Chebyshev UCL	2.13
Fluoranthene	55	55	95% Chebyshev (Mean, Sd) UCL	24.33
Fluorene	55	46	95% KM (Chebyshev) UCL	2.32
Indeno(1,2,3-C,D)Pyrene	55	55	95% Chebyshev (Mean, Sd) UCL	6.73
Naphthalene	55	35	95% KM (Chebyshev) UCL	0.8567
Phenanthrene	55	55	95% Chebyshev (Mean, Sd) UCL	22.24
Pyrene	55	55	95% Chebyshev (Mean, Sd) UCL	13.93
Total HMW PAHs - 1/2MDL	55	55	95% Chebyshev (Mean, Sd) UCL	75.39
Total HMW PAHs - MDL	55	55	95% Chebyshev (Mean, Sd) UCL	75.40
Total HMW PAHs - Zero	55	55	95% Chebyshev (Mean, Sd) UCL	75.38
Total LMW PAHs - 1/2MDL	55	55	95% Chebyshev (Mean, Sd) UCL	57.47
Total LMW PAHs - MDL	55	55	95% Chebyshev (Mean, Sd) UCL	57.49
Total LMW PAHs - Zero	55	55	95% Chebyshev (Mean, Sd) UCL	57.45
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
Benzyl Butyl Phthalate	55	5	95% KM Approximate Gamma UCL	0.0398
Bis(2-Ethylhexyl) Phthalate	55	12	95% KM (Chebyshev) UCL	0.0786
Dibenzofuran	55	37	95% KM (Chebyshev) UCL	1.36
Di-N-Butyl Phthalate	55	5	95% KM (t) UCL	0.0084
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)				
Methylcyclohexane	27	5	95% KM (t) UCL	3.52E-04
Industrial Landfill Area				
TAL Metals (mg/kg)				
Aluminum	6	6	95% Student's-t UCL	58,372
Antimony	6	4	95% KM Bootstrap t UCL	--
Arsenic	6	6	95% Chebyshev (Mean, Sd) UCL	21.45
Barium	6	6	95% Student's-t UCL	183.1
Beryllium	6	6	95% Chebyshev(Mean, Sd) UCL	6.93
Cadmium	6	3	--	--
Chromium, Hexavalent	6	6	95% Adjusted Gamma UCL	0.6063
Chromium, Total	6	6	95% Adjusted Gamma UCL	22.65
Cobalt	6	6	95% Student's-t UCL	10.89
Copper	6	6	95% Chebyshev(Mean, Sd) UCL	533.7
Lead	6	6	95% Student's-t UCL	15.85
Manganese	6	6	95% Student's-t UCL	487.3
Nickel	6	6	95% Chebyshev(Mean, Sd) UCL	452.0
Selenium	6	3	--	--
Thallium	6	2	--	--
Vanadium	6	6	95% Chebyshev(Mean, Sd) UCL	150.6
Zinc	6	6	95% Student's-t UCL	56.49
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	6	3	--	--
Fluoride	6	6	90% Chebyshev(Mean, Sd) UCL	513.2
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Acenaphthene	6	6	95% Student's-t UCL	1.06
Benzo(A)Anthracene	6	6	95% Student's-t UCL	11.09
Benzo(A)Pyrene	6	6	95% Student's-t UCL	13.97
Benzo(B)Fluoranthene	6	6	95% Student's-t UCL	15.49
Benzo(G,H,I)Perylene	6	6	95% Student's-t UCL	13.65
Chrysene	6	6	95% Student's-t UCL	12.77
Fluoranthene	6	6	95% Student's-t UCL	16.38
Naphthalene	6	6	95% Chebyshev(Mean, Sd) UCL	0.5038
Phenanthrene	6	6	95% Student's-t UCL	7.86

Table I-3
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Depth-Weighted Soil Results by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
Pyrene	6	6	95% Student's-t UCL	16.15
Total HMW PAHs - 1/2MDL	6	6	95% Student's-t UCL	103.4
Total HMW PAHs - MDL	6	6	95% Student's-t UCL	103.4
Total HMW PAHs - Zero	6	6	95% Student's-t UCL	103.4
Total LMW PAHs - 1/2MDL	6	6	95% Student's-t UCL	27.47
Total LMW PAHs - MDL	6	6	95% Student's-t UCL	27.49
Total LMW PAHs - Zero	6	6	95% Student's-t UCL	27.45
Eastern Undeveloped Area				
TAL Metals (mg/kg)				
Aluminum	22	22	95% Student's-t UCL	18,531
Arsenic	22	22	95% Student's-t UCL	5.61
Barium	22	22	95% Student's-t UCL	380.5
Cadmium	22	6	95% KM (t) UCL	0.1947
Chromium, Hexavalent	22	22	95% Student's-t UCL	0.2502
Cobalt	22	22	95% Student's-t UCL	4.99
Copper	22	22	95% Student's-t UCL	12.15
Lead	22	22	95% Student's-t UCL	12.65
Manganese	22	22	95% Adjusted Gamma UCL	820.6
Mercury	22	21	95% KM Adjusted Gamma UCL	0.0287
Nickel	22	22	95% Student's-t UCL	16.24
Selenium	22	1	--	--
Thallium	22	5	95% KM (t) UCL	0.0724
Vanadium	22	22	95% Student's-t UCL	12.89
Zinc	22	22	95% Student's-t UCL	60.52
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	22	17	95% KM Adjusted Gamma UCL	0.1737
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Benzo(A)Anthracene	22	20	Gamma Adjusted KM-UCL	0.1957
Benzo(A)Pyrene	22	22	95% Adjusted Gamma UCL	0.3075
Total HMW PAHs - 1/2MDL	22	22	95% Adjusted Gamma UCL	3.34
Total HMW PAHs - MDL	22	22	95% Adjusted Gamma UCL	3.33
Total HMW PAHs - Zero	22	22	95% Adjusted Gamma UCL	3.35
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
Bis(2-Ethylhexyl) Phthalate	22	7	95% KM (t) UCL	0.0625
Di-N-Butyl Phthalate	22	1	--	--
North-Central Undeveloped Area				
TAL Metals (mg/kg)				
Aluminum	27	27	95% Adjusted Gamma UCL	16,317
Arsenic	27	27	95% Student's-t UCL	6.86
Barium	27	27	95% Student's-t UCL	218.9
Cadmium	27	2	--	--
Chromium, Hexavalent	27	27	95% Student's-t UCL	0.2764
Cobalt	27	27	95% Student's-t UCL	5.91
Copper	27	27	95% Student's-t UCL	14.69
Lead	27	27	95% Student's-t UCL	12.23
Manganese	27	27	95% Student's-t UCL	580.9
Nickel	27	27	95% Adjusted Gamma UCL	12.49
Selenium	27	4	95% KM (t) UCL	0.1925
Thallium	27	3	--	--
Vanadium	27	27	95% Student's-t UCL	12.24
Zinc	27	27	95% Student's-t UCL	56.52
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	27	16	95% KM Adjusted Gamma UCL	0.1031
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Total HMW PAHs - 1/2MDL	27	27	95% Student's-t UCL	0.4080
Total HMW PAHs - MDL	27	27	95% Adjusted Gamma UCL	0.4502
Total HMW PAHs - Zero	27	27	95% Adjusted Gamma UCL	0.4446
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
Bis(2-Ethylhexyl) Phthalate	27	13	95% KM Chebyshev UCL	0.1616
Western Undeveloped Area				
TAL Metals (mg/kg)				
Aluminum	41	41	95% Student's-t UCL	18,204
Antimony	41	1	--	--

Table I-3
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Depth-Weighted Soil Results by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
Arsenic	41	41	95% Adjusted Gamma UCL	5.94
Barium	41	41	95% Student's-t UCL	259.9
Beryllium	41	41	95% Student's-t UCL	0.6831
Cadmium	41	3	--	--
Chromium, Hexavalent	41	41	95% Student's-t UCL	0.3143
Cobalt	41	41	95% Student's-t UCL	5.91
Copper	41	41	95% Adjusted Gamma UCL	16.69
Lead	41	41	95% Student's-t UCL	12.63
Manganese	41	41	95% Student's-t UCL	429.5
Nickel	41	41	95% Student's-t UCL	11.29
Selenium	41	16	95% KM Adjusted Gamma UCL	0.3215
Thallium	41	3	--	--
Vanadium	41	41	95% Student's-t UCL	12.71
Zinc	41	41	95% Adjusted Gamma UCL	52.76
Other Inorganic Parameters (mg/kg unless otherwise noted)				
Cyanide	41	35	95% KM Adjusted Gamma UCL	0.1311
Dioxins and Furans (mg/kg)				
1,2,3,4,6,7,8-Heptachlorodibenzofuran	10	4	95% KM (t) UCL	3.45E-07
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD	10	10	95% Student's-t UCL	1.83E-06
1,2,3,4,7,8-Hexachlorodibenzofuran	10	3	--	--
1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	10	1	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran	10	7	95% KM Adjusted Gamma UCL	2.37E-07
1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	10	3	--	--
1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	10	5	95% KM (t) UCL	2.39E-07
1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	10	6	95% KM (t) UCL	8.70E-08
2,3,4,6,7,8-Hexachlorodibenzofuran	10	3	--	--
2,3,4,7,8-Pentachlorodibenzofuran	10	2	--	--
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	10	3	--	--
Octachlorodibenzofuran	10	6	95% KM (t) UCL	1.32E-06
Octachlorodibenzo-P-Dioxin	10	10	95% Student's-t UCL	1.36E-05
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
Total HMW PAHs - 1/2MDL	41	36	Gamma Adjusted KM-UCL	0.2520
Total HMW PAHs - MDL	41	36	Gamma Adjusted KM-UCL	0.2606
Total HMW PAHs - Zero	41	36	Gamma Adjusted KM-UCL	0.2443
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
Bis(2-Ethylhexyl) Phthalate	41	10	95% KM (t) UCL	0.0429
Di-N-Butyl Phthalate	41	4	95% KM (Chebyshev) UCL	0.0578
TCL Volatile Organic Compounds (TCL VOCs) (mg/kg)				
Methylcyclohexane	16	1	--	--
Aluminum	19	19	95% Student's-t UCL	9,062
Arsenic	19	19	95% Student's-t UCL	4.88
Barium	19	19	95% Student's-t UCL	141.2
Cobalt	19	19	95% Student's-t UCL	6.08
Copper	19	19	95% Student's-t UCL	15.90
Lead	19	19	95% Student's-t UCL	9.42
Manganese	19	19	95% Student's-t UCL	312.1
Nickel	19	19	95% Student's-t UCL	12.79
Selenium	19	1	--	--
Vanadium	19	19	95% Student's-t UCL	14.62
Zinc	19	19	95% Student's-t UCL	42.98
Cyanide	19	13	Gamma Adjusted KM-UCL	1.24
Naphthalene	19	3	--	--
Total HMW PAHs - 1/2MDL	19	17	95% KM (t) UCL	0.5181
Total HMW PAHs - MDL	19	17	95% KM (t) UCL	0.5402
Total HMW PAHs - Zero	19	17	95% KM Adjusted Gamma UCL	0.5728
Di-N-Butyl Phthalate	19	3	--	--
Methylcyclohexane	19	19	95% Student's-t UCL	0.0053

Notes:

--: Not enough detected observations to estimate the UCL
mg/kg: milligram per kilogram
TAL: Target Analyte List
TCL: Target Compound List
UCL: Upper Confidence Limit of the Mean

Table I-4
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Surface Water Results by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fraction	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
Cedar Creek Area					
TAL Metals (µg/L)					
Barium	U	28	28	95% Student's-t UCL	108.2
Barium	F	16	16	95% Student's-t UCL	104.6
Chromium, Total	U	28	2	--	--
Chromium, Total	F	16	0	--	--
Copper	U	28	9	95% KM (t) UCL	2.97
Copper	F	16	0	--	--
Iron	U	28	3	--	--
Iron	F	16	0	--	--
Zinc	U	28	2	--	--
Zinc	F	16	1	--	--
Other Inorganic Parameters (µg/L unless otherwise noted)					
Cyanide	U	32	7	95% KM (Chebyshev) UCL	5.01
Cyanide	F	4	0	--	--
Cyanide (Free)	U	20	2	--	--
Cyanide (Free)	F	2	0	--	--
Fluoride	U	28	22	95% KM (t) UCL	107.5
Fluoride	F	4	4	95% Adjusted-CLT UCL (Chen-1995)	129.4
Cedar Creek Reservoir Overflow Ditch Area					
TAL Metals (µg/L)					
Aluminum	U	27	20	95% KM (Chebyshev) UCL	369.2
Aluminum	F	16	1	--	--
Barium	U	27	27	95% Student's-t UCL	101.4
Barium	F	16	16	95% Student's-t UCL	106.5
Copper	U	27	9	95% KM (t) UCL	2.71
Copper	F	16	0	--	--
Iron	U	27	5	Gamma Adjusted KM-UCL	688.2
Iron	F	16	0	--	--
Manganese	U	27	26	95% KM (Chebyshev) UCL	749.3
Manganese	F	16	3	--	--
Vanadium	U	27	6	95% KM (t) UCL	1.52
Vanadium	F	16	0	--	--
Other Inorganic Parameters (µg/L unless otherwise noted)					
Cyanide (Free)	U	11	3	--	--
Fluoride	U	27	27	95% Chebyshev (Mean, Sd) UCL	627.3
Fluoride	F	5	5	95% Student's-t UCL	177.0
South Percolation Pond Area					
TAL Metals (µg/L)					
Aluminum	U	26	22	Gamma Adjusted KM-UCL	6,018
Aluminum	F	17	9	Gamma Adjusted KM-UCL	907.1
Barium	U	26	26	95% Chebyshev (Mean, Sd) UCL	788.0
Barium	F	17	17	95% Adjusted Gamma UCL	313.5
Beryllium	U	26	1	--	--
Beryllium	F	17	0	--	--
Cadmium	U	26	2	--	--
Cadmium	F	17	0	--	--
Chromium, Total	U	26	9	Gamma Adjusted KM-UCL	5.96
Chromium, Total	F	17	1	--	--
Cobalt	U	26	3	--	--
Cobalt	F	17	0	--	--
Copper	U	26	19	95% KM Chebyshev UCL	46.91
Copper	F	17	7	95% KM Chebyshev UCL	12.67
Iron	U	26	23	95% KM (Chebyshev) UCL	5,192
Iron	F	17	10	95% KM (Chebyshev) UCL	640.1
Manganese	U	26	23	95% KM Chebyshev UCL	88.74
Manganese	F	17	11	95% KM (Chebyshev) UCL	88.74
Mercury	U	26	1	--	--
Mercury	F	17	0	--	--
Selenium	U	26	3	--	--
Selenium	F	17	0	--	--
Vanadium	U	26	8	95% KM (Chebyshev) UCL	6.61
Vanadium	F	17	1	--	--

Table I-4
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Surface Water Results by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fraction	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
Zinc	U	26	11	Gamma Adjusted KM-UCL	42.43
Zinc	F	17	3	--	--
Other Inorganic Parameters (µg/L unless otherwise noted)					
Cyanide	U	26	15	95% KM (Chebyshev) UCL	42.84
Cyanide	F	5	3	--	--
Cyanide (Free)	U	16	13	95% KM Adjusted Gamma UCL	5.62
Cyanide (Free)	F	3	3	--	--
Fluoride	U	26	26	95% Chebyshev (Mean, Sd) UCL	2,620
Fluoride	F	3	3	--	--
Nitrogen, Ammonia (As N)	U	26	17	95% KM (Chebyshev) UCL	1,943
Essential Nutrients (µg/L)					
Calcium	U	26	26	95% Chebyshev (Mean, Sd) UCL	153,653
Calcium	F	17	17	95% Student's-t UCL	61,093
Polycyclic Aromatic Hydrocarbons (PAHs) (µg/L)					
Benzo(A)Pyrene	U	5	1	--	--
Benzo(B)Fluoranthene	U	5	1	--	--
Indeno(1,2,3-C,D)Pyrene	U	5	1	--	--
Northern Surface Water Feature					
TAL Metals (µg/L)					
Aluminum	U	16	15	97.5% KM (Chebyshev) UCL	2,713
Aluminum	F	11	0	--	--
Barium	U	16	16	95% Student's-t UCL	146.5
Barium	F	11	11	95% Student's-t UCL	147.2
Copper	U	16	2	--	--
Copper	F	11	0	--	--
Iron	U	16	8	95% KM (Chebyshev) UCL	1,696
Iron	F	11	0	--	--
Manganese	U	16	13	Gamma Adjusted KM-UCL	52.08
Manganese	F	11	8	95% KM Chebyshev UCL	45.47
Selenium	U	16	1	--	--
Selenium	F	11	1	--	--
Vanadium	U	16	3	--	--
Vanadium	F	11	0	--	--
Other Inorganic Parameters (µg/L unless otherwise noted)					
Fluoride	U	16	16	95% Student's-t UCL	227.8
Fluoride	F	1	1	--	--
Flathead River Riparian Area					
TAL Metals (µg/L)					
Aluminum	U	15	15	99% Chebyshev (Mean, Sd) UCL	25,297
Aluminum	F	15	11	95% KM (t) UCL	291.8
Arsenic	U	15	10	95% KM Adjusted Gamma UCL	7.81
Arsenic	F	15	9	95% KM (t) UCL	2.69
Barium	U	15	15	95% Chebyshev(Mean, Sd) UCL	627.2
Barium	F	15	15	95% Student's-t UCL	267.4
Beryllium	U	15	3	--	--
Beryllium	F	15	0	--	--
Cadmium	U	15	1	--	--
Cadmium	F	15	0	--	--
Chromium, Total	U	15	4	95% KM (t) UCL	9.45
Chromium, Total	F	15	0	--	--
Cobalt	U	15	10	95% KM (Chebyshev) UCL	10.04
Cobalt	F	15	6	95% KM (t) UCL	1.44
Copper	U	15	12	95% KM (Chebyshev) UCL	29.78
Copper	F	15	3	--	--
Iron	U	15	15	95% Adjusted Gamma UCL	17,093
Iron	F	15	15	99% Chebyshev (Mean, Sd) UCL	8,108
Lead	U	15	11	975% KM (Chebyshev) UCL	20.60
Lead	F	15	6	95% KM (t) UCL	0.5996
Manganese	U	15	15	95% Adjusted Gamma UCL	1,404
Manganese	F	15	15	95% Adjusted Gamma UCL	1,121
Mercury	U	15	1	--	--
Mercury	F	15	0	--	--
Vanadium	U	15	4	95% KM (t) UCL	11.96

Table I-4
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Surface Water Results by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fraction	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
Vanadium	F	15	0	--	--
Zinc	U	15	6	95% KM (t) UCL	49.72
Zinc	F	15	2	--	--
Other Inorganic Parameters (µg/L unless otherwise noted)					
Cyanide	U	15	15	95% Adjusted Gamma UCL	334.9
Cyanide	F	5	5	95% Student's-t UCL	183.9
Cyanide (Free)	U	15	14	Gamma Adjusted KM-UCL	61.45
Cyanide (Free)	F	5	5	95% Student's-t UCL	44.85
Fluoride	U	15	15	95% Adjusted Gamma UCL	2,661
Essential Nutrients (µg/L)					
Calcium	U	15	15	95% Student's-t UCL	92,086
Calcium	F	15	15	95% Student's-t UCL	62,659
Polycyclic Aromatic Hydrocarbons (PAHs) (µg/L)					
Benzo(A)Anthracene	U	6	1	--	--
Benzo(A)Pyrene	U	6	1	--	--
Benzo(B)Fluoranthene	U	6	1	--	--
Benzo(G,H,I)Perylene	U	6	1	--	--
Benzo(K)Fluoranthene	U	6	1	--	--
Chrysene	U	6	1	--	--
Dibenz(A,H)Anthracene	U	6	1	--	--
Fluoranthene	U	6	6	95% Student's-t UCL	2.64
Indeno(1,2,3-C,D)Pyrene	U	6	1	--	--
Phenanthrene	U	6	3	--	--
Pyrene	U	6	3	--	--
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (µg/L)					
3- And 4- Methylphenol (Total)	U	5	1	--	--
Benzaldehyde	U	6	1	--	--
Caprolactam	U	6	1	--	--
Carbazole	U	6	2	--	--
Phenol	U	6	2	--	--
TCL Volatile Organic Compounds (TCL VOCs) (µg/L)					
Toluene	U	5	2	--	--
Flathead River Area					
TAL Metals (µg/L)					
Aluminum	U	76	70	95% KM (Chebyshev) UCL	486.2
Aluminum	F	49	12	95% KM (t) UCL	22.27
Barium	U	76	76	95% Student's-t UCL	116.8
Barium	F	49	49	95% Student's-t UCL	103.6
Copper	U	76	21	95% KM Chebyshev UCL	3.25
Copper	F	49	2	--	--
Iron	U	76	51	95% KM Approximate Gamma UCL	477.5
Iron	F	49	11	95% KM (t) UCL	62.64
Manganese	U	76	54	95% KM Approximate Gamma UCL	28.43
Manganese	F	49	29	95% KM (Chebyshev) UCL	20.47
Nickel	U	76	4	95% KM (t) UCL	1.35
Nickel	F	49	2	--	--
Vanadium	U	76	4	95% KM (t) UCL	1.24
Vanadium	F	49	0	--	--
Other Inorganic Parameters (µg/L unless otherwise noted)					
Cyanide	U	76	28	95% KM Chebyshev UCL	85.04
Cyanide	F	15	9	Gamma Adjusted KM-UCL	182.8
Cyanide (Free)	U	48	26	95% KM Chebyshev UCL	26.80
Cyanide (Free)	F	10	10	95% Adjusted Gamma UCL	23.20
Fluoride	U	76	65	95% KM (Chebyshev) UCL	742.1
Fluoride	F	9	9	95% Chebyshev (Mean, Sd) UCL	388.9
Polycyclic Aromatic Hydrocarbons (PAHs) (µg/L)					
Benzo(A)Anthracene	U	11	3	--	--
Benzo(A)Pyrene	U	11	2	--	--
Benzo(B)Fluoranthene	U	11	3	--	--
Benzo(G,H,I)Perylene	U	11	1	--	--
Benzo(K)Fluoranthene	U	11	2	--	--
Chrysene	U	11	4	95% KM (t) UCL	0.3657
Dibenz(A,H)Anthracene	U	11	1	--	--

Table I-4
Upper Confidence Limit of the Mean Concentrations (UCL_{mean}) for Surface Water Results by Ecological Exposure Area
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Constituent	Fraction	Number of Samples	Number of Detections	Upper Confidence Limit (UCL) Method	UCL Value
Fluoranthene	U	11	4	95% KM Bootstrap t UCL	--
Indeno(1,2,3-C,D)Pyrene	U	11	1	--	--
Phenanthrene	U	11	2	--	--
Pyrene	U	11	4	95% KM Bootstrap t UCL	--
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (µg/L)					
Bis(2-Ethylhexyl) Phthalate	U	11	4	95% KM (t) UCL	7.71
Caprolactam	U	11	4	95% KM (t) UCL	0.9475

Notes:

--: Not enough detected observations to estimate the UCL
F: Filtered
TAL: Target Analyte List
TCL: Target Compound List
µg/L: microgram per liter
U: Unfiltered
UCL: Upper Confidence Limit of the Mean

Appendix J Incremental Soil Sampling Exposure Point Concentrations

Appendix J1 Calculation of Exposure Point Concentrations in the Operational Area Based on Incremental Soil Sampling (ISS) Data

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-011-SO-0.0-0.5				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
TAL Metals (mg/kg)					
Aluminum	15,100	18,100	16,200	Student's-t 95% UCL	19,025
Antimony	0.16	0.25	0.18	Chebychev 95% UCL	0.32
Arsenic	4.30	4.50	4.90	Student's-t 95% UCL	5.08
Barium	76.7	81.1	81.7	Student's-t 95% UCL	84.4
Beryllium	0.52	0.56	0.54	Student's-t 95% UCL	0.57
Cadmium	0.30	0.25	0.22	Student's-t 95% UCL	0.32
Chromium, Hexavalent	0.50	0.40	0.66	Chebychev 95% UCL	0.85
Chromium, Total	18.5	14.8	24.5	Chebychev 95% UCL	31.6
Chromium, Trivalent	18.0	14.4	23.8	Chebychev 95% UCL	30.7
Cobalt	5.60	5.80	5.80	Student's-t 95% UCL	5.93
Copper	21.1	29.9	22.3	Student's-t 95% UCL	32.5
Iron	14,900	15,200	14,900	Student's-t 95% UCL	15,292
Lead	40.7	19.4	15.2	Chebychev 95% UCL	59.5
Manganese	385.0	379.0	359.0	Student's-t 95% UCL	397.3
Mercury	0.010	0.019	0.020	Chebychev 95% UCL	0.031
Nickel	28.2	32.1	30.4	Student's-t 95% UCL	33.5
Selenium	0.22	0.21	0.27	Student's-t 95% UCL	0.29
Silver	0.041	0.060	0.052	Student's-t 95% UCL	0.067
Thallium	0.067	0.070	0.067	Student's-t 95% UCL	0.071
Vanadium	14.4	15.8	16.0	Student's-t 95% UCL	16.9
Zinc	70.7	93.1	68.1	Student's-t 95% UCL	100.5
Other Inorganic Parameters (mg/kg)					
Cyanide	0.17	0.15	0.14	Student's-t 95% UCL	0.18
Fluoride	45.7	34.1	32.9	Student's-t 95% UCL	49.5

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-011-SO-0.0-0.5				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
Essential Nutrients (mg/kg)					
Calcium	25,400	23,200	24,100	Student's-t 95% UCL	26,098
Magnesium	10,900	10,500	10,600	Student's-t 95% UCL	11,018
Potassium	1,060	1,060	1,080	Student's-t 95% UCL	1,086
Sodium	90.8	128.0	120.0	Student's-t 95% UCL	145.9
Polychlorinated Biphenyls (PCBs) (mg/kg)					
PCB-1254 (Aroclor 1254)	0.005	0.059	0.005	Chebychev 95% UCL	0.10
Polychlorinated Biphenyl (PCBs)	0.005	0.059	0.005	Chebychev 95% UCL	0.10
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)					
Naphthalene	0.057	0.062	0.057	Student's-t 95% UCL	0.064
2-Methylnaphthalene	--	--	--	--	--
Acenaphthene	0.17	0.30	0.19	Chebychev 95% UCL	0.40
Acenaphthylene	--	--	--	--	--
Anthracene	0.39	0.57	0.38	Chebychev 95% UCL	0.72
Benzo(A)Anthracene	2.20	4.40	2.20	Chebychev 95% UCL	6.13
Benzo(A)Pyrene	2.70	5.20	2.60	Chebychev 95% UCL	7.21
Benzo(B)Fluoranthene	3.30	6.00	3.40	Chebychev 95% UCL	8.09
Benzo(G,H,I)Perylene	3.30	5.60	3.40	Chebychev 95% UCL	7.37
Benzo(K)Fluoranthene	1.30	3.00	1.40	Chebychev 95% UCL	4.30
Chrysene	3.30	6.00	3.30	Chebychev 95% UCL	8.12
Dibenz(A,H)Anthracene	0.62	1.40	0.75	Chebychev 95% UCL	1.98
Fluoranthene	4.00	6.10	3.70	Chebychev 95% UCL	7.89
Fluorene	0.11	0.13	0.13	Student's-t 95% UCL	0.14
Indeno(1,2,3-C,D)Pyrene	2.40	4.50	2.50	Chebychev 95% UCL	6.11
Phenanthrene	2.10	2.60	1.90	Student's-t 95% UCL	2.81

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-011-SO-0.0-0.5				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
Pyrene	4.30	6.90	4.00	Chebychev 95% UCL	9.08
Total HMW PAHs - 1/2MDL	23.4	43.0	23.6	Chebychev 95% UCL	58.3
Total HMW PAHs - MDL	23.4	43.0	23.6	Chebychev 95% UCL	58.3
Total HMW PAHs - Zero	23.4	43.0	23.6	Chebychev 95% UCL	58.3
Total LMW PAHs - 1/2MDL	6.86	9.80	6.39	Chebychev 95% UCL	12.3
Total LMW PAHs - MDL	6.90	9.84	6.43	Chebychev 95% UCL	12.4
Total LMW PAHs - Zero	6.83	9.76	6.36	Chebychev 95% UCL	12.3
Total PAHs - 1/2MDL	27.0	46.8	26.5	Chebychev 95% UCL	62.5
Total PAHs - MDL	27.0	46.8	26.5	Chebychev 95% UCL	62.6
Total PAHs - Zero	26.9	46.8	26.5	Chebychev 95% UCL	62.5
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)					
Acetophenone	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--
Carbazole	0.49	0.68	0.49	Student's-t 95% UCL	0.74
Dibenzofuran	0.055	0.075	0.067	Student's-t 95% UCL	0.083
Isophorone	--	--	--	--	--

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-011-SO-0.5-2				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
TAL Metals (mg/kg)					
Aluminum	12,400	12,900	12,700	Student's-t 95% UCL	13,091
Antimony	--	--	--	--	--
Arsenic	4.40	4.30	4.20	Student's-t 95% UCL	4.47
Barium	104.0	117.0	102.0	Student's-t 95% UCL	121.4
Beryllium	0.48	0.49	0.49	Student's-t 95% UCL	0.50
Cadmium	0.095	0.094	0.083	Student's-t 95% UCL	0.10
Chromium, Hexavalent	0.39	0.38	0.40	Student's-t 95% UCL	0.40
Chromium, Total	14.6	14.2	14.8	Student's-t 95% UCL	15.0
Chromium, Trivalent	14.2	13.8	14.4	Student's-t 95% UCL	14.6
Cobalt	5.70	5.80	5.80	Student's-t 95% UCL	5.86
Copper	16.1	17.6	16.1	Student's-t 95% UCL	18.1
Iron	15,800	16,900	15,900	Student's-t 95% UCL	17,225
Lead	11.3	10.8	10.2	Student's-t 95% UCL	11.7
Manganese	459.0	480.0	437.0	Student's-t 95% UCL	494.9
Mercury	0.023	0.021	0.010	Chebychev 95% UCL	0.036
Nickel	12.3	13.4	13.7	Student's-t 95% UCL	14.4
Selenium	0.22	0.23	0.18	Student's-t 95% UCL	0.25
Silver	0.045	0.039	0.040	Student's-t 95% UCL	0.047
Thallium	0.064	0.073	0.067	Student's-t 95% UCL	0.076
Vanadium	11.3	11.4	11.5	Student's-t 95% UCL	11.6
Zinc	62.1	60.4	73.0	Student's-t 95% UCL	76.7
Other Inorganic Parameters (mg/kg)					
Cyanide	0.032	0.080	0.065	Chebychev 95% UCL	0.12
Fluoride	30.6	20.4	31.2	Student's-t 95% UCL	37.6

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-011-SO-0.5-2				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
Essential Nutrients (mg/kg)					
Calcium	23,800	21,200	23,200	Student's-t 95% UCL	25,028
Magnesium	10,900	10,500	11,200	Student's-t 95% UCL	11,459
Potassium	1,030	1,020	978.0	Student's-t 95% UCL	1,056
Sodium	--	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)					
PCB-1254 (Aroclor 1254)	1.30	0.72	0.97	Chebychev 95% UCL	1.73
Polychlorinated Biphenyl (PCBs)	1.30	0.72	0.97	Chebychev 95% UCL	1.73
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)					
Naphthalene	0.015	0.011	0.010	Chebychev 95% UCL	0.019
2-Methylnaphthalene	0.015	0.006	0.007	Chebychev 95% UCL	0.022
Acenaphthene	0.13	0.027	0.040	Chebychev 95% UCL	0.21
Acenaphthylene	0.004	0.002	0.003	Chebychev 95% UCL	0.005
Anthracene	0.25	0.053	0.077	Chebychev 95% UCL	0.40
Benzo(A)Anthracene	0.58	0.24	0.33	Chebychev 95% UCL	0.83
Benzo(A)Pyrene	0.53	0.27	0.36	Chebychev 95% UCL	0.72
Benzo(B)Fluoranthene	0.64	0.34	0.46	Chebychev 95% UCL	0.86
Benzo(G,H,I)Perylene	0.39	0.28	0.36	Student's-t 95% UCL	0.44
Benzo(K)Fluoranthene	0.26	0.15	0.18	Chebychev 95% UCL	0.34
Chrysene	0.65	0.32	0.46	Chebychev 95% UCL	0.89
Dibenz(A,H)Anthracene	0.11	0.065	0.080	Chebychev 95% UCL	0.14
Fluoranthene	1.10	0.39	0.64	Chebychev 95% UCL	1.62
Fluorene	0.068	0.020	0.029	Chebychev 95% UCL	0.10
Indeno(1,2,3-C,D)Pyrene	0.35	0.21	0.27	Chebychev 95% UCL	0.45
Phenanthrene	1.10	0.26	0.41	Chebychev 95% UCL	1.72

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-011-SO-0.5-2				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
Pyrene	1.10	0.41	0.63	Chebychev 95% UCL	1.60
Total HMW PAHs - 1/2MDL	4.61	2.29	3.13	Chebychev 95% UCL	6.30
Total HMW PAHs - MDL	4.61	2.29	3.13	Chebychev 95% UCL	6.30
Total HMW PAHs - Zero	4.61	2.29	3.13	Chebychev 95% UCL	6.30
Total LMW PAHs - 1/2MDL	2.68	0.77	1.22	Chebychev 95% UCL	4.07
Total LMW PAHs - MDL	2.69	0.77	1.22	Chebychev 95% UCL	4.08
Total LMW PAHs - Zero	2.68	0.77	1.22	Chebychev 95% UCL	4.07
Total PAHs - 1/2MDL	6.64	2.71	3.88	Chebychev 95% UCL	9.48
Total PAHs - MDL	6.64	2.71	3.88	Chebychev 95% UCL	9.49
Total PAHs - Zero	6.63	2.71	3.88	Chebychev 95% UCL	9.48
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)					
Acetophenone	0.005	0.003	0.004	Chebychev 95% UCL	0.006
Benzyl Butyl Phthalate	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--
Carbazole	0.17	0.044	0.073	Chebychev 95% UCL	0.26
Dibenzofuran	0.051	0.013	0.016	Chebychev 95% UCL	0.080
Isophorone	--	--	--	--	--

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-015-SO-0.5-2				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
TAL Metals (mg/kg)					
Aluminum	17,600	20,200	16,400	Student's-t 95% UCL	21,341
Antimony	0.085	0.18	0.090	Chebychev 95% UCL	0.25
Arsenic	5.10	5.50	5.50	Student's-t 95% UCL	5.76
Barium	106.0	132.0	105.0	Student's-t 95% UCL	140.1
Beryllium	0.68	0.76	0.65	Student's-t 95% UCL	0.79
Cadmium	0.071	0.075	0.073	Student's-t 95% UCL	0.076
Chromium, Hexavalent	0.40	0.52	0.64	Chebychev 95% UCL	0.82
Chromium, Total	14.8	19.6	23.8	Chebychev 95% UCL	30.7
Chromium, Trivalent	14.4	19.1	23.2	Chebychev 95% UCL	29.9
Cobalt	5.80	6.10	6.10	Student's-t 95% UCL	6.29
Copper	15.2	15.9	15.8	Student's-t 95% UCL	16.3
Iron	15,400	16,200	16,100	Student's-t 95% UCL	16,635
Lead	10.4	9.70	10.6	Student's-t 95% UCL	11.0
Manganese	430.0	528.0	452.0	Student's-t 95% UCL	556.7
Mercury	0.021	0.027	0.024	Student's-t 95% UCL	0.029
Nickel	13.2	16.2	17.3	Student's-t 95% UCL	19.1
Selenium	0.20	0.26	0.17	Student's-t 95% UCL	0.29
Silver	0.038	0.039	0.031	Student's-t 95% UCL	0.043
Thallium	0.091	0.11	0.089	Student's-t 95% UCL	0.12
Vanadium	12.5	14.4	13.4	Student's-t 95% UCL	15.0
Zinc	46.7	49.8	48.5	Student's-t 95% UCL	51.0
Other Inorganic Parameters (mg/kg)					
Cyanide	1.30	1.30	0.85	Chebychev 95% UCL	1.80
Fluoride	597.0	531.0	392.0	Student's-t 95% UCL	683.1

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-015-SO-0.5-2				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
Essential Nutrients (mg/kg)					
Calcium	28,200	26,800	21,100	Student's-t 95% UCL	31,707
Magnesium	11,200	11,600	11,300	Student's-t 95% UCL	11,718
Potassium	1,560	2,250	1,810	Student's-t 95% UCL	2,462
Sodium	1,810	2,520	1,310	Chebychev 95% UCL	3,410
Polychlorinated Biphenyls (PCBs) (mg/kg)					
PCB-1254 (Aroclor 1254)	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)					
Naphthalene	0.003	0.004	0.003	Chebychev 95% UCL	0.005
2-Methylnaphthalene	0.003	0.003	0.002	Student's-t 95% UCL	0.003
Acenaphthene	0.014	0.005	0.005	Chebychev 95% UCL	0.021
Acenaphthylene	0.002	0.002	0.002	Student's-t 95% UCL	0.002
Anthracene	0.036	0.015	0.013	Chebychev 95% UCL	0.053
Benzo(A)Anthracene	0.11	0.086	0.059	Chebychev 95% UCL	0.15
Benzo(A)Pyrene	0.10	0.072	0.050	Chebychev 95% UCL	0.14
Benzo(B)Fluoranthene	0.19	0.21	0.15	Student's-t 95% UCL	0.23
Benzo(G,H,I)Perylene	0.11	0.11	0.073	Student's-t 95% UCL	0.13
Benzo(K)Fluoranthene	0.079	0.088	0.045	Chebychev 95% UCL	0.13
Chrysene	0.17	0.18	0.12	Student's-t 95% UCL	0.21
Dibenz(A,H)Anthracene	0.033	0.037	0.023	Chebychev 95% UCL	0.049
Fluoranthene	0.20	0.13	0.094	Chebychev 95% UCL	0.28
Fluorene	0.011	0.004	0.004	Chebychev 95% UCL	0.017
Indeno(1,2,3-C,D)Pyrene	0.091	0.091	0.062	Student's-t 95% UCL	0.11
Phenanthrene	0.13	0.063	0.052	Chebychev 95% UCL	0.19

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-015-SO-0.5-2				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
Pyrene	0.20	0.13	0.094	Chebychev 95% UCL	0.28
Total HMW PAHs - 1/2MDL	1.08	1.00	0.68	Chebychev 95% UCL	1.46
Total HMW PAHs - MDL	1.08	1.00	0.68	Chebychev 95% UCL	1.46
Total HMW PAHs - Zero	1.08	1.00	0.68	Chebychev 95% UCL	1.46
Total LMW PAHs - 1/2MDL	0.40	0.23	0.17	Chebychev 95% UCL	0.56
Total LMW PAHs - MDL	0.40	0.23	0.17	Chebychev 95% UCL	0.56
Total LMW PAHs - Zero	0.40	0.23	0.17	Chebychev 95% UCL	0.56
Total PAHs - 1/2MDL	1.29	1.02	0.70	Chebychev 95% UCL	1.74
Total PAHs - MDL	1.29	1.02	0.70	Chebychev 95% UCL	1.74
Total PAHs - Zero	1.29	1.02	0.70	Chebychev 95% UCL	1.74
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)					
Acetophenone	0.002	0.003	9.50E-04	Chebychev 95% UCL	0.004
Benzyl Butyl Phthalate	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--
Carbazole	0.023	0.014	0.010	Chebychev 95% UCL	0.032
Dibenzofuran	0.005	0.003	0.003	Chebychev 95% UCL	0.006
Isophorone	--	--	--	--	--

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-015-SO-0-0.5				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
TAL Metals (mg/kg)					
Aluminum	28,300	30,100	30,800	Student's-t 95% UCL	31,908
Antimony	0.43	0.39	0.65	Chebychev 95% UCL	0.84
Arsenic	6.90	6.50	9.00	Student's-t 95% UCL	9.73
Barium	126.0	123.0	119.0	Student's-t 95% UCL	128.6
Beryllium	0.95	0.97	1.10	Student's-t 95% UCL	1.14
Cadmium	0.23	0.22	0.34	Chebychev 95% UCL	0.43
Chromium, Hexavalent	0.53	0.60	0.54	Student's-t 95% UCL	0.62
Chromium, Total	19.7	22.5	20.0	Student's-t 95% UCL	23.3
Chromium, Trivalent	19.2	21.9	19.5	Student's-t 95% UCL	22.7
Cobalt	6.10	6.30	6.70	Student's-t 95% UCL	6.88
Copper	17.8	21.5	20.3	Student's-t 95% UCL	23.0
Iron	16,500	17,700	16,500	Student's-t 95% UCL	18,068
Lead	14.6	14.5	19.8	Student's-t 95% UCL	21.4
Manganese	424.0	425.0	418.0	Student's-t 95% UCL	428.7
Mercury	0.011	0.031	0.025	Chebychev 95% UCL	0.049
Nickel	37.7	35.8	64.1	Chebychev 95% UCL	85.7
Selenium	1.80	1.80	4.10	Chebychev 95% UCL	5.91
Silver	0.045	0.048	0.044	Student's-t 95% UCL	0.049
Thallium	0.14	0.15	0.28	Chebychev 95% UCL	0.39
Vanadium	20.4	22.1	29.4	Student's-t 95% UCL	32.0
Zinc	69.6	73.7	67.3	Student's-t 95% UCL	75.7
Other Inorganic Parameters (mg/kg)					
Cyanide	2.30	1.60	3.40	Chebychev 95% UCL	4.72
Fluoride	730.0	639.0	721.0	Student's-t 95% UCL	781.2

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-015-SO-0-0.5				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
Essential Nutrients (mg/kg)					
Calcium	25,400	21,600	20,600	Student's-t 95% UCL	26,803
Magnesium	10,500	10,600	10,600	Student's-t 95% UCL	10,664
Potassium	2,260	2,870	2,530	Student's-t 95% UCL	3,069
Sodium	4,630	5,910	4,660	Student's-t 95% UCL	6,298
Polychlorinated Biphenyls (PCBs) (mg/kg)					
PCB-1254 (Aroclor 1254)	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)					
Naphthalene	0.009	0.011	0.013	Student's-t 95% UCL	0.014
2-Methylnaphthalene	0.006	0.009	0.008	Student's-t 95% UCL	0.010
Acenaphthene	0.021	0.044	0.023	Chebychev 95% UCL	0.061
Acenaphthylene	0.014	0.030	0.015	Chebychev 95% UCL	0.042
Anthracene	0.14	0.27	0.16	Chebychev 95% UCL	0.37
Benzo(A)Anthracene	1.80	3.00	1.70	Chebychev 95% UCL	3.99
Benzo(A)Pyrene	0.59	1.10	0.60	Chebychev 95% UCL	1.50
Benzo(B)Fluoranthene	9.20	8.70	13.0	Chebychev 95% UCL	16.2
Benzo(G,H,I)Perylene	2.20	2.40	4.30	Chebychev 95% UCL	5.88
Benzo(K)Fluoranthene	1.90	2.20	2.40	Student's-t 95% UCL	2.59
Chrysene	5.10	12.0	6.80	Chebychev 95% UCL	17.0
Dibenz(A,H)Anthracene	1.00	1.00	2.50	Chebychev 95% UCL	3.68
Fluoranthene	1.50	4.20	2.00	Chebychev 95% UCL	6.18
Fluorene	0.017	0.029	0.021	Chebychev 95% UCL	0.038
Indeno(1,2,3-C,D)Pyrene	2.00	2.10	3.50	Chebychev 95% UCL	4.64
Phenanthrene	0.37	0.65	0.56	Chebychev 95% UCL	0.89

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-015-SO-0-0.5				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
Pyrene	1.50	4.40	1.50	Chebychev 95% UCL	6.68
Total HMW PAHs - 1/2MDL	25.3	36.9	36.3	Student's-t 95% UCL	43.8
Total HMW PAHs - MDL	25.3	36.9	36.3	Student's-t 95% UCL	43.8
Total HMW PAHs - Zero	25.3	36.9	36.3	Student's-t 95% UCL	43.8
Total LMW PAHs - 1/2MDL	2.08	5.24	2.80	Chebychev 95% UCL	7.55
Total LMW PAHs - MDL	2.08	5.24	2.81	Chebychev 95% UCL	7.55
Total LMW PAHs - Zero	2.08	5.24	2.79	Chebychev 95% UCL	7.55
Total PAHs - 1/2MDL	18.2	33.4	26.1	Chebychev 95% UCL	45.1
Total PAHs - MDL	18.2	33.4	26.1	Chebychev 95% UCL	45.1
Total PAHs - Zero	18.2	33.4	26.1	Chebychev 95% UCL	45.1
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)					
Acetophenone	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--
Carbazole	0.12	0.16	0.15	Student's-t 95% UCL	0.18
Dibenzofuran	0.012	0.016	0.018	Student's-t 95% UCL	0.020
Isophorone	--	--	--	--	--

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-01-SO-0.5-2				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
TAL Metals (mg/kg)					
Aluminum	24,300	22,100	23,400	Student's-t 95% UCL	25,131
Antimony	0.40	0.085	0.085	Chebychev 95% UCL	0.65
Arsenic	9.30	6.80	7.10	Student's-t 95% UCL	10.0
Barium	184.0	153.0	164.0	Student's-t 95% UCL	193.5
Beryllium	0.90	0.80	0.85	Student's-t 95% UCL	0.93
Cadmium	0.10	0.10	0.11	Student's-t 95% UCL	0.11
Chromium, Hexavalent	0.45	0.40	0.43	Student's-t 95% UCL	0.46
Chromium, Total	16.7	15.1	15.9	Student's-t 95% UCL	17.2
Chromium, Trivalent	16.3	14.7	15.5	Student's-t 95% UCL	16.8
Cobalt	6.50	6.30	6.10	Student's-t 95% UCL	6.64
Copper	14.3	15.0	16.0	Student's-t 95% UCL	16.5
Iron	19,800	18,900	19,300	Student's-t 95% UCL	20,094
Lead	13.7	14.4	13.8	Student's-t 95% UCL	14.6
Manganese	597.0	538.0	530.0	Student's-t 95% UCL	616.7
Mercury	0.025	0.020	0.027	Student's-t 95% UCL	0.030
Nickel	15.3	17.0	15.4	Student's-t 95% UCL	17.5
Selenium	0.51	0.33	0.35	Chebychev 95% UCL	0.64
Silver	0.056	0.039	0.047	Student's-t 95% UCL	0.062
Thallium	0.16	0.14	0.16	Student's-t 95% UCL	0.17
Vanadium	18.4	17.2	17.8	Student's-t 95% UCL	18.8
Zinc	55.4	53.4	56.1	Student's-t 95% UCL	57.3
Other Inorganic Parameters (mg/kg)					
Cyanide	0.90	0.80	1.80	Chebychev 95% UCL	2.55
Fluoride	208.0	260.0	310.0	Student's-t 95% UCL	345.3

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-01-SO-0.5-2				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
Essential Nutrients (mg/kg)					
Calcium	3,110	3,110	5,360	Chebychev 95% UCL	7,129
Magnesium	12,400	12,200	12,800	Student's-t 95% UCL	12,982
Potassium	1,660	1,510	1,600	Student's-t 95% UCL	1,717
Sodium	596.0	629.0	834.0	Student's-t 95% UCL	903.7
Polychlorinated Biphenyls (PCBs) (mg/kg)					
PCB-1254 (Aroclor 1254)	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)					
Naphthalene	0.005	0.006	0.006	Student's-t 95% UCL	0.007
2-Methylnaphthalene	0.003	0.004	0.003	Student's-t 95% UCL	0.004
Acenaphthene	0.008	0.012	0.009	Chebychev 95% UCL	0.015
Acenaphthylene	--	--	--	--	--
Anthracene	0.012	0.020	0.018	Chebychev 95% UCL	0.027
Benzo(A)Anthracene	0.048	0.10	0.071	Chebychev 95% UCL	0.14
Benzo(A)Pyrene	0.047	0.12	0.083	Chebychev 95% UCL	0.18
Benzo(B)Fluoranthene	0.10	0.18	0.15	Chebychev 95% UCL	0.25
Benzo(G,H,I)Perylene	0.058	0.15	0.084	Chebychev 95% UCL	0.22
Benzo(K)Fluoranthene	0.033	0.065	0.044	Chebychev 95% UCL	0.088
Chrysene	0.092	0.17	0.12	Chebychev 95% UCL	0.23
Dibenz(A,H)Anthracene	0.013	0.036	0.025	Chebychev 95% UCL	0.054
Fluoranthene	0.091	0.18	0.15	Chebychev 95% UCL	0.25
Fluorene	0.007	0.010	0.007	Student's-t 95% UCL	0.011
Indeno(1,2,3-C,D)Pyrene	0.048	0.12	0.072	Chebychev 95% UCL	0.17
Phenanthrene	0.068	0.11	0.092	Chebychev 95% UCL	0.14

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-01-SO-0.5-2				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
Pyrene	0.078	0.18	0.13	Chebychev 95% UCL	0.26
Total HMW PAHs - 1/2MDL	0.52	1.12	0.78	Chebychev 95% UCL	1.57
Total HMW PAHs - MDL	0.52	1.12	0.78	Chebychev 95% UCL	1.57
Total HMW PAHs - Zero	0.52	1.12	0.78	Chebychev 95% UCL	1.57
Total LMW PAHs - 1/2MDL	0.20	0.34	0.29	Chebychev 95% UCL	0.46
Total LMW PAHs - MDL	0.20	0.35	0.29	Chebychev 95% UCL	0.47
Total LMW PAHs - Zero	0.19	0.34	0.28	Chebychev 95% UCL	0.46
Total PAHs - 1/2MDL	0.61	1.28	0.91	Chebychev 95% UCL	1.78
Total PAHs - MDL	0.61	1.28	0.92	Chebychev 95% UCL	1.78
Total PAHs - Zero	0.61	1.28	0.91	Chebychev 95% UCL	1.78
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)					
Acetophenone	0.008	0.013	0.010	Chebychev 95% UCL	0.017
Benzyl Butyl Phthalate	0.039	0.023	0.046	Chebychev 95% UCL	0.066
Biphenyl (Diphenyl)	--	--	--	--	--
Carbazole	0.010	0.020	0.017	Chebychev 95% UCL	0.029
Dibenzofuran	0.005	0.006	0.003	Chebychev 95% UCL	0.008
Isophorone	0.003	0.005	0.003	Chebychev 95% UCL	0.006

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-01-SO-0-0.5				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
TAL Metals (mg/kg)					
Aluminum	26,000	27,700	26,200	Student's-t 95% UCL	28,200
Antimony	0.28	0.23	0.34	Student's-t 95% UCL	0.38
Arsenic	6.30	5.70	9.50	Chebychev 95% UCL	12.3
Barium	204.0	206.0	191.0	Student's-t 95% UCL	214.1
Beryllium	1.10	1.20	1.10	Student's-t 95% UCL	1.23
Cadmium	0.23	0.25	0.29	Student's-t 95% UCL	0.31
Chromium, Hexavalent	0.46	0.48	0.44	Student's-t 95% UCL	0.49
Chromium, Total	17.2	18.0	16.6	Student's-t 95% UCL	18.5
Chromium, Trivalent	16.7	17.5	16.2	Student's-t 95% UCL	18.0
Cobalt	6.20	6.20	6.90	Student's-t 95% UCL	7.11
Copper	17.9	20.1	22.2	Student's-t 95% UCL	23.7
Iron	18,100	19,800	17,500	Student's-t 95% UCL	20,478
Lead	29.6	19.1	152.0	Chebychev 95% UCL	252.8
Manganese	657.0	632.0	588.0	Student's-t 95% UCL	684.6
Mercury	0.018	0.010	0.084	Chebychev 95% UCL	0.14
Nickel	36.9	34.8	28.9	Student's-t 95% UCL	40.5
Selenium	0.40	0.36	0.37	Student's-t 95% UCL	0.41
Silver	0.058	0.066	0.061	Student's-t 95% UCL	0.068
Thallium	0.16	0.15	0.17	Student's-t 95% UCL	0.18
Vanadium	23.6	23.5	21.2	Student's-t 95% UCL	25.1
Zinc	69.7	67.8	100.0	Chebychev 95% UCL	124.6
Other Inorganic Parameters (mg/kg)					
Cyanide	0.82	2.60	3.70	Chebychev 95% UCL	6.03
Fluoride	117.0	175.0	110.0	Chebychev 95% UCL	223.8

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-01-SO-0-0.5				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
Essential Nutrients (mg/kg)					
Calcium	12,400	13,200	12,100	Student's-t 95% UCL	13,525
Magnesium	10,900	10,500	10,000	Student's-t 95% UCL	11,227
Potassium	1,790	1,790	1,670	Student's-t 95% UCL	1,867
Sodium	439.0	744.0	437.0	Chebychev 95% UCL	984.6
Polychlorinated Biphenyls (PCBs) (mg/kg)					
PCB-1254 (Aroclor 1254)	0.068	0.005	0.005	Chebychev 95% UCL	0.12
Polychlorinated Biphenyl (PCBs)	0.068	0.005	0.005	Chebychev 95% UCL	0.12
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)					
Naphthalene	0.11	0.031	0.017	Chebychev 95% UCL	0.18
2-Methylnaphthalene	0.048	0.027	0.013	Chebychev 95% UCL	0.074
Acenaphthene	0.20	0.11	0.059	Chebychev 95% UCL	0.30
Acenaphthylene	0.029	0.033	0.014	Chebychev 95% UCL	0.051
Anthracene	0.50	0.28	0.15	Chebychev 95% UCL	0.76
Benzo(A)Anthracene	1.60	1.10	0.64	Chebychev 95% UCL	2.32
Benzo(A)Pyrene	1.70	1.20	0.73	Chebychev 95% UCL	2.43
Benzo(B)Fluoranthene	2.80	3.10	1.20	Chebychev 95% UCL	4.94
Benzo(G,H,I)Perylene	2.20	2.30	1.10	Chebychev 95% UCL	3.54
Benzo(K)Fluoranthene	1.10	1.10	0.41	Chebychev 95% UCL	1.87
Chrysene	2.50	2.40	1.10	Chebychev 95% UCL	3.97
Dibenz(A,H)Anthracene	0.58	0.60	0.25	Chebychev 95% UCL	0.97
Fluoranthene	3.10	2.10	1.20	Chebychev 95% UCL	4.53
Fluorene	0.16	0.079	0.040	Chebychev 95% UCL	0.25
Indeno(1,2,3-C,D)Pyrene	1.60	1.70	0.74	Chebychev 95% UCL	2.67
Phenanthrene	1.80	1.00	0.69	Chebychev 95% UCL	2.60

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-01-SO-0-0.5				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
Pyrene	3.20	2.10	1.20	Chebychev 95% UCL	4.69
Total HMW PAHs - 1/2MDL	17.3	15.6	7.37	Chebychev 95% UCL	26.8
Total HMW PAHs - MDL	17.3	15.6	7.37	Chebychev 95% UCL	26.8
Total HMW PAHs - Zero	17.3	15.6	7.37	Chebychev 95% UCL	26.8
Total LMW PAHs - 1/2MDL	5.95	3.66	2.18	Chebychev 95% UCL	8.70
Total LMW PAHs - MDL	5.95	3.66	2.18	Chebychev 95% UCL	8.70
Total LMW PAHs - Zero	5.95	3.66	2.18	Chebychev 95% UCL	8.70
Total PAHs - 1/2MDL	20.4	16.1	8.34	Chebychev 95% UCL	30.3
Total PAHs - MDL	20.4	16.1	8.34	Chebychev 95% UCL	30.3
Total PAHs - Zero	20.4	16.1	8.34	Chebychev 95% UCL	30.3
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)					
Acetophenone	0.018	0.026	0.010	Chebychev 95% UCL	0.038
Benzyl Butyl Phthalate	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--
Carbazole	0.34	0.22	0.11	Chebychev 95% UCL	0.51
Dibenzofuran	0.090	0.045	0.024	Chebychev 95% UCL	0.14
Isophorone	--	--	--	--	--

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-04-SO-0.5-2				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
TAL Metals (mg/kg)					
Aluminum	21,300	21,600	21,300	Student's-t 95% UCL	21,692
Antimony	--	--	--	--	--
Arsenic	6.90	6.20	6.40	Student's-t 95% UCL	7.11
Barium	129.0	120.0	137.0	Student's-t 95% UCL	143.0
Beryllium	0.73	0.69	0.67	Student's-t 95% UCL	0.75
Cadmium	0.071	0.067	0.079	Student's-t 95% UCL	0.083
Chromium, Hexavalent	0.41	0.41	0.41	Student's-t 95% UCL	0.42
Chromium, Total	15.5	15.4	15.3	Student's-t 95% UCL	15.6
Chromium, Trivalent	15.1	15.0	14.9	Student's-t 95% UCL	15.2
Cobalt	6.30	6.40	6.30	Student's-t 95% UCL	6.43
Copper	15.3	14.6	16.2	Student's-t 95% UCL	16.7
Iron	19,600	19,700	19,900	Student's-t 95% UCL	19,991
Lead	13.1	13.1	13.3	Student's-t 95% UCL	13.4
Manganese	492.0	464.0	527.0	Student's-t 95% UCL	547.5
Mercury	0.009	0.020	0.020	Chebychev 95% UCL	0.033
Nickel	14.5	14.3	14.6	Student's-t 95% UCL	14.7
Selenium	0.56	0.44	0.62	Student's-t 95% UCL	0.69
Silver	0.039	0.039	0.040	Student's-t 95% UCL	0.040
Thallium	0.13	0.13	0.13	Student's-t 95% UCL	0.13
Vanadium	15.6	15.8	16.2	Student's-t 95% UCL	16.4
Zinc	51.6	51.1	56.3	Student's-t 95% UCL	57.8
Other Inorganic Parameters (mg/kg)					
Cyanide	0.36	0.34	0.48	Student's-t 95% UCL	0.52
Fluoride	55.8	76.2	30.8	Chebychev 95% UCL	111.5

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-04-SO-0.5-2				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
Essential Nutrients (mg/kg)					
Calcium	2,800	2,510	2,540	Student's-t 95% UCL	2,886
Magnesium	12,600	12,800	12,500	Student's-t 95% UCL	12,891
Potassium	1,150	1,150	1,120	Student's-t 95% UCL	1,169
Sodium	243.0	268.0	210.0	Student's-t 95% UCL	289.4
Polychlorinated Biphenyls (PCBs) (mg/kg)					
PCB-1254 (Aroclor 1254)	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)					
Naphthalene	0.051	0.062	0.015	Chebychev 95% UCL	0.10
2-Methylnaphthalene	0.007	0.036	0.006	Chebychev 95% UCL	0.059
Acenaphthene	1.70	0.16	0.022	Chebychev 95% UCL	2.97
Acenaphthylene	0.028	7.00E-04	7.00E-04	Chebychev 95% UCL	0.049
Anthracene	4.00	0.18	0.037	Chebychev 95% UCL	7.06
Benzo(A)Anthracene	13.0	0.38	0.13	Chebychev 95% UCL	23.0
Benzo(A)Pyrene	7.70	0.38	0.13	Chebychev 95% UCL	13.6
Benzo(B)Fluoranthene	21.0	0.57	0.21	Chebychev 95% UCL	37.2
Benzo(G,H,I)Perylene	6.60	0.34	0.13	Chebychev 95% UCL	11.6
Benzo(K)Fluoranthene	5.80	0.18	0.065	Chebychev 95% UCL	10.3
Chrysene	24.0	0.56	0.18	Chebychev 95% UCL	42.6
Dibenz(A,H)Anthracene	2.20	0.097	0.035	Chebychev 95% UCL	3.88
Fluoranthene	27.0	0.70	0.23	Chebychev 95% UCL	47.9
Fluorene	1.40	0.15	0.019	Chebychev 95% UCL	2.44
Indeno(1,2,3-C,D)Pyrene	5.60	0.28	0.11	Chebychev 95% UCL	9.85
Phenanthrene	19.0	0.74	0.17	Chebychev 95% UCL	33.6

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-04-SO-0.5-2				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
Pyrene	23.0	0.64	0.22	Chebychev 95% UCL	40.8
Total HMW PAHs - 1/2MDL	108.9	3.43	1.21	Chebychev 95% UCL	192.7
Total HMW PAHs - MDL	108.9	3.43	1.21	Chebychev 95% UCL	192.7
Total HMW PAHs - Zero	108.9	3.43	1.21	Chebychev 95% UCL	192.7
Total LMW PAHs - 1/2MDL	53.2	2.03	0.50	Chebychev 95% UCL	94.0
Total LMW PAHs - MDL	53.2	2.03	0.50	Chebychev 95% UCL	94.0
Total LMW PAHs - Zero	53.2	2.03	0.50	Chebychev 95% UCL	94.0
Total PAHs - 1/2MDL	141.1	4.85	1.49	Chebychev 95% UCL	249.6
Total PAHs - MDL	141.1	4.85	1.49	Chebychev 95% UCL	249.6
Total PAHs - Zero	141.1	4.85	1.49	Chebychev 95% UCL	249.6
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)					
Acetophenone	0.007	0.002	0.003	Chebychev 95% UCL	0.011
Benzyl Butyl Phthalate	--	--	--	--	--
Biphenyl (Diphenyl)	0.024	0.009	0.002	Chebychev 95% UCL	0.040
Carbazole	2.30	0.12	0.024	Chebychev 95% UCL	4.05
Dibenzofuran	0.65	0.083	0.012	Chebychev 95% UCL	1.13
Isophorone	--	--	--	--	--

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-04-SO-0-0.5				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
TAL Metals (mg/kg)					
Aluminum	23,600	24,400	23,900	Student's-t 95% UCL	24,648
Antimony	0.20	0.19	0.085	Chebychev 95% UCL	0.32
Arsenic	5.30	5.50	5.30	Student's-t 95% UCL	5.56
Barium	182.0	197.0	204.0	Student's-t 95% UCL	213.3
Beryllium	0.89	0.98	0.83	Student's-t 95% UCL	1.03
Cadmium	0.20	0.21	0.23	Student's-t 95% UCL	0.24
Chromium, Hexavalent	0.39	0.42	0.38	Student's-t 95% UCL	0.43
Chromium, Total	14.5	15.7	14.2	Student's-t 95% UCL	16.1
Chromium, Trivalent	14.1	15.3	13.8	Student's-t 95% UCL	15.7
Cobalt	6.20	6.10	6.10	Student's-t 95% UCL	6.23
Copper	14.6	17.1	14.6	Student's-t 95% UCL	17.9
Iron	18,600	18,000	18,600	Student's-t 95% UCL	18,984
Lead	20.5	19.1	16.6	Student's-t 95% UCL	22.1
Manganese	651.0	752.0	836.0	Student's-t 95% UCL	902.5
Mercury	0.021	0.031	0.018	Chebychev 95% UCL	0.040
Nickel	22.1	22.9	20.9	Student's-t 95% UCL	23.7
Selenium	0.44	0.52	0.46	Student's-t 95% UCL	0.54
Silver	0.039	0.043	0.044	Student's-t 95% UCL	0.046
Thallium	0.16	0.16	0.14	Student's-t 95% UCL	0.17
Vanadium	21.0	22.0	19.8	Student's-t 95% UCL	22.8
Zinc	67.1	71.5	75.1	Student's-t 95% UCL	78.0
Other Inorganic Parameters (mg/kg)					
Cyanide	1.40	3.10	1.30	Chebychev 95% UCL	4.48
Fluoride	58.6	62.5	34.3	Chebychev 95% UCL	90.3

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-04-SO-0-0.5				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
Essential Nutrients (mg/kg)					
Calcium	5,310	6,450	4,090	Chebychev 95% UCL	8,254
Magnesium	10,700	9,850	10,600	Student's-t 95% UCL	11,167
Potassium	1,470	1,710	1,530	Student's-t 95% UCL	1,781
Sodium	209.0	674.0	344.0	Chebychev 95% UCL	1,011
Polychlorinated Biphenyls (PCBs) (mg/kg)					
PCB-1254 (Aroclor 1254)	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)					
Naphthalene	0.21	0.45	0.14	Chebychev 95% UCL	0.68
2-Methylnaphthalene	0.087	0.23	0.088	Chebychev 95% UCL	0.34
Acenaphthene	0.73	1.50	1.40	Chebychev 95% UCL	2.26
Acenaphthylene	0.022	0.035	0.033	Chebychev 95% UCL	0.048
Anthracene	1.60	2.60	3.20	Chebychev 95% UCL	4.50
Benzo(A)Anthracene	9.50	9.60	11.0	Student's-t 95% UCL	11.4
Benzo(A)Pyrene	6.70	9.80	11.0	Chebychev 95% UCL	14.8
Benzo(B)Fluoranthene	21.0	15.0	20.0	Student's-t 95% UCL	24.1
Benzo(G,H,I)Perylene	6.80	7.40	9.30	Student's-t 95% UCL	10.0
Benzo(K)Fluoranthene	4.50	6.10	6.30	Student's-t 95% UCL	7.30
Chrysene	22.0	14.0	18.0	Student's-t 95% UCL	24.7
Dibenz(A,H)Anthracene	2.10	2.10	2.70	Student's-t 95% UCL	2.88
Fluoranthene	17.0	14.0	21.0	Student's-t 95% UCL	23.3
Fluorene	0.60	1.30	1.10	Chebychev 95% UCL	1.91
Indeno(1,2,3-C,D)Pyrene	5.40	6.20	7.20	Student's-t 95% UCL	7.79
Phenanthrene	8.30	10.0	15.0	Chebychev 95% UCL	19.9

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-04-SO-0-0.5				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
Pyrene	17.0	15.0	19.0	Student's-t 95% UCL	20.4
Total HMW PAHs - 1/2MDL	95.0	85.2	104.5	Student's-t 95% UCL	111.2
Total HMW PAHs - MDL	95.0	85.2	104.5	Student's-t 95% UCL	111.2
Total HMW PAHs - Zero	95.0	85.2	104.5	Student's-t 95% UCL	111.2
Total LMW PAHs - 1/2MDL	28.5	30.1	42.0	Student's-t 95% UCL	45.9
Total LMW PAHs - MDL	28.5	30.2	42.0	Student's-t 95% UCL	45.9
Total LMW PAHs - Zero	28.5	30.1	42.0	Student's-t 95% UCL	45.9
Total PAHs - 1/2MDL	102.5	100.1	126.4	Student's-t 95% UCL	134.2
Total PAHs - MDL	102.5	100.1	126.4	Student's-t 95% UCL	134.1
Total PAHs - Zero	102.5	100.1	126.4	Student's-t 95% UCL	134.2
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)					
Acetophenone	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--
Biphenyl (Diphenyl)	0.035	0.075	0.033	Chebychev 95% UCL	0.11
Carbazole	0.93	1.50	2.00	Chebychev 95% UCL	2.82
Dibenzofuran	0.38	0.77	0.53	Chebychev 95% UCL	1.06
Isophorone	--	--	--	--	--

Appendix J1
Summary of ITRC UCL Results for Triplicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

-- - No data or not available
Gray - Non-detect. Replaced with 1/2 the MDL.
HMW - High molecular weight
LMW - Low molecular weight
mg/kg - milligram per kilogram
MDL - Method Detection Limit
PAH - Polycyclic Aromatic Hydrocarbons
PCB - Polychlorinated Biphenyls
SVOC - Semi-volatile organic compound
TAL - Target Analyte List
TCL - Target Compound List
UCL - Upper confidence limit

Appendix J2 Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-002			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-002-SO-0-0.5			
Sample Date	7/19/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	37,700	4.68%	35,935	39,465
Antimony	0.21	28.1%	0.15	0.27
Arsenic	4.60	13.8%	3.96	5.24
Barium	220	4.03%	211	229
Beryllium	3.70	6.32%	3.47	3.93
Cadmium	0.25	15.0%	0.21	0.29
Chromium, Total	18.6	10.6%	16.6	20.6
Chromium, Hexavalent	0.50	10.6%	0.45	0.55
Chromium, Trivalent	18.1	10.6%	16.2	20.0
Cobalt	5.40	3.51%	5.21	5.59
Copper	16.9	12.3%	14.8	19.0
Iron	15,000	3.40%	14,490	15,510
Lead	17.3	48.5%	8.91	25.7
Manganese	502	5.63%	474	530
Mercury	0.019	54.9%	0.009	0.029
Nickel	44.5	14.5%	38.1	50.9
Selenium	0.74	20.0%	0.59	0.89
Silver	0.056	9.03%	0.051	0.061
Thallium	0.17	14.4%	0.15	0.19
Vanadium	35.8	9.21%	32.5	39.1
Zinc	59.2	12.7%	51.7	66.7
Other Inorganic Parameters (mg/kg)				
Cyanide	18.2	40.2%	10.9	25.5
Fluoride	976	20.5%	776	1,176
Essential Nutrients (mg/kg)				
Calcium	22,000	10.7%	19,653	24,347
Magnesium	10,100	2.82%	9,815	10,385
Potassium	3,080	6.24%	2,888	3,272
Sodium	9,000	30.7%	6,233	11,767
Pesticides (mg/kg)				
Aldrin	3.95E-04	--	3.95E-04	3.95E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	2.95E-04	--	2.95E-04	2.95E-04
Alpha Endosulfan	4.50E-04	--	4.50E-04	4.50E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.15E-04	--	3.15E-04	3.15E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.55E-04	--	3.55E-04	3.55E-04
Dieldrin	4.25E-04	--	4.25E-04	4.25E-04
Endosulfan Sulfate	3.80E-04	--	3.80E-04	3.80E-04
Endrin	4.15E-04	--	4.15E-04	4.15E-04
Endrin Aldehyde	4.05E-04	--	4.05E-04	4.05E-04
Endrin Ketone	4.50E-04	--	4.50E-04	4.50E-04
Gamma Bhc (Lindane)	2.90E-04	--	2.90E-04	2.90E-04
Heptachlor	4.20E-04	--	4.20E-04	4.20E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.30E-04	--	4.30E-04	4.30E-04
P,P'-DDE	4.70E-04	--	4.70E-04	4.70E-04
P,P'-DDT	3.35E-04	--	3.35E-04	3.35E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-002			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-002-SO-0-0.5			
Sample Date	7/19/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.78E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.78E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.011	47.1%	0.006	0.016
Acenaphthene	0.040	42.0%	0.023	0.057
Acenaphthylene	0.004	36.1%	0.003	0.006
Anthracene	0.083	37.7%	0.052	0.11
Fluoranthene	0.86	37.3%	0.54	1.18
Fluorene	0.037	34.6%	0.024	0.050
Naphthalene	0.022	44.9%	0.012	0.032
Phenanthrene	0.49	31.0%	0.34	0.64
Total LMW PAHs - 1/2MDL	1.55	35.8%	0.99	2.10
Total LMW PAHs - MDL	1.55	35.8%	1.00	2.11
Total LMW PAHs - Zero	1.54	35.9%	0.99	2.10
Benzo(A)Pyrene	0.38	36.1%	0.24	0.52
Benzo(A)Anthracene	0.37	32.0%	0.25	0.49
Benzo(B)Fluoranthene	0.75	29.8%	0.53	0.97
Benzo(G,H,I)Perylene	0.34	30.8%	0.24	0.44
Benzo(K)Fluoranthene	0.26	31.3%	0.18	0.34
Chrysene	0.65	35.9%	0.42	0.88
Dibenz(A,H)Anthracene	0.092	39.8%	0.055	0.13
Indeno(1,2,3-C,D)Pyrene	0.38	31.1%	0.26	0.50
Pyrene	0.70	39.3%	0.42	0.98
Total HMW PAHs - 1/2MDL	3.92	26.8%	2.87	4.97
Total HMW PAHs - MDL	3.92	26.8%	2.87	4.97
Total HMW PAHs - Zero	3.92	26.8%	2.87	4.97
Total PAHs - 1/2MDL	4.71	29.6%	3.32	6.10
Total PAHs - MDL	4.71	29.5%	3.32	6.10
Total PAHs - Zero	4.70	29.6%	3.31	6.09
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.013	--	0.013	0.013
1,4-Dioxane (P-Dioxane)	0.045	--	0.045	0.045
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.037	--	0.037	0.037

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-002			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-002-SO-0-0.5			
Sample Date	7/19/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.045	--	0.045	0.045
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.007	--	0.007	0.007
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	44.4%	0.002	0.005
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	--	0.005	0.005
Biphenyl (Diphenyl)	0.014	49.7%	0.007	0.021
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.065	30.5%	0.045	0.085
Dibenzofuran	0.026	33.5%	0.017	0.035
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.011	--	0.011	0.011
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.007	--	0.007	0.007
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-002			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-002-SO-0.5-2			
Sample Date	7/19/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	22,000	4.58%	20,993	23,007
Antimony	0.11	70.4%	0.033	0.19
Arsenic	6.40	7.46%	5.92	6.88
Barium	164	9.24%	149	179
Beryllium	1.10	4.90%	1.05	1.15
Cadmium	0.080	6.03%	0.075	0.085
Chromium, Total	18.2	7.75%	16.8	19.6
Chromium, Hexavalent	0.49	7.75%	0.45	0.52
Chromium, Trivalent	17.7	7.75%	16.3	19.1
Cobalt	5.90	1.99%	5.78	6.02
Copper	15.0	4.63%	14.3	15.7
Iron	19,500	2.40%	19,032	19,968
Lead	12.1	3.33%	11.7	12.5
Manganese	629	7.15%	584	674
Mercury	0.026	27.4%	0.019	0.033
Nickel	15.8	6.58%	14.8	16.8
Selenium	0.85	19.1%	0.69	1.01
Silver	0.035	9.83%	0.032	0.038
Thallium	0.13	6.56%	0.12	0.14
Vanadium	21.5	3.31%	20.8	22.2
Zinc	56.6	5.42%	53.5	59.7
Other Inorganic Parameters (mg/kg)				
Cyanide	3.90	32.7%	2.63	5.17
Fluoride	647	28.8%	461	833
Essential Nutrients (mg/kg)				
Calcium	6,100	15.1%	5,176	7,024
Magnesium	11,800	2.18%	11,543	12,057
Potassium	1,440	6.91%	1,340	1,540
Sodium	2,090	21.1%	1,649	2,531
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-002			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-002-SO-0.5-2			
Sample Date	7/19/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.004	47.7%	0.002	0.005
Acenaphthene	0.004	80.9%	7.72E-04	0.007
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.016	82.4%	0.003	0.029
Fluoranthene	0.021	71.4%	0.006	0.036
Fluorene	0.004	74.2%	9.43E-04	0.006
Naphthalene	0.004	28.9%	0.003	0.005
Phenanthrene	0.011	78.1%	0.002	0.020
Total LMW PAHs - 1/2MDL	0.068	74.3%	0.017	0.12
Total LMW PAHs - MDL	0.10	74.3%	0.027	0.18
Total LMW PAHs - Zero	0.032	74.3%	0.008	0.056
Benzo(A)Pyrene	0.005	67.2%	0.002	0.008
Benzo(A)Anthracene	0.014	68.8%	0.004	0.024
Benzo(B)Fluoranthene	0.039	60.1%	0.016	0.062
Benzo(G,H,I)Perylene	0.010	60.8%	0.004	0.015
Benzo(K)Fluoranthene	0.008	64.5%	0.003	0.012
Chrysene	0.023	62.9%	0.009	0.037
Dibenz(A,H)Anthracene	0.009	63.9%	0.003	0.014
Indeno(1,2,3-C,D)Pyrene	0.011	62.0%	0.004	0.018
Pyrene	0.017	72.7%	0.005	0.029
Total HMW PAHs - 1/2MDL	0.13	64.7%	0.047	0.22
Total HMW PAHs - MDL	0.19	64.7%	0.067	0.31
Total HMW PAHs - Zero	0.079	64.7%	0.028	0.13
Total PAHs - 1/2MDL	0.16	68.3%	0.051	0.27
Total PAHs - MDL	0.25	68.3%	0.078	0.42
Total PAHs - Zero	0.072	68.3%	0.023	0.12
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.013	--	0.013	0.013
1,4-Dioxane (P-Dioxane)	0.045	--	0.045	0.045
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.037	--	0.037	0.037

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-002			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-002-SO-0.5-2			
Sample Date	7/19/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.008	--	0.008	0.008
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.045	--	0.045	0.045
4-Bromophenyl Phenyl Ether	0.006	--	0.006	0.006
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.007	--	0.007	0.007
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	41.1%	0.002	0.005
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.015	98.2%	2.61E-04	0.029
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.004	76.1%	9.92E-04	0.007
Dibenzofuran	0.005	70.0%	0.001	0.009
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.011	--	0.011	0.011
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	32.5%	0.002	0.005
Nitrobenzene	0.006	--	0.006	0.006
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-003			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-03-SO-0-0.5			
Sample Date	5/22/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	28,200	4.68%	26,880	29,520
Antimony	0.19	28.1%	0.14	0.24
Arsenic	4.90	13.8%	4.22	5.58
Barium	181	4.03%	174	188
Beryllium	1.70	6.32%	1.59	1.81
Cadmium	0.27	15.0%	0.23	0.31
Chromium, Total	19.2	10.6%	17.2	21.2
Chromium, Hexavalent	0.51	10.6%	0.46	0.57
Chromium, Trivalent	18.7	10.6%	16.7	20.7
Cobalt	5.80	3.51%	5.60	6.00
Copper	23.9	12.3%	21.0	26.8
Iron	17,200	3.40%	16,615	17,785
Lead	20.9	48.5%	10.8	31.0
Manganese	563	5.63%	531	595
Mercury	0.023	54.9%	0.010	0.036
Nickel	26.7	14.5%	22.8	30.6
Selenium	0.40	20.0%	0.32	0.48
Silver	0.060	9.03%	0.055	0.065
Thallium	0.15	14.4%	0.13	0.17
Vanadium	24.3	9.21%	22.1	26.5
Zinc	68.8	12.7%	60.1	77.5
Other Inorganic Parameters (mg/kg)				
Cyanide	4.40	40.2%	2.63	6.17
Fluoride	224	20.5%	178	270
Essential Nutrients (mg/kg)				
Calcium	20,900	10.7%	18,671	23,129
Magnesium	11,600	2.82%	11,273	11,927
Potassium	2,260	6.24%	2,119	2,401
Sodium	2,210	30.7%	1,531	2,889
Pesticides (mg/kg)				
Aldrin	5.00E-04	--	5.00E-04	5.00E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.45E-04	--	3.45E-04	3.45E-04
Alpha Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.80E-04	--	3.80E-04	3.80E-04
Beta Endosulfan	8.50E-04	--	8.50E-04	8.50E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	2.10E-04	--	2.10E-04	2.10E-04
Dieldrin	4.40E-04	--	4.40E-04	4.40E-04
Endosulfan Sulfate	4.25E-04	--	4.25E-04	4.25E-04
Endrin	4.90E-04	--	4.90E-04	4.90E-04
Endrin Aldehyde	8.00E-04	--	8.00E-04	8.00E-04
Endrin Ketone	6.50E-04	--	6.50E-04	6.50E-04
Gamma Bhc (Lindane)	3.15E-04	--	3.15E-04	3.15E-04
Heptachlor	4.00E-04	--	4.00E-04	4.00E-04
Heptachlor Epoxide	5.00E-04	--	5.00E-04	5.00E-04
Methoxychlor	8.00E-04	--	8.00E-04	8.00E-04
P,P'-DDD	6.00E-04	--	6.00E-04	6.00E-04
P,P'-DDE	4.00E-04	--	4.00E-04	4.00E-04
P,P'-DDT	6.50E-04	--	6.50E-04	6.50E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-003			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-03-SO-0-0.5			
Sample Date	5/22/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.013	--	0.013	0.013
trans-Chlordane	6.00E-04	--	6.00E-04	6.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	140%	-1.86E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.86E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.45	47.1%	0.24	0.66
Acenaphthene	1.90	42.0%	1.10	2.70
Acenaphthylene	0.072	36.1%	0.046	0.098
Anthracene	3.70	37.7%	2.31	5.09
Fluoranthene	17.0	37.3%	10.7	23.3
Fluorene	1.90	34.6%	1.24	2.56
Naphthalene	1.20	44.9%	0.66	1.74
Phenanthrene	14.0	31.0%	9.66	18.3
Total LMW PAHs - 1/2MDL	40.2	35.8%	25.8	54.6
Total LMW PAHs - MDL	40.2	35.8%	25.8	54.6
Total LMW PAHs - Zero	40.2	35.9%	25.8	54.7
Benzo(A)Pyrene	11.0	36.1%	7.02	15.0
Benzo(A)Anthracene	11.0	32.0%	7.48	14.5
Benzo(B)Fluoranthene	16.0	29.8%	11.2	20.8
Benzo(G,H,I)Perylene	9.00	30.8%	6.23	11.8
Benzo(K)Fluoranthene	4.70	31.3%	3.23	6.17
Chrysene	15.0	35.9%	9.62	20.4
Dibenz(A,H)Anthracene	2.10	39.8%	1.26	2.94
Indeno(1,2,3-C,D)Pyrene	7.20	31.1%	4.96	9.44
Pyrene	17.0	39.3%	10.3	23.7
Total HMW PAHs - 1/2MDL	93.0	26.8%	68.1	118
Total HMW PAHs - MDL	93.0	26.8%	68.1	118
Total HMW PAHs - Zero	93.0	26.8%	68.1	118
Total PAHs - 1/2MDL	117	29.6%	82.3	151
Total PAHs - MDL	117	29.5%	82.3	151
Total PAHs - Zero	117	29.6%	82.3	151
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.035	--	0.035	0.035
1,4-Dioxane (P-Dioxane)	0.26	--	0.26	0.26
2,3,4,6-Tetrachlorophenol	0.34	--	0.34	0.34
2,4,5-Trichlorophenol	0.060	--	0.060	0.060
2,4,6-Trichlorophenol	0.045	--	0.045	0.045
2,4-Dichlorophenol	0.065	--	0.065	0.065
2,4-Dimethylphenol	0.050	--	0.050	0.050

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-003			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-03-SO-0-0.5			
Sample Date	5/22/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	2.20	--	2.20	2.20
2,4-Dinitrotoluene	0.041	--	0.041	0.041
2,6-Dinitrotoluene	0.050	--	0.050	0.050
2-Chloronaphthalene	0.037	--	0.037	0.037
2-Chlorophenol	0.038	--	0.038	0.038
2-Methylphenol (O-Cresol)	0.24	--	0.24	0.24
2-Nitroaniline	0.37	--	0.37	0.37
2-Nitrophenol	0.047	--	0.047	0.047
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	0.75	--	0.75	0.75
3-Nitroaniline	0.21	--	0.21	0.21
4,6-Dinitro-2-Methylphenol	1.40	--	1.40	1.40
4-Bromophenyl Phenyl Ether	0.055	--	0.055	0.055
4-Chloro-3-Methylphenol	0.038	--	0.038	0.038
4-Chloroaniline	0.027	--	0.027	0.027
4-Chlorophenyl Phenyl Ether	0.049	--	0.049	0.049
4-Nitroaniline	0.040	--	0.040	0.040
4-Nitrophenol	0.55	--	0.55	0.55
Acetophenone	0.044	44.4%	0.024	0.064
Atrazine	0.36	--	0.36	0.36
Benzaldehyde	0.10	--	0.10	0.10
Benzyl Butyl Phthalate	1.40	--	1.40	1.40
Biphenyl (Diphenyl)	0.14	49.7%	0.070	0.21
Bis(2-Chloroethoxy) Methane	0.039	--	0.039	0.039
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.030	--	0.030	0.030
Bis(2-Chloroisopropyl) Ether	0.060	--	0.060	0.060
Bis(2-Ethylhexyl) Phthalate	0.85	--	0.85	0.85
Caprolactam	0.55	--	0.55	0.55
Carbazole	2.20	30.5%	1.53	2.87
Dibenzofuran	1.20	33.5%	0.80	1.60
Diethyl Phthalate	0.25	--	0.25	0.25
Dimethyl Phthalate	0.030	--	0.030	0.030
Di-N-Butyl Phthalate	0.36	--	0.36	0.36
Di-N-Octylphthalate	0.47	--	0.47	0.47
Hexachlorobenzene	0.060	--	0.060	0.060
Hexachlorobutadiene	0.048	--	0.048	0.048
Hexachlorocyclopentadiene	0.042	--	0.042	0.042
Hexachloroethane	0.042	--	0.042	0.042
Isophorone	0.042	--	0.042	0.042
Nitrobenzene	0.30	--	0.30	0.30
N-Nitrosodi-N-Propylamine	0.055	--	0.055	0.055
N-Nitrosodiphenylamine	0.27	--	0.27	0.27
Pentachlorophenol	1.30	--	1.30	1.30
Phenol	0.25	--	0.25	0.25

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-003			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-03-SO-0.5-2			
Sample Date	5/22/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	23,500	4.58%	22,425	24,575
Antimony	0.085	70.4%	0.025	0.14
Arsenic	6.30	7.46%	5.83	6.77
Barium	148	9.24%	134	162
Beryllium	1.80	4.90%	1.71	1.89
Cadmium	0.10	6.03%	0.094	0.11
Chromium, Total	19.7	7.75%	18.2	21.2
Chromium, Hexavalent	0.53	7.75%	0.49	0.57
Chromium, Trivalent	19.2	7.75%	17.7	20.7
Cobalt	6.00	1.99%	5.88	6.12
Copper	17.3	4.63%	16.5	18.1
Iron	19,200	2.40%	18,739	19,661
Lead	13.7	3.33%	13.2	14.2
Manganese	523	7.15%	486	560
Mercury	0.021	27.4%	0.015	0.027
Nickel	15.7	6.58%	14.7	16.7
Selenium	0.47	19.1%	0.38	0.56
Silver	0.052	9.83%	0.047	0.057
Thallium	0.15	6.56%	0.14	0.16
Vanadium	18.7	3.31%	18.1	19.3
Zinc	51.5	5.42%	48.7	54.3
Other Inorganic Parameters (mg/kg)				
Cyanide	2.20	32.7%	1.48	2.92
Fluoride	302	28.8%	215	389
Essential Nutrients (mg/kg)				
Calcium	7,960	15.1%	6,755	9,165
Magnesium	12,100	2.18%	11,836	12,364
Potassium	1,700	6.91%	1,582	1,818
Sodium	1,750	21.1%	1,381	2,119
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-003			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-03-SO-0.5-2			
Sample Date	5/22/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	4.00	47.7%	2.09	5.91
Acenaphthene	22.0	80.9%	4.19	39.8
Acenaphthylene	0.28	62.8%	0.10	0.46
Anthracene	50.0	82.4%	8.82	91.2
Fluoranthene	180	71.4%	51.4	309
Fluorene	22.0	74.2%	5.68	38.3
Naphthalene	12.0	28.9%	8.54	15.5
Phenanthrene	180	78.1%	39.4	321
Total LMW PAHs - 1/2MDL	470	74.3%	121	820
Total LMW PAHs - MDL	470	74.3%	121	820
Total LMW PAHs - Zero	470	74.3%	121	820
Benzo(A)Pyrene	92.0	67.2%	30.1	154
Benzo(A)Anthracene	91.0	68.8%	28.4	154
Benzo(B)Fluoranthene	100	60.1%	39.9	160
Benzo(G,H,I)Perylene	62.0	60.8%	24.3	99.7
Benzo(K)Fluoranthene	39.0	64.5%	13.8	64.2
Chrysene	97.0	62.9%	36.0	158
Dibenz(A,H)Anthracene	17.0	63.9%	6.15	27.9
Indeno(1,2,3-C,D)Pyrene	53.0	62.0%	20.1	85.9
Pyrene	160	72.7%	43.7	276
Total HMW PAHs - 1/2MDL	711	64.7%	251	1,171
Total HMW PAHs - MDL	711	64.7%	251	1,171
Total HMW PAHs - Zero	711	64.7%	251	1,171
Total PAHs - 1/2MDL	1,077	68.3%	341	1,813
Total PAHs - MDL	1,077	68.3%	341	1,813
Total PAHs - Zero	1,077	68.3%	341	1,813
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.075	--	0.075	0.075
1,4-Dioxane (P-Dioxane)	0.55	--	0.55	0.55
2,3,4,6-Tetrachlorophenol	0.70	--	0.70	0.70
2,4,5-Trichlorophenol	0.12	--	0.12	0.12
2,4,6-Trichlorophenol	0.090	--	0.090	0.090
2,4-Dichlorophenol	0.13	--	0.13	0.13
2,4-Dimethylphenol	0.11	--	0.11	0.11

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-003			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-03-SO-0.5-2			
Sample Date	5/22/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	4.55	--	4.55	4.55
2,4-Dinitrotoluene	0.085	--	0.085	0.085
2,6-Dinitrotoluene	0.11	--	0.11	0.11
2-Chloronaphthalene	0.075	--	0.075	0.075
2-Chlorophenol	0.080	--	0.080	0.080
2-Methylphenol (O-Cresol)	0.49	--	0.49	0.49
2-Nitroaniline	0.75	--	0.75	0.75
2-Nitrophenol	0.095	--	0.095	0.095
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	1.55	--	1.55	1.55
3-Nitroaniline	0.43	--	0.43	0.43
4,6-Dinitro-2-Methylphenol	2.90	--	2.90	2.90
4-Bromophenyl Phenyl Ether	0.12	--	0.12	0.12
4-Chloro-3-Methylphenol	0.080	--	0.080	0.080
4-Chloroaniline	0.055	--	0.055	0.055
4-Chlorophenyl Phenyl Ether	0.10	--	0.10	0.10
4-Nitroaniline	0.080	--	0.080	0.080
4-Nitrophenol	1.20	--	1.20	1.20
Acetophenone	0.090	41.1%	0.053	0.13
Atrazine	0.75	--	0.75	0.75
Benzaldehyde	0.21	--	0.21	0.21
Benzyl Butyl Phthalate	1.15	32.7%	0.77	1.53
Biphenyl (Diphenyl)	1.30	98.2%	0.023	2.58
Bis(2-Chloroethoxy) Methane	0.080	--	0.080	0.080
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.060	--	0.060	0.060
Bis(2-Chloroisopropyl) Ether	0.13	--	0.13	0.13
Bis(2-Ethylhexyl) Phthalate	1.80	--	1.80	1.80
Caprolactam	1.10	--	1.10	1.10
Carbazole	26.0	76.1%	6.22	45.8
Dibenzofuran	13.0	70.0%	3.90	22.1
Diethyl Phthalate	0.50	--	0.50	0.50
Dimethyl Phthalate	0.060	--	0.060	0.060
Di-N-Butyl Phthalate	0.75	--	0.75	0.75
Di-N-Octylphthalate	1.00	--	1.00	1.00
Hexachlorobenzene	0.12	--	0.12	0.12
Hexachlorobutadiene	0.10	--	0.10	0.10
Hexachlorocyclopentadiene	0.085	--	0.085	0.085
Hexachloroethane	0.085	--	0.085	0.085
Isophorone	0.085	32.5%	0.057	0.11
Nitrobenzene	0.60	--	0.60	0.60
N-Nitrosodi-N-Propylamine	0.12	--	0.12	0.12
N-Nitrosodiphenylamine	0.55	--	0.55	0.55
Pentachlorophenol	2.70	--	2.70	2.70
Phenol	0.50	--	0.50	0.50

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-005			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-05-SO-0-0.5			
Sample Date	5/22/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	21,400	4.68%	20,398	22,402
Antimony	1.20	28.1%	0.86	1.54
Arsenic	5.30	13.8%	4.57	6.03
Barium	163	4.03%	156	170
Beryllium	0.80	6.32%	0.75	0.85
Cadmium	0.31	15.0%	0.26	0.36
Chromium, Total	17.8	10.6%	15.9	19.7
Chromium, Hexavalent	0.48	10.6%	0.43	0.53
Chromium, Trivalent	17.3	10.6%	15.5	19.2
Cobalt	6.10	3.51%	5.89	6.31
Copper	381	12.3%	334	428
Iron	17,100	3.40%	16,519	17,681
Lead	67.2	48.5%	34.6	99.8
Manganese	575	5.63%	543	607
Mercury	0.018	54.9%	0.008	0.028
Nickel	29.7	14.5%	25.4	34.0
Selenium	0.50	20.0%	0.40	0.60
Silver	0.058	9.03%	0.053	0.063
Thallium	0.13	14.4%	0.11	0.15
Vanadium	19.5	9.21%	17.7	21.3
Zinc	117	12.7%	102	132
Other Inorganic Parameters (mg/kg)				
Cyanide	0.28	40.2%	0.17	0.39
Fluoride	79.7	20.5%	63.3	96.1
Essential Nutrients (mg/kg)				
Calcium	18,000	10.7%	16,080	19,920
Magnesium	11,300	2.82%	10,981	11,619
Potassium	1,730	6.24%	1,622	1,838
Sodium	169	30.7%	117	221
Pesticides (mg/kg)				
Aldrin	5.00E-04	--	5.00E-04	5.00E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.45E-04	--	3.45E-04	3.45E-04
Alpha Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.85E-04	--	3.85E-04	3.85E-04
Beta Endosulfan	9.00E-04	--	9.00E-04	9.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	2.10E-04	--	2.10E-04	2.10E-04
Dieldrin	4.45E-04	--	4.45E-04	4.45E-04
Endosulfan Sulfate	4.30E-04	--	4.30E-04	4.30E-04
Endrin	4.90E-04	--	4.90E-04	4.90E-04
Endrin Aldehyde	8.00E-04	--	8.00E-04	8.00E-04
Endrin Ketone	6.50E-04	--	6.50E-04	6.50E-04
Gamma Bhc (Lindane)	3.15E-04	--	3.15E-04	3.15E-04
Heptachlor	4.05E-04	--	4.05E-04	4.05E-04
Heptachlor Epoxide	5.00E-04	--	5.00E-04	5.00E-04
Methoxychlor	8.00E-04	--	8.00E-04	8.00E-04
P,P'-DDD	6.00E-04	--	6.00E-04	6.00E-04
P,P'-DDE	4.05E-04	--	4.05E-04	4.05E-04
P,P'-DDT	6.50E-04	--	6.50E-04	6.50E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-005			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-05-SO-0-0.5			
Sample Date	5/22/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.013	--	0.013	0.013
trans-Chlordane	6.00E-04	--	6.00E-04	6.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.057	140%	-2.26E-02	0.14
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.057	140%	-2.26E-02	0.14
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.55	47.1%	0.29	0.81
Acenaphthene	2.50	42.0%	1.45	3.55
Acenaphthylene	0.048	36.1%	0.031	0.065
Anthracene	4.80	37.7%	2.99	6.61
Fluoranthene	24.0	37.3%	15.0	33.0
Fluorene	2.30	34.6%	1.50	3.10
Naphthalene	1.50	44.9%	0.83	2.17
Phenanthrene	18.0	31.0%	12.4	23.6
Total LMW PAHs - 1/2MDL	53.7	35.8%	34.5	72.9
Total LMW PAHs - MDL	53.7	35.8%	34.5	72.9
Total LMW PAHs - Zero	53.7	35.9%	34.4	73.0
Benzo(A)Pyrene	11.0	36.1%	7.02	15.0
Benzo(A)Anthracene	14.0	32.0%	9.51	18.5
Benzo(B)Fluoranthene	18.0	29.8%	12.6	23.4
Benzo(G,H,I)Perylene	8.90	30.8%	6.16	11.6
Benzo(K)Fluoranthene	7.80	31.3%	5.36	10.2
Chrysene	20.0	35.9%	12.8	27.2
Dibenz(A,H)Anthracene	2.50	39.8%	1.50	3.50
Indeno(1,2,3-C,D)Pyrene	7.40	31.1%	5.10	9.70
Pyrene	22.0	39.3%	13.3	30.7
Total HMW PAHs - 1/2MDL	112	26.8%	81.7	142
Total HMW PAHs - MDL	112	26.8%	81.7	142
Total HMW PAHs - Zero	112	26.8%	81.7	142
Total PAHs - 1/2MDL	147	29.6%	103	190
Total PAHs - MDL	147	29.5%	103	190
Total PAHs - Zero	147	29.6%	103	190
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.018	--	0.018	0.018
1,4-Dioxane (P-Dioxane)	0.13	--	0.13	0.13
2,3,4,6-Tetrachlorophenol	0.18	--	0.18	0.18
2,4,5-Trichlorophenol	0.030	--	0.030	0.030
2,4,6-Trichlorophenol	0.023	--	0.023	0.023
2,4-Dichlorophenol	0.033	--	0.033	0.033
2,4-Dimethylphenol	0.026	--	0.026	0.026

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-005			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-05-SO-0-0.5			
Sample Date	5/22/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	1.15	--	1.15	1.15
2,4-Dinitrotoluene	0.021	--	0.021	0.021
2,6-Dinitrotoluene	0.026	--	0.026	0.026
2-Chloronaphthalene	0.020	--	0.020	0.020
2-Chlorophenol	0.020	--	0.020	0.020
2-Methylphenol (O-Cresol)	0.12	--	0.12	0.12
2-Nitroaniline	0.19	--	0.19	0.19
2-Nitrophenol	0.024	--	0.024	0.024
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	0.40	--	0.40	0.40
3-Nitroaniline	0.11	--	0.11	0.11
4,6-Dinitro-2-Methylphenol	0.75	--	0.75	0.75
4-Bromophenyl Phenyl Ether	0.030	--	0.030	0.030
4-Chloro-3-Methylphenol	0.020	--	0.020	0.020
4-Chloroaniline	0.014	--	0.014	0.014
4-Chlorophenyl Phenyl Ether	0.026	--	0.026	0.026
4-Nitroaniline	0.021	--	0.021	0.021
4-Nitrophenol	0.30	--	0.30	0.30
Acetophenone	0.023	44.4%	0.013	0.033
Atrazine	0.19	--	0.19	0.19
Benzaldehyde	0.050	--	0.050	0.050
Benzyl Butyl Phthalate	0.29	--	0.29	0.29
Biphenyl (Diphenyl)	0.16	49.7%	0.080	0.24
Bis(2-Chloroethoxy) Methane	0.020	--	0.020	0.020
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.016	--	0.016	0.016
Bis(2-Chloroisopropyl) Ether	0.031	--	0.031	0.031
Bis(2-Ethylhexyl) Phthalate	0.45	--	0.45	0.45
Caprolactam	0.28	--	0.28	0.28
Carbazole	2.90	30.5%	2.01	3.79
Dibenzofuran	1.40	33.5%	0.93	1.87
Diethyl Phthalate	0.13	--	0.13	0.13
Dimethyl Phthalate	0.016	--	0.016	0.016
Di-N-Butyl Phthalate	0.19	--	0.19	0.19
Di-N-Octylphthalate	0.25	--	0.25	0.25
Hexachlorobenzene	0.030	--	0.030	0.030
Hexachlorobutadiene	0.025	--	0.025	0.025
Hexachlorocyclopentadiene	0.022	--	0.022	0.022
Hexachloroethane	0.022	--	0.022	0.022
Isophorone	0.022	--	0.022	0.022
Nitrobenzene	0.16	--	0.16	0.16
N-Nitrosodi-N-Propylamine	0.029	--	0.029	0.029
N-Nitrosodiphenylamine	0.14	--	0.14	0.14
Pentachlorophenol	0.70	--	0.70	0.70
Phenol	0.13	--	0.13	0.13

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-005			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-05-SO-0.5-2			
Sample Date	5/22/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	18,400	4.58%	17,558	19,242
Antimony	0.085	70.4%	0.025	0.14
Arsenic	5.60	7.46%	5.18	6.02
Barium	115	9.24%	104	126
Beryllium	0.63	4.90%	0.60	0.66
Cadmium	0.084	6.03%	0.079	0.089
Chromium, Total	14.7	7.75%	13.6	15.8
Chromium, Hexavalent	0.39	7.75%	0.36	0.42
Chromium, Trivalent	14.3	7.75%	13.2	15.4
Cobalt	6.20	1.99%	6.08	6.32
Copper	16.6	4.63%	15.8	17.4
Iron	18,500	2.40%	18,056	18,944
Lead	13.9	3.33%	13.4	14.4
Manganese	524	7.15%	487	561
Mercury	0.033	27.4%	0.024	0.042
Nickel	14.3	6.58%	13.4	15.2
Selenium	0.56	19.1%	0.45	0.67
Silver	0.048	9.83%	0.043	0.053
Thallium	0.12	6.56%	0.11	0.13
Vanadium	13.8	3.31%	13.3	14.3
Zinc	52.6	5.42%	49.7	55.5
Other Inorganic Parameters (mg/kg)				
Cyanide	0.45	32.7%	0.30	0.60
Fluoride	72.5	28.8%	51.6	93.4
Essential Nutrients (mg/kg)				
Calcium	4,590	15.1%	3,895	5,285
Magnesium	11,700	2.18%	11,445	11,955
Potassium	1,260	6.91%	1,173	1,347
Sodium	144	21.1%	114	174
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-005			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-05-SO-0.5-2			
Sample Date	5/22/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	3.50	47.7%	1.83	5.17
Acenaphthene	16.0	80.9%	3.05	29.0
Acenaphthylene	0.037	62.8%	0.014	0.060
Anthracene	19.0	82.4%	3.35	34.7
Fluoranthene	62.0	71.4%	17.7	106
Fluorene	16.0	74.2%	4.13	27.9
Naphthalene	5.40	28.9%	3.84	6.96
Phenanthrene	88.0	78.1%	19.3	157
Total LMW PAHs - 1/2MDL	210	74.3%	54.0	366
Total LMW PAHs - MDL	210	74.3%	54.0	366
Total LMW PAHs - Zero	210	74.3%	54.0	366
Benzo(A)Pyrene	35.0	67.2%	11.5	58.5
Benzo(A)Anthracene	34.0	68.8%	10.6	57.4
Benzo(B)Fluoranthene	41.0	60.1%	16.4	65.6
Benzo(G,H,I)Perylene	25.0	60.8%	9.80	40.2
Benzo(K)Fluoranthene	15.0	64.5%	5.32	24.7
Chrysene	42.0	62.9%	15.6	68.4
Dibenz(A,H)Anthracene	7.30	63.9%	2.64	12.0
Indeno(1,2,3-C,D)Pyrene	20.0	62.0%	7.59	32.4
Pyrene	61.0	72.7%	16.6	105
Total HMW PAHs - 1/2MDL	280	64.7%	98.9	462
Total HMW PAHs - MDL	280	64.7%	98.9	462
Total HMW PAHs - Zero	280	64.7%	98.9	462
Total PAHs - 1/2MDL	446	68.3%	141	750
Total PAHs - MDL	446	68.3%	141	750
Total PAHs - Zero	446	68.3%	141	750
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.037	--	0.037	0.037
1,4-Dioxane (P-Dioxane)	0.27	--	0.27	0.27
2,3,4,6-Tetrachlorophenol	0.36	--	0.36	0.36
2,4,5-Trichlorophenol	0.060	--	0.060	0.060
2,4,6-Trichlorophenol	0.047	--	0.047	0.047
2,4-Dichlorophenol	0.065	--	0.065	0.065
2,4-Dimethylphenol	0.055	--	0.055	0.055

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-005			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-05-SO-0.5-2			
Sample Date	5/22/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	2.30	--	2.30	2.30
2,4-Dinitrotoluene	0.042	--	0.042	0.042
2,6-Dinitrotoluene	0.050	--	0.050	0.050
2-Chloronaphthalene	0.039	--	0.039	0.039
2-Chlorophenol	0.040	--	0.040	0.040
2-Methylphenol (O-Cresol)	0.25	--	0.25	0.25
2-Nitroaniline	0.39	--	0.39	0.39
2-Nitrophenol	0.049	--	0.049	0.049
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	0.80	--	0.80	0.80
3-Nitroaniline	0.22	--	0.22	0.22
4,6-Dinitro-2-Methylphenol	1.45	--	1.45	1.45
4-Bromophenyl Phenyl Ether	0.060	--	0.060	0.060
4-Chloro-3-Methylphenol	0.040	--	0.040	0.040
4-Chloroaniline	0.028	--	0.028	0.028
4-Chlorophenyl Phenyl Ether	0.050	--	0.050	0.050
4-Nitroaniline	0.041	--	0.041	0.041
4-Nitrophenol	0.60	--	0.60	0.60
Acetophenone	0.046	41.1%	0.027	0.065
Atrazine	0.37	--	0.37	0.37
Benzaldehyde	0.11	--	0.11	0.11
Benzyl Butyl Phthalate	0.60	32.7%	0.40	0.80
Biphenyl (Diphenyl)	0.87	98.2%	0.016	1.72
Bis(2-Chloroethoxy) Methane	0.041	--	0.041	0.041
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.031	--	0.031	0.031
Bis(2-Chloroisopropyl) Ether	0.065	--	0.065	0.065
Bis(2-Ethylhexyl) Phthalate	0.90	--	0.90	0.90
Caprolactam	0.55	--	0.55	0.55
Carbazole	13.0	76.1%	3.11	22.9
Dibenzofuran	8.80	70.0%	2.64	15.0
Diethyl Phthalate	0.26	--	0.26	0.26
Dimethyl Phthalate	0.031	--	0.031	0.031
Di-N-Butyl Phthalate	0.37	--	0.37	0.37
Di-N-Octylphthalate	0.50	--	0.50	0.50
Hexachlorobenzene	0.060	--	0.060	0.060
Hexachlorobutadiene	0.050	--	0.050	0.050
Hexachlorocyclopentadiene	0.043	--	0.043	0.043
Hexachloroethane	0.044	--	0.044	0.044
Isophorone	0.043	32.5%	0.029	0.057
Nitrobenzene	0.31	--	0.31	0.31
N-Nitrosodi-N-Propylamine	0.055	--	0.055	0.055
N-Nitrosodiphenylamine	0.28	--	0.28	0.28
Pentachlorophenol	1.35	--	1.35	1.35
Phenol	0.26	--	0.26	0.26

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-006			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-006-SO-0-0.5			
Sample Date	7/19/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	17,300	4.68%	16,490	18,110
Antimony	0.23	28.1%	0.17	0.29
Arsenic	4.90	13.8%	4.22	5.58
Barium	136	4.03%	131	141
Beryllium	0.80	6.32%	0.75	0.85
Cadmium	0.22	15.0%	0.19	0.25
Chromium, Total	16.7	10.6%	14.9	18.5
Chromium, Hexavalent	0.45	10.6%	0.40	0.49
Chromium, Trivalent	16.3	10.6%	14.5	18.0
Cobalt	6.10	3.51%	5.89	6.31
Copper	38.8	12.3%	34.0	43.6
Iron	15,000	3.40%	14,490	15,510
Lead	406	48.5%	209	603
Manganese	498	5.63%	470	526
Mercury	0.038	54.9%	0.017	0.059
Nickel	30.9	14.5%	26.4	35.4
Selenium	0.75	20.0%	0.60	0.90
Silver	0.089	9.03%	0.081	0.097
Thallium	0.12	14.4%	0.10	0.14
Vanadium	17.4	9.21%	15.8	19.0
Zinc	66.1	12.7%	57.7	74.5
Other Inorganic Parameters (mg/kg)				
Cyanide	0.15	40.2%	0.090	0.21
Fluoride	70.2	20.5%	55.8	84.6
Essential Nutrients (mg/kg)				
Calcium	20,900	10.7%	18,671	23,129
Magnesium	10,000	2.82%	9,718	10,282
Potassium	1,400	6.24%	1,313	1,487
Sodium	120	30.7%	83.1	157
Pesticides (mg/kg)				
Aldrin	4.05E-04	--	4.05E-04	4.05E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.05E-04	--	3.05E-04	3.05E-04
Alpha Endosulfan	4.65E-04	--	4.65E-04	4.65E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.25E-04	--	3.25E-04	3.25E-04
Beta Endosulfan	5.50E-04	--	5.50E-04	5.50E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.65E-04	--	3.65E-04	3.65E-04
Dieldrin	4.35E-04	--	4.35E-04	4.35E-04
Endosulfan Sulfate	3.90E-04	--	3.90E-04	3.90E-04
Endrin	4.25E-04	--	4.25E-04	4.25E-04
Endrin Aldehyde	4.15E-04	--	4.15E-04	4.15E-04
Endrin Ketone	4.65E-04	--	4.65E-04	4.65E-04
Gamma Bhc (Lindane)	3.00E-04	--	3.00E-04	3.00E-04
Heptachlor	4.30E-04	--	4.30E-04	4.30E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.40E-04	--	4.40E-04	4.40E-04
P,P'-DDE	4.85E-04	--	4.85E-04	4.85E-04
P,P'-DDT	3.45E-04	--	3.45E-04	3.45E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-006			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-006-SO-0-0.5			
Sample Date	7/19/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.50E-04	--	7.50E-04	7.50E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.82E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.82E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.018	47.1%	0.010	0.026
Acenaphthene	0.14	42.0%	0.081	0.20
Acenaphthylene	0.004	36.1%	0.003	0.006
Anthracene	0.53	37.7%	0.33	0.73
Fluoranthene	3.60	37.3%	2.26	4.94
Fluorene	0.17	34.6%	0.11	0.23
Naphthalene	0.037	44.9%	0.020	0.054
Phenanthrene	2.20	31.0%	1.52	2.88
Total LMW PAHs - 1/2MDL	6.70	35.8%	4.30	9.10
Total LMW PAHs - MDL	6.70	35.8%	4.31	9.10
Total LMW PAHs - Zero	6.70	35.9%	4.29	9.10
Benzo(A)Pyrene	2.00	36.1%	1.28	2.72
Benzo(A)Anthracene	1.70	32.0%	1.16	2.24
Benzo(B)Fluoranthene	2.60	29.8%	1.82	3.38
Benzo(G,H,I)Perylene	1.80	30.8%	1.25	2.35
Benzo(K)Fluoranthene	0.85	31.3%	0.58	1.12
Chrysene	1.90	35.9%	1.22	2.58
Dibenz(A,H)Anthracene	0.46	39.8%	0.28	0.64
Indeno(1,2,3-C,D)Pyrene	1.90	31.1%	1.31	2.49
Pyrene	3.20	39.3%	1.94	4.46
Total HMW PAHs - 1/2MDL	16.4	26.8%	12.0	20.8
Total HMW PAHs - MDL	16.4	26.8%	12.0	20.8
Total HMW PAHs - Zero	16.4	26.8%	12.0	20.8
Total PAHs - 1/2MDL	20.5	29.6%	14.4	26.5
Total PAHs - MDL	20.5	29.5%	14.4	26.6
Total PAHs - Zero	20.5	29.6%	14.4	26.5
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.013	--	0.013	0.013
1,4-Dioxane (P-Dioxane)	0.045	--	0.045	0.045
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.037	--	0.037	0.037

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-006			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-006-SO-0-0.5			
Sample Date	7/19/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.008	--	0.008	0.008
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.045	--	0.045	0.045
4-Bromophenyl Phenyl Ether	0.006	--	0.006	0.006
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.007	--	0.007	0.007
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	44.4%	0.002	0.005
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	--	0.005	0.005
Biphenyl (Diphenyl)	0.015	49.7%	0.007	0.022
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.31	30.5%	0.22	0.40
Dibenzofuran	0.10	33.5%	0.066	0.13
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.011	--	0.011	0.011
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	--	0.004	0.004
Nitrobenzene	0.006	--	0.006	0.006
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-006			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-006-SO-0.5-2			
Sample Date	7/19/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	15,100	4.58%	14,409	15,791
Antimony	1.90	70.4%	0.56	3.24
Arsenic	4.70	7.46%	4.35	5.05
Barium	162	9.24%	147	177
Beryllium	0.67	4.90%	0.64	0.70
Cadmium	0.11	6.03%	0.10	0.12
Chromium, Total	17.9	7.75%	16.5	19.3
Chromium, Hexavalent	0.48	7.75%	0.44	0.52
Chromium, Trivalent	17.4	7.75%	16.1	18.8
Cobalt	5.90	1.99%	5.78	6.02
Copper	721	4.63%	688	754
Iron	15,900	2.40%	15,518	16,282
Lead	28.3	3.33%	27.4	29.2
Manganese	562	7.15%	522	602
Mercury	0.025	27.4%	0.018	0.032
Nickel	15.1	6.58%	14.1	16.1
Selenium	0.82	19.1%	0.66	0.98
Silver	0.086	9.83%	0.078	0.094
Thallium	0.11	6.56%	0.10	0.12
Vanadium	12.5	3.31%	12.1	12.9
Zinc	214	5.42%	202	226
Other Inorganic Parameters (mg/kg)				
Cyanide	0.15	32.7%	0.10	0.20
Fluoride	85.4	28.8%	60.8	110
Essential Nutrients (mg/kg)				
Calcium	10,600	15.1%	8,995	12,205
Magnesium	9,580	2.18%	9,371	9,789
Potassium	1,050	6.91%	977	1,123
Sodium	74.4	21.1%	58.7	90.1
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-006			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-006-SO-0.5-2			
Sample Date	7/19/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.067	47.7%	0.035	0.099
Acenaphthene	0.63	80.9%	0.12	1.14
Acenaphthylene	0.021	62.8%	0.008	0.034
Anthracene	2.00	82.4%	0.35	3.65
Fluoranthene	10.0	71.4%	2.86	17.1
Fluorene	0.68	74.2%	0.18	1.18
Naphthalene	0.18	28.9%	0.13	0.23
Phenanthrene	8.30	78.1%	1.82	14.8
Total LMW PAHs - 1/2MDL	21.9	74.3%	5.63	38.1
Total LMW PAHs - MDL	21.9	74.3%	5.64	38.2
Total LMW PAHs - Zero	21.9	74.3%	5.62	38.1
Benzo(A)Pyrene	6.50	67.2%	2.13	10.9
Benzo(A)Anthracene	5.90	68.8%	1.84	9.96
Benzo(B)Fluoranthene	7.90	60.1%	3.16	12.6
Benzo(G,H,I)Perylene	6.10	60.8%	2.39	9.81
Benzo(K)Fluoranthene	2.80	64.5%	0.99	4.61
Chrysene	6.50	62.9%	2.41	10.6
Dibenz(A,H)Anthracene	1.60	63.9%	0.58	2.62
Indeno(1,2,3-C,D)Pyrene	6.40	62.0%	2.43	10.4
Pyrene	12.0	72.7%	3.27	20.7
Total HMW PAHs - 1/2MDL	55.7	64.7%	19.7	91.7
Total HMW PAHs - MDL	55.7	64.7%	19.7	91.7
Total HMW PAHs - Zero	55.7	64.7%	19.7	91.7
Total PAHs - 1/2MDL	69.6	68.3%	22.0	117
Total PAHs - MDL	69.6	68.3%	22.1	117
Total PAHs - Zero	69.6	68.3%	22.0	117
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.060	--	0.060	0.060
1,4-Dioxane (P-Dioxane)	0.22	--	0.22	0.22
2,3,4,6-Tetrachlorophenol	0.075	--	0.075	0.075
2,4,5-Trichlorophenol	0.080	--	0.080	0.080
2,4,6-Trichlorophenol	0.024	--	0.024	0.024
2,4-Dichlorophenol	0.020	--	0.020	0.020
2,4-Dimethylphenol	0.18	--	0.18	0.18

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-006			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-006-SO-0.5-2			
Sample Date	7/19/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.60	--	0.60	0.60
2,4-Dinitrotoluene	0.033	--	0.033	0.033
2,6-Dinitrotoluene	0.044	--	0.044	0.044
2-Chloronaphthalene	0.019	--	0.019	0.019
2-Chlorophenol	0.021	--	0.021	0.021
2-Methylphenol (O-Cresol)	0.036	--	0.036	0.036
2-Nitroaniline	0.027	--	0.027	0.027
2-Nitrophenol	0.028	--	0.028	0.028
3- And 4- Methylphenol (Total)	0.022	--	0.022	0.022
3,3'-Dichlorobenzidine	0.090	--	0.090	0.090
3-Nitroaniline	0.025	--	0.025	0.025
4,6-Dinitro-2-Methylphenol	0.22	--	0.22	0.22
4-Bromophenyl Phenyl Ether	0.026	--	0.026	0.026
4-Chloro-3-Methylphenol	0.036	--	0.036	0.036
4-Chloroaniline	0.021	--	0.021	0.021
4-Chlorophenyl Phenyl Ether	0.025	--	0.025	0.025
4-Nitroaniline	0.031	--	0.031	0.031
4-Nitrophenol	0.40	--	0.40	0.40
Acetophenone	0.018	41.1%	0.011	0.025
Atrazine	0.037	--	0.037	0.037
Benzaldehyde	0.065	--	0.065	0.065
Benzyl Butyl Phthalate	0.026	32.7%	0.017	0.034
Biphenyl (Diphenyl)	0.070	98.2%	0.001	0.14
Bis(2-Chloroethoxy) Methane	0.026	--	0.026	0.026
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.020	--	0.020	0.020
Bis(2-Chloroisopropyl) Ether	0.034	--	0.034	0.034
Bis(2-Ethylhexyl) Phthalate	0.032	--	0.032	0.032
Caprolactam	0.060	--	0.060	0.060
Carbazole	1.00	76.1%	0.24	1.76
Dibenzofuran	0.45	70.0%	0.13	0.77
Diethyl Phthalate	0.024	--	0.024	0.024
Dimethyl Phthalate	0.024	--	0.024	0.024
Di-N-Butyl Phthalate	0.025	--	0.025	0.025
Di-N-Octylphthalate	0.042	--	0.042	0.042
Hexachlorobenzene	0.034	--	0.034	0.034
Hexachlorobutadiene	0.023	--	0.023	0.023
Hexachlorocyclopentadiene	0.050	--	0.050	0.050
Hexachloroethane	0.030	--	0.030	0.030
Isophorone	0.018	32.5%	0.012	0.023
Nitrobenzene	0.026	--	0.026	0.026
N-Nitrosodi-N-Propylamine	0.028	--	0.028	0.028
N-Nitrosodiphenylamine	0.075	--	0.075	0.075
Pentachlorophenol	0.10	--	0.10	0.10
Phenol	0.027	--	0.027	0.027

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-007			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-07-SO-0-0.5			
Sample Date	5/17/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	27,600	4.68%	26,308	28,892
Antimony	0.46	28.1%	0.33	0.59
Arsenic	7.50	13.8%	6.46	8.54
Barium	131	4.03%	126	136
Beryllium	1.40	6.32%	1.31	1.49
Cadmium	0.28	15.0%	0.24	0.32
Chromium, Total	36.8	10.6%	32.9	40.7
Chromium, Hexavalent	0.98	10.6%	0.88	1.09
Chromium, Trivalent	35.8	10.6%	32.0	39.6
Cobalt	6.80	3.51%	6.56	7.04
Copper	68.8	12.3%	60.4	77.2
Iron	26,700	3.40%	25,792	27,608
Lead	24.5	48.5%	12.6	36.4
Manganese	519	5.63%	490	548
Mercury	0.029	54.9%	0.013	0.045
Nickel	37.6	14.5%	32.2	43.0
Selenium	0.47	20.0%	0.38	0.56
Silver	0.074	9.03%	0.067	0.081
Thallium	0.12	14.4%	0.10	0.14
Vanadium	24.4	9.21%	22.2	26.6
Zinc	66.5	12.7%	58.0	75.0
Other Inorganic Parameters (mg/kg)				
Cyanide	0.31	40.2%	0.19	0.43
Fluoride	714	20.5%	567	861
Essential Nutrients (mg/kg)				
Calcium	17,400	10.7%	15,544	19,256
Magnesium	11,000	2.82%	10,690	11,310
Potassium	2,220	6.24%	2,081	2,359
Sodium	2,340	30.7%	1,621	3,059
Pesticides (mg/kg)				
Aldrin	5.50E-04	--	5.50E-04	5.50E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.60E-04	--	3.60E-04	3.60E-04
Alpha Endosulfan	5.50E-04	--	5.50E-04	5.50E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.95E-04	--	3.95E-04	3.95E-04
Beta Endosulfan	9.00E-04	--	9.00E-04	9.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	2.15E-04	--	2.15E-04	2.15E-04
Dieldrin	4.60E-04	--	4.60E-04	4.60E-04
Endosulfan Sulfate	4.45E-04	--	4.45E-04	4.45E-04
Endrin	5.00E-04	--	5.00E-04	5.00E-04
Endrin Aldehyde	8.50E-04	--	8.50E-04	8.50E-04
Endrin Ketone	7.00E-04	--	7.00E-04	7.00E-04
Gamma Bhc (Lindane)	3.25E-04	--	3.25E-04	3.25E-04
Heptachlor	4.15E-04	--	4.15E-04	4.15E-04
Heptachlor Epoxide	5.50E-04	--	5.50E-04	5.50E-04
Methoxychlor	8.00E-04	--	8.00E-04	8.00E-04
P,P'-DDD	6.00E-04	--	6.00E-04	6.00E-04
P,P'-DDE	4.15E-04	--	4.15E-04	4.15E-04
P,P'-DDT	6.50E-04	--	6.50E-04	6.50E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-007			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-07-SO-0-0.5			
Sample Date	5/17/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.013	--	0.013	0.013
trans-Chlordane	6.00E-04	--	6.00E-04	6.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.046	140%	-1.82E-02	0.11
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.046	140%	-1.82E-02	0.11
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.078	47.1%	0.041	0.11
Acenaphthene	0.39	42.0%	0.23	0.55
Acenaphthylene	0.022	36.1%	0.014	0.030
Anthracene	0.72	37.7%	0.45	0.99
Fluoranthene	5.00	37.3%	3.13	6.87
Fluorene	0.32	34.6%	0.21	0.43
Naphthalene	0.16	44.9%	0.088	0.23
Phenanthrene	3.40	31.0%	2.34	4.46
Total LMW PAHs - 1/2MDL	10.1	35.8%	6.47	13.7
Total LMW PAHs - MDL	10.1	35.8%	6.48	13.7
Total LMW PAHs - Zero	10.1	35.9%	6.47	13.7
Benzo(A)Pyrene	3.40	36.1%	2.17	4.63
Benzo(A)Anthracene	2.80	32.0%	1.90	3.70
Benzo(B)Fluoranthene	4.00	29.8%	2.81	5.19
Benzo(G,H,I)Perylene	3.40	30.8%	2.35	4.45
Benzo(K)Fluoranthene	1.60	31.3%	1.10	2.10
Chrysene	3.80	35.9%	2.44	5.16
Dibenz(A,H)Anthracene	0.87	39.8%	0.52	1.22
Indeno(1,2,3-C,D)Pyrene	2.60	31.1%	1.79	3.41
Pyrene	5.00	39.3%	3.03	6.97
Total HMW PAHs - 1/2MDL	27.5	26.8%	20.1	34.8
Total HMW PAHs - MDL	27.5	26.8%	20.1	34.8
Total HMW PAHs - Zero	27.5	26.8%	20.1	34.8
Total PAHs - 1/2MDL	33.5	29.6%	23.6	43.4
Total PAHs - MDL	33.5	29.5%	23.6	43.4
Total PAHs - Zero	33.5	29.6%	23.6	43.4
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.008	--	0.008	0.008
1,4-Dioxane (P-Dioxane)	0.055	--	0.055	0.055
2,3,4,6-Tetrachlorophenol	0.075	--	0.075	0.075
2,4,5-Trichlorophenol	0.013	--	0.013	0.013
2,4,6-Trichlorophenol	0.010	--	0.010	0.010
2,4-Dichlorophenol	0.014	--	0.014	0.014
2,4-Dimethylphenol	0.011	--	0.011	0.011

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-007			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-07-SO-0-0.5			
Sample Date	5/17/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.48	--	0.48	0.48
2,4-Dinitrotoluene	0.009	--	0.009	0.009
2,6-Dinitrotoluene	0.011	--	0.011	0.011
2-Chloronaphthalene	0.008	--	0.008	0.008
2-Chlorophenol	0.008	--	0.008	0.008
2-Methylphenol (O-Cresol)	0.050	--	0.050	0.050
2-Nitroaniline	0.080	--	0.080	0.080
2-Nitrophenol	0.010	--	0.010	0.010
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	0.17	--	0.17	0.17
3-Nitroaniline	0.045	--	0.045	0.045
4,6-Dinitro-2-Methylphenol	0.31	--	0.31	0.31
4-Bromophenyl Phenyl Ether	0.013	--	0.013	0.013
4-Chloro-3-Methylphenol	0.009	--	0.009	0.009
4-Chloroaniline	0.006	--	0.006	0.006
4-Chlorophenyl Phenyl Ether	0.011	--	0.011	0.011
4-Nitroaniline	0.009	--	0.009	0.009
4-Nitrophenol	0.13	--	0.13	0.13
Acetophenone	0.010	44.4%	0.005	0.014
Atrazine	0.075	--	0.075	0.075
Benzaldehyde	0.022	--	0.022	0.022
Benzyl Butyl Phthalate	0.12	--	0.12	0.12
Biphenyl (Diphenyl)	0.024	49.7%	0.012	0.036
Bis(2-Chloroethoxy) Methane	0.009	--	0.009	0.009
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.007	--	0.007	0.007
Bis(2-Chloroisopropyl) Ether	0.013	--	0.013	0.013
Bis(2-Ethylhexyl) Phthalate	0.19	--	0.19	0.19
Caprolactam	0.12	--	0.12	0.12
Carbazole	0.58	30.5%	0.40	0.76
Dibenzofuran	0.21	33.5%	0.14	0.28
Diethyl Phthalate	0.055	--	0.055	0.055
Dimethyl Phthalate	0.007	--	0.007	0.007
Di-N-Butyl Phthalate	0.075	--	0.075	0.075
Di-N-Octylphthalate	0.11	--	0.11	0.11
Hexachlorobenzene	0.013	--	0.013	0.013
Hexachlorobutadiene	0.011	--	0.011	0.011
Hexachlorocyclopentadiene	0.009	--	0.009	0.009
Hexachloroethane	0.009	--	0.009	0.009
Isophorone	0.009	--	0.009	0.009
Nitrobenzene	0.065	--	0.065	0.065
N-Nitrosodi-N-Propylamine	0.012	--	0.012	0.012
N-Nitrosodiphenylamine	0.060	--	0.060	0.060
Pentachlorophenol	0.29	--	0.29	0.29
Phenol	0.055	--	0.055	0.055

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-007			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-07-SO-0.5-2			
Sample Date	5/17/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	15,000	4.58%	14,314	15,686
Antimony	0.085	70.4%	0.025	0.14
Arsenic	4.50	7.46%	4.16	4.84
Barium	136	9.24%	123	149
Beryllium	0.68	4.90%	0.65	0.71
Cadmium	0.14	6.03%	0.13	0.15
Chromium, Total	19.9	7.75%	18.4	21.4
Chromium, Hexavalent	0.53	7.75%	0.49	0.57
Chromium, Trivalent	19.4	7.75%	17.9	20.9
Cobalt	6.00	1.99%	5.88	6.12
Copper	22.2	4.63%	21.2	23.2
Iron	16,800	2.40%	16,397	17,203
Lead	13.6	3.33%	13.1	14.1
Manganese	545	7.15%	506	584
Mercury	0.025	27.4%	0.018	0.032
Nickel	16.9	6.58%	15.8	18.0
Selenium	0.19	19.1%	0.15	0.23
Silver	0.061	9.83%	0.055	0.067
Thallium	0.080	6.56%	0.075	0.085
Vanadium	13.6	3.31%	13.1	14.1
Zinc	92.7	5.42%	87.7	97.7
Other Inorganic Parameters (mg/kg)				
Cyanide	0.15	32.7%	0.10	0.20
Fluoride	196	28.8%	140	252
Essential Nutrients (mg/kg)				
Calcium	18,700	15.1%	15,869	21,531
Magnesium	10,400	2.18%	10,173	10,627
Potassium	1,110	6.91%	1,033	1,187
Sodium	135	21.1%	107	163
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-007			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-07-SO-0.5-2			
Sample Date	5/17/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.58	29.2%	0.41	0.75
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.58	29.2%	0.41	0.75
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.092	47.7%	0.048	0.14
Acenaphthene	0.52	80.9%	0.099	0.94
Acenaphthylene	0.018	62.8%	0.007	0.029
Anthracene	1.20	82.4%	0.21	2.19
Fluoranthene	5.90	71.4%	1.69	10.1
Fluorene	0.45	74.2%	0.12	0.78
Naphthalene	0.19	28.9%	0.14	0.24
Phenanthrene	4.70	78.1%	1.03	8.37
Total LMW PAHs - 1/2MDL	13.1	74.3%	3.36	22.8
Total LMW PAHs - MDL	13.1	74.3%	3.36	22.8
Total LMW PAHs - Zero	13.1	74.3%	3.36	22.8
Benzo(A)Pyrene	2.80	67.2%	0.92	4.68
Benzo(A)Anthracene	2.90	68.8%	0.91	4.89
Benzo(B)Fluoranthene	2.90	60.1%	1.16	4.64
Benzo(G,H,I)Perylene	2.20	60.8%	0.86	3.54
Benzo(K)Fluoranthene	1.40	64.5%	0.50	2.30
Chrysene	3.20	62.9%	1.19	5.21
Dibenz(A,H)Anthracene	0.47	63.9%	0.17	0.77
Indeno(1,2,3-C,D)Pyrene	1.80	62.0%	0.68	2.92
Pyrene	5.20	72.7%	1.42	8.98
Total HMW PAHs - 1/2MDL	22.9	64.7%	8.07	37.7
Total HMW PAHs - MDL	22.9	64.7%	8.07	37.7
Total HMW PAHs - Zero	22.9	64.7%	8.07	37.7
Total PAHs - 1/2MDL	32.9	68.3%	10.4	55.5
Total PAHs - MDL	32.9	68.3%	10.4	55.5
Total PAHs - Zero	32.9	68.3%	10.4	55.5
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.004	--	0.004	0.004
1,4-Dioxane (P-Dioxane)	0.027	--	0.027	0.027
2,3,4,6-Tetrachlorophenol	0.037	--	0.037	0.037
2,4,5-Trichlorophenol	0.006	--	0.006	0.006
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.007	--	0.007	0.007
2,4-Dimethylphenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-007			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-07-SO-0.5-2			
Sample Date	5/17/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.24	--	0.24	0.24
2,4-Dinitrotoluene	0.004	--	0.004	0.004
2,6-Dinitrotoluene	0.006	--	0.006	0.006
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.025	--	0.025	0.025
2-Nitroaniline	0.040	--	0.040	0.040
2-Nitrophenol	0.005	--	0.005	0.005
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	0.080	--	0.080	0.080
3-Nitroaniline	0.022	--	0.022	0.022
4,6-Dinitro-2-Methylphenol	0.15	--	0.15	0.15
4-Bromophenyl Phenyl Ether	0.006	--	0.006	0.006
4-Chloro-3-Methylphenol	0.004	--	0.004	0.004
4-Chloroaniline	0.003	--	0.003	0.003
4-Chlorophenyl Phenyl Ether	0.006	--	0.006	0.006
4-Nitroaniline	0.004	--	0.004	0.004
4-Nitrophenol	0.060	--	0.060	0.060
Acetophenone	0.005	41.1%	0.003	0.007
Atrazine	0.038	--	0.038	0.038
Benzaldehyde	0.011	--	0.011	0.011
Benzyl Butyl Phthalate	0.060	32.7%	0.040	0.080
Biphenyl (Diphenyl)	0.029	98.2%	5.22E-04	0.057
Bis(2-Chloroethoxy) Methane	0.004	--	0.004	0.004
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.003	--	0.003	0.003
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.095	--	0.095	0.095
Caprolactam	0.055	--	0.055	0.055
Carbazole	0.74	76.1%	0.18	1.30
Dibenzofuran	0.28	70.0%	0.084	0.48
Diethyl Phthalate	0.026	--	0.026	0.026
Dimethyl Phthalate	0.003	--	0.003	0.003
Di-N-Butyl Phthalate	0.038	--	0.038	0.038
Di-N-Octylphthalate	0.050	--	0.050	0.050
Hexachlorobenzene	0.006	--	0.006	0.006
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.004	--	0.004	0.004
Hexachloroethane	0.005	--	0.005	0.005
Isophorone	0.004	32.5%	0.003	0.006
Nitrobenzene	0.032	--	0.032	0.032
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.029	--	0.029	0.029
Pentachlorophenol	0.14	--	0.14	0.14
Phenol	0.027	--	0.027	0.027

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-008			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-008-SO-0-0.5			
Sample Date	7/26/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	32,700	4.68%	31,169	34,231
Antimony	0.24	28.1%	0.17	0.31
Arsenic	6.00	13.8%	5.17	6.83
Barium	120	4.03%	115	125
Beryllium	0.92	6.32%	0.86	0.98
Cadmium	0.27	15.0%	0.23	0.31
Chromium, Total	25.2	10.6%	22.5	27.9
Chromium, Hexavalent	0.67	10.6%	0.60	0.75
Chromium, Trivalent	24.5	10.6%	21.9	27.1
Cobalt	6.20	3.51%	5.98	6.42
Copper	21.1	12.3%	18.5	23.7
Iron	16,500	3.40%	15,939	17,061
Lead	16.9	48.5%	8.70	25.1
Manganese	448	5.63%	423	473
Mercury	0.016	54.9%	0.007	0.025
Nickel	39.9	14.5%	34.1	45.7
Selenium	1.50	20.0%	1.20	1.80
Silver	0.052	9.03%	0.047	0.057
Thallium	0.11	14.4%	0.094	0.13
Vanadium	18.9	9.21%	17.2	20.6
Zinc	56.6	12.7%	49.4	63.8
Other Inorganic Parameters (mg/kg)				
Cyanide	0.97	40.2%	0.58	1.36
Fluoride	662	20.5%	526	798
Essential Nutrients (mg/kg)				
Calcium	21,400	10.7%	19,117	23,683
Magnesium	11,100	2.82%	10,787	11,413
Potassium	2,040	6.24%	1,913	2,167
Sodium	3,780	30.7%	2,618	4,942
Pesticides (mg/kg)				
Aldrin	4.10E-04	--	4.10E-04	4.10E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.10E-04	--	3.10E-04	3.10E-04
Alpha Endosulfan	4.70E-04	--	4.70E-04	4.70E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.30E-04	--	3.30E-04	3.30E-04
Beta Endosulfan	5.50E-04	--	5.50E-04	5.50E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.70E-04	--	3.70E-04	3.70E-04
Dieldrin	4.40E-04	--	4.40E-04	4.40E-04
Endosulfan Sulfate	3.95E-04	--	3.95E-04	3.95E-04
Endrin	4.30E-04	--	4.30E-04	4.30E-04
Endrin Aldehyde	4.20E-04	--	4.20E-04	4.20E-04
Endrin Ketone	4.70E-04	--	4.70E-04	4.70E-04
Gamma Bhc (Lindane)	3.05E-04	--	3.05E-04	3.05E-04
Heptachlor	4.35E-04	--	4.35E-04	4.35E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.45E-04	--	4.45E-04	4.45E-04
P,P'-DDE	4.90E-04	--	4.90E-04	4.90E-04
P,P'-DDT	3.50E-04	--	3.50E-04	3.50E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-008			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-008-SO-0-0.5			
Sample Date	7/26/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.50E-04	--	7.50E-04	7.50E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	140%	-1.84E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.84E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.008	47.1%	0.004	0.012
Acenaphthene	0.067	42.0%	0.039	0.095
Acenaphthylene	0.004	36.1%	0.003	0.006
Anthracene	0.089	37.7%	0.055	0.12
Fluoranthene	0.66	37.3%	0.41	0.91
Fluorene	0.048	34.6%	0.031	0.065
Naphthalene	0.014	44.9%	0.008	0.020
Phenanthrene	0.47	31.0%	0.32	0.62
Total LMW PAHs - 1/2MDL	1.36	35.8%	0.87	1.85
Total LMW PAHs - MDL	1.36	35.8%	0.88	1.85
Total LMW PAHs - Zero	1.36	35.9%	0.87	1.84
Benzo(A)Pyrene	0.38	36.1%	0.24	0.52
Benzo(A)Anthracene	0.32	32.0%	0.22	0.42
Benzo(B)Fluoranthene	0.53	29.8%	0.37	0.69
Benzo(G,H,I)Perylene	0.36	30.8%	0.25	0.47
Benzo(K)Fluoranthene	0.16	31.3%	0.11	0.21
Chrysene	0.42	35.9%	0.27	0.57
Dibenz(A,H)Anthracene	0.069	39.8%	0.042	0.096
Indeno(1,2,3-C,D)Pyrene	0.41	31.1%	0.28	0.54
Pyrene	0.65	39.3%	0.39	0.91
Total HMW PAHs - 1/2MDL	3.30	26.8%	2.42	4.18
Total HMW PAHs - MDL	3.30	26.8%	2.42	4.18
Total HMW PAHs - Zero	3.30	26.8%	2.42	4.18
Total PAHs - 1/2MDL	4.12	29.6%	2.90	5.34
Total PAHs - MDL	4.13	29.5%	2.91	5.34
Total PAHs - Zero	4.12	29.6%	2.90	5.33
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.044	--	0.044	0.044
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.036	--	0.036	0.036

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-008			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-008-SO-0-0.5			
Sample Date	7/26/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.044	--	0.044	0.044
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	44.4%	0.002	0.005
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	--	0.005	0.005
Biphenyl (Diphenyl)	0.014	49.7%	0.007	0.021
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.059	30.5%	0.041	0.077
Dibenzofuran	0.022	33.5%	0.015	0.029
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	--	0.004	0.004
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-008			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-008-SO-0.5-2			
Sample Date	7/26/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	19,000	4.58%	18,131	19,869
Antimony	0.14	70.4%	0.041	0.24
Arsenic	5.80	7.46%	5.37	6.23
Barium	118	9.24%	107	129
Beryllium	0.80	4.90%	0.76	0.84
Cadmium	0.13	6.03%	0.12	0.14
Chromium, Total	20.0	7.75%	18.5	21.5
Chromium, Hexavalent	0.54	7.75%	0.49	0.58
Chromium, Trivalent	19.5	7.75%	18.0	21.0
Cobalt	6.20	1.99%	6.08	6.32
Copper	17.1	4.63%	16.3	17.9
Iron	16,600	2.40%	16,201	16,999
Lead	13.5	3.33%	13.1	13.9
Manganese	501	7.15%	465	537
Mercury	0.023	27.4%	0.017	0.029
Nickel	21.5	6.58%	20.1	22.9
Selenium	1.60	19.1%	1.29	1.91
Silver	0.042	9.83%	0.038	0.046
Thallium	0.091	6.56%	0.085	0.097
Vanadium	14.4	3.31%	13.9	14.9
Zinc	51.7	5.42%	48.9	54.5
Other Inorganic Parameters (mg/kg)				
Cyanide	1.60	32.7%	1.08	2.12
Fluoride	508	28.8%	362	654
Essential Nutrients (mg/kg)				
Calcium	22,600	15.1%	19,178	26,022
Magnesium	12,700	2.18%	12,423	12,977
Potassium	1,530	6.91%	1,424	1,636
Sodium	1,550	21.1%	1,223	1,877
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-008			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-008-SO-0.5-2			
Sample Date	7/26/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.008	47.7%	0.004	0.012
Acenaphthene	0.074	80.9%	0.014	0.13
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.094	82.4%	0.017	0.17
Fluoranthene	0.56	71.4%	0.16	0.96
Fluorene	0.054	74.2%	0.014	0.094
Naphthalene	0.016	28.9%	0.011	0.021
Phenanthrene	0.49	78.1%	0.11	0.87
Total LMW PAHs - 1/2MDL	1.30	74.3%	0.33	2.27
Total LMW PAHs - MDL	1.30	74.3%	0.34	2.27
Total LMW PAHs - Zero	1.30	74.3%	0.33	2.26
Benzo(A)Pyrene	0.30	67.2%	0.098	0.50
Benzo(A)Anthracene	0.26	68.8%	0.081	0.44
Benzo(B)Fluoranthene	0.41	60.1%	0.16	0.66
Benzo(G,H,I)Perylene	0.23	60.8%	0.090	0.37
Benzo(K)Fluoranthene	0.18	64.5%	0.064	0.30
Chrysene	0.36	62.9%	0.13	0.59
Dibenz(A,H)Anthracene	0.064	63.9%	0.023	0.10
Indeno(1,2,3-C,D)Pyrene	0.26	62.0%	0.099	0.42
Pyrene	0.64	72.7%	0.17	1.11
Total HMW PAHs - 1/2MDL	2.70	64.7%	0.95	4.45
Total HMW PAHs - MDL	2.70	64.7%	0.95	4.45
Total HMW PAHs - Zero	2.70	64.7%	0.95	4.45
Total PAHs - 1/2MDL	3.59	68.3%	1.14	6.04
Total PAHs - MDL	3.59	68.3%	1.14	6.04
Total PAHs - Zero	3.58	68.3%	1.13	6.03
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.044	--	0.044	0.044
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.036	--	0.036	0.036

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-008			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-008-SO-0.5-2			
Sample Date	7/26/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.044	--	0.044	0.044
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	41.1%	0.002	0.005
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.014	98.2%	2.52E-04	0.028
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.050	76.1%	0.012	0.088
Dibenzofuran	0.027	70.0%	0.008	0.046
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	32.5%	0.002	0.005
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-009			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-09-SO-0-0.5			
Sample Date	5/21/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	16,200	4.68%	15,441	16,959
Antimony	0.085	28.1%	0.061	0.11
Arsenic	5.00	13.8%	4.31	5.69
Barium	118	4.03%	113	123
Beryllium	0.59	6.32%	0.55	0.63
Cadmium	0.12	15.0%	0.10	0.14
Chromium, Total	14.6	10.6%	13.1	16.1
Chromium, Hexavalent	0.39	10.6%	0.35	0.43
Chromium, Trivalent	14.2	10.6%	12.7	15.7
Cobalt	6.00	3.51%	5.79	6.21
Copper	15.7	12.3%	13.8	17.6
Iron	17,000	3.40%	16,422	17,578
Lead	12.1	48.5%	6.23	18.0
Manganese	515	5.63%	486	544
Mercury	0.021	54.9%	0.009	0.033
Nickel	17.5	14.5%	15.0	20.0
Selenium	0.41	20.0%	0.33	0.49
Silver	0.038	9.03%	0.035	0.041
Thallium	0.094	14.4%	0.081	0.11
Vanadium	14.3	9.21%	13.0	15.6
Zinc	52.6	12.7%	45.9	59.3
Other Inorganic Parameters (mg/kg)				
Cyanide	0.11	40.2%	0.066	0.15
Fluoride	36.1	20.5%	28.7	43.5
Essential Nutrients (mg/kg)				
Calcium	15,300	10.7%	13,668	16,932
Magnesium	11,400	2.82%	11,079	11,721
Potassium	1,100	6.24%	1,031	1,169
Sodium	35.1	30.7%	24.3	45.8
Pesticides (mg/kg)				
Aldrin	5.00E-04	--	5.00E-04	5.00E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.45E-04	--	3.45E-04	3.45E-04
Alpha Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.80E-04	--	3.80E-04	3.80E-04
Beta Endosulfan	9.00E-04	--	9.00E-04	9.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	2.10E-04	--	2.10E-04	2.10E-04
Dieldrin	4.45E-04	--	4.45E-04	4.45E-04
Endosulfan Sulfate	4.30E-04	--	4.30E-04	4.30E-04
Endrin	4.90E-04	--	4.90E-04	4.90E-04
Endrin Aldehyde	8.00E-04	--	8.00E-04	8.00E-04
Endrin Ketone	6.50E-04	--	6.50E-04	6.50E-04
Gamma Bhc (Lindane)	3.15E-04	--	3.15E-04	3.15E-04
Heptachlor	4.05E-04	--	4.05E-04	4.05E-04
Heptachlor Epoxide	5.00E-04	--	5.00E-04	5.00E-04
Methoxychlor	8.00E-04	--	8.00E-04	8.00E-04
P,P'-DDD	6.00E-04	--	6.00E-04	6.00E-04
P,P'-DDE	4.05E-04	--	4.05E-04	4.05E-04
P,P'-DDT	6.50E-04	--	6.50E-04	6.50E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-009			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-09-SO-0-0.5			
Sample Date	5/21/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.013	--	0.013	0.013
trans-Chlordane	6.00E-04	--	6.00E-04	6.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	140%	-1.86E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.86E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.012	47.1%	0.006	0.018
Acenaphthene	0.063	42.0%	0.037	0.089
Acenaphthylene	0.003	36.1%	0.002	0.004
Anthracene	0.12	37.7%	0.075	0.17
Fluoranthene	0.89	37.3%	0.56	1.22
Fluorene	0.048	34.6%	0.031	0.065
Naphthalene	0.030	44.9%	0.017	0.043
Phenanthrene	0.58	31.0%	0.40	0.76
Total LMW PAHs - 1/2MDL	1.75	35.8%	1.12	2.37
Total LMW PAHs - MDL	1.75	35.8%	1.12	2.37
Total LMW PAHs - Zero	1.75	35.9%	1.12	2.37
Benzo(A)Pyrene	0.55	36.1%	0.35	0.75
Benzo(A)Anthracene	0.53	32.0%	0.36	0.70
Benzo(B)Fluoranthene	0.80	29.8%	0.56	1.04
Benzo(G,H,I)Perylene	0.63	30.8%	0.44	0.82
Benzo(K)Fluoranthene	0.32	31.3%	0.22	0.42
Chrysene	0.77	35.9%	0.49	1.05
Dibenz(A,H)Anthracene	0.13	39.8%	0.078	0.18
Indeno(1,2,3-C,D)Pyrene	0.50	31.1%	0.34	0.66
Pyrene	0.91	39.3%	0.55	1.27
Total HMW PAHs - 1/2MDL	5.14	26.8%	3.76	6.52
Total HMW PAHs - MDL	5.14	26.8%	3.76	6.52
Total HMW PAHs - Zero	5.14	26.8%	3.76	6.52
Total PAHs - 1/2MDL	6.07	29.6%	4.28	7.87
Total PAHs - MDL	6.07	29.5%	4.28	7.87
Total PAHs - Zero	6.07	29.6%	4.28	7.87
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	7.50E-04	--	7.50E-04	7.50E-04
1,4-Dioxane (P-Dioxane)	0.006	--	0.006	0.006
2,3,4,6-Tetrachlorophenol	0.007	--	0.007	0.007
2,4,5-Trichlorophenol	0.001	--	0.001	0.001
2,4,6-Trichlorophenol	9.50E-04	--	9.50E-04	9.50E-04
2,4-Dichlorophenol	0.001	--	0.001	0.001
2,4-Dimethylphenol	0.001	--	0.001	0.001

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-009			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-09-SO-0-0.5			
Sample Date	5/21/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.046	--	0.046	0.046
2,4-Dinitrotoluene	8.50E-04	--	8.50E-04	8.50E-04
2,6-Dinitrotoluene	0.001	--	0.001	0.001
2-Chloronaphthalene	8.00E-04	--	8.00E-04	8.00E-04
2-Chlorophenol	8.00E-04	--	8.00E-04	8.00E-04
2-Methylphenol (O-Cresol)	0.005	--	0.005	0.005
2-Nitroaniline	0.008	--	0.008	0.008
2-Nitrophenol	0.001	--	0.001	0.001
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	0.016	--	0.016	0.016
3-Nitroaniline	0.004	--	0.004	0.004
4,6-Dinitro-2-Methylphenol	0.030	--	0.030	0.030
4-Bromophenyl Phenyl Ether	0.001	--	0.001	0.001
4-Chloro-3-Methylphenol	8.00E-04	--	8.00E-04	8.00E-04
4-Chloroaniline	5.50E-04	--	5.50E-04	5.50E-04
4-Chlorophenyl Phenyl Ether	0.001	--	0.001	0.001
4-Nitroaniline	8.50E-04	--	8.50E-04	8.50E-04
4-Nitrophenol	0.012	--	0.012	0.012
Acetophenone	0.002	44.4%	0.001	0.003
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.007	--	0.007	0.007
Benzyl Butyl Phthalate	0.012	--	0.012	0.012
Biphenyl (Diphenyl)	0.004	49.7%	0.002	0.006
Bis(2-Chloroethoxy) Methane	8.00E-04	--	8.00E-04	8.00E-04
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	6.00E-04	--	6.00E-04	6.00E-04
Bis(2-Chloroisopropyl) Ether	0.001	--	0.001	0.001
Bis(2-Ethylhexyl) Phthalate	0.018	--	0.018	0.018
Caprolactam	0.011	--	0.011	0.011
Carbazole	0.12	30.5%	0.083	0.16
Dibenzofuran	0.027	33.5%	0.018	0.036
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	6.00E-04	--	6.00E-04	6.00E-04
Di-N-Butyl Phthalate	0.008	--	0.008	0.008
Di-N-Octylphthalate	0.010	--	0.010	0.010
Hexachlorobenzene	0.001	--	0.001	0.001
Hexachlorobutadiene	0.001	--	0.001	0.001
Hexachlorocyclopentadiene	8.50E-04	--	8.50E-04	8.50E-04
Hexachloroethane	9.00E-04	--	9.00E-04	9.00E-04
Isophorone	8.50E-04	--	8.50E-04	8.50E-04
Nitrobenzene	0.006	--	0.006	0.006
N-Nitrosodi-N-Propylamine	0.001	--	0.001	0.001
N-Nitrosodiphenylamine	0.006	--	0.006	0.006
Pentachlorophenol	0.028	--	0.028	0.028
Phenol	0.005	--	0.005	0.005

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-009			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-09-SO-0.5-2			
Sample Date	5/21/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	18,400	4.58%	17,558	19,242
Antimony	0.085	70.4%	0.025	0.14
Arsenic	6.10	7.46%	5.65	6.55
Barium	113	9.24%	103	123
Beryllium	0.59	4.90%	0.56	0.62
Cadmium	0.067	6.03%	0.063	0.071
Chromium, Total	14.5	7.75%	13.4	15.6
Chromium, Hexavalent	0.39	7.75%	0.36	0.42
Chromium, Trivalent	14.1	7.75%	13.0	15.2
Cobalt	5.90	1.99%	5.78	6.02
Copper	15.2	4.63%	14.5	15.9
Iron	18,700	2.40%	18,251	19,149
Lead	11.2	3.33%	10.8	11.6
Manganese	501	7.15%	465	537
Mercury	0.030	27.4%	0.022	0.038
Nickel	13.8	6.58%	12.9	14.7
Selenium	0.51	19.1%	0.41	0.61
Silver	0.038	9.83%	0.034	0.042
Thallium	0.099	6.56%	0.093	0.11
Vanadium	12.2	3.31%	11.8	12.6
Zinc	50.5	5.42%	47.8	53.2
Other Inorganic Parameters (mg/kg)				
Cyanide	0.10	32.7%	0.067	0.13
Fluoride	41.0	28.8%	29.2	52.8
Essential Nutrients (mg/kg)				
Calcium	12,400	15.1%	10,523	14,277
Magnesium	13,300	2.18%	13,010	13,590
Potassium	1,040	6.91%	968	1,112
Sodium	70.6	21.1%	55.7	85.5
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-009			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-09-SO-0.5-2			
Sample Date	5/21/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.007	47.7%	0.004	0.010
Acenaphthene	0.018	80.9%	0.003	0.033
Acenaphthylene	7.00E-04	62.8%	2.60E-04	0.001
Anthracene	0.030	82.4%	0.005	0.055
Fluoranthene	0.16	71.4%	0.046	0.27
Fluorene	0.015	74.2%	0.004	0.026
Naphthalene	0.014	28.9%	0.010	0.018
Phenanthrene	0.14	78.1%	0.031	0.25
Total LMW PAHs - 1/2MDL	0.38	74.3%	0.099	0.67
Total LMW PAHs - MDL	0.39	74.3%	0.099	0.67
Total LMW PAHs - Zero	0.38	74.3%	0.099	0.67
Benzo(A)Pyrene	0.096	67.2%	0.031	0.16
Benzo(A)Anthracene	0.090	68.8%	0.028	0.15
Benzo(B)Fluoranthene	0.11	60.1%	0.044	0.18
Benzo(G,H,I)Perylene	0.091	60.8%	0.036	0.15
Benzo(K)Fluoranthene	0.048	64.5%	0.017	0.079
Chrysene	0.11	62.9%	0.041	0.18
Dibenz(A,H)Anthracene	0.021	63.9%	0.008	0.034
Indeno(1,2,3-C,D)Pyrene	0.076	62.0%	0.029	0.12
Pyrene	0.15	72.7%	0.041	0.26
Total HMW PAHs - 1/2MDL	0.79	64.7%	0.28	1.30
Total HMW PAHs - MDL	0.79	64.7%	0.28	1.30
Total HMW PAHs - Zero	0.79	64.7%	0.28	1.30
Total PAHs - 1/2MDL	1.06	68.3%	0.34	1.78
Total PAHs - MDL	1.06	68.3%	0.34	1.78
Total PAHs - Zero	1.06	68.3%	0.34	1.78
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	7.00E-04	--	7.00E-04	7.00E-04
1,4-Dioxane (P-Dioxane)	0.005	--	0.005	0.005
2,3,4,6-Tetrachlorophenol	0.007	--	0.007	0.007
2,4,5-Trichlorophenol	0.001	--	0.001	0.001
2,4,6-Trichlorophenol	8.50E-04	--	8.50E-04	8.50E-04
2,4-Dichlorophenol	0.001	--	0.001	0.001
2,4-Dimethylphenol	0.001	--	0.001	0.001

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-009			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-09-SO-0.5-2			
Sample Date	5/21/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.043	--	0.043	0.043
2,4-Dinitrotoluene	8.00E-04	--	8.00E-04	8.00E-04
2,6-Dinitrotoluene	0.001	--	0.001	0.001
2-Chloronaphthalene	7.50E-04	--	7.50E-04	7.50E-04
2-Chlorophenol	7.50E-04	--	7.50E-04	7.50E-04
2-Methylphenol (O-Cresol)	0.005	--	0.005	0.005
2-Nitroaniline	0.007	--	0.007	0.007
2-Nitrophenol	9.00E-04	--	9.00E-04	9.00E-04
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	0.015	--	0.015	0.015
3-Nitroaniline	0.004	--	0.004	0.004
4,6-Dinitro-2-Methylphenol	0.028	--	0.028	0.028
4-Bromophenyl Phenyl Ether	0.001	--	0.001	0.001
4-Chloro-3-Methylphenol	7.50E-04	--	7.50E-04	7.50E-04
4-Chloroaniline	5.50E-04	--	5.50E-04	5.50E-04
4-Chlorophenyl Phenyl Ether	9.50E-04	--	9.50E-04	9.50E-04
4-Nitroaniline	7.50E-04	--	7.50E-04	7.50E-04
4-Nitrophenol	0.011	--	0.011	0.011
Acetophenone	0.029	41.1%	0.017	0.041
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.015	--	0.015	0.015
Benzyl Butyl Phthalate	0.011	32.7%	0.007	0.015
Biphenyl (Diphenyl)	0.002	98.2%	3.78E-05	0.004
Bis(2-Chloroethoxy) Methane	7.50E-04	--	7.50E-04	7.50E-04
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	6.00E-04	--	6.00E-04	6.00E-04
Bis(2-Chloroisopropyl) Ether	0.001	--	0.001	0.001
Bis(2-Ethylhexyl) Phthalate	0.017	--	0.017	0.017
Caprolactam	0.011	--	0.011	0.011
Carbazole	0.021	76.1%	0.005	0.037
Dibenzofuran	0.009	70.0%	0.003	0.016
Diethyl Phthalate	0.015	--	0.015	0.015
Dimethyl Phthalate	6.00E-04	--	6.00E-04	6.00E-04
Di-N-Butyl Phthalate	0.007	--	0.007	0.007
Di-N-Octylphthalate	0.010	--	0.010	0.010
Hexachlorobenzene	0.001	--	0.001	0.001
Hexachlorobutadiene	9.50E-04	--	9.50E-04	9.50E-04
Hexachlorocyclopentadiene	8.00E-04	--	8.00E-04	8.00E-04
Hexachloroethane	8.00E-04	--	8.00E-04	8.00E-04
Isophorone	0.010	32.5%	0.007	0.013
Nitrobenzene	0.006	--	0.006	0.006
N-Nitrosodi-N-Propylamine	0.001	--	0.001	0.001
N-Nitrosodiphenylamine	0.006	--	0.006	0.006
Pentachlorophenol	0.026	--	0.026	0.026
Phenol	0.014	--	0.014	0.014

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-010			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-010-SO-0-0.5			
Sample Date	5/21/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	17,100	4.68%	16,299	17,901
Antimony	0.090	28.1%	0.065	0.12
Arsenic	4.80	13.8%	4.14	5.46
Barium	111	4.03%	107	115
Beryllium	0.58	6.32%	0.54	0.62
Cadmium	0.31	15.0%	0.26	0.36
Chromium, Total	22.0	10.6%	19.7	24.3
Chromium, Hexavalent	0.59	10.6%	0.53	0.65
Chromium, Trivalent	21.4	10.6%	19.1	23.7
Cobalt	6.10	3.51%	5.89	6.31
Copper	17.2	12.3%	15.1	19.3
Iron	17,100	3.40%	16,519	17,681
Lead	18.3	48.5%	9.42	27.2
Manganese	515	5.63%	486	544
Mercury	0.024	54.9%	0.011	0.037
Nickel	24.8	14.5%	21.2	28.4
Selenium	0.47	20.0%	0.38	0.56
Silver	0.051	9.03%	0.046	0.056
Thallium	0.098	14.4%	0.084	0.11
Vanadium	14.8	9.21%	13.4	16.2
Zinc	61.1	12.7%	53.3	68.9
Other Inorganic Parameters (mg/kg)				
Cyanide	0.17	40.2%	0.10	0.24
Fluoride	58.6	20.5%	46.6	70.6
Essential Nutrients (mg/kg)				
Calcium	20,500	10.7%	18,313	22,687
Magnesium	12,200	2.82%	11,856	12,544
Potassium	1,200	6.24%	1,125	1,275
Sodium	36.1	30.7%	25.0	47.1
Pesticides (mg/kg)				
Aldrin	5.00E-04	--	5.00E-04	5.00E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.45E-04	--	3.45E-04	3.45E-04
Alpha Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.85E-04	--	3.85E-04	3.85E-04
Beta Endosulfan	9.00E-04	--	9.00E-04	9.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	2.10E-04	--	2.10E-04	2.10E-04
Dieldrin	4.45E-04	--	4.45E-04	4.45E-04
Endosulfan Sulfate	4.30E-04	--	4.30E-04	4.30E-04
Endrin	4.90E-04	--	4.90E-04	4.90E-04
Endrin Aldehyde	8.00E-04	--	8.00E-04	8.00E-04
Endrin Ketone	6.50E-04	--	6.50E-04	6.50E-04
Gamma Bhc (Lindane)	3.15E-04	--	3.15E-04	3.15E-04
Heptachlor	4.05E-04	--	4.05E-04	4.05E-04
Heptachlor Epoxide	5.00E-04	--	5.00E-04	5.00E-04
Methoxychlor	8.00E-04	--	8.00E-04	8.00E-04
P,P'-DDD	6.00E-04	--	6.00E-04	6.00E-04
P,P'-DDE	4.05E-04	--	4.05E-04	4.05E-04
P,P'-DDT	6.50E-04	--	6.50E-04	6.50E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-010			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-010-SO-0-0.5			
Sample Date	5/21/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.013	--	0.013	0.013
trans-Chlordane	6.00E-04	--	6.00E-04	6.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.24	140%	-9.50E-02	0.57
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.24	140%	-9.50E-02	0.57
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.015	47.1%	0.008	0.022
Acenaphthene	0.097	42.0%	0.056	0.14
Acenaphthylene	0.004	36.1%	0.002	0.005
Anthracene	0.24	37.7%	0.15	0.33
Fluoranthene	2.40	37.3%	1.50	3.30
Fluorene	0.068	34.6%	0.044	0.092
Naphthalene	0.028	44.9%	0.015	0.041
Phenanthrene	1.10	31.0%	0.76	1.44
Total LMW PAHs - 1/2MDL	3.95	35.8%	2.54	5.37
Total LMW PAHs - MDL	3.96	35.8%	2.54	5.37
Total LMW PAHs - Zero	3.95	35.9%	2.53	5.36
Benzo(A)Pyrene	1.40	36.1%	0.89	1.91
Benzo(A)Anthracene	1.40	32.0%	0.95	1.85
Benzo(B)Fluoranthene	2.80	29.8%	1.96	3.64
Benzo(G,H,I)Perylene	1.70	30.8%	1.18	2.22
Benzo(K)Fluoranthene	1.10	31.3%	0.76	1.44
Chrysene	2.60	35.9%	1.67	3.53
Dibenz(A,H)Anthracene	0.44	39.8%	0.26	0.62
Indeno(1,2,3-C,D)Pyrene	1.40	31.1%	0.96	1.84
Pyrene	2.70	39.3%	1.64	3.76
Total HMW PAHs - 1/2MDL	15.5	26.8%	11.4	19.7
Total HMW PAHs - MDL	15.5	26.8%	11.4	19.7
Total HMW PAHs - Zero	15.5	26.8%	11.4	19.7
Total PAHs - 1/2MDL	16.7	29.6%	11.7	21.6
Total PAHs - MDL	16.7	29.5%	11.8	21.6
Total PAHs - Zero	16.7	29.6%	11.7	21.6
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.004	--	0.004	0.004
1,4-Dioxane (P-Dioxane)	0.026	--	0.026	0.026
2,3,4,6-Tetrachlorophenol	0.035	--	0.035	0.035
2,4,5-Trichlorophenol	0.006	--	0.006	0.006
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.007	--	0.007	0.007
2,4-Dimethylphenol	0.005	--	0.005	0.005

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-010			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-010-SO-0-0.5			
Sample Date	5/21/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.23	--	0.23	0.23
2,4-Dinitrotoluene	0.004	--	0.004	0.004
2,6-Dinitrotoluene	0.005	--	0.005	0.005
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.024	--	0.024	0.024
2-Nitroaniline	0.039	--	0.039	0.039
2-Nitrophenol	0.005	--	0.005	0.005
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	0.080	--	0.080	0.080
3-Nitroaniline	0.022	--	0.022	0.022
4,6-Dinitro-2-Methylphenol	0.15	--	0.15	0.15
4-Bromophenyl Phenyl Ether	0.006	--	0.006	0.006
4-Chloro-3-Methylphenol	0.004	--	0.004	0.004
4-Chloroaniline	0.003	--	0.003	0.003
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.004	--	0.004	0.004
4-Nitrophenol	0.060	--	0.060	0.060
Acetophenone	0.005	44.4%	0.003	0.007
Atrazine	0.037	--	0.037	0.037
Benzaldehyde	0.011	--	0.011	0.011
Benzyl Butyl Phthalate	0.060	--	0.060	0.060
Biphenyl (Diphenyl)	0.004	49.7%	0.002	0.005
Bis(2-Chloroethoxy) Methane	0.004	--	0.004	0.004
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.003	--	0.003	0.003
Bis(2-Chloroisopropyl) Ether	0.006	--	0.006	0.006
Bis(2-Ethylhexyl) Phthalate	0.090	--	0.090	0.090
Caprolactam	0.055	--	0.055	0.055
Carbazole	0.37	30.5%	0.26	0.48
Dibenzofuran	0.032	33.5%	0.021	0.043
Diethyl Phthalate	0.025	--	0.025	0.025
Dimethyl Phthalate	0.003	--	0.003	0.003
Di-N-Butyl Phthalate	0.037	--	0.037	0.037
Di-N-Octylphthalate	0.049	--	0.049	0.049
Hexachlorobenzene	0.006	--	0.006	0.006
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.004	--	0.004	0.004
Hexachloroethane	0.004	--	0.004	0.004
Isophorone	0.004	--	0.004	0.004
Nitrobenzene	0.031	--	0.031	0.031
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.028	--	0.028	0.028
Pentachlorophenol	0.14	--	0.14	0.14
Phenol	0.026	--	0.026	0.026

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-010			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-010-SO-0.5-2			
Sample Date	5/21/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	19,800	4.58%	18,894	20,706
Antimony	0.085	70.4%	0.025	0.14
Arsenic	5.50	7.46%	5.09	5.91
Barium	121	9.24%	110	132
Beryllium	0.62	4.90%	0.59	0.65
Cadmium	0.080	6.03%	0.075	0.085
Chromium, Total	15.1	7.75%	13.9	16.3
Chromium, Hexavalent	0.40	7.75%	0.37	0.44
Chromium, Trivalent	14.7	7.75%	13.6	15.8
Cobalt	5.70	1.99%	5.59	5.81
Copper	16.4	4.63%	15.6	17.2
Iron	18,500	2.40%	18,056	18,944
Lead	53.1	3.33%	51.3	54.9
Manganese	455	7.15%	422	488
Mercury	0.032	27.4%	0.023	0.041
Nickel	13.6	6.58%	12.7	14.5
Selenium	0.53	19.1%	0.43	0.63
Silver	0.048	9.83%	0.043	0.053
Thallium	0.12	6.56%	0.11	0.13
Vanadium	13.7	3.31%	13.2	14.2
Zinc	51.0	5.42%	48.2	53.8
Other Inorganic Parameters (mg/kg)				
Cyanide	0.034	32.7%	0.023	0.044
Fluoride	46.4	28.8%	33.0	59.8
Essential Nutrients (mg/kg)				
Calcium	8,610	15.1%	7,306	9,914
Magnesium	11,900	2.18%	11,640	12,160
Potassium	1,090	6.91%	1,015	1,165
Sodium	76.1	21.1%	60.1	92.1
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-010			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-010-SO-0.5-2			
Sample Date	5/21/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.003	47.7%	0.002	0.005
Acenaphthene	0.015	80.9%	0.003	0.027
Acenaphthylene	0.001	62.8%	5.21E-04	0.002
Anthracene	0.029	82.4%	0.005	0.053
Fluoranthene	0.15	71.4%	0.043	0.26
Fluorene	0.013	74.2%	0.003	0.023
Naphthalene	0.008	28.9%	0.005	0.010
Phenanthrene	0.12	78.1%	0.026	0.21
Total LMW PAHs - 1/2MDL	0.34	74.3%	0.087	0.59
Total LMW PAHs - MDL	0.34	74.3%	0.087	0.59
Total LMW PAHs - Zero	0.34	74.3%	0.087	0.59
Benzo(A)Pyrene	0.089	67.2%	0.029	0.15
Benzo(A)Anthracene	0.084	68.8%	0.026	0.14
Benzo(B)Fluoranthene	0.11	60.1%	0.044	0.18
Benzo(G,H,I)Perylene	0.094	60.8%	0.037	0.15
Benzo(K)Fluoranthene	0.054	64.5%	0.019	0.089
Chrysene	0.10	62.9%	0.037	0.16
Dibenz(A,H)Anthracene	0.021	63.9%	0.008	0.034
Indeno(1,2,3-C,D)Pyrene	0.077	62.0%	0.029	0.12
Pyrene	0.15	72.7%	0.041	0.26
Total HMW PAHs - 1/2MDL	0.78	64.7%	0.27	1.28
Total HMW PAHs - MDL	0.78	64.7%	0.27	1.28
Total HMW PAHs - Zero	0.78	64.7%	0.27	1.28
Total PAHs - 1/2MDL	1.01	68.3%	0.32	1.69
Total PAHs - MDL	1.01	68.3%	0.32	1.69
Total PAHs - Zero	1.01	68.3%	0.32	1.69
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	6.00E-04	--	6.00E-04	6.00E-04
1,4-Dioxane (P-Dioxane)	0.005	--	0.005	0.005
2,3,4,6-Tetrachlorophenol	0.006	--	0.006	0.006
2,4,5-Trichlorophenol	0.001	--	0.001	0.001
2,4,6-Trichlorophenol	8.00E-04	--	8.00E-04	8.00E-04
2,4-Dichlorophenol	0.001	--	0.001	0.001
2,4-Dimethylphenol	9.00E-04	--	9.00E-04	9.00E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-010			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-010-SO-0.5-2			
Sample Date	5/21/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.039	--	0.039	0.039
2,4-Dinitrotoluene	7.00E-04	--	7.00E-04	7.00E-04
2,6-Dinitrotoluene	9.00E-04	--	9.00E-04	9.00E-04
2-Chloronaphthalene	6.50E-04	--	6.50E-04	6.50E-04
2-Chlorophenol	6.50E-04	--	6.50E-04	6.50E-04
2-Methylphenol (O-Cresol)	0.004	--	0.004	0.004
2-Nitroaniline	0.007	--	0.007	0.007
2-Nitrophenol	8.50E-04	--	8.50E-04	8.50E-04
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	0.014	--	0.014	0.014
3-Nitroaniline	0.004	--	0.004	0.004
4,6-Dinitro-2-Methylphenol	0.025	--	0.025	0.025
4-Bromophenyl Phenyl Ether	0.001	--	0.001	0.001
4-Chloro-3-Methylphenol	7.00E-04	--	7.00E-04	7.00E-04
4-Chloroaniline	4.80E-04	--	4.80E-04	4.80E-04
4-Chlorophenyl Phenyl Ether	9.00E-04	--	9.00E-04	9.00E-04
4-Nitroaniline	7.00E-04	--	7.00E-04	7.00E-04
4-Nitrophenol	0.010	--	0.010	0.010
Acetophenone	0.028	41.1%	0.016	0.040
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.010	--	0.010	0.010
Benzyl Butyl Phthalate	0.010	32.7%	0.007	0.013
Biphenyl (Diphenyl)	0.001	98.2%	2.34E-05	0.003
Bis(2-Chloroethoxy) Methane	7.00E-04	--	7.00E-04	7.00E-04
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	5.00E-04	--	5.00E-04	5.00E-04
Bis(2-Chloroisopropyl) Ether	0.001	--	0.001	0.001
Bis(2-Ethylhexyl) Phthalate	0.016	--	0.016	0.016
Caprolactam	0.010	--	0.010	0.010
Carbazole	0.023	76.1%	0.005	0.041
Dibenzofuran	0.008	70.0%	0.002	0.013
Diethyl Phthalate	0.014	--	0.014	0.014
Dimethyl Phthalate	5.00E-04	--	5.00E-04	5.00E-04
Di-N-Butyl Phthalate	0.007	--	0.007	0.007
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.001	--	0.001	0.001
Hexachlorobutadiene	8.50E-04	--	8.50E-04	8.50E-04
Hexachlorocyclopentadiene	7.50E-04	--	7.50E-04	7.50E-04
Hexachloroethane	7.50E-04	--	7.50E-04	7.50E-04
Isophorone	0.010	32.5%	0.006	0.013
Nitrobenzene	0.006	--	0.006	0.006
N-Nitrosodi-N-Propylamine	0.001	--	0.001	0.001
N-Nitrosodiphenylamine	0.005	--	0.005	0.005
Pentachlorophenol	0.023	--	0.023	0.023
Phenol	0.004	--	0.004	0.004

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-012			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-012-0.0-0.5			
Sample Date	5/18/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	17,300	4.68%	16,490	18,110
Antimony	0.18	28.1%	0.13	0.23
Arsenic	4.50	13.8%	3.88	5.12
Barium	81.2	4.03%	77.9	84.5
Beryllium	0.59	6.32%	0.55	0.63
Cadmium	0.32	15.0%	0.27	0.37
Chromium, Total	18.9	10.6%	16.9	20.9
Chromium, Hexavalent	0.51	10.6%	0.45	0.56
Chromium, Trivalent	18.4	10.6%	16.5	20.3
Cobalt	6.10	3.51%	5.89	6.31
Copper	22.7	12.3%	19.9	25.5
Iron	15,500	3.40%	14,973	16,027
Lead	20.1	48.5%	10.3	29.9
Manganese	383	5.63%	361	405
Mercury	0.011	54.9%	0.005	0.016
Nickel	33.2	14.5%	28.4	38.0
Selenium	0.30	20.0%	0.24	0.36
Silver	0.063	9.03%	0.057	0.069
Thallium	0.076	14.4%	0.065	0.087
Vanadium	16.3	9.21%	14.8	17.8
Zinc	67.9	12.7%	59.3	76.5
Other Inorganic Parameters (mg/kg)				
Cyanide	0.13	40.2%	0.078	0.18
Fluoride	80.2	20.5%	63.7	96.7
Essential Nutrients (mg/kg)				
Calcium	20,700	10.7%	18,492	22,908
Magnesium	10,800	2.82%	10,495	11,105
Potassium	1,040	6.24%	975	1,105
Sodium	118	30.7%	81.7	154
Pesticides (mg/kg)				
Aldrin	5.00E-04	--	5.00E-04	5.00E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.50E-04	--	3.50E-04	3.50E-04
Alpha Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.85E-04	--	3.85E-04	3.85E-04
Beta Endosulfan	9.00E-04	--	9.00E-04	9.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	2.10E-04	--	2.10E-04	2.10E-04
Dieldrin	4.45E-04	--	4.45E-04	4.45E-04
Endosulfan Sulfate	4.30E-04	--	4.30E-04	4.30E-04
Endrin	4.90E-04	--	4.90E-04	4.90E-04
Endrin Aldehyde	8.00E-04	--	8.00E-04	8.00E-04
Endrin Ketone	6.50E-04	--	6.50E-04	6.50E-04
Gamma Bhc (Lindane)	3.15E-04	--	3.15E-04	3.15E-04
Heptachlor	4.05E-04	--	4.05E-04	4.05E-04
Heptachlor Epoxide	5.00E-04	--	5.00E-04	5.00E-04
Methoxychlor	8.00E-04	--	8.00E-04	8.00E-04
P,P'-DDD	6.00E-04	--	6.00E-04	6.00E-04
P,P'-DDE	4.05E-04	--	4.05E-04	4.05E-04
P,P'-DDT	6.50E-04	--	6.50E-04	6.50E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-012			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-012-0.0-0.5			
Sample Date	5/18/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.013	--	0.013	0.013
trans-Chlordane	6.00E-04	--	6.00E-04	6.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.061	140%	-2.41E-02	0.15
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.061	140%	-2.41E-02	0.15
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.27	47.1%	0.14	0.40
Acenaphthene	1.50	42.0%	0.87	2.13
Acenaphthylene	0.10	36.1%	0.064	0.14
Anthracene	3.00	37.7%	1.87	4.13
Fluoranthene	16.0	37.3%	10.0	22.0
Fluorene	1.10	34.6%	0.72	1.48
Naphthalene	0.49	44.9%	0.27	0.71
Phenanthrene	12.0	31.0%	8.28	15.7
Total LMW PAHs - 1/2MDL	34.5	35.8%	22.1	46.8
Total LMW PAHs - MDL	34.5	35.8%	22.1	46.8
Total LMW PAHs - Zero	34.5	35.9%	22.1	46.8
Benzo(A)Pyrene	9.80	36.1%	6.26	13.3
Benzo(A)Anthracene	9.70	32.0%	6.59	12.8
Benzo(B)Fluoranthene	13.0	29.8%	9.12	16.9
Benzo(G,H,I)Perylene	9.20	30.8%	6.37	12.0
Benzo(K)Fluoranthene	4.30	31.3%	2.95	5.65
Chrysene	12.0	35.9%	7.69	16.3
Dibenz(A,H)Anthracene	2.40	39.8%	1.44	3.36
Indeno(1,2,3-C,D)Pyrene	7.60	31.1%	5.23	9.97
Pyrene	17.0	39.3%	10.3	23.7
Total HMW PAHs - 1/2MDL	85.0	26.8%	62.2	108
Total HMW PAHs - MDL	85.0	26.8%	62.2	108
Total HMW PAHs - Zero	85.0	26.8%	62.2	108
Total PAHs - 1/2MDL	106	29.6%	74.8	138
Total PAHs - MDL	106	29.5%	74.8	138
Total PAHs - Zero	106	29.6%	74.8	138
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.018	--	0.018	0.018
1,4-Dioxane (P-Dioxane)	0.13	--	0.13	0.13
2,3,4,6-Tetrachlorophenol	0.18	--	0.18	0.18
2,4,5-Trichlorophenol	0.030	--	0.030	0.030
2,4,6-Trichlorophenol	0.023	--	0.023	0.023
2,4-Dichlorophenol	0.033	--	0.033	0.033
2,4-Dimethylphenol	0.026	--	0.026	0.026

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-012			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-012-0.0-0.5			
Sample Date	5/18/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	1.15	--	1.15	1.15
2,4-Dinitrotoluene	0.021	--	0.021	0.021
2,6-Dinitrotoluene	0.026	--	0.026	0.026
2-Chloronaphthalene	0.020	--	0.020	0.020
2-Chlorophenol	0.020	--	0.020	0.020
2-Methylphenol (O-Cresol)	0.12	--	0.12	0.12
2-Nitroaniline	0.19	--	0.19	0.19
2-Nitrophenol	0.024	--	0.024	0.024
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	0.40	--	0.40	0.40
3-Nitroaniline	0.11	--	0.11	0.11
4,6-Dinitro-2-Methylphenol	0.75	--	0.75	0.75
4-Bromophenyl Phenyl Ether	0.030	--	0.030	0.030
4-Chloro-3-Methylphenol	0.020	--	0.020	0.020
4-Chloroaniline	0.014	--	0.014	0.014
4-Chlorophenyl Phenyl Ether	0.026	--	0.026	0.026
4-Nitroaniline	0.021	--	0.021	0.021
4-Nitrophenol	0.30	--	0.30	0.30
Acetophenone	0.023	44.4%	0.013	0.033
Atrazine	0.19	--	0.19	0.19
Benzaldehyde	0.050	--	0.050	0.050
Benzyl Butyl Phthalate	0.29	--	0.29	0.29
Biphenyl (Diphenyl)	0.063	49.7%	0.032	0.094
Bis(2-Chloroethoxy) Methane	0.020	--	0.020	0.020
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.016	--	0.016	0.016
Bis(2-Chloroisopropyl) Ether	0.031	--	0.031	0.031
Bis(2-Ethylhexyl) Phthalate	0.45	--	0.45	0.45
Caprolactam	0.28	--	0.28	0.28
Carbazole	2.20	30.5%	1.53	2.87
Dibenzofuran	0.64	33.5%	0.43	0.85
Diethyl Phthalate	0.13	--	0.13	0.13
Dimethyl Phthalate	0.016	--	0.016	0.016
Di-N-Butyl Phthalate	0.19	--	0.19	0.19
Di-N-Octylphthalate	0.25	--	0.25	0.25
Hexachlorobenzene	0.030	--	0.030	0.030
Hexachlorobutadiene	0.025	--	0.025	0.025
Hexachlorocyclopentadiene	0.022	--	0.022	0.022
Hexachloroethane	0.022	--	0.022	0.022
Isophorone	0.022	--	0.022	0.022
Nitrobenzene	0.16	--	0.16	0.16
N-Nitrosodi-N-Propylamine	0.029	--	0.029	0.029
N-Nitrosodiphenylamine	0.14	--	0.14	0.14
Pentachlorophenol	0.70	--	0.70	0.70
Phenol	0.13	--	0.13	0.13

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-012			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-012-0.5-2			
Sample Date	5/18/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	11,900	4.58%	11,356	12,444
Antimony	0.085	70.4%	0.025	0.14
Arsenic	4.70	7.46%	4.35	5.05
Barium	102	9.24%	92.6	111
Beryllium	0.47	4.90%	0.45	0.49
Cadmium	0.090	6.03%	0.085	0.095
Chromium, Total	16.8	7.75%	15.5	18.1
Chromium, Hexavalent	0.45	7.75%	0.41	0.48
Chromium, Trivalent	16.4	7.75%	15.1	17.6
Cobalt	6.00	1.99%	5.88	6.12
Copper	19.1	4.63%	18.2	20.0
Iron	15,700	2.40%	15,323	16,077
Lead	10.7	3.33%	10.3	11.1
Manganese	448	7.15%	416	480
Mercury	0.021	27.4%	0.015	0.027
Nickel	13.9	6.58%	13.0	14.8
Selenium	0.18	19.1%	0.15	0.21
Silver	0.059	9.83%	0.053	0.065
Thallium	0.070	6.56%	0.065	0.075
Vanadium	11.3	3.31%	10.9	11.7
Zinc	64.1	5.42%	60.6	67.6
Other Inorganic Parameters (mg/kg)				
Cyanide	0.15	32.7%	0.10	0.20
Fluoride	47.9	28.8%	34.1	61.7
Essential Nutrients (mg/kg)				
Calcium	26,100	15.1%	22,148	30,052
Magnesium	11,600	2.18%	11,347	11,853
Potassium	918	6.91%	855	981
Sodium	35.1	21.1%	27.7	42.4
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-012			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-012-0.5-2			
Sample Date	5/18/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.20	29.2%	0.14	0.26
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.20	29.2%	0.14	0.26
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	1.10	47.7%	0.58	1.62
Acenaphthene	4.90	80.9%	0.93	8.87
Acenaphthylene	0.17	62.8%	0.063	0.28
Anthracene	9.00	82.4%	1.59	16.4
Fluoranthene	43.0	71.4%	12.3	73.7
Fluorene	4.10	74.2%	1.06	7.14
Naphthalene	2.00	28.9%	1.42	2.58
Phenanthrene	40.0	78.1%	8.76	71.2
Total LMW PAHs - 1/2MDL	104	74.3%	26.8	182
Total LMW PAHs - MDL	104	74.3%	26.8	182
Total LMW PAHs - Zero	104	74.3%	26.8	182
Benzo(A)Pyrene	23.0	67.2%	7.54	38.5
Benzo(A)Anthracene	22.0	68.8%	6.87	37.1
Benzo(B)Fluoranthene	31.0	60.1%	12.4	49.6
Benzo(G,H,I)Perylene	17.0	60.8%	6.67	27.3
Benzo(K)Fluoranthene	8.10	64.5%	2.87	13.3
Chrysene	25.0	62.9%	9.27	40.7
Dibenz(A,H)Anthracene	4.00	63.9%	1.45	6.55
Indeno(1,2,3-C,D)Pyrene	14.0	62.0%	5.31	22.7
Pyrene	40.0	72.7%	10.9	69.1
Total HMW PAHs - 1/2MDL	184	64.7%	65.0	303
Total HMW PAHs - MDL	184	64.7%	65.0	303
Total HMW PAHs - Zero	184	64.7%	65.0	303
Total PAHs - 1/2MDL	256	68.3%	81.2	431
Total PAHs - MDL	256	68.3%	81.2	431
Total PAHs - Zero	256	68.3%	81.1	431
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.019	--	0.019	0.019
1,4-Dioxane (P-Dioxane)	0.13	--	0.13	0.13
2,3,4,6-Tetrachlorophenol	0.18	--	0.18	0.18
2,4,5-Trichlorophenol	0.030	--	0.030	0.030
2,4,6-Trichlorophenol	0.023	--	0.023	0.023
2,4-Dichlorophenol	0.033	--	0.033	0.033
2,4-Dimethylphenol	0.027	--	0.027	0.027

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-012			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-012-0.5-2			
Sample Date	5/18/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	1.15	--	1.15	1.15
2,4-Dinitrotoluene	0.021	--	0.021	0.021
2,6-Dinitrotoluene	0.026	--	0.026	0.026
2-Chloronaphthalene	0.020	--	0.020	0.020
2-Chlorophenol	0.020	--	0.020	0.020
2-Methylphenol (O-Cresol)	0.12	--	0.12	0.12
2-Nitroaniline	0.20	--	0.20	0.20
2-Nitrophenol	0.024	--	0.024	0.024
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	0.40	--	0.40	0.40
3-Nitroaniline	0.11	--	0.11	0.11
4,6-Dinitro-2-Methylphenol	0.75	--	0.75	0.75
4-Bromophenyl Phenyl Ether	0.030	--	0.030	0.030
4-Chloro-3-Methylphenol	0.020	--	0.020	0.020
4-Chloroaniline	0.014	--	0.014	0.014
4-Chlorophenyl Phenyl Ether	0.026	--	0.026	0.026
4-Nitroaniline	0.021	--	0.021	0.021
4-Nitrophenol	0.30	--	0.30	0.30
Acetophenone	0.023	41.1%	0.014	0.032
Atrazine	0.19	--	0.19	0.19
Benzaldehyde	0.055	--	0.055	0.055
Benzyl Butyl Phthalate	0.29	32.7%	0.20	0.38
Biphenyl (Diphenyl)	0.25	98.2%	0.004	0.50
Bis(2-Chloroethoxy) Methane	0.020	--	0.020	0.020
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.016	--	0.016	0.016
Bis(2-Chloroisopropyl) Ether	0.032	--	0.032	0.032
Bis(2-Ethylhexyl) Phthalate	0.45	--	0.45	0.45
Caprolactam	0.28	--	0.28	0.28
Carbazole	5.20	76.1%	1.24	9.16
Dibenzofuran	2.30	70.0%	0.69	3.91
Diethyl Phthalate	0.13	--	0.13	0.13
Dimethyl Phthalate	0.016	--	0.016	0.016
Di-N-Butyl Phthalate	0.19	--	0.19	0.19
Di-N-Octylphthalate	0.25	--	0.25	0.25
Hexachlorobenzene	0.031	--	0.031	0.031
Hexachlorobutadiene	0.025	--	0.025	0.025
Hexachlorocyclopentadiene	0.022	--	0.022	0.022
Hexachloroethane	0.022	--	0.022	0.022
Isophorone	0.022	32.5%	0.015	0.028
Nitrobenzene	0.16	--	0.16	0.16
N-Nitrosodi-N-Propylamine	0.029	--	0.029	0.029
N-Nitrosodiphenylamine	0.14	--	0.14	0.14
Pentachlorophenol	0.70	--	0.70	0.70
Phenol	0.13	--	0.13	0.13

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-013			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-013-SO-0-0.5			
Sample Date	5/17/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	25,200	4.68%	24,020	26,380
Antimony	1.10	28.1%	0.79	1.41
Arsenic	5.50	13.8%	4.74	6.26
Barium	99.3	4.03%	95.3	103
Beryllium	1.00	6.32%	0.94	1.06
Cadmium	0.51	15.0%	0.43	0.59
Chromium, Total	25.0	10.6%	22.4	27.6
Chromium, Hexavalent	0.67	10.6%	0.60	0.74
Chromium, Trivalent	24.3	10.6%	21.8	26.9
Cobalt	6.20	3.51%	5.98	6.42
Copper	44.8	12.3%	39.3	50.3
Iron	19,500	3.40%	18,837	20,163
Lead	35.9	48.5%	18.5	53.3
Manganese	403	5.63%	380	426
Mercury	0.032	54.9%	0.014	0.050
Nickel	37.2	14.5%	31.8	42.6
Selenium	0.35	20.0%	0.28	0.42
Silver	0.11	9.03%	0.10	0.12
Thallium	0.10	14.4%	0.086	0.11
Vanadium	22.6	9.21%	20.5	24.7
Zinc	88.4	12.7%	77.2	99.6
Other Inorganic Parameters (mg/kg)				
Cyanide	0.51	40.2%	0.30	0.72
Fluoride	251	20.5%	199	303
Essential Nutrients (mg/kg)				
Calcium	24,700	10.7%	22,065	27,335
Magnesium	9,970	2.82%	9,689	10,251
Potassium	1,530	6.24%	1,434	1,626
Sodium	701	30.7%	486	916
Pesticides (mg/kg)				
Aldrin	5.00E-04	--	5.00E-04	5.00E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.45E-04	--	3.45E-04	3.45E-04
Alpha Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.80E-04	--	3.80E-04	3.80E-04
Beta Endosulfan	9.00E-04	--	9.00E-04	9.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	2.10E-04	--	2.10E-04	2.10E-04
Dieldrin	4.45E-04	--	4.45E-04	4.45E-04
Endosulfan Sulfate	4.25E-04	--	4.25E-04	4.25E-04
Endrin	4.90E-04	--	4.90E-04	4.90E-04
Endrin Aldehyde	8.00E-04	--	8.00E-04	8.00E-04
Endrin Ketone	6.50E-04	--	6.50E-04	6.50E-04
Gamma Bhc (Lindane)	3.15E-04	--	3.15E-04	3.15E-04
Heptachlor	4.00E-04	--	4.00E-04	4.00E-04
Heptachlor Epoxide	5.00E-04	--	5.00E-04	5.00E-04
Methoxychlor	8.00E-04	--	8.00E-04	8.00E-04
P,P'-DDD	6.00E-04	--	6.00E-04	6.00E-04
P,P'-DDE	4.00E-04	--	4.00E-04	4.00E-04
P,P'-DDT	6.50E-04	--	6.50E-04	6.50E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-013			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-013-SO-0-0.5			
Sample Date	5/17/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.013	--	0.013	0.013
trans-Chlordane	6.00E-04	--	6.00E-04	6.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.27	140%	-1.07E-01	0.65
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.27	140%	-1.07E-01	0.65
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	9.10	47.1%	4.82	13.4
Acenaphthene	38.0	42.0%	22.0	54.0
Acenaphthylene	3.00	36.1%	1.92	4.08
Anthracene	71.0	37.7%	44.3	97.7
Fluoranthene	300	37.3%	188	412
Fluorene	31.0	34.6%	20.3	41.7
Naphthalene	17.0	44.9%	9.36	24.6
Phenanthrene	270	31.0%	186	354
Total LMW PAHs - 1/2MDL	739	35.8%	474	1,004
Total LMW PAHs - MDL	739	35.8%	475	1,004
Total LMW PAHs - Zero	739	35.9%	474	1,004
Benzo(A)Pyrene	130	36.1%	83.0	177
Benzo(A)Anthracene	140	32.0%	95.1	185
Benzo(B)Fluoranthene	150	29.8%	105	195
Benzo(G,H,I)Perylene	100	30.8%	69.2	131
Benzo(K)Fluoranthene	51.0	31.3%	35.0	67.0
Chrysene	160	35.9%	103	217
Dibenz(A,H)Anthracene	25.0	39.8%	15.0	35.0
Indeno(1,2,3-C,D)Pyrene	85.0	31.1%	58.5	111
Pyrene	290	39.3%	176	404
Total HMW PAHs - 1/2MDL	1,131	26.8%	828	1,434
Total HMW PAHs - MDL	1,131	26.8%	828	1,434
Total HMW PAHs - Zero	1,131	26.8%	828	1,434
Total PAHs - 1/2MDL	1,711	29.6%	1,205	2,217
Total PAHs - MDL	1,711	29.5%	1,205	2,217
Total PAHs - Zero	1,711	29.6%	1,205	2,217
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.070	--	0.070	0.070
1,4-Dioxane (P-Dioxane)	0.50	--	0.50	0.50
2,3,4,6-Tetrachlorophenol	0.70	--	0.70	0.70
2,4,5-Trichlorophenol	0.12	--	0.12	0.12
2,4,6-Trichlorophenol	0.090	--	0.090	0.090
2,4-Dichlorophenol	0.13	--	0.13	0.13
2,4-Dimethylphenol	0.25	--	0.25	0.25

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-013			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-013-SO-0-0.5			
Sample Date	5/17/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	4.45	--	4.45	4.45
2,4-Dinitrotoluene	0.080	--	0.080	0.080
2,6-Dinitrotoluene	0.10	--	0.10	0.10
2-Chloronaphthalene	0.075	--	0.075	0.075
2-Chlorophenol	0.075	--	0.075	0.075
2-Methylphenol (O-Cresol)	0.48	--	0.48	0.48
2-Nitroaniline	0.75	--	0.75	0.75
2-Nitrophenol	0.095	--	0.095	0.095
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	1.55	--	1.55	1.55
3-Nitroaniline	0.42	--	0.42	0.42
4,6-Dinitro-2-Methylphenol	2.85	--	2.85	2.85
4-Bromophenyl Phenyl Ether	0.12	--	0.12	0.12
4-Chloro-3-Methylphenol	0.080	--	0.080	0.080
4-Chloroaniline	0.055	--	0.055	0.055
4-Chlorophenyl Phenyl Ether	0.10	--	0.10	0.10
4-Nitroaniline	0.080	--	0.080	0.080
4-Nitrophenol	1.15	--	1.15	1.15
Acetophenone	0.090	44.4%	0.050	0.13
Atrazine	0.70	--	0.70	0.70
Benzaldehyde	0.21	--	0.21	0.21
Benzyl Butyl Phthalate	1.15	--	1.15	1.15
Biphenyl (Diphenyl)	2.10	49.7%	1.06	3.14
Bis(2-Chloroethoxy) Methane	0.080	--	0.080	0.080
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.060	--	0.060	0.060
Bis(2-Chloroisopropyl) Ether	0.13	--	0.13	0.13
Bis(2-Ethylhexyl) Phthalate	1.75	--	1.75	1.75
Caprolactam	1.10	--	1.10	1.10
Carbazole	38.0	30.5%	26.4	49.6
Dibenzofuran	17.0	33.5%	11.3	22.7
Diethyl Phthalate	0.50	--	0.50	0.50
Dimethyl Phthalate	0.060	--	0.060	0.060
Di-N-Butyl Phthalate	0.70	--	0.70	0.70
Di-N-Octylphthalate	0.95	--	0.95	0.95
Hexachlorobenzene	0.12	--	0.12	0.12
Hexachlorobutadiene	0.095	--	0.095	0.095
Hexachlorocyclopentadiene	0.085	--	0.085	0.085
Hexachloroethane	0.085	--	0.085	0.085
Isophorone	0.085	--	0.085	0.085
Nitrobenzene	0.60	--	0.60	0.60
N-Nitrosodi-N-Propylamine	0.11	--	0.11	0.11
N-Nitrosodiphenylamine	0.55	--	0.55	0.55
Pentachlorophenol	2.65	--	2.65	2.65
Phenol	0.50	--	0.50	0.50

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-013			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-013-SO-0.5-2			
Sample Date	5/17/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	27,300	4.58%	26,051	28,549
Antimony	0.62	70.4%	0.18	1.06
Arsenic	6.80	7.46%	6.29	7.31
Barium	115	9.24%	104	126
Beryllium	2.10	4.90%	2.00	2.20
Cadmium	0.87	6.03%	0.82	0.92
Chromium, Total	48.5	7.75%	44.7	52.3
Chromium, Hexavalent	1.30	7.75%	1.20	1.40
Chromium, Trivalent	47.2	7.75%	43.5	50.9
Cobalt	7.70	1.99%	7.55	7.85
Copper	105	4.63%	100	110
Iron	27,100	2.40%	26,449	27,751
Lead	56.0	3.33%	54.1	57.9
Manganese	518	7.15%	481	555
Mercury	0.034	27.4%	0.025	0.043
Nickel	62.3	6.58%	58.2	66.4
Selenium	0.43	19.1%	0.35	0.51
Silver	0.095	9.83%	0.086	0.10
Thallium	0.15	6.56%	0.14	0.16
Vanadium	54.1	3.31%	52.3	55.9
Zinc	97.4	5.42%	92.1	103
Other Inorganic Parameters (mg/kg)				
Cyanide	0.39	32.7%	0.26	0.52
Fluoride	576	28.8%	410	742
Essential Nutrients (mg/kg)				
Calcium	25,600	15.1%	21,724	29,476
Magnesium	10,200	2.18%	9,978	10,422
Potassium	2,000	6.91%	1,862	2,138
Sodium	2,360	21.1%	1,863	2,857
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-013			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-013-SO-0.5-2			
Sample Date	5/17/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.64	29.2%	0.45	0.83
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.64	29.2%	0.45	0.83
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	27.0	47.7%	14.1	39.9
Acenaphthene	110	80.9%	21.0	199
Acenaphthylene	3.10	62.8%	1.15	5.05
Anthracene	150	82.4%	26.4	274
Fluoranthene	440	71.4%	126	754
Fluorene	94.0	74.2%	24.3	164
Naphthalene	68.0	28.9%	48.4	87.6
Phenanthrene	450	78.1%	98.5	801
Total LMW PAHs - 1/2MDL	1,342	74.3%	345	2,339
Total LMW PAHs - MDL	1,342	74.3%	345	2,339
Total LMW PAHs - Zero	1,342	74.3%	345	2,339
Benzo(A)Pyrene	240	67.2%	78.6	401
Benzo(A)Anthracene	240	68.8%	74.9	405
Benzo(B)Fluoranthene	270	60.1%	108	432
Benzo(G,H,I)Perylene	220	60.8%	86.3	354
Benzo(K)Fluoranthene	130	64.5%	46.1	214
Chrysene	250	62.9%	92.7	407
Dibenz(A,H)Anthracene	51.0	63.9%	18.4	83.6
Indeno(1,2,3-C,D)Pyrene	170	62.0%	64.5	275
Pyrene	410	72.7%	112	708
Total HMW PAHs - 1/2MDL	1,981	64.7%	699	3,263
Total HMW PAHs - MDL	1,981	64.7%	699	3,263
Total HMW PAHs - Zero	1,981	64.7%	699	3,263
Total PAHs - 1/2MDL	3,026	68.3%	958	5,094
Total PAHs - MDL	3,026	68.3%	959	5,094
Total PAHs - Zero	3,026	68.3%	958	5,094
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.15	--	0.15	0.15
1,4-Dioxane (P-Dioxane)	1.05	--	1.05	1.05
2,3,4,6-Tetrachlorophenol	1.40	--	1.40	1.40
2,4,5-Trichlorophenol	0.24	--	0.24	0.24
2,4,6-Trichlorophenol	0.19	--	0.19	0.19
2,4-Dichlorophenol	0.26	--	0.26	0.26
2,4-Dimethylphenol	0.71	--	0.71	0.71

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-013			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-013-SO-0.5-2			
Sample Date	5/17/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	9.00	--	9.00	9.00
2,4-Dinitrotoluene	0.17	--	0.17	0.17
2,6-Dinitrotoluene	0.21	--	0.21	0.21
2-Chloronaphthalene	0.16	--	0.16	0.16
2-Chlorophenol	0.16	--	0.16	0.16
2-Methylphenol (O-Cresol)	0.95	--	0.95	0.95
2-Nitroaniline	1.50	--	1.50	1.50
2-Nitrophenol	0.19	--	0.19	0.19
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	3.10	--	3.10	3.10
3-Nitroaniline	0.85	--	0.85	0.85
4,6-Dinitro-2-Methylphenol	5.50	--	5.50	5.50
4-Bromophenyl Phenyl Ether	0.24	--	0.24	0.24
4-Chloro-3-Methylphenol	0.16	--	0.16	0.16
4-Chloroaniline	0.11	--	0.11	0.11
4-Chlorophenyl Phenyl Ether	0.20	--	0.20	0.20
4-Nitroaniline	0.16	--	0.16	0.16
4-Nitrophenol	2.35	--	2.35	2.35
Acetophenone	0.18	41.1%	0.11	0.25
Atrazine	1.45	--	1.45	1.45
Benzaldehyde	0.42	--	0.42	0.42
Benzyl Butyl Phthalate	2.30	32.7%	1.55	3.05
Biphenyl (Diphenyl)	7.10	98.2%	0.13	14.1
Bis(2-Chloroethoxy) Methane	0.16	--	0.16	0.16
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.12	--	0.12	0.12
Bis(2-Chloroisopropyl) Ether	0.25	--	0.25	0.25
Bis(2-Ethylhexyl) Phthalate	3.55	--	3.55	3.55
Caprolactam	2.15	--	2.15	2.15
Carbazole	78.0	76.1%	18.6	137
Dibenzofuran	55.0	70.0%	16.5	93.5
Diethyl Phthalate	1.00	--	1.00	1.00
Dimethyl Phthalate	0.12	--	0.12	0.12
Di-N-Butyl Phthalate	1.45	--	1.45	1.45
Di-N-Octylphthalate	1.95	--	1.95	1.95
Hexachlorobenzene	0.24	--	0.24	0.24
Hexachlorobutadiene	0.20	--	0.20	0.20
Hexachlorocyclopentadiene	0.17	--	0.17	0.17
Hexachloroethane	0.17	--	0.17	0.17
Isophorone	0.17	32.5%	0.11	0.23
Nitrobenzene	1.20	--	1.20	1.20
N-Nitrosodi-N-Propylamine	0.23	--	0.23	0.23
N-Nitrosodiphenylamine	1.10	--	1.10	1.10
Pentachlorophenol	5.50	--	5.50	5.50
Phenol	1.00	--	1.00	1.00

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-014			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-014-SO-0-0.5			
Sample Date	5/16/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	26,000	4.68%	24,783	27,217
Antimony	0.47	28.1%	0.34	0.60
Arsenic	6.60	13.8%	5.69	7.51
Barium	129	4.03%	124	134
Beryllium	0.85	6.32%	0.80	0.90
Cadmium	0.40	15.0%	0.34	0.46
Chromium, Total	36.8	10.6%	32.9	40.7
Chromium, Hexavalent	0.98	10.6%	0.88	1.09
Chromium, Trivalent	35.8	10.6%	32.0	39.6
Cobalt	7.30	3.51%	7.04	7.56
Copper	65.9	12.3%	57.8	74.0
Iron	30,500	3.40%	29,463	31,537
Lead	216	48.5%	111	321
Manganese	545	5.63%	514	576
Mercury	0.025	54.9%	0.011	0.039
Nickel	56.1	14.5%	48.0	64.2
Selenium	1.60	20.0%	1.28	1.92
Silver	0.080	9.03%	0.073	0.087
Thallium	0.12	14.4%	0.10	0.14
Vanadium	24.0	9.21%	21.8	26.2
Zinc	85.5	12.7%	74.6	96.4
Other Inorganic Parameters (mg/kg)				
Cyanide	1.50	40.2%	0.90	2.10
Fluoride	584	20.5%	464	704
Essential Nutrients (mg/kg)				
Calcium	20,300	10.7%	18,135	22,465
Magnesium	9,980	2.82%	9,699	10,261
Potassium	1,630	6.24%	1,528	1,732
Sodium	2,060	30.7%	1,427	2,693
Pesticides (mg/kg)				
Aldrin	5.00E-04	--	5.00E-04	5.00E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.45E-04	--	3.45E-04	3.45E-04
Alpha Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.85E-04	--	3.85E-04	3.85E-04
Beta Endosulfan	9.00E-04	--	9.00E-04	9.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	2.10E-04	--	2.10E-04	2.10E-04
Dieldrin	4.45E-04	--	4.45E-04	4.45E-04
Endosulfan Sulfate	4.30E-04	--	4.30E-04	4.30E-04
Endrin	4.90E-04	--	4.90E-04	4.90E-04
Endrin Aldehyde	8.00E-04	--	8.00E-04	8.00E-04
Endrin Ketone	6.50E-04	--	6.50E-04	6.50E-04
Gamma Bhc (Lindane)	3.15E-04	--	3.15E-04	3.15E-04
Heptachlor	4.05E-04	--	4.05E-04	4.05E-04
Heptachlor Epoxide	5.00E-04	--	5.00E-04	5.00E-04
Methoxychlor	8.00E-04	--	8.00E-04	8.00E-04
P,P'-DDD	6.00E-04	--	6.00E-04	6.00E-04
P,P'-DDE	4.05E-04	--	4.05E-04	4.05E-04
P,P'-DDT	6.50E-04	--	6.50E-04	6.50E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-014			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-014-SO-0-0.5			
Sample Date	5/16/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.013	--	0.013	0.013
trans-Chlordane	6.00E-04	--	6.00E-04	6.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.20	--	0.20	0.20
PCB-1254 (Aroclor 1254)	0.005	140%	-1.86E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.20	140%	-7.92E-02	0.48
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.099	47.1%	0.052	0.15
Acenaphthene	0.69	42.0%	0.40	0.98
Acenaphthylene	0.042	36.1%	0.027	0.057
Anthracene	1.00	37.7%	0.62	1.38
Fluoranthene	6.10	37.3%	3.82	8.38
Fluorene	0.50	34.6%	0.33	0.67
Naphthalene	0.22	44.9%	0.12	0.32
Phenanthrene	4.10	31.0%	2.83	5.37
Total LMW PAHs - 1/2MDL	12.8	35.8%	8.18	17.3
Total LMW PAHs - MDL	12.8	35.8%	8.19	17.3
Total LMW PAHs - Zero	12.8	35.9%	8.18	17.3
Benzo(A)Pyrene	3.50	36.1%	2.23	4.77
Benzo(A)Anthracene	3.90	32.0%	2.65	5.15
Benzo(B)Fluoranthene	7.30	29.8%	5.12	9.48
Benzo(G,H,I)Perylene	3.80	30.8%	2.63	4.97
Benzo(K)Fluoranthene	2.50	31.3%	1.72	3.28
Chrysene	6.70	35.9%	4.30	9.10
Dibenz(A,H)Anthracene	0.81	39.8%	0.49	1.13
Indeno(1,2,3-C,D)Pyrene	3.00	31.1%	2.07	3.93
Pyrene	6.80	39.3%	4.13	9.47
Total HMW PAHs - 1/2MDL	38.3	26.8%	28.0	48.6
Total HMW PAHs - MDL	38.3	26.8%	28.0	48.6
Total HMW PAHs - Zero	38.3	26.8%	28.0	48.6
Total PAHs - 1/2MDL	43.7	29.6%	30.8	56.6
Total PAHs - MDL	43.7	29.5%	30.8	56.6
Total PAHs - Zero	43.7	29.6%	30.8	56.6
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.018	--	0.018	0.018
1,4-Dioxane (P-Dioxane)	0.13	--	0.13	0.13
2,3,4,6-Tetrachlorophenol	0.18	--	0.18	0.18
2,4,5-Trichlorophenol	0.030	--	0.030	0.030
2,4,6-Trichlorophenol	0.023	--	0.023	0.023
2,4-Dichlorophenol	0.032	--	0.032	0.032
2,4-Dimethylphenol	0.026	--	0.026	0.026

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-014			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-014-SO-0-0.5			
Sample Date	5/16/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	1.10	--	1.10	1.10
2,4-Dinitrotoluene	0.021	--	0.021	0.021
2,6-Dinitrotoluene	0.026	--	0.026	0.026
2-Chloronaphthalene	0.019	--	0.019	0.019
2-Chlorophenol	0.020	--	0.020	0.020
2-Methylphenol (O-Cresol)	0.12	--	0.12	0.12
2-Nitroaniline	0.19	--	0.19	0.19
2-Nitrophenol	0.024	--	0.024	0.024
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	0.39	--	0.39	0.39
3-Nitroaniline	0.11	--	0.11	0.11
4,6-Dinitro-2-Methylphenol	0.70	--	0.70	0.70
4-Bromophenyl Phenyl Ether	0.029	--	0.029	0.029
4-Chloro-3-Methylphenol	0.020	--	0.020	0.020
4-Chloroaniline	0.014	--	0.014	0.014
4-Chlorophenyl Phenyl Ether	0.025	--	0.025	0.025
4-Nitroaniline	0.020	--	0.020	0.020
4-Nitrophenol	0.29	--	0.29	0.29
Acetophenone	0.023	44.4%	0.013	0.033
Atrazine	0.18	--	0.18	0.18
Benzaldehyde	0.050	--	0.050	0.050
Benzyl Butyl Phthalate	0.29	--	0.29	0.29
Biphenyl (Diphenyl)	0.018	49.7%	0.009	0.026
Bis(2-Chloroethoxy) Methane	0.020	--	0.020	0.020
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.015	--	0.015	0.015
Bis(2-Chloroisopropyl) Ether	0.031	--	0.031	0.031
Bis(2-Ethylhexyl) Phthalate	0.44	--	0.44	0.44
Caprolactam	0.27	--	0.27	0.27
Carbazole	0.53	30.5%	0.37	0.69
Dibenzofuran	0.23	33.5%	0.15	0.31
Diethyl Phthalate	0.13	--	0.13	0.13
Dimethyl Phthalate	0.015	--	0.015	0.015
Di-N-Butyl Phthalate	0.18	--	0.18	0.18
Di-N-Octylphthalate	0.24	--	0.24	0.24
Hexachlorobenzene	0.030	--	0.030	0.030
Hexachlorobutadiene	0.025	--	0.025	0.025
Hexachlorocyclopentadiene	0.021	--	0.021	0.021
Hexachloroethane	0.022	--	0.022	0.022
Isophorone	0.021	--	0.021	0.021
Nitrobenzene	0.15	--	0.15	0.15
N-Nitrosodi-N-Propylamine	0.028	--	0.028	0.028
N-Nitrosodiphenylamine	0.14	--	0.14	0.14
Pentachlorophenol	0.65	--	0.65	0.65
Phenol	0.13	--	0.13	0.13

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-014			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-014-SO-0.5-2			
Sample Date	5/16/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	21,500	4.58%	20,516	22,484
Antimony	0.22	70.4%	0.065	0.37
Arsenic	5.30	7.46%	4.90	5.70
Barium	150	9.24%	136	164
Beryllium	0.91	4.90%	0.87	0.95
Cadmium	0.16	6.03%	0.15	0.17
Chromium, Total	28.6	7.75%	26.4	30.8
Chromium, Hexavalent	0.77	7.75%	0.71	0.82
Chromium, Trivalent	27.8	7.75%	25.7	30.0
Cobalt	6.30	1.99%	6.17	6.43
Copper	18.3	4.63%	17.5	19.1
Iron	17,200	2.40%	16,787	17,613
Lead	17.9	3.33%	17.3	18.5
Manganese	481	7.15%	447	515
Mercury	0.024	27.4%	0.017	0.031
Nickel	26.7	6.58%	24.9	28.5
Selenium	0.27	19.1%	0.22	0.32
Silver	0.039	9.83%	0.035	0.043
Thallium	0.12	6.56%	0.11	0.13
Vanadium	17.5	3.31%	16.9	18.1
Zinc	73.5	5.42%	69.5	77.5
Other Inorganic Parameters (mg/kg)				
Cyanide	4.10	32.7%	2.76	5.44
Fluoride	763	28.8%	543	983
Essential Nutrients (mg/kg)				
Calcium	20,300	15.1%	17,226	23,374
Magnesium	11,200	2.18%	10,956	11,444
Potassium	2,320	6.91%	2,160	2,480
Sodium	3,640	21.1%	2,873	4,407
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-014			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-014-SO-0.5-2			
Sample Date	5/16/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.10	29.2%	0.071	0.13
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.10	29.2%	0.071	0.13
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.008	47.7%	0.004	0.012
Acenaphthene	0.041	80.9%	0.008	0.074
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.076	82.4%	0.013	0.14
Fluoranthene	0.51	71.4%	0.15	0.87
Fluorene	0.027	74.2%	0.007	0.047
Naphthalene	0.013	28.9%	0.009	0.017
Phenanthrene	0.35	78.1%	0.077	0.62
Total LMW PAHs - 1/2MDL	1.03	74.3%	0.26	1.79
Total LMW PAHs - MDL	1.03	74.3%	0.26	1.79
Total LMW PAHs - Zero	1.03	74.3%	0.26	1.79
Benzo(A)Pyrene	0.27	67.2%	0.088	0.45
Benzo(A)Anthracene	0.28	68.8%	0.087	0.47
Benzo(B)Fluoranthene	0.44	60.1%	0.18	0.70
Benzo(G,H,I)Perylene	0.34	60.8%	0.13	0.55
Benzo(K)Fluoranthene	0.24	64.5%	0.085	0.39
Chrysene	0.45	62.9%	0.17	0.73
Dibenz(A,H)Anthracene	0.070	63.9%	0.025	0.11
Indeno(1,2,3-C,D)Pyrene	0.25	62.0%	0.095	0.41
Pyrene	0.52	72.7%	0.14	0.90
Total HMW PAHs - 1/2MDL	2.86	64.7%	1.01	4.71
Total HMW PAHs - MDL	2.86	64.7%	1.01	4.71
Total HMW PAHs - Zero	2.86	64.7%	1.01	4.71
Total PAHs - 1/2MDL	3.44	68.3%	1.09	5.79
Total PAHs - MDL	3.44	68.3%	1.09	5.79
Total PAHs - Zero	3.44	68.3%	1.09	5.79
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.002	--	0.002	0.002
1,4-Dioxane (P-Dioxane)	0.011	--	0.011	0.011
2,3,4,6-Tetrachlorophenol	0.015	--	0.015	0.015
2,4,5-Trichlorophenol	0.003	--	0.003	0.003
2,4,6-Trichlorophenol	0.002	--	0.002	0.002
2,4-Dichlorophenol	0.003	--	0.003	0.003
2,4-Dimethylphenol	0.002	--	0.002	0.002

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-014			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-014-SO-0.5-2			
Sample Date	5/16/2018			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.095	--	0.095	0.095
2,4-Dinitrotoluene	0.002	--	0.002	0.002
2,6-Dinitrotoluene	0.002	--	0.002	0.002
2-Chloronaphthalene	0.002	--	0.002	0.002
2-Chlorophenol	0.002	--	0.002	0.002
2-Methylphenol (O-Cresol)	0.010	--	0.010	0.010
2-Nitroaniline	0.016	--	0.016	0.016
2-Nitrophenol	0.002	--	0.002	0.002
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	0.033	--	0.033	0.033
3-Nitroaniline	0.009	--	0.009	0.009
4,6-Dinitro-2-Methylphenol	0.060	--	0.060	0.060
4-Bromophenyl Phenyl Ether	0.002	--	0.002	0.002
4-Chloro-3-Methylphenol	0.002	--	0.002	0.002
4-Chloroaniline	0.001	--	0.001	0.001
4-Chlorophenyl Phenyl Ether	0.002	--	0.002	0.002
4-Nitroaniline	0.002	--	0.002	0.002
4-Nitrophenol	0.025	--	0.025	0.025
Acetophenone	0.002	41.1%	0.001	0.003
Atrazine	0.016	--	0.016	0.016
Benzaldehyde	0.004	--	0.004	0.004
Benzyl Butyl Phthalate	0.024	32.7%	0.016	0.032
Biphenyl (Diphenyl)	0.003	98.2%	5.76E-05	0.006
Bis(2-Chloroethoxy) Methane	0.002	--	0.002	0.002
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.001	--	0.001	0.001
Bis(2-Chloroisopropyl) Ether	0.003	--	0.003	0.003
Bis(2-Ethylhexyl) Phthalate	0.037	--	0.037	0.037
Caprolactam	0.023	--	0.023	0.023
Carbazole	0.057	76.1%	0.014	0.10
Dibenzofuran	0.018	70.0%	0.005	0.031
Diethyl Phthalate	0.011	--	0.011	0.011
Dimethyl Phthalate	0.001	--	0.001	0.001
Di-N-Butyl Phthalate	0.016	--	0.016	0.016
Di-N-Octylphthalate	0.021	--	0.021	0.021
Hexachlorobenzene	0.003	--	0.003	0.003
Hexachlorobutadiene	0.002	--	0.002	0.002
Hexachlorocyclopentadiene	0.002	--	0.002	0.002
Hexachloroethane	0.002	--	0.002	0.002
Isophorone	0.002	32.5%	0.001	0.002
Nitrobenzene	0.013	--	0.013	0.013
N-Nitrosodi-N-Propylamine	0.002	--	0.002	0.002
N-Nitrosodiphenylamine	0.012	--	0.012	0.012
Pentachlorophenol	0.055	--	0.055	0.055
Phenol	0.011	--	0.011	0.011

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-016			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-016-SO-0-0.5			
Sample Date	6/23/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	14,500	4.68%	13,821	15,179
Antimony	0.17	28.1%	0.12	0.22
Arsenic	5.10	13.8%	4.39	5.81
Barium	99.8	4.03%	95.8	104
Beryllium	0.59	6.32%	0.55	0.63
Cadmium	0.19	15.0%	0.16	0.22
Chromium, Total	18.3	10.6%	16.4	20.2
Chromium, Hexavalent	0.49	10.6%	0.44	0.54
Chromium, Trivalent	17.8	10.6%	15.9	19.7
Cobalt	6.10	3.51%	5.89	6.31
Copper	19.0	12.3%	16.7	21.3
Iron	16,000	3.40%	15,456	16,544
Lead	19.1	48.5%	9.83	28.4
Manganese	439	5.63%	414	464
Mercury	0.018	54.9%	0.008	0.028
Nickel	25.4	14.5%	21.7	29.1
Selenium	1.70	20.0%	1.36	2.04
Silver	0.055	9.03%	0.050	0.060
Thallium	0.091	14.4%	0.078	0.10
Vanadium	14.6	9.21%	13.3	15.9
Zinc	59.7	12.7%	52.1	67.3
Other Inorganic Parameters (mg/kg)				
Cyanide	0.12	40.2%	0.072	0.17
Fluoride	27.6	20.5%	21.9	33.3
Essential Nutrients (mg/kg)				
Calcium	16,900	10.7%	15,097	18,703
Magnesium	11,500	2.82%	11,176	11,824
Potassium	1,250	6.24%	1,172	1,328
Sodium	64.1	30.7%	44.4	83.8
Pesticides (mg/kg)				
Aldrin	3.95E-04	--	3.95E-04	3.95E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	2.95E-04	--	2.95E-04	2.95E-04
Alpha Endosulfan	4.50E-04	--	4.50E-04	4.50E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.15E-04	--	3.15E-04	3.15E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.55E-04	--	3.55E-04	3.55E-04
Dieldrin	4.25E-04	--	4.25E-04	4.25E-04
Endosulfan Sulfate	3.80E-04	--	3.80E-04	3.80E-04
Endrin	4.15E-04	--	4.15E-04	4.15E-04
Endrin Aldehyde	4.05E-04	--	4.05E-04	4.05E-04
Endrin Ketone	4.50E-04	--	4.50E-04	4.50E-04
Gamma Bhc (Lindane)	2.90E-04	--	2.90E-04	2.90E-04
Heptachlor	4.20E-04	--	4.20E-04	4.20E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.25E-04	--	4.25E-04	4.25E-04
P,P'-DDE	4.70E-04	--	4.70E-04	4.70E-04
P,P'-DDT	3.35E-04	--	3.35E-04	3.35E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-016			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-016-SO-0-0.5			
Sample Date	6/23/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.004	140%	-1.76E-03	0.011
PCB-1260 (Aroclor 1260)	0.004	--	0.004	0.004
PCB-1262 (Aroclor 1262)	0.004	--	0.004	0.004
PCB-1268 (Aroclor 1268)	0.004	--	0.004	0.004
Polychlorinated Biphenyl (PCBs)	0.004	140%	-1.76E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.011	47.1%	0.006	0.016
Acenaphthene	0.025	42.0%	0.015	0.035
Acenaphthylene	0.004	36.1%	0.003	0.006
Anthracene	0.049	37.7%	0.031	0.067
Fluoranthene	0.57	37.3%	0.36	0.78
Fluorene	0.015	34.6%	0.010	0.020
Naphthalene	0.014	44.9%	0.008	0.020
Phenanthrene	0.31	31.0%	0.21	0.41
Total LMW PAHs - 1/2MDL	1.00	35.8%	0.64	1.36
Total LMW PAHs - MDL	1.00	35.8%	0.64	1.36
Total LMW PAHs - Zero	0.99	35.9%	0.64	1.35
Benzo(A)Pyrene	0.42	36.1%	0.27	0.57
Benzo(A)Anthracene	0.32	32.0%	0.22	0.42
Benzo(B)Fluoranthene	0.74	29.8%	0.52	0.96
Benzo(G,H,I)Perylene	0.43	30.8%	0.30	0.56
Benzo(K)Fluoranthene	0.24	31.3%	0.16	0.32
Chrysene	0.49	35.9%	0.31	0.67
Dibenz(A,H)Anthracene	0.11	39.8%	0.066	0.15
Indeno(1,2,3-C,D)Pyrene	0.41	31.1%	0.28	0.54
Pyrene	0.74	39.3%	0.45	1.03
Total HMW PAHs - 1/2MDL	3.90	26.8%	2.86	4.94
Total HMW PAHs - MDL	3.90	26.8%	2.86	4.94
Total HMW PAHs - Zero	3.90	26.8%	2.86	4.94
Total PAHs - 1/2MDL	4.15	29.6%	2.92	5.37
Total PAHs - MDL	4.15	29.5%	2.92	5.38
Total PAHs - Zero	4.14	29.6%	2.92	5.37
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.043	--	0.043	0.043
2,3,4,6-Tetrachlorophenol	0.015	--	0.015	0.015
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.035	--	0.035	0.035

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-016			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-016-SO-0-0.5			
Sample Date	6/23/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.12	--	0.12	0.12
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.005	--	0.005	0.005
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.043	--	0.043	0.043
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.075	--	0.075	0.075
Acetophenone	0.003	44.4%	0.002	0.005
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.012	--	0.012	0.012
Benzyl Butyl Phthalate	0.005	--	0.005	0.005
Biphenyl (Diphenyl)	0.014	49.7%	0.007	0.020
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.006	--	0.006	0.006
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.046	30.5%	0.032	0.060
Dibenzofuran	0.013	33.5%	0.009	0.017
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.008	--	0.008	0.008
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.004	--	0.004	0.004
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.047	--	0.047	0.047
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.019	--	0.019	0.019
Phenol	0.005	--	0.005	0.005

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-016			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-016-SO-0.5-2			
Sample Date	6/28/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	13,200	4.58%	12,596	13,804
Antimony	0.12	70.4%	0.035	0.20
Arsenic	5.00	7.46%	4.63	5.37
Barium	105	9.24%	95.3	115
Beryllium	0.53	4.90%	0.50	0.56
Cadmium	0.085	6.03%	0.080	0.090
Chromium, Total	13.6	7.75%	12.5	14.7
Chromium, Hexavalent	0.36	7.75%	0.34	0.39
Chromium, Trivalent	13.2	7.75%	12.2	14.3
Cobalt	5.90	1.99%	5.78	6.02
Copper	17.0	4.63%	16.2	17.8
Iron	16,100	2.40%	15,713	16,487
Lead	10.6	3.33%	10.2	11.0
Manganese	459	7.15%	426	492
Mercury	0.018	27.4%	0.013	0.023
Nickel	13.5	6.58%	12.6	14.4
Selenium	1.80	19.1%	1.46	2.14
Silver	0.037	9.83%	0.033	0.041
Thallium	0.094	6.56%	0.088	0.10
Vanadium	11.1	3.31%	10.7	11.5
Zinc	47.5	5.42%	44.9	50.1
Other Inorganic Parameters (mg/kg)				
Cyanide	0.12	32.7%	0.081	0.16
Fluoride	36.8	28.8%	26.2	47.4
Essential Nutrients (mg/kg)				
Calcium	23,200	15.1%	19,687	26,713
Magnesium	12,500	2.18%	12,227	12,773
Potassium	1,130	6.91%	1,052	1,208
Sodium	54.4	21.1%	42.9	65.9
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-016			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-016-SO-0.5-2			
Sample Date	6/28/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.004	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.004	--	0.004	0.004
PCB-1262 (Aroclor 1262)	0.004	--	0.004	0.004
PCB-1268 (Aroclor 1268)	0.004	--	0.004	0.004
Polychlorinated Biphenyl (PCBs)	0.004	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.015	47.7%	0.008	0.022
Acenaphthene	0.036	80.9%	0.007	0.065
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.066	82.4%	0.012	0.12
Fluoranthene	0.49	71.4%	0.14	0.84
Fluorene	0.031	74.2%	0.008	0.054
Naphthalene	0.016	28.9%	0.011	0.021
Phenanthrene	0.46	78.1%	0.10	0.82
Total LMW PAHs - 1/2MDL	1.12	74.3%	0.29	1.95
Total LMW PAHs - MDL	1.12	74.3%	0.29	1.96
Total LMW PAHs - Zero	1.11	74.3%	0.29	1.94
Benzo(A)Pyrene	0.23	67.2%	0.075	0.38
Benzo(A)Anthracene	0.24	68.8%	0.075	0.41
Benzo(B)Fluoranthene	0.38	60.1%	0.15	0.61
Benzo(G,H,I)Perylene	0.25	60.8%	0.098	0.40
Benzo(K)Fluoranthene	0.14	64.5%	0.050	0.23
Chrysene	0.30	62.9%	0.11	0.49
Dibenz(A,H)Anthracene	0.068	63.9%	0.025	0.11
Indeno(1,2,3-C,D)Pyrene	0.25	62.0%	0.095	0.41
Pyrene	0.58	72.7%	0.16	1.00
Total HMW PAHs - 1/2MDL	2.44	64.7%	0.86	4.02
Total HMW PAHs - MDL	2.44	64.7%	0.86	4.02
Total HMW PAHs - Zero	2.44	64.7%	0.86	4.02
Total PAHs - 1/2MDL	3.16	68.3%	1.00	5.32
Total PAHs - MDL	3.17	68.3%	1.00	5.33
Total PAHs - Zero	3.16	68.3%	1.00	5.31
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.043	--	0.043	0.043
2,3,4,6-Tetrachlorophenol	0.015	--	0.015	0.015
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.035	--	0.035	0.035

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-016			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-016-SO-0.5-2			
Sample Date	6/28/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.12	--	0.12	0.12
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.043	--	0.043	0.043
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.075	--	0.075	0.075
Acetophenone	0.015	41.1%	0.009	0.021
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.012	--	0.012	0.012
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.014	98.2%	2.43E-04	0.027
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.049	76.1%	0.012	0.086
Dibenzofuran	0.030	70.0%	0.009	0.051
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.019	--	0.019	0.019
Di-N-Octylphthalate	0.008	--	0.008	0.008
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.003	32.5%	0.002	0.005
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.005	--	0.005	0.005

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-017			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-017-SO-0-0.5			
Sample Date	6/29/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	12,800	4.68%	12,201	13,399
Antimony	0.15	28.1%	0.11	0.19
Arsenic	4.30	13.8%	3.71	4.89
Barium	77.1	4.03%	74.0	80.2
Beryllium	0.48	6.32%	0.45	0.51
Cadmium	0.16	15.0%	0.14	0.18
Chromium, Total	15.0	10.6%	13.4	16.6
Chromium, Hexavalent	0.40	10.6%	0.36	0.44
Chromium, Trivalent	14.6	10.6%	13.1	16.1
Cobalt	5.60	3.51%	5.40	5.80
Copper	16.4	12.3%	14.4	18.4
Iron	14,700	3.40%	14,200	15,200
Lead	15.2	48.5%	7.83	22.6
Manganese	353	5.63%	333	373
Mercury	0.008	54.9%	0.004	0.012
Nickel	21.6	14.5%	18.5	24.7
Selenium	1.50	20.0%	1.20	1.80
Silver	0.046	9.03%	0.042	0.050
Thallium	0.085	14.4%	0.073	0.097
Vanadium	12.9	9.21%	11.7	14.1
Zinc	48.3	12.7%	42.2	54.4
Other Inorganic Parameters (mg/kg)				
Cyanide	0.16	40.2%	0.096	0.22
Fluoride	36.7	20.5%	29.2	44.2
Essential Nutrients (mg/kg)				
Calcium	24,700	10.7%	22,065	27,335
Magnesium	11,600	2.82%	11,273	11,927
Potassium	977	6.24%	916	1,038
Sodium	61.1	30.7%	42.3	79.9
Pesticides (mg/kg)				
Aldrin	4.00E-04	--	4.00E-04	4.00E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.05E-04	--	3.05E-04	3.05E-04
Alpha Endosulfan	4.60E-04	--	4.60E-04	4.60E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.25E-04	--	3.25E-04	3.25E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.60E-04	--	3.60E-04	3.60E-04
Dieldrin	4.30E-04	--	4.30E-04	4.30E-04
Endosulfan Sulfate	3.85E-04	--	3.85E-04	3.85E-04
Endrin	4.20E-04	--	4.20E-04	4.20E-04
Endrin Aldehyde	4.10E-04	--	4.10E-04	4.10E-04
Endrin Ketone	4.60E-04	--	4.60E-04	4.60E-04
Gamma Bhc (Lindane)	3.00E-04	--	3.00E-04	3.00E-04
Heptachlor	4.25E-04	--	4.25E-04	4.25E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.35E-04	--	4.35E-04	4.35E-04
P,P'-DDE	4.80E-04	--	4.80E-04	4.80E-04
P,P'-DDT	3.45E-04	--	3.45E-04	3.45E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-017			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-017-SO-0-0.5			
Sample Date	6/29/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.80E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.80E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.018	47.1%	0.010	0.026
Acenaphthene	0.13	42.0%	0.075	0.18
Acenaphthylene	0.009	36.1%	0.005	0.012
Anthracene	0.25	37.7%	0.16	0.34
Fluoranthene	3.00	37.3%	1.88	4.12
Fluorene	0.095	34.6%	0.062	0.13
Naphthalene	0.049	44.9%	0.027	0.071
Phenanthrene	1.60	31.0%	1.10	2.10
Total LMW PAHs - 1/2MDL	5.15	35.8%	3.31	7.00
Total LMW PAHs - MDL	5.16	35.8%	3.31	7.00
Total LMW PAHs - Zero	5.14	35.9%	3.30	6.99
Benzo(A)Pyrene	2.10	36.1%	1.34	2.86
Benzo(A)Anthracene	1.60	32.0%	1.09	2.11
Benzo(B)Fluoranthene	2.70	29.8%	1.89	3.51
Benzo(G,H,I)Perylene	2.20	30.8%	1.52	2.88
Benzo(K)Fluoranthene	0.84	31.3%	0.58	1.10
Chrysene	2.30	35.9%	1.47	3.13
Dibenz(A,H)Anthracene	0.59	39.8%	0.36	0.82
Indeno(1,2,3-C,D)Pyrene	2.40	31.1%	1.65	3.15
Pyrene	2.20	39.3%	1.33	3.07
Total HMW PAHs - 1/2MDL	16.9	26.8%	12.4	21.5
Total HMW PAHs - MDL	16.9	26.8%	12.4	21.5
Total HMW PAHs - Zero	16.9	26.8%	12.4	21.5
Total PAHs - 1/2MDL	19.4	29.6%	13.6	25.1
Total PAHs - MDL	19.4	29.5%	13.6	25.1
Total PAHs - Zero	19.4	29.6%	13.6	25.1
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.025	--	0.025	0.025
1,4-Dioxane (P-Dioxane)	0.090	--	0.090	0.090
2,3,4,6-Tetrachlorophenol	0.031	--	0.031	0.031
2,4,5-Trichlorophenol	0.033	--	0.033	0.033
2,4,6-Trichlorophenol	0.010	--	0.010	0.010
2,4-Dichlorophenol	0.008	--	0.008	0.008
2,4-Dimethylphenol	0.075	--	0.075	0.075

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-017			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-017-SO-0-0.5			
Sample Date	6/29/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.25	--	0.25	0.25
2,4-Dinitrotoluene	0.013	--	0.013	0.013
2,6-Dinitrotoluene	0.018	--	0.018	0.018
2-Chloronaphthalene	0.008	--	0.008	0.008
2-Chlorophenol	0.009	--	0.009	0.009
2-Methylphenol (O-Cresol)	0.015	--	0.015	0.015
2-Nitroaniline	0.011	--	0.011	0.011
2-Nitrophenol	0.011	--	0.011	0.011
3- And 4- Methylphenol (Total)	0.009	--	0.009	0.009
3,3'-Dichlorobenzidine	0.037	--	0.037	0.037
3-Nitroaniline	0.010	--	0.010	0.010
4,6-Dinitro-2-Methylphenol	0.090	--	0.090	0.090
4-Bromophenyl Phenyl Ether	0.011	--	0.011	0.011
4-Chloro-3-Methylphenol	0.015	--	0.015	0.015
4-Chloroaniline	0.009	--	0.009	0.009
4-Chlorophenyl Phenyl Ether	0.010	--	0.010	0.010
4-Nitroaniline	0.013	--	0.013	0.013
4-Nitrophenol	0.16	--	0.16	0.16
Acetophenone	0.007	44.4%	0.004	0.010
Atrazine	0.015	--	0.015	0.015
Benzaldehyde	0.026	--	0.026	0.026
Benzyl Butyl Phthalate	0.010	--	0.010	0.010
Biphenyl (Diphenyl)	0.029	49.7%	0.014	0.043
Bis(2-Chloroethoxy) Methane	0.011	--	0.011	0.011
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.008	--	0.008	0.008
Bis(2-Chloroisopropyl) Ether	0.014	--	0.014	0.014
Bis(2-Ethylhexyl) Phthalate	0.033	--	0.033	0.033
Caprolactam	0.024	--	0.024	0.024
Carbazole	0.26	30.5%	0.18	0.34
Dibenzofuran	0.058	33.5%	0.039	0.077
Diethyl Phthalate	0.010	--	0.010	0.010
Dimethyl Phthalate	0.010	--	0.010	0.010
Di-N-Butyl Phthalate	0.010	--	0.010	0.010
Di-N-Octylphthalate	0.017	--	0.017	0.017
Hexachlorobenzene	0.014	--	0.014	0.014
Hexachlorobutadiene	0.010	--	0.010	0.010
Hexachlorocyclopentadiene	0.021	--	0.021	0.021
Hexachloroethane	0.012	--	0.012	0.012
Isophorone	0.086	--	0.086	0.086
Nitrobenzene	0.011	--	0.011	0.011
N-Nitrosodi-N-Propylamine	0.011	--	0.011	0.011
N-Nitrosodiphenylamine	0.030	--	0.030	0.030
Pentachlorophenol	0.040	--	0.040	0.040
Phenol	0.011	--	0.011	0.011

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-017			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-017-SO-0.5-2			
Sample Date	6/23/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	12,100	4.58%	11,546	12,654
Antimony	0.12	70.4%	0.035	0.20
Arsenic	4.70	7.46%	4.35	5.05
Barium	109	9.24%	98.9	119
Beryllium	0.48	4.90%	0.46	0.50
Cadmium	0.054	6.03%	0.051	0.057
Chromium, Total	17.0	7.75%	15.7	18.3
Chromium, Hexavalent	0.45	7.75%	0.42	0.49
Chromium, Trivalent	16.5	7.75%	15.3	17.8
Cobalt	5.60	1.99%	5.49	5.71
Copper	14.1	4.63%	13.4	14.8
Iron	15,300	2.40%	14,933	15,667
Lead	9.40	3.33%	9.09	9.71
Manganese	444	7.15%	412	476
Mercury	0.018	27.4%	0.013	0.023
Nickel	14.0	6.58%	13.1	14.9
Selenium	1.70	19.1%	1.38	2.02
Silver	0.030	9.83%	0.027	0.033
Thallium	0.079	6.56%	0.074	0.084
Vanadium	11.0	3.31%	10.6	11.4
Zinc	44.4	5.42%	42.0	46.8
Other Inorganic Parameters (mg/kg)				
Cyanide	0.044	32.7%	0.030	0.058
Fluoride	28.6	28.8%	20.4	36.8
Essential Nutrients (mg/kg)				
Calcium	30,400	15.1%	25,797	35,003
Magnesium	12,700	2.18%	12,423	12,977
Potassium	1,020	6.91%	949	1,091
Sodium	58.0	21.1%	45.8	70.2
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-017			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-017-SO-0.5-2			
Sample Date	6/23/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.004	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.004	--	0.004	0.004
PCB-1262 (Aroclor 1262)	0.004	--	0.004	0.004
PCB-1268 (Aroclor 1268)	0.004	--	0.004	0.004
Polychlorinated Biphenyl (PCBs)	0.004	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.012	47.7%	0.006	0.018
Acenaphthene	0.004	80.9%	7.24E-04	0.007
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.015	82.4%	0.003	0.027
Fluoranthene	0.030	71.4%	0.009	0.051
Fluorene	0.003	74.2%	8.91E-04	0.006
Naphthalene	0.004	28.9%	0.003	0.005
Phenanthrene	0.026	78.1%	0.006	0.046
Total LMW PAHs - 1/2MDL	0.098	74.3%	0.025	0.17
Total LMW PAHs - MDL	0.13	74.3%	0.033	0.22
Total LMW PAHs - Zero	0.068	74.3%	0.018	0.12
Benzo(A)Pyrene	0.018	67.2%	0.006	0.030
Benzo(A)Anthracene	0.013	68.8%	0.004	0.022
Benzo(B)Fluoranthene	0.022	60.1%	0.009	0.035
Benzo(G,H,I)Perylene	0.025	60.8%	0.010	0.040
Benzo(K)Fluoranthene	0.015	64.5%	0.005	0.025
Chrysene	0.022	62.9%	0.008	0.036
Dibenz(A,H)Anthracene	0.008	63.9%	0.003	0.013
Indeno(1,2,3-C,D)Pyrene	0.011	62.0%	0.004	0.017
Pyrene	0.026	72.7%	0.007	0.045
Total HMW PAHs - 1/2MDL	0.16	64.7%	0.056	0.26
Total HMW PAHs - MDL	0.19	64.7%	0.067	0.31
Total HMW PAHs - Zero	0.13	64.7%	0.045	0.21
Total PAHs - 1/2MDL	0.22	68.3%	0.071	0.38
Total PAHs - MDL	0.29	68.3%	0.090	0.48
Total PAHs - Zero	0.16	68.3%	0.051	0.27
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.042	--	0.042	0.042
2,3,4,6-Tetrachlorophenol	0.015	--	0.015	0.015
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.035	--	0.035	0.035

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-017			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-017-SO-0.5-2			
Sample Date	6/23/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.12	--	0.12	0.12
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.005	--	0.005	0.005
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.042	--	0.042	0.042
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.075	--	0.075	0.075
Acetophenone	0.009	41.1%	0.005	0.012
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.012	--	0.012	0.012
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.006
Biphenyl (Diphenyl)	0.014	98.2%	2.43E-04	0.027
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.006	--	0.006	0.006
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.004	76.1%	9.32E-04	0.007
Dibenzofuran	0.005	70.0%	0.001	0.008
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.008	--	0.008	0.008
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.004	--	0.004	0.004
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.037	32.5%	0.025	0.049
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.019	--	0.019	0.019
Phenol	0.005	--	0.005	0.005

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-018			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-018-SO-0-0.5			
Sample Date	6/24/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	11,400	4.68%	10,866	11,934
Antimony	0.18	28.1%	0.13	0.23
Arsenic	4.20	13.8%	3.62	4.78
Barium	59.4	4.03%	57.0	61.8
Beryllium	0.52	6.32%	0.49	0.55
Cadmium	0.18	15.0%	0.15	0.21
Chromium, Total	18.6	10.6%	16.6	20.6
Chromium, Hexavalent	0.50	10.6%	0.45	0.55
Chromium, Trivalent	18.1	10.6%	16.2	20.0
Cobalt	5.50	3.51%	5.31	5.69
Copper	15.8	12.3%	13.9	17.7
Iron	13,900	3.40%	13,427	14,373
Lead	13.5	48.5%	6.95	20.0
Manganese	341	5.63%	322	360
Mercury	0.017	54.9%	0.008	0.026
Nickel	29.8	14.5%	25.5	34.1
Selenium	1.40	20.0%	1.12	1.68
Silver	0.046	9.03%	0.042	0.050
Thallium	0.085	14.4%	0.073	0.097
Vanadium	13.7	9.21%	12.4	15.0
Zinc	48.8	12.7%	42.6	55.0
Other Inorganic Parameters (mg/kg)				
Cyanide	0.15	40.2%	0.090	0.21
Fluoride	72.9	20.5%	57.9	87.9
Essential Nutrients (mg/kg)				
Calcium	30,400	10.7%	27,157	33,643
Magnesium	11,600	2.82%	11,273	11,927
Potassium	825	6.24%	774	876
Sodium	79.9	30.7%	55.3	104
Pesticides (mg/kg)				
Aldrin	3.95E-04	--	3.95E-04	3.95E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	2.95E-04	--	2.95E-04	2.95E-04
Alpha Endosulfan	4.55E-04	--	4.55E-04	4.55E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.15E-04	--	3.15E-04	3.15E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.55E-04	--	3.55E-04	3.55E-04
Dieldrin	4.25E-04	--	4.25E-04	4.25E-04
Endosulfan Sulfate	3.80E-04	--	3.80E-04	3.80E-04
Endrin	4.15E-04	--	4.15E-04	4.15E-04
Endrin Aldehyde	4.05E-04	--	4.05E-04	4.05E-04
Endrin Ketone	4.55E-04	--	4.55E-04	4.55E-04
Gamma Bhc (Lindane)	2.90E-04	--	2.90E-04	2.90E-04
Heptachlor	4.20E-04	--	4.20E-04	4.20E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.30E-04	--	4.30E-04	4.30E-04
P,P'-DDE	4.70E-04	--	4.70E-04	4.70E-04
P,P'-DDT	3.35E-04	--	3.35E-04	3.35E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-018			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-018-SO-0-0.5			
Sample Date	6/24/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.78E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.78E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.010	47.1%	0.005	0.014
Acenaphthene	0.073	42.0%	0.042	0.10
Acenaphthylene	0.004	36.1%	0.003	0.006
Anthracene	0.13	37.7%	0.081	0.18
Fluoranthene	1.70	37.3%	1.07	2.33
Fluorene	0.041	34.6%	0.027	0.055
Naphthalene	0.016	44.9%	0.009	0.023
Phenanthrene	0.86	31.0%	0.59	1.13
Total LMW PAHs - 1/2MDL	2.83	35.8%	1.82	3.85
Total LMW PAHs - MDL	2.84	35.8%	1.82	3.85
Total LMW PAHs - Zero	2.83	35.9%	1.81	3.84
Benzo(A)Pyrene	1.30	36.1%	0.83	1.77
Benzo(A)Anthracene	1.10	32.0%	0.75	1.45
Benzo(B)Fluoranthene	2.00	29.8%	1.40	2.60
Benzo(G,H,I)Perylene	1.90	30.8%	1.32	2.48
Benzo(K)Fluoranthene	0.67	31.3%	0.46	0.88
Chrysene	1.50	35.9%	0.96	2.04
Dibenz(A,H)Anthracene	0.42	39.8%	0.25	0.59
Indeno(1,2,3-C,D)Pyrene	1.70	31.1%	1.17	2.23
Pyrene	1.60	39.3%	0.97	2.23
Total HMW PAHs - 1/2MDL	12.2	26.8%	8.92	15.5
Total HMW PAHs - MDL	12.2	26.8%	8.92	15.5
Total HMW PAHs - Zero	12.2	26.8%	8.92	15.5
Total PAHs - 1/2MDL	13.0	29.6%	9.17	16.9
Total PAHs - MDL	13.0	29.5%	9.17	16.9
Total PAHs - Zero	13.0	29.6%	9.16	16.9
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.013	--	0.013	0.013
1,4-Dioxane (P-Dioxane)	0.045	--	0.045	0.045
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.037	--	0.037	0.037

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-018			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-018-SO-0-0.5			
Sample Date	6/24/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.045	--	0.045	0.045
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.007	--	0.007	0.007
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	44.4%	0.002	0.005
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	--	0.005	0.005
Biphenyl (Diphenyl)	0.014	49.7%	0.007	0.021
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.15	30.5%	0.10	0.20
Dibenzofuran	0.023	33.5%	0.015	0.031
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.011	--	0.011	0.011
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	--	0.004	0.004
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-018			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-018-SO-0.5-2			
Sample Date	6/24/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	8,620	4.58%	8,226	9,014
Antimony	0.092	70.4%	0.027	0.16
Arsenic	4.90	7.46%	4.53	5.27
Barium	74.8	9.24%	67.9	81.7
Beryllium	0.40	4.90%	0.38	0.42
Cadmium	0.081	6.03%	0.076	0.086
Chromium, Total	17.8	7.75%	16.4	19.2
Chromium, Hexavalent	0.48	7.75%	0.44	0.51
Chromium, Trivalent	17.3	7.75%	16.0	18.7
Cobalt	5.50	1.99%	5.39	5.61
Copper	15.9	4.63%	15.2	16.6
Iron	14,100	2.40%	13,762	14,438
Lead	8.60	3.33%	8.31	8.89
Manganese	386	7.15%	358	414
Mercury	0.028	27.4%	0.020	0.036
Nickel	15.2	6.58%	14.2	16.2
Selenium	1.50	19.1%	1.21	1.79
Silver	0.030	9.83%	0.027	0.033
Thallium	0.060	6.56%	0.056	0.064
Vanadium	8.60	3.31%	8.32	8.88
Zinc	51.3	5.42%	48.5	54.1
Other Inorganic Parameters (mg/kg)				
Cyanide	0.017	32.7%	0.011	0.023
Fluoride	16.6	28.8%	11.8	21.4
Essential Nutrients (mg/kg)				
Calcium	32,400	15.1%	27,494	37,306
Magnesium	11,900	2.18%	11,640	12,160
Potassium	721	6.91%	671	771
Sodium	46.1	21.1%	36.4	55.8
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-018			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-018-SO-0.5-2			
Sample Date	6/24/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.004	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.004	--	0.004	0.004
PCB-1262 (Aroclor 1262)	0.004	--	0.004	0.004
PCB-1268 (Aroclor 1268)	0.004	--	0.004	0.004
Polychlorinated Biphenyl (PCBs)	0.004	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.004	47.7%	0.002	0.005
Acenaphthene	0.008	80.9%	0.002	0.014
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.016	82.4%	0.003	0.028
Fluoranthene	0.16	71.4%	0.046	0.27
Fluorene	0.004	74.2%	9.30E-04	0.006
Naphthalene	0.004	28.9%	0.003	0.005
Phenanthrene	0.12	78.1%	0.026	0.21
Total LMW PAHs - 1/2MDL	0.32	74.3%	0.082	0.56
Total LMW PAHs - MDL	0.35	74.3%	0.090	0.61
Total LMW PAHs - Zero	0.29	74.3%	0.074	0.50
Benzo(A)Pyrene	0.095	67.2%	0.031	0.16
Benzo(A)Anthracene	0.091	68.8%	0.028	0.15
Benzo(B)Fluoranthene	0.15	60.1%	0.060	0.24
Benzo(G,H,I)Perylene	0.097	60.8%	0.038	0.16
Benzo(K)Fluoranthene	0.053	64.5%	0.019	0.087
Chrysene	0.12	62.9%	0.044	0.20
Dibenz(A,H)Anthracene	0.027	63.9%	0.010	0.044
Indeno(1,2,3-C,D)Pyrene	0.10	62.0%	0.038	0.16
Pyrene	0.19	72.7%	0.052	0.33
Total HMW PAHs - 1/2MDL	0.92	64.7%	0.33	1.52
Total HMW PAHs - MDL	0.92	64.7%	0.33	1.52
Total HMW PAHs - Zero	0.92	64.7%	0.33	1.52
Total PAHs - 1/2MDL	1.09	68.3%	0.34	1.83
Total PAHs - MDL	1.12	68.3%	0.35	1.88
Total PAHs - Zero	1.06	68.3%	0.34	1.79
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.013	--	0.013	0.013
1,4-Dioxane (P-Dioxane)	0.044	--	0.044	0.044
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.036	--	0.036	0.036

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-018			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-018-SO-0.5-2			
Sample Date	6/24/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.044	--	0.044	0.044
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	41.1%	0.002	0.005
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.014	98.2%	2.52E-04	0.028
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.012	76.1%	0.003	0.021
Dibenzofuran	0.005	70.0%	0.001	0.009
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.011	--	0.011	0.011
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	32.5%	0.002	0.005
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-019			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-019-SO-0-0.5			
Sample Date	6/24/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	15,700	4.68%	14,965	16,435
Antimony	0.31	28.1%	0.22	0.40
Arsenic	5.10	13.8%	4.39	5.81
Barium	92.9	4.03%	89.2	96.6
Beryllium	0.60	6.32%	0.56	0.64
Cadmium	0.27	15.0%	0.23	0.31
Chromium, Total	17.9	10.6%	16.0	19.8
Chromium, Hexavalent	0.48	10.6%	0.43	0.53
Chromium, Trivalent	17.4	10.6%	15.6	19.3
Cobalt	6.00	3.51%	5.79	6.21
Copper	21.9	12.3%	19.2	24.6
Iron	14,900	3.40%	14,393	15,407
Lead	20.6	48.5%	10.6	30.6
Manganese	381	5.63%	360	402
Mercury	0.026	54.9%	0.012	0.040
Nickel	35.4	14.5%	30.3	40.5
Selenium	1.30	20.0%	1.04	1.56
Silver	0.058	9.03%	0.053	0.063
Thallium	0.083	14.4%	0.071	0.095
Vanadium	17.1	9.21%	15.5	18.7
Zinc	64.8	12.7%	56.6	73.0
Other Inorganic Parameters (mg/kg)				
Cyanide	0.22	40.2%	0.13	0.31
Fluoride	215	20.5%	171	259
Essential Nutrients (mg/kg)				
Calcium	25,800	10.7%	23,048	28,552
Magnesium	10,900	2.82%	10,593	11,207
Potassium	1,040	6.24%	975	1,105
Sodium	673	30.7%	466	880
Pesticides (mg/kg)				
Aldrin	4.05E-04	--	4.05E-04	4.05E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.05E-04	--	3.05E-04	3.05E-04
Alpha Endosulfan	4.65E-04	--	4.65E-04	4.65E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.25E-04	--	3.25E-04	3.25E-04
Beta Endosulfan	5.50E-04	--	5.50E-04	5.50E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.65E-04	--	3.65E-04	3.65E-04
Dieldrin	4.35E-04	--	4.35E-04	4.35E-04
Endosulfan Sulfate	3.90E-04	--	3.90E-04	3.90E-04
Endrin	4.25E-04	--	4.25E-04	4.25E-04
Endrin Aldehyde	4.15E-04	--	4.15E-04	4.15E-04
Endrin Ketone	4.65E-04	--	4.65E-04	4.65E-04
Gamma Bhc (Lindane)	3.00E-04	--	3.00E-04	3.00E-04
Heptachlor	4.30E-04	--	4.30E-04	4.30E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.40E-04	--	4.40E-04	4.40E-04
P,P'-DDE	4.85E-04	--	4.85E-04	4.85E-04
P,P'-DDT	3.45E-04	--	3.45E-04	3.45E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-019			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-019-SO-0-0.5			
Sample Date	6/24/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.50E-04	--	7.50E-04	7.50E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.82E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.82E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.040	47.1%	0.021	0.059
Acenaphthene	0.25	42.0%	0.15	0.35
Acenaphthylene	0.004	36.1%	0.003	0.006
Anthracene	0.44	37.7%	0.27	0.61
Fluoranthene	4.50	37.3%	2.82	6.18
Fluorene	0.15	34.6%	0.098	0.20
Naphthalene	0.070	44.9%	0.039	0.10
Phenanthrene	2.40	31.0%	1.66	3.14
Total LMW PAHs - 1/2MDL	7.85	35.8%	5.04	10.7
Total LMW PAHs - MDL	7.86	35.8%	5.05	10.7
Total LMW PAHs - Zero	7.85	35.9%	5.03	10.7
Benzo(A)Pyrene	3.40	36.1%	2.17	4.63
Benzo(A)Anthracene	2.80	32.0%	1.90	3.70
Benzo(B)Fluoranthene	4.30	29.8%	3.02	5.58
Benzo(G,H,I)Perylene	4.10	30.8%	2.84	5.36
Benzo(K)Fluoranthene	1.60	31.3%	1.10	2.10
Chrysene	3.40	35.9%	2.18	4.62
Dibenz(A,H)Anthracene	1.00	39.8%	0.60	1.40
Indeno(1,2,3-C,D)Pyrene	4.00	31.1%	2.76	5.24
Pyrene	3.80	39.3%	2.31	5.29
Total HMW PAHs - 1/2MDL	28.4	26.8%	20.8	36.0
Total HMW PAHs - MDL	28.4	26.8%	20.8	36.0
Total HMW PAHs - Zero	28.4	26.8%	20.8	36.0
Total PAHs - 1/2MDL	31.9	29.6%	22.5	41.3
Total PAHs - MDL	31.9	29.5%	22.5	41.3
Total PAHs - Zero	31.9	29.6%	22.5	41.3
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.044	--	0.044	0.044
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.036	--	0.036	0.036

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-019			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-019-SO-0-0.5			
Sample Date	6/24/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.044	--	0.044	0.044
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	44.4%	0.002	0.005
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	--	0.005	0.005
Biphenyl (Diphenyl)	0.014	49.7%	0.007	0.021
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.37	30.5%	0.26	0.48
Dibenzofuran	0.090	33.5%	0.060	0.12
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.022	--	0.022	0.022
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	--	0.004	0.004
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-019			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-019-SO-0.5-2			
Sample Date	6/24/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	11,700	4.58%	11,165	12,235
Antimony	0.25	70.4%	0.074	0.43
Arsenic	4.90	7.46%	4.53	5.27
Barium	119	9.24%	108	130
Beryllium	0.49	4.90%	0.47	0.51
Cadmium	0.13	6.03%	0.12	0.14
Chromium, Total	22.9	7.75%	21.1	24.7
Chromium, Hexavalent	0.61	7.75%	0.57	0.66
Chromium, Trivalent	22.3	7.75%	20.6	24.0
Cobalt	6.10	1.99%	5.98	6.22
Copper	25.2	4.63%	24.0	26.4
Iron	14,900	2.40%	14,542	15,258
Lead	14.9	3.33%	14.4	15.4
Manganese	447	7.15%	415	479
Mercury	0.027	27.4%	0.020	0.034
Nickel	19.1	6.58%	17.8	20.4
Selenium	1.60	19.1%	1.29	1.91
Silver	0.055	9.83%	0.050	0.060
Thallium	0.075	6.56%	0.070	0.080
Vanadium	12.3	3.31%	11.9	12.7
Zinc	54.3	5.42%	51.4	57.2
Other Inorganic Parameters (mg/kg)				
Cyanide	0.073	32.7%	0.049	0.097
Fluoride	70.5	28.8%	50.2	90.8
Essential Nutrients (mg/kg)				
Calcium	24,300	15.1%	20,621	27,979
Magnesium	11,600	2.18%	11,347	11,853
Potassium	1,020	6.91%	949	1,091
Sodium	71.3	21.1%	56.3	86.3
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-019			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-019-SO-0.5-2			
Sample Date	6/24/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.081	47.7%	0.042	0.12
Acenaphthene	0.42	80.9%	0.080	0.76
Acenaphthylene	0.009	62.8%	0.003	0.014
Anthracene	0.73	82.4%	0.13	1.33
Fluoranthene	3.30	71.4%	0.94	5.66
Fluorene	0.34	74.2%	0.088	0.59
Naphthalene	0.18	28.9%	0.13	0.23
Phenanthrene	2.80	78.1%	0.61	4.99
Total LMW PAHs - 1/2MDL	7.86	74.3%	2.02	13.7
Total LMW PAHs - MDL	7.87	74.3%	2.02	13.7
Total LMW PAHs - Zero	7.85	74.3%	2.02	13.7
Benzo(A)Pyrene	2.30	67.2%	0.75	3.85
Benzo(A)Anthracene	1.90	68.8%	0.59	3.21
Benzo(B)Fluoranthene	2.70	60.1%	1.08	4.32
Benzo(G,H,I)Perylene	1.70	60.8%	0.67	2.73
Benzo(K)Fluoranthene	0.98	64.5%	0.35	1.61
Chrysene	2.40	62.9%	0.89	3.91
Dibenz(A,H)Anthracene	0.54	63.9%	0.20	0.88
Indeno(1,2,3-C,D)Pyrene	2.00	62.0%	0.76	3.24
Pyrene	2.60	72.7%	0.71	4.49
Total HMW PAHs - 1/2MDL	17.1	64.7%	6.04	28.2
Total HMW PAHs - MDL	17.1	64.7%	6.04	28.2
Total HMW PAHs - Zero	17.1	64.7%	6.04	28.2
Total PAHs - 1/2MDL	22.2	68.3%	7.03	37.4
Total PAHs - MDL	22.2	68.3%	7.03	37.4
Total PAHs - Zero	22.2	68.3%	7.03	37.4
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.025	--	0.025	0.025
1,4-Dioxane (P-Dioxane)	0.090	--	0.090	0.090
2,3,4,6-Tetrachlorophenol	0.031	--	0.031	0.031
2,4,5-Trichlorophenol	0.033	--	0.033	0.033
2,4,6-Trichlorophenol	0.010	--	0.010	0.010
2,4-Dichlorophenol	0.008	--	0.008	0.008
2,4-Dimethylphenol	0.075	--	0.075	0.075

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-019			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-019-SO-0.5-2			
Sample Date	6/24/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.25	--	0.25	0.25
2,4-Dinitrotoluene	0.013	--	0.013	0.013
2,6-Dinitrotoluene	0.018	--	0.018	0.018
2-Chloronaphthalene	0.008	--	0.008	0.008
2-Chlorophenol	0.009	--	0.009	0.009
2-Methylphenol (O-Cresol)	0.015	--	0.015	0.015
2-Nitroaniline	0.011	--	0.011	0.011
2-Nitrophenol	0.011	--	0.011	0.011
3- And 4- Methylphenol (Total)	0.009	--	0.009	0.009
3,3'-Dichlorobenzidine	0.037	--	0.037	0.037
3-Nitroaniline	0.010	--	0.010	0.010
4,6-Dinitro-2-Methylphenol	0.090	--	0.090	0.090
4-Bromophenyl Phenyl Ether	0.011	--	0.011	0.011
4-Chloro-3-Methylphenol	0.014	--	0.014	0.014
4-Chloroaniline	0.009	--	0.009	0.009
4-Chlorophenyl Phenyl Ether	0.010	--	0.010	0.010
4-Nitroaniline	0.013	--	0.013	0.013
4-Nitrophenol	0.16	--	0.16	0.16
Acetophenone	0.007	41.1%	0.004	0.010
Atrazine	0.015	--	0.015	0.015
Benzaldehyde	0.025	--	0.025	0.025
Benzyl Butyl Phthalate	0.010	32.7%	0.007	0.013
Biphenyl (Diphenyl)	0.028	98.2%	5.04E-04	0.055
Bis(2-Chloroethoxy) Methane	0.011	--	0.011	0.011
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.008	--	0.008	0.008
Bis(2-Chloroisopropyl) Ether	0.014	--	0.014	0.014
Bis(2-Ethylhexyl) Phthalate	0.013	--	0.013	0.013
Caprolactam	0.024	--	0.024	0.024
Carbazole	0.39	76.1%	0.093	0.69
Dibenzofuran	0.23	70.0%	0.069	0.39
Diethyl Phthalate	0.010	--	0.010	0.010
Dimethyl Phthalate	0.010	--	0.010	0.010
Di-N-Butyl Phthalate	0.010	--	0.010	0.010
Di-N-Octylphthalate	0.017	--	0.017	0.017
Hexachlorobenzene	0.014	--	0.014	0.014
Hexachlorobutadiene	0.010	--	0.010	0.010
Hexachlorocyclopentadiene	0.021	--	0.021	0.021
Hexachloroethane	0.012	--	0.012	0.012
Isophorone	0.007	32.5%	0.005	0.009
Nitrobenzene	0.011	--	0.011	0.011
N-Nitrosodi-N-Propylamine	0.011	--	0.011	0.011
N-Nitrosodiphenylamine	0.030	--	0.030	0.030
Pentachlorophenol	0.040	--	0.040	0.040
Phenol	0.011	--	0.011	0.011

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-020			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-020-SO-0-0.5			
Sample Date	6/25/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	14,300	4.68%	13,630	14,970
Antimony	0.26	28.1%	0.19	0.33
Arsenic	4.80	13.8%	4.14	5.46
Barium	93.8	4.03%	90.0	97.6
Beryllium	0.56	6.32%	0.52	0.60
Cadmium	0.26	15.0%	0.22	0.30
Chromium, Total	19.3	10.6%	17.3	21.3
Chromium, Hexavalent	0.52	10.6%	0.46	0.57
Chromium, Trivalent	18.8	10.6%	16.8	20.8
Cobalt	5.80	3.51%	5.60	6.00
Copper	25.8	12.3%	22.6	29.0
Iron	16,400	3.40%	15,843	16,957
Lead	21.7	48.5%	11.2	32.2
Manganese	393	5.63%	371	415
Mercury	0.024	54.9%	0.011	0.037
Nickel	30.8	14.5%	26.3	35.3
Selenium	1.50	20.0%	1.20	1.80
Silver	0.17	9.03%	0.15	0.19
Thallium	0.090	14.4%	0.077	0.10
Vanadium	17.0	9.21%	15.4	18.6
Zinc	79.4	12.7%	69.3	89.5
Other Inorganic Parameters (mg/kg)				
Cyanide	0.25	40.2%	0.15	0.35
Fluoride	61.2	20.5%	48.6	73.8
Essential Nutrients (mg/kg)				
Calcium	30,600	10.7%	27,336	33,864
Magnesium	11,600	2.82%	11,273	11,927
Potassium	1,170	6.24%	1,097	1,243
Sodium	272	30.7%	188	356
Pesticides (mg/kg)				
Aldrin	4.00E-04	--	4.00E-04	4.00E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.00E-04	--	3.00E-04	3.00E-04
Alpha Endosulfan	4.60E-04	--	4.60E-04	4.60E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.20E-04	--	3.20E-04	3.20E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.60E-04	--	3.60E-04	3.60E-04
Dieldrin	4.30E-04	--	4.30E-04	4.30E-04
Endosulfan Sulfate	3.85E-04	--	3.85E-04	3.85E-04
Endrin	4.20E-04	--	4.20E-04	4.20E-04
Endrin Aldehyde	4.10E-04	--	4.10E-04	4.10E-04
Endrin Ketone	4.60E-04	--	4.60E-04	4.60E-04
Gamma Bhc (Lindane)	2.95E-04	--	2.95E-04	2.95E-04
Heptachlor	4.25E-04	--	4.25E-04	4.25E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.35E-04	--	4.35E-04	4.35E-04
P,P'-DDE	4.80E-04	--	4.80E-04	4.80E-04
P,P'-DDT	3.40E-04	--	3.40E-04	3.40E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-020			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-020-SO-0-0.5			
Sample Date	6/25/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.079	140%	-3.13E-02	0.19
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.079	140%	-3.13E-02	0.19
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	1.30	47.1%	0.69	1.91
Acenaphthene	5.40	42.0%	3.13	7.67
Acenaphthylene	0.20	36.1%	0.13	0.27
Anthracene	8.50	37.7%	5.30	11.7
Fluoranthene	39.0	37.3%	24.5	53.5
Fluorene	4.10	34.6%	2.68	5.52
Naphthalene	2.20	44.9%	1.21	3.19
Phenanthrene	32.0	31.0%	22.1	41.9
Total LMW PAHs - 1/2MDL	92.7	35.8%	59.5	126
Total LMW PAHs - MDL	92.7	35.8%	59.5	126
Total LMW PAHs - Zero	92.7	35.9%	59.4	126
Benzo(A)Pyrene	24.0	36.1%	15.3	32.7
Benzo(A)Anthracene	23.0	32.0%	15.6	30.4
Benzo(B)Fluoranthene	30.0	29.8%	21.0	39.0
Benzo(G,H,I)Perylene	21.0	30.8%	14.5	27.5
Benzo(K)Fluoranthene	12.0	31.3%	8.25	15.8
Chrysene	25.0	35.9%	16.0	34.0
Dibenz(A,H)Anthracene	6.20	39.8%	3.73	8.67
Indeno(1,2,3-C,D)Pyrene	22.0	31.1%	15.2	28.8
Pyrene	40.0	39.3%	24.3	55.7
Total HMW PAHs - 1/2MDL	203	26.8%	149	258
Total HMW PAHs - MDL	203	26.8%	149	258
Total HMW PAHs - Zero	203	26.8%	149	258
Total PAHs - 1/2MDL	265	29.6%	186	343
Total PAHs - MDL	265	29.5%	186	343
Total PAHs - Zero	265	29.6%	186	343
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.13	--	0.13	0.13
1,4-Dioxane (P-Dioxane)	0.44	--	0.44	0.44
2,3,4,6-Tetrachlorophenol	0.16	--	0.16	0.16
2,4,5-Trichlorophenol	0.17	--	0.17	0.17
2,4,6-Trichlorophenol	0.047	--	0.047	0.047
2,4-Dichlorophenol	0.039	--	0.039	0.039
2,4-Dimethylphenol	0.37	--	0.37	0.37

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-020			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-020-SO-0-0.5			
Sample Date	6/25/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	1.25	--	1.25	1.25
2,4-Dinitrotoluene	0.065	--	0.065	0.065
2,6-Dinitrotoluene	0.090	--	0.090	0.090
2-Chloronaphthalene	0.038	--	0.038	0.038
2-Chlorophenol	0.042	--	0.042	0.042
2-Methylphenol (O-Cresol)	0.070	--	0.070	0.070
2-Nitroaniline	0.055	--	0.055	0.055
2-Nitrophenol	0.055	--	0.055	0.055
3- And 4- Methylphenol (Total)	0.044	--	0.044	0.044
3,3'-Dichlorobenzidine	0.19	--	0.19	0.19
3-Nitroaniline	0.049	--	0.049	0.049
4,6-Dinitro-2-Methylphenol	0.44	--	0.44	0.44
4-Bromophenyl Phenyl Ether	0.050	--	0.050	0.050
4-Chloro-3-Methylphenol	0.070	--	0.070	0.070
4-Chloroaniline	0.043	--	0.043	0.043
4-Chlorophenyl Phenyl Ether	0.050	--	0.050	0.050
4-Nitroaniline	0.060	--	0.060	0.060
4-Nitrophenol	0.80	--	0.80	0.80
Acetophenone	0.036	44.4%	0.020	0.052
Atrazine	0.075	--	0.075	0.075
Benzaldehyde	0.13	--	0.13	0.13
Benzyl Butyl Phthalate	0.050	--	0.050	0.050
Biphenyl (Diphenyl)	0.31	49.7%	0.16	0.46
Bis(2-Chloroethoxy) Methane	0.050	--	0.050	0.050
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.039	--	0.039	0.039
Bis(2-Chloroisopropyl) Ether	0.070	--	0.070	0.070
Bis(2-Ethylhexyl) Phthalate	0.81	--	0.81	0.81
Caprolactam	0.12	--	0.12	0.12
Carbazole	4.30	30.5%	2.99	5.61
Dibenzofuran	2.30	33.5%	1.53	3.07
Diethyl Phthalate	0.047	--	0.047	0.047
Dimethyl Phthalate	0.048	--	0.048	0.048
Di-N-Butyl Phthalate	0.050	--	0.050	0.050
Di-N-Octylphthalate	0.085	--	0.085	0.085
Hexachlorobenzene	0.065	--	0.065	0.065
Hexachlorobutadiene	0.047	--	0.047	0.047
Hexachlorocyclopentadiene	0.11	--	0.11	0.11
Hexachloroethane	0.060	--	0.060	0.060
Isophorone	0.036	--	0.036	0.036
Nitrobenzene	0.050	--	0.050	0.050
N-Nitrosodi-N-Propylamine	0.055	--	0.055	0.055
N-Nitrosodiphenylamine	0.15	--	0.15	0.15
Pentachlorophenol	0.20	--	0.20	0.20
Phenol	0.055	--	0.055	0.055

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-020			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-020-SO-0.5-2			
Sample Date	6/25/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	10,700	4.58%	10,210	11,190
Antimony	0.14	70.4%	0.041	0.24
Arsenic	5.00	7.46%	4.63	5.37
Barium	99.4	9.24%	90.2	109
Beryllium	0.44	4.90%	0.42	0.46
Cadmium	0.24	6.03%	0.23	0.25
Chromium, Total	14.8	7.75%	13.7	15.9
Chromium, Hexavalent	0.40	7.75%	0.37	0.43
Chromium, Trivalent	14.4	7.75%	13.3	15.5
Cobalt	5.90	1.99%	5.78	6.02
Copper	20.0	4.63%	19.1	20.9
Iron	15,900	2.40%	15,518	16,282
Lead	15.2	3.33%	14.7	15.7
Manganese	475	7.15%	441	509
Mercury	0.017	27.4%	0.012	0.022
Nickel	13.9	6.58%	13.0	14.8
Selenium	1.50	19.1%	1.21	1.79
Silver	0.19	9.83%	0.17	0.21
Thallium	0.095	6.56%	0.089	0.10
Vanadium	10.3	3.31%	9.96	10.6
Zinc	75.3	5.42%	71.2	79.4
Other Inorganic Parameters (mg/kg)				
Cyanide	0.077	32.7%	0.052	0.10
Fluoride	36.7	28.8%	26.1	47.3
Essential Nutrients (mg/kg)				
Calcium	25,900	15.1%	21,979	29,821
Magnesium	11,600	2.18%	11,347	11,853
Potassium	805	6.91%	749	861
Sodium	71.1	21.1%	56.1	86.1
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-020			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-020-SO-0.5-2			
Sample Date	6/25/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.16	29.2%	0.11	0.21
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.16	29.2%	0.11	0.21
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.43	47.7%	0.22	0.64
Acenaphthene	2.30	80.9%	0.44	4.16
Acenaphthylene	0.10	62.8%	0.037	0.16
Anthracene	4.20	82.4%	0.74	7.66
Fluoranthene	22.0	71.4%	6.29	37.7
Fluorene	1.70	74.2%	0.44	2.96
Naphthalene	0.87	28.9%	0.62	1.12
Phenanthrene	17.0	78.1%	3.72	30.3
Total LMW PAHs - 1/2MDL	48.6	74.3%	12.5	84.7
Total LMW PAHs - MDL	48.6	74.3%	12.5	84.7
Total LMW PAHs - Zero	48.6	74.3%	12.5	84.7
Benzo(A)Pyrene	11.0	67.2%	3.60	18.4
Benzo(A)Anthracene	12.0	68.8%	3.75	20.3
Benzo(B)Fluoranthene	13.0	60.1%	5.19	20.8
Benzo(G,H,I)Perylene	6.20	60.8%	2.43	9.97
Benzo(K)Fluoranthene	4.90	64.5%	1.74	8.06
Chrysene	12.0	62.9%	4.45	19.6
Dibenz(A,H)Anthracene	2.40	63.9%	0.87	3.93
Indeno(1,2,3-C,D)Pyrene	8.00	62.0%	3.04	13.0
Pyrene	15.0	72.7%	4.09	25.9
Total HMW PAHs - 1/2MDL	84.5	64.7%	29.8	139
Total HMW PAHs - MDL	84.5	64.7%	29.8	139
Total HMW PAHs - Zero	84.5	64.7%	29.8	139
Total PAHs - 1/2MDL	120	68.3%	37.9	201
Total PAHs - MDL	120	68.3%	37.9	201
Total PAHs - Zero	120	68.3%	37.9	201
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.12	--	0.12	0.12
1,4-Dioxane (P-Dioxane)	0.43	--	0.43	0.43
2,3,4,6-Tetrachlorophenol	0.15	--	0.15	0.15
2,4,5-Trichlorophenol	0.16	--	0.16	0.16
2,4,6-Trichlorophenol	0.045	--	0.045	0.045
2,4-Dichlorophenol	0.038	--	0.038	0.038
2,4-Dimethylphenol	0.35	--	0.35	0.35

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-020			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-020-SO-0.5-2			
Sample Date	6/25/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	1.20	--	1.20	1.20
2,4-Dinitrotoluene	0.065	--	0.065	0.065
2,6-Dinitrotoluene	0.085	--	0.085	0.085
2-Chloronaphthalene	0.036	--	0.036	0.036
2-Chlorophenol	0.041	--	0.041	0.041
2-Methylphenol (O-Cresol)	0.070	--	0.070	0.070
2-Nitroaniline	0.050	--	0.050	0.050
2-Nitrophenol	0.055	--	0.055	0.055
3- And 4- Methylphenol (Total)	0.043	--	0.043	0.043
3,3'-Dichlorobenzidine	0.18	--	0.18	0.18
3-Nitroaniline	0.047	--	0.047	0.047
4,6-Dinitro-2-Methylphenol	0.43	--	0.43	0.43
4-Bromophenyl Phenyl Ether	0.050	--	0.050	0.050
4-Chloro-3-Methylphenol	0.070	--	0.070	0.070
4-Chloroaniline	0.041	--	0.041	0.041
4-Chlorophenyl Phenyl Ether	0.048	--	0.048	0.048
4-Nitroaniline	0.060	--	0.060	0.060
4-Nitrophenol	0.75	--	0.75	0.75
Acetophenone	0.035	41.1%	0.020	0.049
Atrazine	0.070	--	0.070	0.070
Benzaldehyde	0.12	--	0.12	0.12
Benzyl Butyl Phthalate	0.049	32.7%	0.033	0.065
Biphenyl (Diphenyl)	0.14	98.2%	0.002	0.27
Bis(2-Chloroethoxy) Methane	0.050	--	0.050	0.050
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.038	--	0.038	0.038
Bis(2-Chloroisopropyl) Ether	0.065	--	0.065	0.065
Bis(2-Ethylhexyl) Phthalate	0.060	--	0.060	0.060
Caprolactam	0.12	--	0.12	0.12
Carbazole	2.40	76.1%	0.57	4.23
Dibenzofuran	1.10	70.0%	0.33	1.87
Diethyl Phthalate	0.045	--	0.045	0.045
Dimethyl Phthalate	0.046	--	0.046	0.046
Di-N-Butyl Phthalate	0.048	--	0.048	0.048
Di-N-Octylphthalate	0.080	--	0.080	0.080
Hexachlorobenzene	0.065	--	0.065	0.065
Hexachlorobutadiene	0.045	--	0.045	0.045
Hexachlorocyclopentadiene	0.10	--	0.10	0.10
Hexachloroethane	0.060	--	0.060	0.060
Isophorone	0.034	32.5%	0.023	0.045
Nitrobenzene	0.050	--	0.050	0.050
N-Nitrosodi-N-Propylamine	0.055	--	0.055	0.055
N-Nitrosodiphenylamine	0.15	--	0.15	0.15
Pentachlorophenol	0.19	--	0.19	0.19
Phenol	0.050	--	0.050	0.050

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-021			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-021-SO-0-0.5			
Sample Date	6/25/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	22,600	4.68%	21,542	23,658
Antimony	0.63	28.1%	0.45	0.81
Arsenic	8.20	13.8%	7.07	9.33
Barium	113	4.03%	108	118
Beryllium	0.91	6.32%	0.85	0.97
Cadmium	0.97	15.0%	0.82	1.12
Chromium, Total	31.1	10.6%	27.8	34.4
Chromium, Hexavalent	0.83	10.6%	0.74	0.92
Chromium, Trivalent	30.3	10.6%	27.1	33.5
Cobalt	7.70	3.51%	7.43	7.97
Copper	44.0	12.3%	38.6	49.4
Iron	24,500	3.40%	23,667	25,333
Lead	46.5	48.5%	23.9	69.1
Manganese	499	5.63%	471	527
Mercury	0.028	54.9%	0.013	0.043
Nickel	93.6	14.5%	80.0	107
Selenium	3.80	20.0%	3.04	4.56
Silver	0.12	9.03%	0.11	0.13
Thallium	0.17	14.4%	0.15	0.19
Vanadium	35.3	9.21%	32.0	38.6
Zinc	103	12.7%	89.9	116
Other Inorganic Parameters (mg/kg)				
Cyanide	0.56	40.2%	0.33	0.79
Fluoride	251	20.5%	199	303
Essential Nutrients (mg/kg)				
Calcium	20,300	10.7%	18,135	22,465
Magnesium	11,100	2.82%	10,787	11,413
Potassium	1,600	6.24%	1,500	1,700
Sodium	1,200	30.7%	831	1,569
Pesticides (mg/kg)				
Aldrin	4.00E-04	--	4.00E-04	4.00E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.00E-04	--	3.00E-04	3.00E-04
Alpha Endosulfan	4.60E-04	--	4.60E-04	4.60E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.20E-04	--	3.20E-04	3.20E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.60E-04	--	3.60E-04	3.60E-04
Dieldrin	4.30E-04	--	4.30E-04	4.30E-04
Endosulfan Sulfate	3.85E-04	--	3.85E-04	3.85E-04
Endrin	4.20E-04	--	4.20E-04	4.20E-04
Endrin Aldehyde	4.10E-04	--	4.10E-04	4.10E-04
Endrin Ketone	4.60E-04	--	4.60E-04	4.60E-04
Gamma Bhc (Lindane)	2.95E-04	--	2.95E-04	2.95E-04
Heptachlor	4.25E-04	--	4.25E-04	4.25E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.35E-04	--	4.35E-04	4.35E-04
P,P'-DDE	4.80E-04	--	4.80E-04	4.80E-04
P,P'-DDT	3.40E-04	--	3.40E-04	3.40E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-021			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-021-SO-0-0.5			
Sample Date	6/25/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.80E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.80E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.035	47.1%	0.019	0.051
Acenaphthene	0.21	42.0%	0.12	0.30
Acenaphthylene	0.009	36.1%	0.005	0.012
Anthracene	0.30	37.7%	0.19	0.41
Fluoranthene	4.50	37.3%	2.82	6.18
Fluorene	0.14	34.6%	0.091	0.19
Naphthalene	0.070	44.9%	0.039	0.10
Phenanthrene	2.10	31.0%	1.45	2.75
Total LMW PAHs - 1/2MDL	7.36	35.8%	4.73	10.0
Total LMW PAHs - MDL	7.37	35.8%	4.73	10.0
Total LMW PAHs - Zero	7.36	35.9%	4.72	9.99
Benzo(A)Pyrene	2.90	36.1%	1.85	3.95
Benzo(A)Anthracene	2.60	32.0%	1.77	3.43
Benzo(B)Fluoranthene	7.50	29.8%	5.26	9.74
Benzo(G,H,I)Perylene	4.70	30.8%	3.25	6.15
Benzo(K)Fluoranthene	2.40	31.3%	1.65	3.15
Chrysene	5.30	35.9%	3.40	7.20
Dibenz(A,H)Anthracene	1.60	39.8%	0.96	2.24
Indeno(1,2,3-C,D)Pyrene	4.80	31.1%	3.31	6.29
Pyrene	4.60	39.3%	2.79	6.41
Total HMW PAHs - 1/2MDL	36.4	26.8%	26.6	46.2
Total HMW PAHs - MDL	36.4	26.8%	26.6	46.2
Total HMW PAHs - Zero	36.4	26.8%	26.6	46.2
Total PAHs - 1/2MDL	36.2	29.6%	25.5	46.9
Total PAHs - MDL	36.2	29.5%	25.5	46.9
Total PAHs - Zero	36.2	29.6%	25.5	46.9
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.025	--	0.025	0.025
1,4-Dioxane (P-Dioxane)	0.090	--	0.090	0.090
2,3,4,6-Tetrachlorophenol	0.031	--	0.031	0.031
2,4,5-Trichlorophenol	0.033	--	0.033	0.033
2,4,6-Trichlorophenol	0.010	--	0.010	0.010
2,4-Dichlorophenol	0.008	--	0.008	0.008
2,4-Dimethylphenol	0.075	--	0.075	0.075

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-021			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-021-SO-0-0.5			
Sample Date	6/25/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.25	--	0.25	0.25
2,4-Dinitrotoluene	0.013	--	0.013	0.013
2,6-Dinitrotoluene	0.018	--	0.018	0.018
2-Chloronaphthalene	0.008	--	0.008	0.008
2-Chlorophenol	0.009	--	0.009	0.009
2-Methylphenol (O-Cresol)	0.015	--	0.015	0.015
2-Nitroaniline	0.011	--	0.011	0.011
2-Nitrophenol	0.011	--	0.011	0.011
3- And 4- Methylphenol (Total)	0.009	--	0.009	0.009
3,3'-Dichlorobenzidine	0.037	--	0.037	0.037
3-Nitroaniline	0.010	--	0.010	0.010
4,6-Dinitro-2-Methylphenol	0.090	--	0.090	0.090
4-Bromophenyl Phenyl Ether	0.011	--	0.011	0.011
4-Chloro-3-Methylphenol	0.014	--	0.014	0.014
4-Chloroaniline	0.009	--	0.009	0.009
4-Chlorophenyl Phenyl Ether	0.010	--	0.010	0.010
4-Nitroaniline	0.013	--	0.013	0.013
4-Nitrophenol	0.16	--	0.16	0.16
Acetophenone	0.007	44.4%	0.004	0.010
Atrazine	0.015	--	0.015	0.015
Benzaldehyde	0.025	--	0.025	0.025
Benzyl Butyl Phthalate	0.43	--	0.43	0.43
Biphenyl (Diphenyl)	0.028	49.7%	0.014	0.042
Bis(2-Chloroethoxy) Methane	0.011	--	0.011	0.011
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.008	--	0.008	0.008
Bis(2-Chloroisopropyl) Ether	0.014	--	0.014	0.014
Bis(2-Ethylhexyl) Phthalate	0.086	--	0.086	0.086
Caprolactam	0.024	--	0.024	0.024
Carbazole	0.41	30.5%	0.28	0.54
Dibenzofuran	0.071	33.5%	0.047	0.095
Diethyl Phthalate	0.010	--	0.010	0.010
Dimethyl Phthalate	0.010	--	0.010	0.010
Di-N-Butyl Phthalate	0.010	--	0.010	0.010
Di-N-Octylphthalate	0.017	--	0.017	0.017
Hexachlorobenzene	0.014	--	0.014	0.014
Hexachlorobutadiene	0.010	--	0.010	0.010
Hexachlorocyclopentadiene	0.021	--	0.021	0.021
Hexachloroethane	0.012	--	0.012	0.012
Isophorone	0.007	--	0.007	0.007
Nitrobenzene	0.011	--	0.011	0.011
N-Nitrosodi-N-Propylamine	0.011	--	0.011	0.011
N-Nitrosodiphenylamine	0.030	--	0.030	0.030
Pentachlorophenol	0.040	--	0.040	0.040
Phenol	0.011	--	0.011	0.011

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-021			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-021-SO-0.5-2			
Sample Date	6/25/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	12,500	4.58%	11,928	13,072
Antimony	0.16	70.4%	0.047	0.27
Arsenic	5.10	7.46%	4.72	5.48
Barium	113	9.24%	103	123
Beryllium	0.53	4.90%	0.50	0.56
Cadmium	0.15	6.03%	0.14	0.16
Chromium, Total	22.1	7.75%	20.4	23.8
Chromium, Hexavalent	0.59	7.75%	0.55	0.64
Chromium, Trivalent	21.5	7.75%	19.8	23.2
Cobalt	6.10	1.99%	5.98	6.22
Copper	21.7	4.63%	20.7	22.7
Iron	17,200	2.40%	16,787	17,613
Lead	15.3	3.33%	14.8	15.8
Manganese	477	7.15%	443	511
Mercury	0.026	27.4%	0.019	0.033
Nickel	20.5	6.58%	19.2	21.8
Selenium	1.80	19.1%	1.46	2.14
Silver	0.050	9.83%	0.045	0.055
Thallium	0.083	6.56%	0.078	0.088
Vanadium	12.1	3.31%	11.7	12.5
Zinc	73.8	5.42%	69.8	77.8
Other Inorganic Parameters (mg/kg)				
Cyanide	0.36	32.7%	0.24	0.48
Fluoride	136	28.8%	96.9	175
Essential Nutrients (mg/kg)				
Calcium	22,200	15.1%	18,839	25,561
Magnesium	11,100	2.18%	10,858	11,342
Potassium	1,040	6.91%	968	1,112
Sodium	288	21.1%	227	349
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-021			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-021-SO-0.5-2			
Sample Date	6/25/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.003	47.7%	0.002	0.005
Acenaphthene	0.033	80.9%	0.006	0.060
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.24	82.4%	0.042	0.44
Fluoranthene	0.49	71.4%	0.14	0.84
Fluorene	0.031	74.2%	0.008	0.054
Naphthalene	0.010	28.9%	0.007	0.013
Phenanthrene	0.31	78.1%	0.068	0.55
Total LMW PAHs - 1/2MDL	1.12	74.3%	0.29	1.95
Total LMW PAHs - MDL	1.13	74.3%	0.29	1.97
Total LMW PAHs - Zero	1.11	74.3%	0.29	1.94
Benzo(A)Pyrene	0.30	67.2%	0.098	0.50
Benzo(A)Anthracene	0.27	68.8%	0.084	0.46
Benzo(B)Fluoranthene	0.43	60.1%	0.17	0.69
Benzo(G,H,I)Perylene	0.30	60.8%	0.12	0.48
Benzo(K)Fluoranthene	0.14	64.5%	0.050	0.23
Chrysene	0.44	62.9%	0.16	0.72
Dibenz(A,H)Anthracene	0.079	63.9%	0.029	0.13
Indeno(1,2,3-C,D)Pyrene	0.36	62.0%	0.14	0.58
Pyrene	0.50	72.7%	0.14	0.86
Total HMW PAHs - 1/2MDL	2.82	64.7%	0.99	4.64
Total HMW PAHs - MDL	2.82	64.7%	0.99	4.64
Total HMW PAHs - Zero	2.82	64.7%	0.99	4.64
Total PAHs - 1/2MDL	3.51	68.3%	1.11	5.90
Total PAHs - MDL	3.51	68.3%	1.11	5.91
Total PAHs - Zero	3.50	68.3%	1.11	5.90
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.042	--	0.042	0.042
2,3,4,6-Tetrachlorophenol	0.015	--	0.015	0.015
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.004	--	0.004	0.004
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.035	--	0.035	0.035

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-021			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-021-SO-0.5-2			
Sample Date	6/25/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.12	--	0.12	0.12
2,4-Dinitrotoluene	0.006	--	0.006	0.006
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.005	--	0.005	0.005
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.042	--	0.042	0.042
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.075	--	0.075	0.075
Acetophenone	0.003	41.1%	0.002	0.005
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.012	--	0.012	0.012
Benzyl Butyl Phthalate	0.010	32.7%	0.007	0.013
Biphenyl (Diphenyl)	0.014	98.2%	2.43E-04	0.027
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.006	--	0.006	0.006
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.13	76.1%	0.031	0.23
Dibenzofuran	0.013	70.0%	0.004	0.022
Diethyl Phthalate	0.004	--	0.004	0.004
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.008	--	0.008	0.008
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.004	--	0.004	0.004
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.011	32.5%	0.007	0.015
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.019	--	0.019	0.019
Phenol	0.005	--	0.005	0.005

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-022			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-022-SO-0-0.5			
Sample Date	6/27/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	27,500	4.68%	26,212	28,788
Antimony	1.00	28.1%	0.72	1.28
Arsenic	12.3	13.8%	10.6	14.0
Barium	143	4.03%	137	149
Beryllium	0.99	6.32%	0.93	1.05
Cadmium	1.20	15.0%	1.02	1.38
Chromium, Total	50.4	10.6%	45.1	55.7
Chromium, Hexavalent	1.35	10.6%	1.21	1.49
Chromium, Trivalent	49.1	10.6%	43.9	54.2
Cobalt	9.30	3.51%	8.97	9.63
Copper	47.6	12.3%	41.8	53.4
Iron	30,400	3.40%	29,367	31,433
Lead	64.9	48.5%	33.4	96.4
Manganese	564	5.63%	532	596
Mercury	0.026	54.9%	0.012	0.040
Nickel	142	14.5%	121	163
Selenium	13.3	20.0%	10.6	16.0
Silver	0.11	9.03%	0.10	0.12
Thallium	0.40	14.4%	0.34	0.46
Vanadium	54.5	9.21%	49.5	59.5
Zinc	88.2	12.7%	77.0	99.4
Other Inorganic Parameters (mg/kg)				
Cyanide	0.66	40.2%	0.39	0.93
Fluoride	732	20.5%	582	882
Essential Nutrients (mg/kg)				
Calcium	12,600	10.7%	11,256	13,944
Magnesium	10,700	2.82%	10,398	11,002
Potassium	2,150	6.24%	2,016	2,284
Sodium	1,670	30.7%	1,157	2,183
Pesticides (mg/kg)				
Aldrin	4.00E-04	--	4.00E-04	4.00E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.00E-04	--	3.00E-04	3.00E-04
Alpha Endosulfan	4.60E-04	--	4.60E-04	4.60E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.20E-04	--	3.20E-04	3.20E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.60E-04	--	3.60E-04	3.60E-04
Dieldrin	4.30E-04	--	4.30E-04	4.30E-04
Endosulfan Sulfate	3.85E-04	--	3.85E-04	3.85E-04
Endrin	4.20E-04	--	4.20E-04	4.20E-04
Endrin Aldehyde	4.10E-04	--	4.10E-04	4.10E-04
Endrin Ketone	4.60E-04	--	4.60E-04	4.60E-04
Gamma Bhc (Lindane)	2.95E-04	--	2.95E-04	2.95E-04
Heptachlor	4.25E-04	--	4.25E-04	4.25E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.35E-04	--	4.35E-04	4.35E-04
P,P'-DDE	4.80E-04	--	4.80E-04	4.80E-04
P,P'-DDT	3.40E-04	--	3.40E-04	3.40E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-022			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-022-SO-0-0.5			
Sample Date	6/27/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.060	140%	-2.37E-02	0.14
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.060	140%	-2.37E-02	0.14
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.16	47.1%	0.085	0.24
Acenaphthene	0.73	42.0%	0.42	1.04
Acenaphthylene	0.026	36.1%	0.017	0.035
Anthracene	1.60	37.7%	1.00	2.20
Fluoranthene	13.0	37.3%	8.15	17.8
Fluorene	0.52	34.6%	0.34	0.70
Naphthalene	0.36	44.9%	0.20	0.52
Phenanthrene	6.60	31.0%	4.55	8.65
Total LMW PAHs - 1/2MDL	23.0	35.8%	14.8	31.2
Total LMW PAHs - MDL	23.0	35.8%	14.8	31.2
Total LMW PAHs - Zero	23.0	35.9%	14.7	31.2
Benzo(A)Pyrene	7.70	36.1%	4.92	10.5
Benzo(A)Anthracene	11.0	32.0%	7.48	14.5
Benzo(B)Fluoranthene	45.0	29.8%	31.6	58.4
Benzo(G,H,I)Perylene	17.0	30.8%	11.8	22.2
Benzo(K)Fluoranthene	11.0	31.3%	7.56	14.4
Chrysene	29.0	35.9%	18.6	39.4
Dibenz(A,H)Anthracene	6.80	39.8%	4.09	9.51
Indeno(1,2,3-C,D)Pyrene	17.0	31.1%	11.7	22.3
Pyrene	16.0	39.3%	9.71	22.3
Total HMW PAHs - 1/2MDL	161	26.8%	117	204
Total HMW PAHs - MDL	161	26.8%	117	204
Total HMW PAHs - Zero	161	26.8%	117	204
Total PAHs - 1/2MDL	138	29.6%	97.5	179
Total PAHs - MDL	138	29.5%	97.5	179
Total PAHs - Zero	138	29.6%	97.4	179
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.043	--	0.043	0.043
2,3,4,6-Tetrachlorophenol	0.015	--	0.015	0.015
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.036	--	0.036	0.036

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-022			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-022-SO-0-0.5			
Sample Date	6/27/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.12	--	0.12	0.12
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.011	--	0.011	0.011
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.043	--	0.043	0.043
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.075	--	0.075	0.075
Acetophenone	0.007	44.4%	0.004	0.010
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.012	--	0.012	0.012
Benzyl Butyl Phthalate	0.005	--	0.005	0.005
Biphenyl (Diphenyl)	0.041	49.7%	0.021	0.061
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	1.40	30.5%	0.97	1.83
Dibenzofuran	0.30	33.5%	0.20	0.40
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.035	--	0.035	0.035
Di-N-Octylphthalate	0.008	--	0.008	0.008
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.024	--	0.024	0.024
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.018	--	0.018	0.018

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-022			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-022-SO-0.5-2			
Sample Date	6/27/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	17,700	4.58%	16,890	18,510
Antimony	0.16	70.4%	0.047	0.27
Arsenic	5.80	7.46%	5.37	6.23
Barium	168	9.24%	152	184
Beryllium	0.89	4.90%	0.85	0.93
Cadmium	0.13	6.03%	0.12	0.14
Chromium, Total	20.0	7.75%	18.5	21.5
Chromium, Hexavalent	0.54	7.75%	0.49	0.58
Chromium, Trivalent	19.5	7.75%	18.0	21.0
Cobalt	6.50	1.99%	6.37	6.63
Copper	17.8	4.63%	17.0	18.6
Iron	17,800	2.40%	17,373	18,227
Lead	15.0	3.33%	14.5	15.5
Manganese	563	7.15%	523	603
Mercury	0.021	27.4%	0.015	0.027
Nickel	18.6	6.58%	17.4	19.8
Selenium	1.90	19.1%	1.54	2.26
Silver	0.047	9.83%	0.042	0.052
Thallium	0.11	6.56%	0.10	0.12
Vanadium	15.7	3.31%	15.2	16.2
Zinc	55.1	5.42%	52.1	58.1
Other Inorganic Parameters (mg/kg)				
Cyanide	0.63	32.7%	0.42	0.84
Fluoride	282	28.8%	201	363
Essential Nutrients (mg/kg)				
Calcium	11,100	15.1%	9,419	12,781
Magnesium	10,700	2.18%	10,467	10,933
Potassium	1,280	6.91%	1,192	1,368
Sodium	461	21.1%	364	558
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-022			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-022-SO-0.5-2			
Sample Date	6/27/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.014	47.7%	0.007	0.021
Acenaphthene	0.059	80.9%	0.011	0.11
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.096	82.4%	0.017	0.18
Fluoranthene	0.59	71.4%	0.17	1.01
Fluorene	0.056	74.2%	0.014	0.098
Naphthalene	0.024	28.9%	0.017	0.031
Phenanthrene	0.46	78.1%	0.10	0.82
Total LMW PAHs - 1/2MDL	1.30	74.3%	0.34	2.27
Total LMW PAHs - MDL	1.31	74.3%	0.34	2.28
Total LMW PAHs - Zero	1.30	74.3%	0.33	2.26
Benzo(A)Pyrene	0.33	67.2%	0.11	0.55
Benzo(A)Anthracene	0.30	68.8%	0.094	0.51
Benzo(B)Fluoranthene	0.65	60.1%	0.26	1.04
Benzo(G,H,I)Perylene	0.31	60.8%	0.12	0.50
Benzo(K)Fluoranthene	0.20	64.5%	0.071	0.33
Chrysene	0.43	62.9%	0.16	0.70
Dibenz(A,H)Anthracene	0.087	63.9%	0.031	0.14
Indeno(1,2,3-C,D)Pyrene	0.33	62.0%	0.13	0.53
Pyrene	0.74	72.7%	0.20	1.28
Total HMW PAHs - 1/2MDL	3.38	64.7%	1.19	5.56
Total HMW PAHs - MDL	3.38	64.7%	1.19	5.56
Total HMW PAHs - Zero	3.38	64.7%	1.19	5.56
Total PAHs - 1/2MDL	4.02	68.3%	1.27	6.76
Total PAHs - MDL	4.02	68.3%	1.27	6.77
Total PAHs - Zero	4.01	68.3%	1.27	6.75
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.013	--	0.013	0.013
1,4-Dioxane (P-Dioxane)	0.045	--	0.045	0.045
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.037	--	0.037	0.037

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-022			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-022-SO-0.5-2			
Sample Date	6/27/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.045	--	0.045	0.045
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.007	--	0.007	0.007
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.007	41.1%	0.004	0.010
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.014	32.7%	0.009	0.019
Biphenyl (Diphenyl)	0.014	98.2%	2.52E-04	0.028
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.035	--	0.035	0.035
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.050	76.1%	0.012	0.088
Dibenzofuran	0.028	70.0%	0.008	0.048
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.011	--	0.011	0.011
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	32.5%	0.002	0.005
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-023			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-023-SO-0-0.5			
Sample Date	6/27/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	17,500	4.68%	16,681	18,319
Antimony	0.15	28.1%	0.11	0.19
Arsenic	5.30	13.8%	4.57	6.03
Barium	110	4.03%	106	114
Beryllium	0.65	6.32%	0.61	0.69
Cadmium	0.18	15.0%	0.15	0.21
Chromium, Total	15.8	10.6%	14.1	17.5
Chromium, Hexavalent	0.42	10.6%	0.38	0.47
Chromium, Trivalent	15.4	10.6%	13.8	17.0
Cobalt	6.50	3.51%	6.27	6.73
Copper	17.4	12.3%	15.3	19.5
Iron	17,200	3.40%	16,615	17,785
Lead	14.6	48.5%	7.52	21.7
Manganese	465	5.63%	439	491
Mercury	0.020	54.9%	0.009	0.031
Nickel	26.3	14.5%	22.5	30.1
Selenium	1.80	20.0%	1.44	2.16
Silver	0.048	9.03%	0.044	0.052
Thallium	0.098	14.4%	0.084	0.11
Vanadium	15.3	9.21%	13.9	16.7
Zinc	89.2	12.7%	77.9	101
Other Inorganic Parameters (mg/kg)				
Cyanide	0.19	40.2%	0.11	0.27
Fluoride	39.3	20.5%	31.2	47.4
Essential Nutrients (mg/kg)				
Calcium	13,300	10.7%	11,881	14,719
Magnesium	11,000	2.82%	10,690	11,310
Potassium	1,150	6.24%	1,078	1,222
Sodium	79.9	30.7%	55.3	104
Pesticides (mg/kg)				
Aldrin	3.95E-04	--	3.95E-04	3.95E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.00E-04	--	3.00E-04	3.00E-04
Alpha Endosulfan	4.55E-04	--	4.55E-04	4.55E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.20E-04	--	3.20E-04	3.20E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.55E-04	--	3.55E-04	3.55E-04
Dieldrin	4.25E-04	--	4.25E-04	4.25E-04
Endosulfan Sulfate	3.80E-04	--	3.80E-04	3.80E-04
Endrin	4.15E-04	--	4.15E-04	4.15E-04
Endrin Aldehyde	4.05E-04	--	4.05E-04	4.05E-04
Endrin Ketone	4.55E-04	--	4.55E-04	4.55E-04
Gamma Bhc (Lindane)	2.95E-04	--	2.95E-04	2.95E-04
Heptachlor	4.20E-04	--	4.20E-04	4.20E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.30E-04	--	4.30E-04	4.30E-04
P,P'-DDE	4.75E-04	--	4.75E-04	4.75E-04
P,P'-DDT	3.40E-04	--	3.40E-04	3.40E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-023			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-023-SO-0-0.5			
Sample Date	6/27/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.78E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.78E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.004	47.1%	0.002	0.005
Acenaphthene	0.014	42.0%	0.008	0.020
Acenaphthylene	0.004	36.1%	0.003	0.006
Anthracene	0.016	37.7%	0.010	0.022
Fluoranthene	0.41	37.3%	0.26	0.56
Fluorene	0.010	34.6%	0.007	0.013
Naphthalene	0.004	44.9%	0.002	0.006
Phenanthrene	0.18	31.0%	0.12	0.24
Total LMW PAHs - 1/2MDL	0.64	35.8%	0.41	0.87
Total LMW PAHs - MDL	0.67	35.8%	0.43	0.91
Total LMW PAHs - Zero	0.61	35.9%	0.39	0.83
Benzo(A)Pyrene	0.36	36.1%	0.23	0.49
Benzo(A)Anthracene	0.25	32.0%	0.17	0.33
Benzo(B)Fluoranthene	0.79	29.8%	0.55	1.03
Benzo(G,H,I)Perylene	0.44	30.8%	0.30	0.58
Benzo(K)Fluoranthene	0.25	31.3%	0.17	0.33
Chrysene	0.46	35.9%	0.29	0.63
Dibenz(A,H)Anthracene	0.11	39.8%	0.066	0.15
Indeno(1,2,3-C,D)Pyrene	0.44	31.1%	0.30	0.58
Pyrene	0.58	39.3%	0.35	0.81
Total HMW PAHs - 1/2MDL	3.68	26.8%	2.69	4.67
Total HMW PAHs - MDL	3.68	26.8%	2.69	4.67
Total HMW PAHs - Zero	3.68	26.8%	2.69	4.67
Total PAHs - 1/2MDL	3.53	29.6%	2.49	4.57
Total PAHs - MDL	3.55	29.5%	2.50	4.60
Total PAHs - Zero	3.50	29.6%	2.47	4.54
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.013	--	0.013	0.013
1,4-Dioxane (P-Dioxane)	0.045	--	0.045	0.045
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.037	--	0.037	0.037

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-023			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-023-SO-0-0.5			
Sample Date	6/27/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.008	--	0.008	0.008
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.045	--	0.045	0.045
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.007	--	0.007	0.007
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.007	44.4%	0.004	0.011
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	--	0.005	0.005
Biphenyl (Diphenyl)	0.014	49.7%	0.007	0.021
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.033	--	0.033	0.033
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.032	30.5%	0.022	0.042
Dibenzofuran	0.005	33.5%	0.003	0.007
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.015	--	0.015	0.015
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.011	--	0.011	0.011
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	--	0.004	0.004
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-023			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-023-SO-0.5-2			
Sample Date	6/27/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	15,100	4.58%	14,409	15,791
Antimony	0.13	70.4%	0.038	0.22
Arsenic	5.60	7.46%	5.18	6.02
Barium	138	9.24%	125	151
Beryllium	0.57	4.90%	0.54	0.60
Cadmium	0.092	6.03%	0.086	0.098
Chromium, Total	15.5	7.75%	14.3	16.7
Chromium, Hexavalent	0.41	7.75%	0.38	0.45
Chromium, Trivalent	15.1	7.75%	13.9	16.3
Cobalt	6.50	1.99%	6.37	6.63
Copper	16.6	4.63%	15.8	17.4
Iron	17,200	2.40%	16,787	17,613
Lead	12.8	3.33%	12.4	13.2
Manganese	501	7.15%	465	537
Mercury	0.021	27.4%	0.015	0.027
Nickel	14.3	6.58%	13.4	15.2
Selenium	1.90	19.1%	1.54	2.26
Silver	0.043	9.83%	0.039	0.047
Thallium	0.098	6.56%	0.092	0.10
Vanadium	13.0	3.31%	12.6	13.4
Zinc	50.5	5.42%	47.8	53.2
Other Inorganic Parameters (mg/kg)				
Cyanide	0.11	32.7%	0.074	0.15
Fluoride	44.6	28.8%	31.8	57.4
Essential Nutrients (mg/kg)				
Calcium	17,600	15.1%	14,935	20,265
Magnesium	11,100	2.18%	10,858	11,342
Potassium	1,210	6.91%	1,126	1,294
Sodium	80.3	21.1%	63.4	97.2
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-023			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-023-SO-0.5-2			
Sample Date	6/27/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.007	47.7%	0.004	0.011
Acenaphthene	0.019	80.9%	0.004	0.034
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.033	82.4%	0.006	0.060
Fluoranthene	0.19	71.4%	0.054	0.33
Fluorene	0.020	74.2%	0.005	0.035
Naphthalene	0.014	28.9%	0.010	0.018
Phenanthrene	0.18	78.1%	0.039	0.32
Total LMW PAHs - 1/2MDL	0.47	74.3%	0.12	0.81
Total LMW PAHs - MDL	0.47	74.3%	0.12	0.82
Total LMW PAHs - Zero	0.46	74.3%	0.12	0.81
Benzo(A)Pyrene	0.12	67.2%	0.039	0.20
Benzo(A)Anthracene	0.12	68.8%	0.037	0.20
Benzo(B)Fluoranthene	0.16	60.1%	0.064	0.26
Benzo(G,H,I)Perylene	0.15	60.8%	0.059	0.24
Benzo(K)Fluoranthene	0.077	64.5%	0.027	0.13
Chrysene	0.14	62.9%	0.052	0.23
Dibenz(A,H)Anthracene	0.008	63.9%	0.003	0.013
Indeno(1,2,3-C,D)Pyrene	0.12	62.0%	0.046	0.19
Pyrene	0.26	72.7%	0.071	0.45
Total HMW PAHs - 1/2MDL	1.16	64.7%	0.41	1.90
Total HMW PAHs - MDL	1.16	64.7%	0.41	1.92
Total HMW PAHs - Zero	1.15	64.7%	0.40	1.89
Total PAHs - 1/2MDL	1.46	68.3%	0.46	2.45
Total PAHs - MDL	1.47	68.3%	0.46	2.47
Total PAHs - Zero	1.44	68.3%	0.46	2.43
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.043	--	0.043	0.043
2,3,4,6-Tetrachlorophenol	0.015	--	0.015	0.015
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.035	--	0.035	0.035

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-023			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-023-SO-0.5-2			
Sample Date	6/27/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.12	--	0.12	0.12
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.005	--	0.005	0.005
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.043	--	0.043	0.043
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.075	--	0.075	0.075
Acetophenone	0.003	41.1%	0.002	0.005
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.012	--	0.012	0.012
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.014	98.2%	2.43E-04	0.027
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.014	--	0.014	0.014
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.018	76.1%	0.004	0.032
Dibenzofuran	0.011	70.0%	0.003	0.019
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.011	--	0.011	0.011
Di-N-Octylphthalate	0.008	--	0.008	0.008
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.004	--	0.004	0.004
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.003	32.5%	0.002	0.005
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.019	--	0.019	0.019
Phenol	0.005	--	0.005	0.005

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-024			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-024-SO-0-0.5			
Sample Date	6/29/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	22,900	4.68%	21,828	23,972
Antimony	0.22	28.1%	0.16	0.28
Arsenic	6.00	13.8%	5.17	6.83
Barium	97.2	4.03%	93.3	101
Beryllium	0.81	6.32%	0.76	0.86
Cadmium	0.28	15.0%	0.24	0.32
Chromium, Total	18.5	10.6%	16.5	20.5
Chromium, Hexavalent	0.50	10.6%	0.44	0.55
Chromium, Trivalent	18.0	10.6%	16.1	19.9
Cobalt	6.30	3.51%	6.08	6.52
Copper	19.6	12.3%	17.2	22.0
Iron	16,700	3.40%	16,132	17,268
Lead	18.1	48.5%	9.32	26.9
Manganese	390	5.63%	368	412
Mercury	0.039	54.9%	0.018	0.060
Nickel	51.4	14.5%	44.0	58.8
Selenium	1.60	20.0%	1.28	1.92
Silver	0.047	9.03%	0.043	0.051
Thallium	0.10	14.4%	0.086	0.11
Vanadium	21.7	9.21%	19.7	23.7
Zinc	77.8	12.7%	67.9	87.7
Other Inorganic Parameters (mg/kg)				
Cyanide	0.31	40.2%	0.19	0.43
Fluoride	592	20.5%	470	714
Essential Nutrients (mg/kg)				
Calcium	23,600	10.7%	21,083	26,117
Magnesium	11,800	2.82%	11,467	12,133
Potassium	1,790	6.24%	1,678	1,902
Sodium	1,520	30.7%	1,053	1,987
Pesticides (mg/kg)				
Aldrin	3.90E-04	--	3.90E-04	3.90E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	2.95E-04	--	2.95E-04	2.95E-04
Alpha Endosulfan	4.50E-04	--	4.50E-04	4.50E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.15E-04	--	3.15E-04	3.15E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.50E-04	--	3.50E-04	3.50E-04
Dieldrin	4.20E-04	--	4.20E-04	4.20E-04
Endosulfan Sulfate	3.75E-04	--	3.75E-04	3.75E-04
Endrin	4.10E-04	--	4.10E-04	4.10E-04
Endrin Aldehyde	4.00E-04	--	4.00E-04	4.00E-04
Endrin Ketone	4.50E-04	--	4.50E-04	4.50E-04
Gamma Bhc (Lindane)	2.90E-04	--	2.90E-04	2.90E-04
Heptachlor	4.15E-04	--	4.15E-04	4.15E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.25E-04	--	4.25E-04	4.25E-04
P,P'-DDE	4.70E-04	--	4.70E-04	4.70E-04
P,P'-DDT	3.35E-04	--	3.35E-04	3.35E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-024			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-024-SO-0-0.5			
Sample Date	6/29/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.004	140%	-1.76E-03	0.011
PCB-1260 (Aroclor 1260)	0.004	--	0.004	0.004
PCB-1262 (Aroclor 1262)	0.004	--	0.004	0.004
PCB-1268 (Aroclor 1268)	0.004	--	0.004	0.004
Polychlorinated Biphenyl (PCBs)	0.004	140%	-1.76E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.052	47.1%	0.028	0.076
Acenaphthene	0.35	42.0%	0.20	0.50
Acenaphthylene	0.009	36.1%	0.005	0.012
Anthracene	0.57	37.7%	0.36	0.78
Fluoranthene	5.10	37.3%	3.20	7.00
Fluorene	0.22	34.6%	0.14	0.30
Naphthalene	0.11	44.9%	0.061	0.16
Phenanthrene	2.70	31.0%	1.86	3.54
Total LMW PAHs - 1/2MDL	9.11	35.8%	5.85	12.4
Total LMW PAHs - MDL	9.12	35.8%	5.86	12.4
Total LMW PAHs - Zero	9.10	35.9%	5.84	12.4
Benzo(A)Pyrene	3.50	36.1%	2.23	4.77
Benzo(A)Anthracene	2.90	32.0%	1.97	3.83
Benzo(B)Fluoranthene	4.90	29.8%	3.44	6.36
Benzo(G,H,I)Perylene	3.80	30.8%	2.63	4.97
Benzo(K)Fluoranthene	1.50	31.3%	1.03	1.97
Chrysene	4.00	35.9%	2.56	5.44
Dibenz(A,H)Anthracene	1.00	39.8%	0.60	1.40
Indeno(1,2,3-C,D)Pyrene	4.00	31.1%	2.76	5.24
Pyrene	3.50	39.3%	2.12	4.88
Total HMW PAHs - 1/2MDL	29.1	26.8%	21.3	36.9
Total HMW PAHs - MDL	29.1	26.8%	21.3	36.9
Total HMW PAHs - Zero	29.1	26.8%	21.3	36.9
Total PAHs - 1/2MDL	33.3	29.6%	23.4	43.1
Total PAHs - MDL	33.3	29.5%	23.4	43.1
Total PAHs - Zero	33.3	29.6%	23.4	43.1
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.024	--	0.024	0.024
1,4-Dioxane (P-Dioxane)	0.085	--	0.085	0.085
2,3,4,6-Tetrachlorophenol	0.031	--	0.031	0.031
2,4,5-Trichlorophenol	0.032	--	0.032	0.032
2,4,6-Trichlorophenol	0.009	--	0.009	0.009
2,4-Dichlorophenol	0.008	--	0.008	0.008
2,4-Dimethylphenol	0.070	--	0.070	0.070

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-024			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-024-SO-0-0.5			
Sample Date	6/29/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.25	--	0.25	0.25
2,4-Dinitrotoluene	0.013	--	0.013	0.013
2,6-Dinitrotoluene	0.017	--	0.017	0.017
2-Chloronaphthalene	0.008	--	0.008	0.008
2-Chlorophenol	0.008	--	0.008	0.008
2-Methylphenol (O-Cresol)	0.014	--	0.014	0.014
2-Nitroaniline	0.011	--	0.011	0.011
2-Nitrophenol	0.011	--	0.011	0.011
3- And 4- Methylphenol (Total)	0.009	--	0.009	0.009
3,3'-Dichlorobenzidine	0.036	--	0.036	0.036
3-Nitroaniline	0.010	--	0.010	0.010
4,6-Dinitro-2-Methylphenol	0.085	--	0.085	0.085
4-Bromophenyl Phenyl Ether	0.010	--	0.010	0.010
4-Chloro-3-Methylphenol	0.014	--	0.014	0.014
4-Chloroaniline	0.009	--	0.009	0.009
4-Chlorophenyl Phenyl Ether	0.010	--	0.010	0.010
4-Nitroaniline	0.012	--	0.012	0.012
4-Nitrophenol	0.16	--	0.16	0.16
Acetophenone	0.007	44.4%	0.004	0.010
Atrazine	0.015	--	0.015	0.015
Benzaldehyde	0.025	--	0.025	0.025
Benzyl Butyl Phthalate	0.010	--	0.010	0.010
Biphenyl (Diphenyl)	0.028	49.7%	0.014	0.041
Bis(2-Chloroethoxy) Methane	0.010	--	0.010	0.010
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.008	--	0.008	0.008
Bis(2-Chloroisopropyl) Ether	0.014	--	0.014	0.014
Bis(2-Ethylhexyl) Phthalate	0.013	--	0.013	0.013
Caprolactam	0.024	--	0.024	0.024
Carbazole	0.43	30.5%	0.30	0.56
Dibenzofuran	0.14	33.5%	0.093	0.19
Diethyl Phthalate	0.009	--	0.009	0.009
Dimethyl Phthalate	0.010	--	0.010	0.010
Di-N-Butyl Phthalate	0.010	--	0.010	0.010
Di-N-Octylphthalate	0.017	--	0.017	0.017
Hexachlorobenzene	0.013	--	0.013	0.013
Hexachlorobutadiene	0.009	--	0.009	0.009
Hexachlorocyclopentadiene	0.020	--	0.020	0.020
Hexachloroethane	0.012	--	0.012	0.012
Isophorone	0.076	--	0.076	0.076
Nitrobenzene	0.010	--	0.010	0.010
N-Nitrosodi-N-Propylamine	0.011	--	0.011	0.011
N-Nitrosodiphenylamine	0.030	--	0.030	0.030
Pentachlorophenol	0.039	--	0.039	0.039
Phenol	0.011	--	0.011	0.011

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-024			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-024-SO-0.5-2			
Sample Date	6/29/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	13,200	4.58%	12,596	13,804
Antimony	0.14	70.4%	0.041	0.24
Arsenic	5.00	7.46%	4.63	5.37
Barium	123	9.24%	112	134
Beryllium	0.56	4.90%	0.53	0.59
Cadmium	0.10	6.03%	0.094	0.11
Chromium, Total	15.9	7.75%	14.7	17.1
Chromium, Hexavalent	0.43	7.75%	0.39	0.46
Chromium, Trivalent	15.5	7.75%	14.3	16.7
Cobalt	6.10	1.99%	5.98	6.22
Copper	17.7	4.63%	16.9	18.5
Iron	15,400	2.40%	15,030	15,770
Lead	12.4	3.33%	12.0	12.8
Manganese	437	7.15%	406	468
Mercury	0.021	27.4%	0.015	0.027
Nickel	19.0	6.58%	17.8	20.2
Selenium	1.50	19.1%	1.21	1.79
Silver	0.049	9.83%	0.044	0.054
Thallium	0.082	6.56%	0.077	0.087
Vanadium	13.4	3.31%	13.0	13.8
Zinc	52.4	5.42%	49.6	55.2
Other Inorganic Parameters (mg/kg)				
Cyanide	0.14	32.7%	0.094	0.19
Fluoride	204	28.8%	145	263
Essential Nutrients (mg/kg)				
Calcium	25,400	15.1%	21,554	29,246
Magnesium	11,700	2.18%	11,445	11,955
Potassium	1,270	6.91%	1,182	1,358
Sodium	177	21.1%	140	214
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-024			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-024-SO-0.5-2			
Sample Date	6/29/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.004	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.004	--	0.004	0.004
PCB-1262 (Aroclor 1262)	0.004	--	0.004	0.004
PCB-1268 (Aroclor 1268)	0.004	--	0.004	0.004
Polychlorinated Biphenyl (PCBs)	0.004	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.037	47.7%	0.019	0.055
Acenaphthene	0.31	80.9%	0.059	0.56
Acenaphthylene	0.009	62.8%	0.003	0.014
Anthracene	0.53	82.4%	0.093	0.97
Fluoranthene	4.40	71.4%	1.26	7.54
Fluorene	0.20	74.2%	0.052	0.35
Naphthalene	0.060	28.9%	0.043	0.077
Phenanthrene	2.70	78.1%	0.59	4.81
Total LMW PAHs - 1/2MDL	8.25	74.3%	2.12	14.4
Total LMW PAHs - MDL	8.25	74.3%	2.12	14.4
Total LMW PAHs - Zero	8.24	74.3%	2.12	14.4
Benzo(A)Pyrene	3.10	67.2%	1.02	5.18
Benzo(A)Anthracene	2.40	68.8%	0.75	4.05
Benzo(B)Fluoranthene	3.40	60.1%	1.36	5.44
Benzo(G,H,I)Perylene	2.90	60.8%	1.14	4.66
Benzo(K)Fluoranthene	1.20	64.5%	0.43	1.97
Chrysene	3.10	62.9%	1.15	5.05
Dibenz(A,H)Anthracene	0.69	63.9%	0.25	1.13
Indeno(1,2,3-C,D)Pyrene	3.00	62.0%	1.14	4.86
Pyrene	3.80	72.7%	1.04	6.56
Total HMW PAHs - 1/2MDL	23.6	64.7%	8.32	38.9
Total HMW PAHs - MDL	23.6	64.7%	8.32	38.9
Total HMW PAHs - Zero	23.6	64.7%	8.32	38.9
Total PAHs - 1/2MDL	28.4	68.3%	8.99	47.8
Total PAHs - MDL	28.4	68.3%	9.00	47.8
Total PAHs - Zero	28.4	68.3%	8.99	47.8
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.025	--	0.025	0.025
1,4-Dioxane (P-Dioxane)	0.090	--	0.090	0.090
2,3,4,6-Tetrachlorophenol	0.032	--	0.032	0.032
2,4,5-Trichlorophenol	0.033	--	0.033	0.033
2,4,6-Trichlorophenol	0.010	--	0.010	0.010
2,4-Dichlorophenol	0.008	--	0.008	0.008
2,4-Dimethylphenol	0.075	--	0.075	0.075

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-024			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-024-SO-0.5-2			
Sample Date	6/29/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.25	--	0.25	0.25
2,4-Dinitrotoluene	0.013	--	0.013	0.013
2,6-Dinitrotoluene	0.018	--	0.018	0.018
2-Chloronaphthalene	0.008	--	0.008	0.008
2-Chlorophenol	0.009	--	0.009	0.009
2-Methylphenol (O-Cresol)	0.015	--	0.015	0.015
2-Nitroaniline	0.011	--	0.011	0.011
2-Nitrophenol	0.011	--	0.011	0.011
3- And 4- Methylphenol (Total)	0.009	--	0.009	0.009
3,3'-Dichlorobenzidine	0.037	--	0.037	0.037
3-Nitroaniline	0.010	--	0.010	0.010
4,6-Dinitro-2-Methylphenol	0.090	--	0.090	0.090
4-Bromophenyl Phenyl Ether	0.011	--	0.011	0.011
4-Chloro-3-Methylphenol	0.015	--	0.015	0.015
4-Chloroaniline	0.009	--	0.009	0.009
4-Chlorophenyl Phenyl Ether	0.010	--	0.010	0.010
4-Nitroaniline	0.013	--	0.013	0.013
4-Nitrophenol	0.16	--	0.16	0.16
Acetophenone	0.008	41.1%	0.004	0.011
Atrazine	0.015	--	0.015	0.015
Benzaldehyde	0.026	--	0.026	0.026
Benzyl Butyl Phthalate	0.011	32.7%	0.007	0.014
Biphenyl (Diphenyl)	0.029	98.2%	5.13E-04	0.056
Bis(2-Chloroethoxy) Methane	0.011	--	0.011	0.011
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.008	--	0.008	0.008
Bis(2-Chloroisopropyl) Ether	0.014	--	0.014	0.014
Bis(2-Ethylhexyl) Phthalate	0.013	--	0.013	0.013
Caprolactam	0.024	--	0.024	0.024
Carbazole	0.45	76.1%	0.11	0.79
Dibenzofuran	0.089	70.0%	0.027	0.15
Diethyl Phthalate	0.010	--	0.010	0.010
Dimethyl Phthalate	0.010	--	0.010	0.010
Di-N-Butyl Phthalate	0.010	--	0.010	0.010
Di-N-Octylphthalate	0.017	--	0.017	0.017
Hexachlorobenzene	0.014	--	0.014	0.014
Hexachlorobutadiene	0.010	--	0.010	0.010
Hexachlorocyclopentadiene	0.021	--	0.021	0.021
Hexachloroethane	0.012	--	0.012	0.012
Isophorone	0.007	32.5%	0.005	0.009
Nitrobenzene	0.011	--	0.011	0.011
N-Nitrosodi-N-Propylamine	0.011	--	0.011	0.011
N-Nitrosodiphenylamine	0.030	--	0.030	0.030
Pentachlorophenol	0.041	--	0.041	0.041
Phenol	0.011	--	0.011	0.011

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-025			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-025-SO-0-0.5			
Sample Date	6/30/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	24,800	4.68%	23,639	25,961
Antimony	0.40	28.1%	0.29	0.51
Arsenic	6.00	13.8%	5.17	6.83
Barium	98.7	4.03%	94.7	103
Beryllium	0.67	6.32%	0.63	0.71
Cadmium	0.38	15.0%	0.32	0.44
Chromium, Total	18.3	10.6%	16.4	20.2
Chromium, Hexavalent	0.49	10.6%	0.44	0.54
Chromium, Trivalent	17.8	10.6%	15.9	19.7
Cobalt	6.30	3.51%	6.08	6.52
Copper	33.3	12.3%	29.2	37.4
Iron	17,500	3.40%	16,905	18,095
Lead	19.7	48.5%	10.1	29.3
Manganese	399	5.63%	377	421
Mercury	0.008	54.9%	0.003	0.012
Nickel	46.6	14.5%	39.9	53.3
Selenium	1.90	20.0%	1.52	2.28
Silver	0.065	9.03%	0.059	0.071
Thallium	0.11	14.4%	0.094	0.13
Vanadium	20.9	9.21%	19.0	22.8
Zinc	70.3	12.7%	61.4	79.2
Other Inorganic Parameters (mg/kg)				
Cyanide	0.69	40.2%	0.41	0.97
Fluoride	69.8	20.5%	55.5	84.1
Essential Nutrients (mg/kg)				
Calcium	27,900	10.7%	24,924	30,876
Magnesium	11,700	2.82%	11,370	12,030
Potassium	1,680	6.24%	1,575	1,785
Sodium	312	30.7%	216	408
Pesticides (mg/kg)				
Aldrin	3.95E-04	--	3.95E-04	3.95E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.00E-04	--	3.00E-04	3.00E-04
Alpha Endosulfan	4.55E-04	--	4.55E-04	4.55E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.15E-04	--	3.15E-04	3.15E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.55E-04	--	3.55E-04	3.55E-04
Dieldrin	4.25E-04	--	4.25E-04	4.25E-04
Endosulfan Sulfate	3.80E-04	--	3.80E-04	3.80E-04
Endrin	4.15E-04	--	4.15E-04	4.15E-04
Endrin Aldehyde	4.05E-04	--	4.05E-04	4.05E-04
Endrin Ketone	4.55E-04	--	4.55E-04	4.55E-04
Gamma Bhc (Lindane)	2.95E-04	--	2.95E-04	2.95E-04
Heptachlor	4.20E-04	--	4.20E-04	4.20E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.30E-04	--	4.30E-04	4.30E-04
P,P'-DDE	4.75E-04	--	4.75E-04	4.75E-04
P,P'-DDT	3.35E-04	--	3.35E-04	3.35E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-025			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-025-SO-0-0.5			
Sample Date	6/30/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.78E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.78E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.033	47.1%	0.017	0.049
Acenaphthene	0.21	42.0%	0.12	0.30
Acenaphthylene	0.009	36.1%	0.005	0.012
Anthracene	0.40	37.7%	0.25	0.55
Fluoranthene	4.00	37.3%	2.51	5.49
Fluorene	0.13	34.6%	0.085	0.18
Naphthalene	0.054	44.9%	0.030	0.078
Phenanthrene	2.10	31.0%	1.45	2.75
Total LMW PAHs - 1/2MDL	6.94	35.8%	4.45	9.42
Total LMW PAHs - MDL	6.94	35.8%	4.46	9.43
Total LMW PAHs - Zero	6.93	35.9%	4.44	9.41
Benzo(A)Pyrene	3.10	36.1%	1.98	4.22
Benzo(A)Anthracene	2.40	32.0%	1.63	3.17
Benzo(B)Fluoranthene	4.60	29.8%	3.23	5.97
Benzo(G,H,I)Perylene	4.90	30.8%	3.39	6.41
Benzo(K)Fluoranthene	1.80	31.3%	1.24	2.36
Chrysene	3.60	35.9%	2.31	4.89
Dibenz(A,H)Anthracene	1.20	39.8%	0.72	1.68
Indeno(1,2,3-C,D)Pyrene	4.50	31.1%	3.10	5.90
Pyrene	3.80	39.3%	2.31	5.29
Total HMW PAHs - 1/2MDL	29.9	26.8%	21.9	37.9
Total HMW PAHs - MDL	29.9	26.8%	21.9	37.9
Total HMW PAHs - Zero	29.9	26.8%	21.9	37.9
Total PAHs - 1/2MDL	32.2	29.6%	22.7	41.7
Total PAHs - MDL	32.2	29.5%	22.7	41.7
Total PAHs - Zero	32.2	29.6%	22.7	41.7
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.025	--	0.025	0.025
1,4-Dioxane (P-Dioxane)	0.090	--	0.090	0.090
2,3,4,6-Tetrachlorophenol	0.031	--	0.031	0.031
2,4,5-Trichlorophenol	0.033	--	0.033	0.033
2,4,6-Trichlorophenol	0.010	--	0.010	0.010
2,4-Dichlorophenol	0.008	--	0.008	0.008
2,4-Dimethylphenol	0.075	--	0.075	0.075

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-025			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-025-SO-0-0.5			
Sample Date	6/30/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.25	--	0.25	0.25
2,4-Dinitrotoluene	0.013	--	0.013	0.013
2,6-Dinitrotoluene	0.018	--	0.018	0.018
2-Chloronaphthalene	0.008	--	0.008	0.008
2-Chlorophenol	0.009	--	0.009	0.009
2-Methylphenol (O-Cresol)	0.015	--	0.015	0.015
2-Nitroaniline	0.011	--	0.011	0.011
2-Nitrophenol	0.011	--	0.011	0.011
3- And 4- Methylphenol (Total)	0.009	--	0.009	0.009
3,3'-Dichlorobenzidine	0.037	--	0.037	0.037
3-Nitroaniline	0.010	--	0.010	0.010
4,6-Dinitro-2-Methylphenol	0.090	--	0.090	0.090
4-Bromophenyl Phenyl Ether	0.011	--	0.011	0.011
4-Chloro-3-Methylphenol	0.015	--	0.015	0.015
4-Chloroaniline	0.009	--	0.009	0.009
4-Chlorophenyl Phenyl Ether	0.010	--	0.010	0.010
4-Nitroaniline	0.013	--	0.013	0.013
4-Nitrophenol	0.16	--	0.16	0.16
Acetophenone	0.020	44.4%	0.011	0.029
Atrazine	0.015	--	0.015	0.015
Benzaldehyde	0.051	--	0.051	0.051
Benzyl Butyl Phthalate	0.046	--	0.046	0.046
Biphenyl (Diphenyl)	0.029	49.7%	0.014	0.043
Bis(2-Chloroethoxy) Methane	0.011	--	0.011	0.011
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.008	--	0.008	0.008
Bis(2-Chloroisopropyl) Ether	0.014	--	0.014	0.014
Bis(2-Ethylhexyl) Phthalate	0.047	--	0.047	0.047
Caprolactam	0.024	--	0.024	0.024
Carbazole	0.35	30.5%	0.24	0.46
Dibenzofuran	0.066	33.5%	0.044	0.088
Diethyl Phthalate	0.010	--	0.010	0.010
Dimethyl Phthalate	0.010	--	0.010	0.010
Di-N-Butyl Phthalate	0.010	--	0.010	0.010
Di-N-Octylphthalate	0.017	--	0.017	0.017
Hexachlorobenzene	0.014	--	0.014	0.014
Hexachlorobutadiene	0.010	--	0.010	0.010
Hexachlorocyclopentadiene	0.021	--	0.021	0.021
Hexachloroethane	0.012	--	0.012	0.012
Isophorone	0.007	--	0.007	0.007
Nitrobenzene	0.011	--	0.011	0.011
N-Nitrosodi-N-Propylamine	0.011	--	0.011	0.011
N-Nitrosodiphenylamine	0.030	--	0.030	0.030
Pentachlorophenol	0.040	--	0.040	0.040
Phenol	0.011	--	0.011	0.011

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-025			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-025-SO-0.5-2			
Sample Date	6/30/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	13,900	4.58%	13,264	14,536
Antimony	0.14	70.4%	0.041	0.24
Arsenic	4.50	7.46%	4.16	4.84
Barium	94.7	9.24%	85.9	103
Beryllium	0.54	4.90%	0.51	0.57
Cadmium	0.099	6.03%	0.093	0.10
Chromium, Total	15.8	7.75%	14.6	17.0
Chromium, Hexavalent	0.42	7.75%	0.39	0.46
Chromium, Trivalent	15.4	7.75%	14.2	16.6
Cobalt	5.70	1.99%	5.59	5.81
Copper	15.6	4.63%	14.9	16.3
Iron	15,600	2.40%	15,225	15,975
Lead	11.1	3.33%	10.7	11.5
Manganese	403	7.15%	374	432
Mercury	0.016	27.4%	0.012	0.020
Nickel	18.6	6.58%	17.4	19.8
Selenium	1.50	19.1%	1.21	1.79
Silver	0.034	9.83%	0.031	0.037
Thallium	0.077	6.56%	0.072	0.082
Vanadium	12.6	3.31%	12.2	13.0
Zinc	47.7	5.42%	45.1	50.3
Other Inorganic Parameters (mg/kg)				
Cyanide	0.16	32.7%	0.11	0.21
Fluoride	157	28.8%	112	202
Essential Nutrients (mg/kg)				
Calcium	26,900	15.1%	22,827	30,973
Magnesium	11,800	2.18%	11,543	12,057
Potassium	1,210	6.91%	1,126	1,294
Sodium	93.4	21.1%	73.7	113
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-025			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-025-SO-0.5-2			
Sample Date	6/30/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.017	47.7%	0.009	0.025
Acenaphthene	0.10	80.9%	0.019	0.18
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.19	82.4%	0.033	0.35
Fluoranthene	1.80	71.4%	0.51	3.09
Fluorene	0.068	74.2%	0.018	0.12
Naphthalene	0.027	28.9%	0.019	0.035
Phenanthrene	1.00	78.1%	0.22	1.78
Total LMW PAHs - 1/2MDL	3.21	74.3%	0.83	5.59
Total LMW PAHs - MDL	3.21	74.3%	0.83	5.59
Total LMW PAHs - Zero	3.20	74.3%	0.82	5.58
Benzo(A)Pyrene	1.10	67.2%	0.36	1.84
Benzo(A)Anthracene	0.87	68.8%	0.27	1.47
Benzo(B)Fluoranthene	1.40	60.1%	0.56	2.24
Benzo(G,H,I)Perylene	1.40	60.8%	0.55	2.25
Benzo(K)Fluoranthene	0.50	64.5%	0.18	0.82
Chrysene	1.20	62.9%	0.44	1.96
Dibenz(A,H)Anthracene	0.32	63.9%	0.12	0.52
Indeno(1,2,3-C,D)Pyrene	1.40	62.0%	0.53	2.27
Pyrene	1.40	72.7%	0.38	2.42
Total HMW PAHs - 1/2MDL	9.59	64.7%	3.38	15.8
Total HMW PAHs - MDL	9.59	64.7%	3.38	15.8
Total HMW PAHs - Zero	9.59	64.7%	3.38	15.8
Total PAHs - 1/2MDL	11.4	68.3%	3.60	19.2
Total PAHs - MDL	11.4	68.3%	3.61	19.2
Total PAHs - Zero	11.4	68.3%	3.60	19.1
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.044	--	0.044	0.044
2,3,4,6-Tetrachlorophenol	0.015	--	0.015	0.015
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.036	--	0.036	0.036

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-025			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-025-SO-0.5-2			
Sample Date	6/30/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.12	--	0.12	0.12
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.043	--	0.043	0.043
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.012	41.1%	0.007	0.017
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.014	98.2%	2.52E-04	0.028
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.15	76.1%	0.036	0.26
Dibenzofuran	0.035	70.0%	0.010	0.060
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.008	--	0.008	0.008
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	32.5%	0.002	0.005
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-026			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-026-SO-0-0.5			
Sample Date	6/30/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	37,100	4.68%	35,363	38,837
Antimony	0.27	28.1%	0.19	0.35
Arsenic	7.20	13.8%	6.20	8.20
Barium	251	4.03%	241	261
Beryllium	1.30	6.32%	1.22	1.38
Cadmium	0.55	15.0%	0.47	0.63
Chromium, Total	27.6	10.6%	24.7	30.5
Chromium, Hexavalent	0.74	10.6%	0.66	0.82
Chromium, Trivalent	26.9	10.6%	24.0	29.7
Cobalt	7.20	3.51%	6.95	7.45
Copper	45.2	12.3%	39.7	50.7
Iron	27,100	3.40%	26,179	28,021
Lead	37.6	48.5%	19.4	55.8
Manganese	583	5.63%	550	616
Mercury	0.008	54.9%	0.004	0.012
Nickel	54.1	14.5%	46.3	61.9
Selenium	3.10	20.0%	2.48	3.72
Silver	0.11	9.03%	0.10	0.12
Thallium	0.17	14.4%	0.15	0.19
Vanadium	27.7	9.21%	25.1	30.3
Zinc	90.0	12.7%	78.6	101
Other Inorganic Parameters (mg/kg)				
Cyanide	0.38	40.2%	0.23	0.53
Fluoride	617	20.5%	490	744
Essential Nutrients (mg/kg)				
Calcium	9,150	10.7%	8,174	10,126
Magnesium	9,870	2.82%	9,592	10,148
Potassium	2,290	6.24%	2,147	2,433
Sodium	2,160	30.7%	1,496	2,824
Pesticides (mg/kg)				
Aldrin	4.00E-04	--	4.00E-04	4.00E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.00E-04	--	3.00E-04	3.00E-04
Alpha Endosulfan	4.60E-04	--	4.60E-04	4.60E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.20E-04	--	3.20E-04	3.20E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.60E-04	--	3.60E-04	3.60E-04
Dieldrin	4.30E-04	--	4.30E-04	4.30E-04
Endosulfan Sulfate	3.85E-04	--	3.85E-04	3.85E-04
Endrin	4.20E-04	--	4.20E-04	4.20E-04
Endrin Aldehyde	4.10E-04	--	4.10E-04	4.10E-04
Endrin Ketone	4.60E-04	--	4.60E-04	4.60E-04
Gamma Bhc (Lindane)	2.95E-04	--	2.95E-04	2.95E-04
Heptachlor	4.25E-04	--	4.25E-04	4.25E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.35E-04	--	4.35E-04	4.35E-04
P,P'-DDE	4.80E-04	--	4.80E-04	4.80E-04
P,P'-DDT	3.40E-04	--	3.40E-04	3.40E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-026			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-026-SO-0-0.5			
Sample Date	6/30/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.80E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.80E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.17	47.1%	0.090	0.25
Acenaphthene	0.41	42.0%	0.24	0.58
Acenaphthylene	0.009	36.1%	0.005	0.012
Anthracene	0.58	37.7%	0.36	0.80
Fluoranthene	3.00	37.3%	1.88	4.12
Fluorene	0.39	34.6%	0.25	0.53
Naphthalene	0.64	44.9%	0.35	0.93
Phenanthrene	2.60	31.0%	1.79	3.41
Total LMW PAHs - 1/2MDL	7.80	35.8%	5.00	10.6
Total LMW PAHs - MDL	7.81	35.8%	5.01	10.6
Total LMW PAHs - Zero	7.79	35.9%	4.99	10.6
Benzo(A)Pyrene	1.80	36.1%	1.15	2.45
Benzo(A)Anthracene	1.70	32.0%	1.16	2.24
Benzo(B)Fluoranthene	4.00	29.8%	2.81	5.19
Benzo(G,H,I)Perylene	2.70	30.8%	1.87	3.53
Benzo(K)Fluoranthene	1.20	31.3%	0.82	1.58
Chrysene	2.90	35.9%	1.86	3.94
Dibenz(A,H)Anthracene	0.86	39.8%	0.52	1.20
Indeno(1,2,3-C,D)Pyrene	3.00	31.1%	2.07	3.93
Pyrene	2.70	39.3%	1.64	3.76
Total HMW PAHs - 1/2MDL	20.9	26.8%	15.3	26.4
Total HMW PAHs - MDL	20.9	26.8%	15.3	26.4
Total HMW PAHs - Zero	20.9	26.8%	15.3	26.4
Total PAHs - 1/2MDL	24.5	29.6%	17.3	31.7
Total PAHs - MDL	24.5	29.5%	17.3	31.7
Total PAHs - Zero	24.5	29.6%	17.2	31.7
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.025	--	0.025	0.025
1,4-Dioxane (P-Dioxane)	0.090	--	0.090	0.090
2,3,4,6-Tetrachlorophenol	0.031	--	0.031	0.031
2,4,5-Trichlorophenol	0.033	--	0.033	0.033
2,4,6-Trichlorophenol	0.010	--	0.010	0.010
2,4-Dichlorophenol	0.008	--	0.008	0.008
2,4-Dimethylphenol	0.075	--	0.075	0.075

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-026			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-026-SO-0-0.5			
Sample Date	6/30/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.25	--	0.25	0.25
2,4-Dinitrotoluene	0.013	--	0.013	0.013
2,6-Dinitrotoluene	0.018	--	0.018	0.018
2-Chloronaphthalene	0.008	--	0.008	0.008
2-Chlorophenol	0.009	--	0.009	0.009
2-Methylphenol (O-Cresol)	0.015	--	0.015	0.015
2-Nitroaniline	0.011	--	0.011	0.011
2-Nitrophenol	0.011	--	0.011	0.011
3- And 4- Methylphenol (Total)	0.009	--	0.009	0.009
3,3'-Dichlorobenzidine	0.037	--	0.037	0.037
3-Nitroaniline	0.010	--	0.010	0.010
4,6-Dinitro-2-Methylphenol	0.090	--	0.090	0.090
4-Bromophenyl Phenyl Ether	0.011	--	0.011	0.011
4-Chloro-3-Methylphenol	0.014	--	0.014	0.014
4-Chloroaniline	0.009	--	0.009	0.009
4-Chlorophenyl Phenyl Ether	0.010	--	0.010	0.010
4-Nitroaniline	0.013	--	0.013	0.013
4-Nitrophenol	0.16	--	0.16	0.16
Acetophenone	0.023	44.4%	0.013	0.033
Atrazine	0.015	--	0.015	0.015
Benzaldehyde	0.025	--	0.025	0.025
Benzyl Butyl Phthalate	0.010	--	0.010	0.010
Biphenyl (Diphenyl)	0.058	49.7%	0.029	0.087
Bis(2-Chloroethoxy) Methane	0.011	--	0.011	0.011
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.008	--	0.008	0.008
Bis(2-Chloroisopropyl) Ether	0.014	--	0.014	0.014
Bis(2-Ethylhexyl) Phthalate	0.055	--	0.055	0.055
Caprolactam	0.024	--	0.024	0.024
Carbazole	0.34	30.5%	0.24	0.44
Dibenzofuran	0.26	33.5%	0.17	0.35
Diethyl Phthalate	0.010	--	0.010	0.010
Dimethyl Phthalate	0.010	--	0.010	0.010
Di-N-Butyl Phthalate	0.021	--	0.021	0.021
Di-N-Octylphthalate	0.017	--	0.017	0.017
Hexachlorobenzene	0.014	--	0.014	0.014
Hexachlorobutadiene	0.010	--	0.010	0.010
Hexachlorocyclopentadiene	0.021	--	0.021	0.021
Hexachloroethane	0.012	--	0.012	0.012
Isophorone	0.007	--	0.007	0.007
Nitrobenzene	0.011	--	0.011	0.011
N-Nitrosodi-N-Propylamine	0.011	--	0.011	0.011
N-Nitrosodiphenylamine	0.030	--	0.030	0.030
Pentachlorophenol	0.040	--	0.040	0.040
Phenol	0.011	--	0.011	0.011

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-026			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-026-SO-0.5-2			
Sample Date	6/30/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	22,400	4.58%	21,375	23,425
Antimony	0.16	70.4%	0.047	0.27
Arsenic	5.60	7.46%	5.18	6.02
Barium	158	9.24%	143	173
Beryllium	0.82	4.90%	0.78	0.86
Cadmium	0.17	6.03%	0.16	0.18
Chromium, Total	18.9	7.75%	17.4	20.4
Chromium, Hexavalent	0.51	7.75%	0.47	0.55
Chromium, Trivalent	18.4	7.75%	17.0	19.8
Cobalt	6.10	1.99%	5.98	6.22
Copper	18.0	4.63%	17.2	18.8
Iron	17,200	2.40%	16,787	17,613
Lead	13.0	3.33%	12.6	13.4
Manganese	455	7.15%	422	488
Mercury	0.017	27.4%	0.012	0.022
Nickel	21.2	6.58%	19.8	22.6
Selenium	2.00	19.1%	1.62	2.38
Silver	0.050	9.83%	0.045	0.055
Thallium	0.12	6.56%	0.11	0.13
Vanadium	18.2	3.31%	17.6	18.8
Zinc	56.8	5.42%	53.7	59.9
Other Inorganic Parameters (mg/kg)				
Cyanide	0.26	32.7%	0.18	0.34
Fluoride	632	28.8%	450	814
Essential Nutrients (mg/kg)				
Calcium	18,800	15.1%	15,954	21,646
Magnesium	11,400	2.18%	11,151	11,649
Potassium	2,180	6.91%	2,029	2,331
Sodium	2,020	21.1%	1,594	2,446
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-026			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-026-SO-0.5-2			
Sample Date	6/30/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.019	47.7%	0.010	0.028
Acenaphthene	0.077	80.9%	0.015	0.14
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.16	82.4%	0.028	0.29
Fluoranthene	1.60	71.4%	0.46	2.74
Fluorene	0.064	74.2%	0.017	0.11
Naphthalene	0.046	28.9%	0.033	0.059
Phenanthrene	0.82	78.1%	0.18	1.46
Total LMW PAHs - 1/2MDL	2.79	74.3%	0.72	4.86
Total LMW PAHs - MDL	2.79	74.3%	0.72	4.87
Total LMW PAHs - Zero	2.79	74.3%	0.72	4.86
Benzo(A)Pyrene	1.30	67.2%	0.43	2.17
Benzo(A)Anthracene	1.00	68.8%	0.31	1.69
Benzo(B)Fluoranthene	1.70	60.1%	0.68	2.72
Benzo(G,H,I)Perylene	1.30	60.8%	0.51	2.09
Benzo(K)Fluoranthene	0.60	64.5%	0.21	0.99
Chrysene	1.30	62.9%	0.48	2.12
Dibenz(A,H)Anthracene	0.38	63.9%	0.14	0.62
Indeno(1,2,3-C,D)Pyrene	1.40	62.0%	0.53	2.27
Pyrene	1.30	72.7%	0.35	2.25
Total HMW PAHs - 1/2MDL	10.3	64.7%	3.63	16.9
Total HMW PAHs - MDL	10.3	64.7%	3.63	16.9
Total HMW PAHs - Zero	10.3	64.7%	3.63	16.9
Total PAHs - 1/2MDL	11.4	68.3%	3.59	19.1
Total PAHs - MDL	11.4	68.3%	3.60	19.1
Total PAHs - Zero	11.3	68.3%	3.59	19.1
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.043	--	0.043	0.043
2,3,4,6-Tetrachlorophenol	0.015	--	0.015	0.015
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.035	--	0.035	0.035

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-026			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-026-SO-0.5-2			
Sample Date	6/30/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.12	--	0.12	0.12
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.043	--	0.043	0.043
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.075	--	0.075	0.075
Acetophenone	0.017	41.1%	0.010	0.024
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.012	--	0.012	0.012
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.014	98.2%	2.43E-04	0.027
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.006	--	0.006	0.006
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.13	76.1%	0.031	0.23
Dibenzofuran	0.035	70.0%	0.010	0.060
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.008	--	0.008	0.008
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.10	32.5%	0.068	0.13
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.005	--	0.005	0.005

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-027			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-027-SO-0-0.5			
Sample Date	7/1/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	30,900	4.68%	29,453	32,347
Antimony	0.31	28.1%	0.22	0.40
Arsenic	8.20	13.8%	7.07	9.33
Barium	293	4.03%	281	305
Beryllium	1.10	6.32%	1.03	1.17
Cadmium	0.65	15.0%	0.55	0.75
Chromium, Total	38.5	10.6%	34.4	42.6
Chromium, Hexavalent	1.03	10.6%	0.92	1.14
Chromium, Trivalent	37.5	10.6%	33.5	41.4
Cobalt	7.60	3.51%	7.33	7.87
Copper	40.3	12.3%	35.4	45.2
Iron	25,500	3.40%	24,633	26,367
Lead	61.2	48.5%	31.5	90.9
Manganese	485	5.63%	458	512
Mercury	0.018	54.9%	0.008	0.028
Nickel	78.0	14.5%	66.7	89.3
Selenium	5.70	20.0%	4.56	6.84
Silver	0.096	9.03%	0.087	0.10
Thallium	0.22	14.4%	0.19	0.25
Vanadium	33.7	9.21%	30.6	36.8
Zinc	83.3	12.7%	72.7	93.9
Other Inorganic Parameters (mg/kg)				
Cyanide	0.43	40.2%	0.26	0.60
Fluoride	244	20.5%	194	294
Essential Nutrients (mg/kg)				
Calcium	7,060	10.7%	6,307	7,813
Magnesium	10,000	2.82%	9,718	10,282
Potassium	2,370	6.24%	2,222	2,518
Sodium	739	30.7%	512	966
Pesticides (mg/kg)				
Aldrin	4.05E-04	--	4.05E-04	4.05E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.05E-04	--	3.05E-04	3.05E-04
Alpha Endosulfan	4.65E-04	--	4.65E-04	4.65E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.25E-04	--	3.25E-04	3.25E-04
Beta Endosulfan	5.50E-04	--	5.50E-04	5.50E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.65E-04	--	3.65E-04	3.65E-04
Dieldrin	4.35E-04	--	4.35E-04	4.35E-04
Endosulfan Sulfate	3.90E-04	--	3.90E-04	3.90E-04
Endrin	4.25E-04	--	4.25E-04	4.25E-04
Endrin Aldehyde	4.15E-04	--	4.15E-04	4.15E-04
Endrin Ketone	4.65E-04	--	4.65E-04	4.65E-04
Gamma Bhc (Lindane)	3.00E-04	--	3.00E-04	3.00E-04
Heptachlor	4.30E-04	--	4.30E-04	4.30E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.40E-04	--	4.40E-04	4.40E-04
P,P'-DDE	4.85E-04	--	4.85E-04	4.85E-04
P,P'-DDT	3.45E-04	--	3.45E-04	3.45E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-027			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-027-SO-0-0.5			
Sample Date	7/1/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.50E-04	--	7.50E-04	7.50E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.82E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.82E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.079	47.1%	0.042	0.12
Acenaphthene	0.13	42.0%	0.075	0.18
Acenaphthylene	0.021	36.1%	0.013	0.029
Anthracene	0.27	37.7%	0.17	0.37
Fluoranthene	3.20	37.3%	2.01	4.39
Fluorene	0.10	34.6%	0.065	0.13
Naphthalene	0.052	44.9%	0.029	0.075
Phenanthrene	1.50	31.0%	1.03	1.97
Total LMW PAHs - 1/2MDL	5.35	35.8%	3.43	7.27
Total LMW PAHs - MDL	5.37	35.8%	3.45	7.30
Total LMW PAHs - Zero	5.33	35.9%	3.42	7.24
Benzo(A)Pyrene	2.00	36.1%	1.28	2.72
Benzo(A)Anthracene	2.70	32.0%	1.83	3.57
Benzo(B)Fluoranthene	12.0	29.8%	8.42	15.6
Benzo(G,H,I)Perylene	6.10	30.8%	4.22	7.98
Benzo(K)Fluoranthene	3.10	31.3%	2.13	4.07
Chrysene	6.10	35.9%	3.91	8.29
Dibenz(A,H)Anthracene	2.40	39.8%	1.44	3.36
Indeno(1,2,3-C,D)Pyrene	6.70	31.1%	4.61	8.79
Pyrene	2.70	39.3%	1.64	3.76
Total HMW PAHs - 1/2MDL	43.8	26.8%	32.1	55.5
Total HMW PAHs - MDL	43.8	26.8%	32.1	55.5
Total HMW PAHs - Zero	43.8	26.8%	32.1	55.5
Total PAHs - 1/2MDL	37.1	29.6%	26.1	48.0
Total PAHs - MDL	37.1	29.5%	26.1	48.1
Total PAHs - Zero	37.1	29.6%	26.1	48.0
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.060	--	0.060	0.060
1,4-Dioxane (P-Dioxane)	0.22	--	0.22	0.22
2,3,4,6-Tetrachlorophenol	0.075	--	0.075	0.075
2,4,5-Trichlorophenol	0.080	--	0.080	0.080
2,4,6-Trichlorophenol	0.023	--	0.023	0.023
2,4-Dichlorophenol	0.019	--	0.019	0.019
2,4-Dimethylphenol	0.18	--	0.18	0.18

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-027			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-027-SO-0-0.5			
Sample Date	7/1/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.60	--	0.60	0.60
2,4-Dinitrotoluene	0.032	--	0.032	0.032
2,6-Dinitrotoluene	0.043	--	0.043	0.043
2-Chloronaphthalene	0.019	--	0.019	0.019
2-Chlorophenol	0.021	--	0.021	0.021
2-Methylphenol (O-Cresol)	0.036	--	0.036	0.036
2-Nitroaniline	0.027	--	0.027	0.027
2-Nitrophenol	0.027	--	0.027	0.027
3- And 4- Methylphenol (Total)	0.022	--	0.022	0.022
3,3'-Dichlorobenzidine	0.090	--	0.090	0.090
3-Nitroaniline	0.024	--	0.024	0.024
4,6-Dinitro-2-Methylphenol	0.22	--	0.22	0.22
4-Bromophenyl Phenyl Ether	0.026	--	0.026	0.026
4-Chloro-3-Methylphenol	0.035	--	0.035	0.035
4-Chloroaniline	0.021	--	0.021	0.021
4-Chlorophenyl Phenyl Ether	0.024	--	0.024	0.024
4-Nitroaniline	0.031	--	0.031	0.031
4-Nitrophenol	0.39	--	0.39	0.39
Acetophenone	0.018	44.4%	0.010	0.025
Atrazine	0.036	--	0.036	0.036
Benzaldehyde	0.060	--	0.060	0.060
Benzyl Butyl Phthalate	0.025	--	0.025	0.025
Biphenyl (Diphenyl)	0.070	49.7%	0.035	0.10
Bis(2-Chloroethoxy) Methane	0.025	--	0.025	0.025
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.019	--	0.019	0.019
Bis(2-Chloroisopropyl) Ether	0.034	--	0.034	0.034
Bis(2-Ethylhexyl) Phthalate	0.27	--	0.27	0.27
Caprolactam	0.060	--	0.060	0.060
Carbazole	0.25	30.5%	0.17	0.33
Dibenzofuran	0.088	33.5%	0.059	0.12
Diethyl Phthalate	0.023	--	0.023	0.023
Dimethyl Phthalate	0.024	--	0.024	0.024
Di-N-Butyl Phthalate	0.024	--	0.024	0.024
Di-N-Octylphthalate	0.041	--	0.041	0.041
Hexachlorobenzene	0.033	--	0.033	0.033
Hexachlorobutadiene	0.023	--	0.023	0.023
Hexachlorocyclopentadiene	0.050	--	0.050	0.050
Hexachloroethane	0.030	--	0.030	0.030
Isophorone	0.018	--	0.018	0.018
Nitrobenzene	0.026	--	0.026	0.026
N-Nitrosodi-N-Propylamine	0.027	--	0.027	0.027
N-Nitrosodiphenylamine	0.075	--	0.075	0.075
Pentachlorophenol	0.10	--	0.10	0.10
Phenol	0.027	--	0.027	0.027

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-027			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-027-SO-0.5-2			
Sample Date	7/1/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	24,900	4.58%	23,761	26,039
Antimony	0.21	70.4%	0.062	0.36
Arsenic	5.80	7.46%	5.37	6.23
Barium	165	9.24%	150	180
Beryllium	1.20	4.90%	1.14	1.26
Cadmium	0.19	6.03%	0.18	0.20
Chromium, Total	54.4	7.75%	50.2	58.6
Chromium, Hexavalent	1.46	7.75%	1.34	1.57
Chromium, Trivalent	52.9	7.75%	48.8	57.0
Cobalt	6.30	1.99%	6.17	6.43
Copper	18.7	4.63%	17.8	19.6
Iron	17,200	2.40%	16,787	17,613
Lead	13.9	3.33%	13.4	14.4
Manganese	448	7.15%	416	480
Mercury	0.008	27.4%	0.005	0.010
Nickel	38.5	6.58%	36.0	41.0
Selenium	1.80	19.1%	1.46	2.14
Silver	0.053	9.83%	0.048	0.058
Thallium	0.15	6.56%	0.14	0.16
Vanadium	31.2	3.31%	30.2	32.2
Zinc	53.4	5.42%	50.5	56.3
Other Inorganic Parameters (mg/kg)				
Cyanide	0.43	32.7%	0.29	0.57
Fluoride	946	28.8%	674	1,218
Essential Nutrients (mg/kg)				
Calcium	19,100	15.1%	16,208	21,992
Magnesium	10,700	2.18%	10,467	10,933
Potassium	2,480	6.91%	2,309	2,651
Sodium	2,760	21.1%	2,178	3,342
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-027			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-027-SO-0.5-2			
Sample Date	7/1/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	4.45E-05	--	4.45E-05	4.45E-05
PCB-1221 (Aroclor 1221)	4.45E-05	--	4.45E-05	4.45E-05
PCB-1232 (Aroclor 1232)	4.45E-05	--	4.45E-05	4.45E-05
PCB-1242 (Aroclor 1242)	4.45E-05	--	4.45E-05	4.45E-05
PCB-1248 (Aroclor 1248)	4.45E-05	--	4.45E-05	4.45E-05
PCB-1254 (Aroclor 1254)	4.60E-05	29.2%	3.26E-05	5.94E-05
PCB-1260 (Aroclor 1260)	4.60E-05	--	4.60E-05	4.60E-05
PCB-1262 (Aroclor 1262)	4.60E-05	--	4.60E-05	4.60E-05
PCB-1268 (Aroclor 1268)	4.60E-05	--	4.60E-05	4.60E-05
Polychlorinated Biphenyl (PCBs)	4.60E-05	29.2%	3.26E-05	5.94E-05
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.054	47.7%	0.028	0.080
Acenaphthene	0.29	80.9%	0.055	0.52
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.58	82.4%	0.10	1.06
Fluoranthene	5.40	71.4%	1.54	9.26
Fluorene	0.22	74.2%	0.057	0.38
Naphthalene	0.079	28.9%	0.056	0.10
Phenanthrene	2.70	78.1%	0.59	4.81
Total LMW PAHs - 1/2MDL	9.33	74.3%	2.40	16.3
Total LMW PAHs - MDL	9.33	74.3%	2.40	16.3
Total LMW PAHs - Zero	9.32	74.3%	2.40	16.2
Benzo(A)Pyrene	3.90	67.2%	1.28	6.52
Benzo(A)Anthracene	3.00	68.8%	0.94	5.06
Benzo(B)Fluoranthene	4.90	60.1%	1.96	7.84
Benzo(G,H,I)Perylene	4.20	60.8%	1.65	6.75
Benzo(K)Fluoranthene	1.70	64.5%	0.60	2.80
Chrysene	4.30	62.9%	1.59	7.01
Dibenz(A,H)Anthracene	1.10	63.9%	0.40	1.80
Indeno(1,2,3-C,D)Pyrene	3.90	62.0%	1.48	6.32
Pyrene	4.60	72.7%	1.26	7.94
Total HMW PAHs - 1/2MDL	31.6	64.7%	11.1	52.1
Total HMW PAHs - MDL	31.6	64.7%	11.1	52.1
Total HMW PAHs - Zero	31.6	64.7%	11.1	52.1
Total PAHs - 1/2MDL	36.0	68.3%	11.4	60.6
Total PAHs - MDL	36.0	68.3%	11.4	60.6
Total PAHs - Zero	36.0	68.3%	11.4	60.5
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.043	--	0.043	0.043
2,3,4,6-Tetrachlorophenol	0.015	--	0.015	0.015
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.035	--	0.035	0.035

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-027			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-027-SO-0.5-2			
Sample Date	7/1/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.12	--	0.12	0.12
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.005	--	0.005	0.005
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.043	--	0.043	0.043
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.075	--	0.075	0.075
Acetophenone	0.020	41.1%	0.012	0.028
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.026	--	0.026	0.026
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.014	98.2%	2.43E-04	0.027
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.074	--	0.074	0.074
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.48	76.1%	0.11	0.85
Dibenzofuran	0.11	70.0%	0.033	0.19
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.008	--	0.008	0.008
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.004	--	0.004	0.004
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.11	32.5%	0.074	0.15
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.019	--	0.019	0.019
Phenol	0.017	--	0.017	0.017

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-028			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-028-SO-0-0.5			
Sample Date	7/1/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	26,900	4.68%	25,640	28,160
Antimony	0.15	28.1%	0.11	0.19
Arsenic	5.30	13.8%	4.57	6.03
Barium	262	4.03%	251	273
Beryllium	0.92	6.32%	0.86	0.98
Cadmium	0.22	15.0%	0.19	0.25
Chromium, Total	17.7	10.6%	15.8	19.6
Chromium, Hexavalent	0.47	10.6%	0.42	0.52
Chromium, Trivalent	17.2	10.6%	15.4	19.0
Cobalt	6.50	3.51%	6.27	6.73
Copper	20.6	12.3%	18.1	23.1
Iron	18,400	3.40%	17,775	19,025
Lead	16.6	48.5%	8.55	24.7
Manganese	452	5.63%	427	477
Mercury	0.008	54.9%	0.004	0.012
Nickel	24.7	14.5%	21.1	28.3
Selenium	2.30	20.0%	1.84	2.76
Silver	0.063	9.03%	0.057	0.069
Thallium	0.12	14.4%	0.10	0.14
Vanadium	18.0	9.21%	16.3	19.7
Zinc	64.3	12.7%	56.1	72.5
Other Inorganic Parameters (mg/kg)				
Cyanide	0.28	40.2%	0.17	0.39
Fluoride	183	20.5%	145	221
Essential Nutrients (mg/kg)				
Calcium	7,530	10.7%	6,727	8,333
Magnesium	10,100	2.82%	9,815	10,385
Potassium	1,770	6.24%	1,660	1,880
Sodium	357	30.7%	247	467
Pesticides (mg/kg)				
Aldrin	4.05E-04	--	4.05E-04	4.05E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.05E-04	--	3.05E-04	3.05E-04
Alpha Endosulfan	4.65E-04	--	4.65E-04	4.65E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.25E-04	--	3.25E-04	3.25E-04
Beta Endosulfan	5.50E-04	--	5.50E-04	5.50E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.65E-04	--	3.65E-04	3.65E-04
Dieldrin	4.35E-04	--	4.35E-04	4.35E-04
Endosulfan Sulfate	3.90E-04	--	3.90E-04	3.90E-04
Endrin	4.25E-04	--	4.25E-04	4.25E-04
Endrin Aldehyde	4.15E-04	--	4.15E-04	4.15E-04
Endrin Ketone	4.65E-04	--	4.65E-04	4.65E-04
Gamma Bhc (Lindane)	3.00E-04	--	3.00E-04	3.00E-04
Heptachlor	4.30E-04	--	4.30E-04	4.30E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.40E-04	--	4.40E-04	4.40E-04
P,P'-DDE	4.85E-04	--	4.85E-04	4.85E-04
P,P'-DDT	3.45E-04	--	3.45E-04	3.45E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-028			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-028-SO-0-0.5			
Sample Date	7/1/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.50E-04	--	7.50E-04	7.50E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.82E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.82E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.011	47.1%	0.006	0.016
Acenaphthene	0.035	42.0%	0.020	0.050
Acenaphthylene	0.004	36.1%	0.003	0.006
Anthracene	0.079	37.7%	0.049	0.11
Fluoranthene	0.88	37.3%	0.55	1.21
Fluorene	0.028	34.6%	0.018	0.038
Naphthalene	0.019	44.9%	0.010	0.028
Phenanthrene	0.41	31.0%	0.28	0.54
Total LMW PAHs - 1/2MDL	1.47	35.8%	0.94	1.99
Total LMW PAHs - MDL	1.47	35.8%	0.94	2.00
Total LMW PAHs - Zero	1.46	35.9%	0.94	1.99
Benzo(A)Pyrene	0.61	36.1%	0.39	0.83
Benzo(A)Anthracene	0.47	32.0%	0.32	0.62
Benzo(B)Fluoranthene	0.96	29.8%	0.67	1.25
Benzo(G,H,I)Perylene	0.72	30.8%	0.50	0.94
Benzo(K)Fluoranthene	0.35	31.3%	0.24	0.46
Chrysene	0.74	35.9%	0.47	1.01
Dibenz(A,H)Anthracene	0.19	39.8%	0.11	0.27
Indeno(1,2,3-C,D)Pyrene	0.82	31.1%	0.56	1.08
Pyrene	0.65	39.3%	0.39	0.91
Total HMW PAHs - 1/2MDL	5.51	26.8%	4.03	6.99
Total HMW PAHs - MDL	5.51	26.8%	4.03	6.99
Total HMW PAHs - Zero	5.51	26.8%	4.03	6.99
Total PAHs - 1/2MDL	6.01	29.6%	4.23	7.78
Total PAHs - MDL	6.01	29.5%	4.23	7.78
Total PAHs - Zero	6.00	29.6%	4.23	7.77
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.044	--	0.044	0.044
2,3,4,6-Tetrachlorophenol	0.015	--	0.015	0.015
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.036	--	0.036	0.036

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-028			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-028-SO-0-0.5			
Sample Date	7/1/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.12	--	0.12	0.12
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.043	--	0.043	0.043
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.030	44.4%	0.017	0.043
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.038	--	0.038	0.038
Benzyl Butyl Phthalate	0.005	--	0.005	0.005
Biphenyl (Diphenyl)	0.014	49.7%	0.007	0.021
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.079	30.5%	0.055	0.10
Dibenzofuran	0.017	33.5%	0.011	0.023
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.012	--	0.012	0.012
Di-N-Octylphthalate	0.008	--	0.008	0.008
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.099	--	0.099	0.099
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.015	--	0.015	0.015

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-028			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-028-SO-0.5-2			
Sample Date	7/1/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	25,600	4.58%	24,429	26,771
Antimony	0.17	70.4%	0.050	0.29
Arsenic	5.90	7.46%	5.46	6.34
Barium	180	9.24%	163	197
Beryllium	0.90	4.90%	0.86	0.94
Cadmium	0.13	6.03%	0.12	0.14
Chromium, Total	19.3	7.75%	17.8	20.8
Chromium, Hexavalent	0.52	7.75%	0.48	0.56
Chromium, Trivalent	18.8	7.75%	17.3	20.2
Cobalt	6.10	1.99%	5.98	6.22
Copper	16.1	4.63%	15.4	16.8
Iron	16,300	2.40%	15,909	16,691
Lead	13.9	3.33%	13.4	14.4
Manganese	454	7.15%	422	486
Mercury	0.008	27.4%	0.006	0.010
Nickel	18.6	6.58%	17.4	19.8
Selenium	1.90	19.1%	1.54	2.26
Silver	0.053	9.83%	0.048	0.058
Thallium	0.13	6.56%	0.12	0.14
Vanadium	18.0	3.31%	17.4	18.6
Zinc	53.1	5.42%	50.2	56.0
Other Inorganic Parameters (mg/kg)				
Cyanide	0.77	32.7%	0.52	1.02
Fluoride	861	28.8%	613	1,109
Essential Nutrients (mg/kg)				
Calcium	19,500	15.1%	16,548	22,452
Magnesium	11,000	2.18%	10,760	11,240
Potassium	2,490	6.91%	2,318	2,662
Sodium	3,280	21.1%	2,589	3,971
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-028			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-028-SO-0.5-2			
Sample Date	7/1/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.017	47.7%	0.009	0.025
Acenaphthene	0.095	80.9%	0.018	0.17
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.23	82.4%	0.041	0.42
Fluoranthene	2.70	71.4%	0.77	4.63
Fluorene	0.078	74.2%	0.020	0.14
Naphthalene	0.033	28.9%	0.023	0.043
Phenanthrene	1.30	78.1%	0.28	2.32
Total LMW PAHs - 1/2MDL	4.46	74.3%	1.15	7.77
Total LMW PAHs - MDL	4.46	74.3%	1.15	7.77
Total LMW PAHs - Zero	4.45	74.3%	1.15	7.76
Benzo(A)Pyrene	1.80	67.2%	0.59	3.01
Benzo(A)Anthracene	1.50	68.8%	0.47	2.53
Benzo(B)Fluoranthene	2.30	60.1%	0.92	3.68
Benzo(G,H,I)Perylene	1.70	60.8%	0.67	2.73
Benzo(K)Fluoranthene	0.79	64.5%	0.28	1.30
Chrysene	2.00	62.9%	0.74	3.26
Dibenz(A,H)Anthracene	0.46	63.9%	0.17	0.75
Indeno(1,2,3-C,D)Pyrene	1.80	62.0%	0.68	2.92
Pyrene	2.10	72.7%	0.57	3.63
Total HMW PAHs - 1/2MDL	14.5	64.7%	5.10	23.8
Total HMW PAHs - MDL	14.5	64.7%	5.10	23.8
Total HMW PAHs - Zero	14.5	64.7%	5.10	23.8
Total PAHs - 1/2MDL	16.6	68.3%	5.25	27.9
Total PAHs - MDL	16.6	68.3%	5.26	27.9
Total PAHs - Zero	16.6	68.3%	5.25	27.9
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.043	--	0.043	0.043
2,3,4,6-Tetrachlorophenol	0.015	--	0.015	0.015
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.036	--	0.036	0.036

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-028			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-028-SO-0.5-2			
Sample Date	7/1/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.12	--	0.12	0.12
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.043	--	0.043	0.043
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.075	--	0.075	0.075
Acetophenone	0.021	41.1%	0.012	0.030
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.032	--	0.032	0.032
Benzyl Butyl Phthalate	0.012	32.7%	0.008	0.016
Biphenyl (Diphenyl)	0.014	98.2%	2.43E-04	0.027
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.046	--	0.046	0.046
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.22	76.1%	0.053	0.39
Dibenzofuran	0.041	70.0%	0.012	0.070
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.019	--	0.019	0.019
Di-N-Octylphthalate	0.008	--	0.008	0.008
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.003	32.5%	0.002	0.005
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.014	--	0.014	0.014

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-029			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-029-SO-0-0.5			
Sample Date	6/27/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	17,900	4.68%	17,062	18,738
Antimony	0.24	28.1%	0.17	0.31
Arsenic	5.90	13.8%	5.08	6.72
Barium	120	4.03%	115	125
Beryllium	0.58	6.32%	0.54	0.62
Cadmium	0.24	15.0%	0.20	0.28
Chromium, Total	14.9	10.6%	13.3	16.5
Chromium, Hexavalent	0.40	10.6%	0.36	0.44
Chromium, Trivalent	14.5	10.6%	13.0	16.0
Cobalt	6.30	3.51%	6.08	6.52
Copper	65.1	12.3%	57.1	73.1
Iron	16,500	3.40%	15,939	17,061
Lead	16.6	48.5%	8.55	24.7
Manganese	445	5.63%	420	470
Mercury	0.024	54.9%	0.011	0.037
Nickel	25.2	14.5%	21.6	28.8
Selenium	1.70	20.0%	1.36	2.04
Silver	0.043	9.03%	0.039	0.047
Thallium	0.095	14.4%	0.081	0.11
Vanadium	14.7	9.21%	13.3	16.1
Zinc	75.5	12.7%	65.9	85.1
Other Inorganic Parameters (mg/kg)				
Cyanide	0.27	40.2%	0.16	0.38
Fluoride	39.9	20.5%	31.7	48.1
Essential Nutrients (mg/kg)				
Calcium	18,300	10.7%	16,348	20,252
Magnesium	11,200	2.82%	10,884	11,516
Potassium	1,330	6.24%	1,247	1,413
Sodium	87.2	30.7%	60.4	114
Pesticides (mg/kg)				
Aldrin	3.90E-04	--	3.90E-04	3.90E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	2.95E-04	--	2.95E-04	2.95E-04
Alpha Endosulfan	4.45E-04	--	4.45E-04	4.45E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.15E-04	--	3.15E-04	3.15E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.00E-04	--	5.00E-04	5.00E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.50E-04	--	3.50E-04	3.50E-04
Dieldrin	4.20E-04	--	4.20E-04	4.20E-04
Endosulfan Sulfate	3.75E-04	--	3.75E-04	3.75E-04
Endrin	4.10E-04	--	4.10E-04	4.10E-04
Endrin Aldehyde	4.00E-04	--	4.00E-04	4.00E-04
Endrin Ketone	4.45E-04	--	4.45E-04	4.45E-04
Gamma Bhc (Lindane)	2.90E-04	--	2.90E-04	2.90E-04
Heptachlor	4.15E-04	--	4.15E-04	4.15E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.25E-04	--	4.25E-04	4.25E-04
P,P'-DDE	4.65E-04	--	4.65E-04	4.65E-04
P,P'-DDT	3.30E-04	--	3.30E-04	3.30E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-029			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-029-SO-0-0.5			
Sample Date	6/27/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.004	140%	-1.76E-03	0.011
PCB-1260 (Aroclor 1260)	0.004	--	0.004	0.004
PCB-1262 (Aroclor 1262)	0.004	--	0.004	0.004
PCB-1268 (Aroclor 1268)	0.004	--	0.004	0.004
Polychlorinated Biphenyl (PCBs)	0.004	140%	-1.76E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.008	47.1%	0.004	0.011
Acenaphthene	0.039	42.0%	0.023	0.055
Acenaphthylene	0.004	36.1%	0.003	0.006
Anthracene	0.079	37.7%	0.049	0.11
Fluoranthene	0.96	37.3%	0.60	1.32
Fluorene	0.027	34.6%	0.018	0.036
Naphthalene	0.012	44.9%	0.007	0.017
Phenanthrene	0.47	31.0%	0.32	0.62
Total LMW PAHs - 1/2MDL	1.60	35.8%	1.03	2.17
Total LMW PAHs - MDL	1.60	35.8%	1.03	2.18
Total LMW PAHs - Zero	1.59	35.9%	1.02	2.17
Benzo(A)Pyrene	0.85	36.1%	0.54	1.16
Benzo(A)Anthracene	0.67	32.0%	0.46	0.88
Benzo(B)Fluoranthene	1.40	29.8%	0.98	1.82
Benzo(G,H,I)Perylene	1.10	30.8%	0.76	1.44
Benzo(K)Fluoranthene	0.53	31.3%	0.36	0.70
Chrysene	0.95	35.9%	0.61	1.29
Dibenz(A,H)Anthracene	0.25	39.8%	0.15	0.35
Indeno(1,2,3-C,D)Pyrene	1.10	31.1%	0.76	1.44
Pyrene	1.30	39.3%	0.79	1.81
Total HMW PAHs - 1/2MDL	8.15	26.8%	5.97	10.3
Total HMW PAHs - MDL	8.15	26.8%	5.97	10.3
Total HMW PAHs - Zero	8.15	26.8%	5.97	10.3
Total PAHs - 1/2MDL	8.34	29.6%	5.88	10.8
Total PAHs - MDL	8.35	29.5%	5.88	10.8
Total PAHs - Zero	8.34	29.6%	5.87	10.8
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.044	--	0.044	0.044
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.036	--	0.036	0.036

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-029			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-029-SO-0-0.5			
Sample Date	6/27/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.044	--	0.044	0.044
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.020	44.4%	0.011	0.029
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	--	0.005	0.005
Biphenyl (Diphenyl)	0.014	49.7%	0.007	0.021
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.10	--	0.10	0.10
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.080	30.5%	0.056	0.10
Dibenzofuran	0.015	33.5%	0.010	0.020
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.067	--	0.067	0.067
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	--	0.004	0.004
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.012	--	0.012	0.012

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-029			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-029-SO-0.5-2			
Sample Date	6/27/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	15,600	4.58%	14,886	16,314
Antimony	0.17	70.4%	0.050	0.29
Arsenic	6.40	7.46%	5.92	6.88
Barium	135	9.24%	123	147
Beryllium	0.53	4.90%	0.50	0.56
Cadmium	0.14	6.03%	0.13	0.15
Chromium, Total	17.1	7.75%	15.8	18.4
Chromium, Hexavalent	0.46	7.75%	0.42	0.49
Chromium, Trivalent	16.6	7.75%	15.4	17.9
Cobalt	6.40	1.99%	6.27	6.53
Copper	398	4.63%	380	416
Iron	17,300	2.40%	16,885	17,715
Lead	16.1	3.33%	15.6	16.6
Manganese	515	7.15%	478	552
Mercury	0.024	27.4%	0.017	0.031
Nickel	15.4	6.58%	14.4	16.4
Selenium	1.70	19.1%	1.38	2.02
Silver	0.053	9.83%	0.048	0.058
Thallium	0.089	6.56%	0.083	0.095
Vanadium	12.6	3.31%	12.2	13.0
Zinc	55.0	5.42%	52.0	58.0
Other Inorganic Parameters (mg/kg)				
Cyanide	0.15	32.7%	0.10	0.20
Fluoride	53.0	28.8%	37.7	68.3
Essential Nutrients (mg/kg)				
Calcium	17,300	15.1%	14,681	19,919
Magnesium	11,100	2.18%	10,858	11,342
Potassium	1,100	6.91%	1,024	1,176
Sodium	77.4	21.1%	61.1	93.7
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-029			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-029-SO-0.5-2			
Sample Date	6/27/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.004	47.7%	0.002	0.005
Acenaphthene	0.014	80.9%	0.003	0.025
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.016	82.4%	0.003	0.028
Fluoranthene	0.22	71.4%	0.063	0.38
Fluorene	0.012	74.2%	0.003	0.021
Naphthalene	0.004	28.9%	0.003	0.005
Phenanthrene	0.14	78.1%	0.031	0.25
Total LMW PAHs - 1/2MDL	0.41	74.3%	0.11	0.72
Total LMW PAHs - MDL	0.44	74.3%	0.11	0.77
Total LMW PAHs - Zero	0.39	74.3%	0.099	0.67
Benzo(A)Pyrene	0.17	67.2%	0.056	0.28
Benzo(A)Anthracene	0.14	68.8%	0.044	0.24
Benzo(B)Fluoranthene	0.24	60.1%	0.096	0.38
Benzo(G,H,I)Perylene	0.18	60.8%	0.071	0.29
Benzo(K)Fluoranthene	0.095	64.5%	0.034	0.16
Chrysene	0.17	62.9%	0.063	0.28
Dibenz(A,H)Anthracene	0.055	63.9%	0.020	0.090
Indeno(1,2,3-C,D)Pyrene	0.18	62.0%	0.068	0.29
Pyrene	0.28	72.7%	0.076	0.48
Total HMW PAHs - 1/2MDL	1.51	64.7%	0.53	2.49
Total HMW PAHs - MDL	1.51	64.7%	0.53	2.49
Total HMW PAHs - Zero	1.51	64.7%	0.53	2.49
Total PAHs - 1/2MDL	1.68	68.3%	0.53	2.83
Total PAHs - MDL	1.70	68.3%	0.54	2.87
Total PAHs - Zero	1.66	68.3%	0.52	2.79
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.044	--	0.044	0.044
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.036	--	0.036	0.036

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-029			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-029-SO-0.5-2			
Sample Date	6/27/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.044	--	0.044	0.044
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.015	41.1%	0.009	0.021
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.014	98.2%	2.52E-04	0.028
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.049	--	0.049	0.049
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.025	76.1%	0.006	0.044
Dibenzofuran	0.005	70.0%	0.001	0.008
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.023	--	0.023	0.023
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	32.5%	0.002	0.005
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-030			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-030-SO-0-0.5			
Sample Date	7/25/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	22,500	4.68%	21,446	23,554
Antimony	0.42	28.1%	0.30	0.54
Arsenic	6.20	13.8%	5.34	7.06
Barium	127	4.03%	122	132
Beryllium	0.80	6.32%	0.75	0.85
Cadmium	0.39	15.0%	0.33	0.45
Chromium, Total	18.5	10.6%	16.5	20.5
Chromium, Hexavalent	0.50	10.6%	0.44	0.55
Chromium, Trivalent	18.0	10.6%	16.1	19.9
Cobalt	6.30	3.51%	6.08	6.52
Copper	26.5	12.3%	23.2	29.8
Iron	15,500	3.40%	14,973	16,027
Lead	33.2	48.5%	17.1	49.3
Manganese	461	5.63%	435	487
Mercury	0.031	54.9%	0.014	0.048
Nickel	41.0	14.5%	35.1	46.9
Selenium	1.40	20.0%	1.12	1.68
Silver	0.073	9.03%	0.066	0.080
Thallium	0.11	14.4%	0.094	0.13
Vanadium	20.6	9.21%	18.7	22.5
Zinc	99.2	12.7%	86.6	112
Other Inorganic Parameters (mg/kg)				
Cyanide	0.40	40.2%	0.24	0.56
Fluoride	270	20.5%	215	325
Essential Nutrients (mg/kg)				
Calcium	27,500	10.7%	24,567	30,433
Magnesium	10,700	2.82%	10,398	11,002
Potassium	1,390	6.24%	1,303	1,477
Sodium	679	30.7%	470	888
Pesticides (mg/kg)				
Aldrin	3.95E-04	--	3.95E-04	3.95E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	2.95E-04	--	2.95E-04	2.95E-04
Alpha Endosulfan	4.55E-04	--	4.55E-04	4.55E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.15E-04	--	3.15E-04	3.15E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.55E-04	--	3.55E-04	3.55E-04
Dieldrin	4.25E-04	--	4.25E-04	4.25E-04
Endosulfan Sulfate	3.80E-04	--	3.80E-04	3.80E-04
Endrin	4.15E-04	--	4.15E-04	4.15E-04
Endrin Aldehyde	4.05E-04	--	4.05E-04	4.05E-04
Endrin Ketone	4.55E-04	--	4.55E-04	4.55E-04
Gamma Bhc (Lindane)	2.90E-04	--	2.90E-04	2.90E-04
Heptachlor	4.20E-04	--	4.20E-04	4.20E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.30E-04	--	4.30E-04	4.30E-04
P,P'-DDE	4.75E-04	--	4.75E-04	4.75E-04
P,P'-DDT	3.35E-04	--	3.35E-04	3.35E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-030			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-030-SO-0-0.5			
Sample Date	7/25/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.78E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.78E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.031	47.1%	0.016	0.046
Acenaphthene	0.28	42.0%	0.16	0.40
Acenaphthylene	0.009	36.1%	0.005	0.012
Anthracene	0.66	37.7%	0.41	0.91
Fluoranthene	6.60	37.3%	4.14	9.06
Fluorene	0.17	34.6%	0.11	0.23
Naphthalene	0.063	44.9%	0.035	0.091
Phenanthrene	3.10	31.0%	2.14	4.06
Total LMW PAHs - 1/2MDL	10.9	35.8%	7.00	14.8
Total LMW PAHs - MDL	10.9	35.8%	7.01	14.8
Total LMW PAHs - Zero	10.9	35.9%	6.99	14.8
Benzo(A)Pyrene	5.50	36.1%	3.51	7.49
Benzo(A)Anthracene	4.50	32.0%	3.06	5.94
Benzo(B)Fluoranthene	6.50	29.8%	4.56	8.44
Benzo(G,H,I)Perylene	7.20	30.8%	4.98	9.42
Benzo(K)Fluoranthene	2.40	31.3%	1.65	3.15
Chrysene	5.60	35.9%	3.59	7.61
Dibenz(A,H)Anthracene	1.80	39.8%	1.08	2.52
Indeno(1,2,3-C,D)Pyrene	6.90	31.1%	4.75	9.05
Pyrene	7.10	39.3%	4.31	9.89
Total HMW PAHs - 1/2MDL	47.5	26.8%	34.8	60.2
Total HMW PAHs - MDL	47.5	26.8%	34.8	60.2
Total HMW PAHs - Zero	47.5	26.8%	34.8	60.2
Total PAHs - 1/2MDL	51.9	29.6%	36.5	67.2
Total PAHs - MDL	51.9	29.5%	36.6	67.2
Total PAHs - Zero	51.9	29.6%	36.5	67.2
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.024	--	0.024	0.024
1,4-Dioxane (P-Dioxane)	0.085	--	0.085	0.085
2,3,4,6-Tetrachlorophenol	0.031	--	0.031	0.031
2,4,5-Trichlorophenol	0.032	--	0.032	0.032
2,4,6-Trichlorophenol	0.009	--	0.009	0.009
2,4-Dichlorophenol	0.008	--	0.008	0.008
2,4-Dimethylphenol	0.070	--	0.070	0.070

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-030			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-030-SO-0-0.5			
Sample Date	7/25/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.25	--	0.25	0.25
2,4-Dinitrotoluene	0.013	--	0.013	0.013
2,6-Dinitrotoluene	0.017	--	0.017	0.017
2-Chloronaphthalene	0.008	--	0.008	0.008
2-Chlorophenol	0.008	--	0.008	0.008
2-Methylphenol (O-Cresol)	0.014	--	0.014	0.014
2-Nitroaniline	0.011	--	0.011	0.011
2-Nitrophenol	0.011	--	0.011	0.011
3- And 4- Methylphenol (Total)	0.009	--	0.009	0.009
3,3'-Dichlorobenzidine	0.036	--	0.036	0.036
3-Nitroaniline	0.010	--	0.010	0.010
4,6-Dinitro-2-Methylphenol	0.085	--	0.085	0.085
4-Bromophenyl Phenyl Ether	0.010	--	0.010	0.010
4-Chloro-3-Methylphenol	0.014	--	0.014	0.014
4-Chloroaniline	0.009	--	0.009	0.009
4-Chlorophenyl Phenyl Ether	0.010	--	0.010	0.010
4-Nitroaniline	0.012	--	0.012	0.012
4-Nitrophenol	0.16	--	0.16	0.16
Acetophenone	0.007	44.4%	0.004	0.010
Atrazine	0.015	--	0.015	0.015
Benzaldehyde	0.025	--	0.025	0.025
Benzyl Butyl Phthalate	0.048	--	0.048	0.048
Biphenyl (Diphenyl)	0.028	49.7%	0.014	0.041
Bis(2-Chloroethoxy) Methane	0.010	--	0.010	0.010
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.008	--	0.008	0.008
Bis(2-Chloroisopropyl) Ether	0.013	--	0.013	0.013
Bis(2-Ethylhexyl) Phthalate	0.058	--	0.058	0.058
Caprolactam	0.023	--	0.023	0.023
Carbazole	0.52	30.5%	0.36	0.68
Dibenzofuran	0.085	33.5%	0.057	0.11
Diethyl Phthalate	0.009	--	0.009	0.009
Dimethyl Phthalate	0.010	--	0.010	0.010
Di-N-Butyl Phthalate	0.010	--	0.010	0.010
Di-N-Octylphthalate	0.017	--	0.017	0.017
Hexachlorobenzene	0.013	--	0.013	0.013
Hexachlorobutadiene	0.009	--	0.009	0.009
Hexachlorocyclopentadiene	0.020	--	0.020	0.020
Hexachloroethane	0.012	--	0.012	0.012
Isophorone	0.007	--	0.007	0.007
Nitrobenzene	0.010	--	0.010	0.010
N-Nitrosodi-N-Propylamine	0.011	--	0.011	0.011
N-Nitrosodiphenylamine	0.029	--	0.029	0.029
Pentachlorophenol	0.039	--	0.039	0.039
Phenol	0.011	--	0.011	0.011

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-030			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-030-SO-0.5-2			
Sample Date	7/25/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	16,200	4.58%	15,459	16,941
Antimony	0.12	70.4%	0.035	0.20
Arsenic	4.70	7.46%	4.35	5.05
Barium	157	9.24%	142	172
Beryllium	0.61	4.90%	0.58	0.64
Cadmium	0.16	6.03%	0.15	0.17
Chromium, Total	17.0	7.75%	15.7	18.3
Chromium, Hexavalent	0.45	7.75%	0.42	0.49
Chromium, Trivalent	16.5	7.75%	15.3	17.8
Cobalt	5.80	1.99%	5.68	5.92
Copper	20.8	4.63%	19.8	21.8
Iron	15,200	2.40%	14,835	15,565
Lead	16.8	3.33%	16.2	17.4
Manganese	494	7.15%	459	529
Mercury	0.016	27.4%	0.012	0.020
Nickel	18.6	6.58%	17.4	19.8
Selenium	1.40	19.1%	1.13	1.67
Silver	0.040	9.83%	0.036	0.044
Thallium	0.089	6.56%	0.083	0.095
Vanadium	14.4	3.31%	13.9	14.9
Zinc	61.6	5.42%	58.3	64.9
Other Inorganic Parameters (mg/kg)				
Cyanide	0.18	32.7%	0.12	0.24
Fluoride	297	28.8%	212	382
Essential Nutrients (mg/kg)				
Calcium	20,800	15.1%	17,651	23,949
Magnesium	10,300	2.18%	10,075	10,525
Potassium	1,070	6.91%	996	1,144
Sodium	413	21.1%	326	500
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-030			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-030-SO-0.5-2			
Sample Date	7/25/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.010	47.7%	0.005	0.014
Acenaphthene	0.050	80.9%	0.010	0.090
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.10	82.4%	0.018	0.18
Fluoranthene	1.00	71.4%	0.29	1.71
Fluorene	0.039	74.2%	0.010	0.068
Naphthalene	0.020	28.9%	0.014	0.026
Phenanthrene	0.56	78.1%	0.12	1.00
Total LMW PAHs - 1/2MDL	1.78	74.3%	0.46	3.11
Total LMW PAHs - MDL	1.79	74.3%	0.46	3.11
Total LMW PAHs - Zero	1.78	74.3%	0.46	3.10
Benzo(A)Pyrene	0.88	67.2%	0.29	1.47
Benzo(A)Anthracene	0.64	68.8%	0.20	1.08
Benzo(B)Fluoranthene	1.20	60.1%	0.48	1.92
Benzo(G,H,I)Perylene	0.86	60.8%	0.34	1.38
Benzo(K)Fluoranthene	0.38	64.5%	0.13	0.63
Chrysene	0.84	62.9%	0.31	1.37
Dibenz(A,H)Anthracene	0.19	63.9%	0.069	0.31
Indeno(1,2,3-C,D)Pyrene	0.88	62.0%	0.33	1.43
Pyrene	1.20	72.7%	0.33	2.07
Total HMW PAHs - 1/2MDL	7.07	64.7%	2.49	11.6
Total HMW PAHs - MDL	7.07	64.7%	2.49	11.6
Total HMW PAHs - Zero	7.07	64.7%	2.49	11.6
Total PAHs - 1/2MDL	7.64	68.3%	2.42	12.9
Total PAHs - MDL	7.65	68.3%	2.42	12.9
Total PAHs - Zero	7.64	68.3%	2.42	12.9
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.043	--	0.043	0.043
2,3,4,6-Tetrachlorophenol	0.015	--	0.015	0.015
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.035	--	0.035	0.035

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-030			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-030-SO-0.5-2			
Sample Date	7/25/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.12	--	0.12	0.12
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.043	--	0.043	0.043
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.075	--	0.075	0.075
Acetophenone	0.003	41.1%	0.002	0.005
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.012	--	0.012	0.012
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.014	98.2%	2.43E-04	0.027
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.006	--	0.006	0.006
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.087	76.1%	0.021	0.15
Dibenzofuran	0.021	70.0%	0.006	0.036
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.008	--	0.008	0.008
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.003	32.5%	0.002	0.005
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.005	--	0.005	0.005

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-031			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-031-SO-0-0.5			
Sample Date	7/13/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	29,300	4.68%	27,928	30,672
Antimony	0.39	28.1%	0.28	0.50
Arsenic	5.50	13.8%	4.74	6.26
Barium	116	4.03%	111	121
Beryllium	1.10	6.32%	1.03	1.17
Cadmium	0.59	15.0%	0.50	0.68
Chromium, Total	20.1	10.6%	18.0	22.2
Chromium, Hexavalent	0.54	10.6%	0.48	0.59
Chromium, Trivalent	19.6	10.6%	17.5	21.6
Cobalt	5.80	3.51%	5.60	6.00
Copper	35.7	12.3%	31.3	40.1
Iron	16,900	3.40%	16,326	17,474
Lead	24.8	48.5%	12.8	36.8
Manganese	387	5.63%	365	409
Mercury	0.008	54.9%	0.003	0.012
Nickel	47.6	14.5%	40.7	54.5
Selenium	1.00	20.0%	0.80	1.20
Silver	0.066	9.03%	0.060	0.072
Thallium	0.12	14.4%	0.10	0.14
Vanadium	21.9	9.21%	19.9	23.9
Zinc	90.8	12.7%	79.3	102
Other Inorganic Parameters (mg/kg)				
Cyanide	0.80	40.2%	0.48	1.12
Fluoride	391	20.5%	311	471
Essential Nutrients (mg/kg)				
Calcium	17,300	10.7%	15,455	19,145
Magnesium	8,230	2.82%	7,998	8,462
Potassium	1,620	6.24%	1,519	1,721
Sodium	1,490	30.7%	1,032	1,948
Pesticides (mg/kg)				
Aldrin	4.10E-04	--	4.10E-04	4.10E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.10E-04	--	3.10E-04	3.10E-04
Alpha Endosulfan	4.75E-04	--	4.75E-04	4.75E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.30E-04	--	3.30E-04	3.30E-04
Beta Endosulfan	5.50E-04	--	5.50E-04	5.50E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.70E-04	--	3.70E-04	3.70E-04
Dieldrin	4.40E-04	--	4.40E-04	4.40E-04
Endosulfan Sulfate	3.95E-04	--	3.95E-04	3.95E-04
Endrin	4.30E-04	--	4.30E-04	4.30E-04
Endrin Aldehyde	4.20E-04	--	4.20E-04	4.20E-04
Endrin Ketone	4.75E-04	--	4.75E-04	4.75E-04
Gamma Bhc (Lindane)	3.05E-04	--	3.05E-04	3.05E-04
Heptachlor	4.35E-04	--	4.35E-04	4.35E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.45E-04	--	4.45E-04	4.45E-04
P,P'-DDE	4.95E-04	--	4.95E-04	4.95E-04
P,P'-DDT	3.50E-04	--	3.50E-04	3.50E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-031			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-031-SO-0-0.5			
Sample Date	7/13/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.50E-04	--	7.50E-04	7.50E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	140%	-1.86E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.86E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.011	47.1%	0.006	0.016
Acenaphthene	0.040	42.0%	0.023	0.057
Acenaphthylene	0.004	36.1%	0.003	0.006
Anthracene	0.13	37.7%	0.081	0.18
Fluoranthene	1.60	37.3%	1.00	2.20
Fluorene	0.038	34.6%	0.025	0.051
Naphthalene	0.018	44.9%	0.010	0.026
Phenanthrene	1.00	31.0%	0.69	1.31
Total LMW PAHs - 1/2MDL	2.84	35.8%	1.82	3.86
Total LMW PAHs - MDL	2.85	35.8%	1.83	3.86
Total LMW PAHs - Zero	2.84	35.9%	1.82	3.86
Benzo(A)Pyrene	0.59	36.1%	0.38	0.80
Benzo(A)Anthracene	0.60	32.0%	0.41	0.79
Benzo(B)Fluoranthene	1.00	29.8%	0.70	1.30
Benzo(G,H,I)Perylene	0.75	30.8%	0.52	0.98
Benzo(K)Fluoranthene	0.31	31.3%	0.21	0.41
Chrysene	0.98	35.9%	0.63	1.33
Dibenz(A,H)Anthracene	0.19	39.8%	0.11	0.27
Indeno(1,2,3-C,D)Pyrene	0.71	31.1%	0.49	0.93
Pyrene	1.10	39.3%	0.67	1.53
Total HMW PAHs - 1/2MDL	6.23	26.8%	4.56	7.90
Total HMW PAHs - MDL	6.23	26.8%	4.56	7.90
Total HMW PAHs - Zero	6.23	26.8%	4.56	7.90
Total PAHs - 1/2MDL	8.06	29.6%	5.68	10.4
Total PAHs - MDL	8.06	29.5%	5.68	10.4
Total PAHs - Zero	8.06	29.6%	5.67	10.4
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.044	--	0.044	0.044
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.036	--	0.036	0.036

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-031			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-031-SO-0-0.5			
Sample Date	7/13/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.044	--	0.044	0.044
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	44.4%	0.002	0.005
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	--	0.005	0.005
Biphenyl (Diphenyl)	0.014	49.7%	0.007	0.021
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.13	30.5%	0.090	0.17
Dibenzofuran	0.036	33.5%	0.024	0.048
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.011	--	0.011	0.011
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	--	0.004	0.004
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-031			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-031-SO-0.5-2			
Sample Date	7/13/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	17,300	4.58%	16,508	18,092
Antimony	0.12	70.4%	0.035	0.20
Arsenic	4.80	7.46%	4.44	5.16
Barium	195	9.24%	177	213
Beryllium	0.65	4.90%	0.62	0.68
Cadmium	0.14	6.03%	0.13	0.15
Chromium, Total	17.0	7.75%	15.7	18.3
Chromium, Hexavalent	0.45	7.75%	0.42	0.49
Chromium, Trivalent	16.5	7.75%	15.3	17.8
Cobalt	6.60	1.99%	6.47	6.73
Copper	16.8	4.63%	16.0	17.6
Iron	16,800	2.40%	16,397	17,203
Lead	13.3	3.33%	12.9	13.7
Manganese	592	7.15%	550	634
Mercury	0.009	27.4%	0.006	0.011
Nickel	16.4	6.58%	15.3	17.5
Selenium	1.20	19.1%	0.97	1.43
Silver	0.040	9.83%	0.036	0.044
Thallium	0.098	6.56%	0.092	0.10
Vanadium	15.5	3.31%	15.0	16.0
Zinc	57.3	5.42%	54.2	60.4
Other Inorganic Parameters (mg/kg)				
Cyanide	0.24	32.7%	0.16	0.32
Fluoride	96.0	28.8%	68.4	124
Essential Nutrients (mg/kg)				
Calcium	11,900	15.1%	10,098	13,702
Magnesium	8,910	2.18%	8,716	9,104
Potassium	1,030	6.91%	959	1,101
Sodium	193	21.1%	152	234
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-031			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-031-SO-0.5-2			
Sample Date	7/13/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.008	47.7%	0.004	0.011
Acenaphthene	0.040	80.9%	0.008	0.072
Acenaphthylene	0.009	62.8%	0.003	0.014
Anthracene	0.12	82.4%	0.021	0.22
Fluoranthene	1.40	71.4%	0.40	2.40
Fluorene	0.035	74.2%	0.009	0.061
Naphthalene	0.018	28.9%	0.013	0.023
Phenanthrene	0.99	78.1%	0.22	1.76
Total LMW PAHs - 1/2MDL	2.62	74.3%	0.67	4.56
Total LMW PAHs - MDL	2.64	74.3%	0.68	4.59
Total LMW PAHs - Zero	2.60	74.3%	0.67	4.54
Benzo(A)Pyrene	0.57	67.2%	0.19	0.95
Benzo(A)Anthracene	0.57	68.8%	0.18	0.96
Benzo(B)Fluoranthene	1.00	60.1%	0.40	1.60
Benzo(G,H,I)Perylene	0.64	60.8%	0.25	1.03
Benzo(K)Fluoranthene	0.35	64.5%	0.12	0.58
Chrysene	0.92	62.9%	0.34	1.50
Dibenz(A,H)Anthracene	0.13	63.9%	0.047	0.21
Indeno(1,2,3-C,D)Pyrene	0.57	62.0%	0.22	0.92
Pyrene	1.30	72.7%	0.35	2.25
Total HMW PAHs - 1/2MDL	6.05	64.7%	2.13	9.97
Total HMW PAHs - MDL	6.05	64.7%	2.13	9.97
Total HMW PAHs - Zero	6.05	64.7%	2.13	9.97
Total PAHs - 1/2MDL	7.66	68.3%	2.43	12.9
Total PAHs - MDL	7.67	68.3%	2.43	12.9
Total PAHs - Zero	7.65	68.3%	2.42	12.9
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.025	--	0.025	0.025
1,4-Dioxane (P-Dioxane)	0.090	--	0.090	0.090
2,3,4,6-Tetrachlorophenol	0.032	--	0.032	0.032
2,4,5-Trichlorophenol	0.034	--	0.034	0.034
2,4,6-Trichlorophenol	0.010	--	0.010	0.010
2,4-Dichlorophenol	0.008	--	0.008	0.008
2,4-Dimethylphenol	0.075	--	0.075	0.075

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-031			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-031-SO-0.5-2			
Sample Date	7/13/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.26	--	0.26	0.26
2,4-Dinitrotoluene	0.014	--	0.014	0.014
2,6-Dinitrotoluene	0.018	--	0.018	0.018
2-Chloronaphthalene	0.008	--	0.008	0.008
2-Chlorophenol	0.009	--	0.009	0.009
2-Methylphenol (O-Cresol)	0.015	--	0.015	0.015
2-Nitroaniline	0.011	--	0.011	0.011
2-Nitrophenol	0.012	--	0.012	0.012
3- And 4- Methylphenol (Total)	0.009	--	0.009	0.009
3,3'-Dichlorobenzidine	0.038	--	0.038	0.038
3-Nitroaniline	0.010	--	0.010	0.010
4,6-Dinitro-2-Methylphenol	0.090	--	0.090	0.090
4-Bromophenyl Phenyl Ether	0.011	--	0.011	0.011
4-Chloro-3-Methylphenol	0.015	--	0.015	0.015
4-Chloroaniline	0.009	--	0.009	0.009
4-Chlorophenyl Phenyl Ether	0.010	--	0.010	0.010
4-Nitroaniline	0.013	--	0.013	0.013
4-Nitrophenol	0.17	--	0.17	0.17
Acetophenone	0.008	41.1%	0.004	0.011
Atrazine	0.015	--	0.015	0.015
Benzaldehyde	0.026	--	0.026	0.026
Benzyl Butyl Phthalate	0.011	32.7%	0.007	0.014
Biphenyl (Diphenyl)	0.029	98.2%	5.22E-04	0.057
Bis(2-Chloroethoxy) Methane	0.011	--	0.011	0.011
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.008	--	0.008	0.008
Bis(2-Chloroisopropyl) Ether	0.014	--	0.014	0.014
Bis(2-Ethylhexyl) Phthalate	0.013	--	0.013	0.013
Caprolactam	0.025	--	0.025	0.025
Carbazole	0.13	76.1%	0.031	0.23
Dibenzofuran	0.035	70.0%	0.010	0.060
Diethyl Phthalate	0.010	--	0.010	0.010
Dimethyl Phthalate	0.010	--	0.010	0.010
Di-N-Butyl Phthalate	0.010	--	0.010	0.010
Di-N-Octylphthalate	0.017	--	0.017	0.017
Hexachlorobenzene	0.014	--	0.014	0.014
Hexachlorobutadiene	0.010	--	0.010	0.010
Hexachlorocyclopentadiene	0.021	--	0.021	0.021
Hexachloroethane	0.013	--	0.013	0.013
Isophorone	0.008	32.5%	0.005	0.010
Nitrobenzene	0.011	--	0.011	0.011
N-Nitrosodi-N-Propylamine	0.012	--	0.012	0.012
N-Nitrosodiphenylamine	0.031	--	0.031	0.031
Pentachlorophenol	0.041	--	0.041	0.041
Phenol	0.011	--	0.011	0.011

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-032			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-032-SO-0-0.5			
Sample Date	7/12/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	23,800	4.68%	22,686	24,914
Antimony	0.20	28.1%	0.14	0.26
Arsenic	6.30	13.8%	5.43	7.17
Barium	245	4.03%	235	255
Beryllium	0.93	6.32%	0.87	0.99
Cadmium	0.28	15.0%	0.24	0.32
Chromium, Total	17.1	10.6%	15.3	18.9
Chromium, Hexavalent	0.46	10.6%	0.41	0.51
Chromium, Trivalent	16.6	10.6%	14.9	18.4
Cobalt	7.10	3.51%	6.85	7.35
Copper	23.3	12.3%	20.4	26.2
Iron	18,900	3.40%	18,258	19,542
Lead	19.2	48.5%	9.89	28.5
Manganese	457	5.63%	431	483
Mercury	0.049	54.9%	0.022	0.076
Nickel	26.2	14.5%	22.4	30.0
Selenium	2.10	20.0%	1.68	2.52
Silver	0.063	9.03%	0.057	0.069
Thallium	0.10	14.4%	0.086	0.11
Vanadium	19.9	9.21%	18.1	21.7
Zinc	75.2	12.7%	65.6	84.8
Other Inorganic Parameters (mg/kg)				
Cyanide	0.31	40.2%	0.19	0.43
Fluoride	59.3	20.5%	47.1	71.5
Essential Nutrients (mg/kg)				
Calcium	13,300	10.7%	11,881	14,719
Magnesium	9,530	2.82%	9,261	9,799
Potassium	1,320	6.24%	1,238	1,402
Sodium	205	30.7%	142	268
Pesticides (mg/kg)				
Aldrin	4.00E-04	--	4.00E-04	4.00E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.00E-04	--	3.00E-04	3.00E-04
Alpha Endosulfan	4.60E-04	--	4.60E-04	4.60E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.20E-04	--	3.20E-04	3.20E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.60E-04	--	3.60E-04	3.60E-04
Dieldrin	4.30E-04	--	4.30E-04	4.30E-04
Endosulfan Sulfate	3.85E-04	--	3.85E-04	3.85E-04
Endrin	4.20E-04	--	4.20E-04	4.20E-04
Endrin Aldehyde	4.10E-04	--	4.10E-04	4.10E-04
Endrin Ketone	4.60E-04	--	4.60E-04	4.60E-04
Gamma Bhc (Lindane)	2.95E-04	--	2.95E-04	2.95E-04
Heptachlor	4.25E-04	--	4.25E-04	4.25E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.35E-04	--	4.35E-04	4.35E-04
P,P'-DDE	4.80E-04	--	4.80E-04	4.80E-04
P,P'-DDT	3.40E-04	--	3.40E-04	3.40E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-032			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-032-SO-0-0.5			
Sample Date	7/12/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.80E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.80E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.013	47.1%	0.007	0.019
Acenaphthene	0.12	42.0%	0.070	0.17
Acenaphthylene	0.004	36.1%	0.003	0.006
Anthracene	0.25	37.7%	0.16	0.34
Fluoranthene	2.30	37.3%	1.44	3.16
Fluorene	0.079	34.6%	0.052	0.11
Naphthalene	0.018	44.9%	0.010	0.026
Phenanthrene	1.50	31.0%	1.03	1.97
Total LMW PAHs - 1/2MDL	4.28	35.8%	2.75	5.82
Total LMW PAHs - MDL	4.29	35.8%	2.75	5.82
Total LMW PAHs - Zero	4.28	35.9%	2.74	5.82
Benzo(A)Pyrene	1.90	36.1%	1.21	2.59
Benzo(A)Anthracene	1.60	32.0%	1.09	2.11
Benzo(B)Fluoranthene	2.30	29.8%	1.61	2.99
Benzo(G,H,I)Perylene	1.60	30.8%	1.11	2.09
Benzo(K)Fluoranthene	0.88	31.3%	0.60	1.16
Chrysene	2.00	35.9%	1.28	2.72
Dibenz(A,H)Anthracene	0.44	39.8%	0.26	0.62
Indeno(1,2,3-C,D)Pyrene	1.70	31.1%	1.17	2.23
Pyrene	2.90	39.3%	1.76	4.04
Total HMW PAHs - 1/2MDL	15.3	26.8%	11.2	19.4
Total HMW PAHs - MDL	15.3	26.8%	11.2	19.4
Total HMW PAHs - Zero	15.3	26.8%	11.2	19.4
Total PAHs - 1/2MDL	17.3	29.6%	12.2	22.4
Total PAHs - MDL	17.3	29.5%	12.2	22.4
Total PAHs - Zero	17.3	29.6%	12.2	22.4
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.013	--	0.013	0.013
1,4-Dioxane (P-Dioxane)	0.044	--	0.044	0.044
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.037	--	0.037	0.037

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-032			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-032-SO-0-0.5			
Sample Date	7/12/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.044	--	0.044	0.044
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	44.4%	0.002	0.005
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	--	0.005	0.005
Biphenyl (Diphenyl)	0.014	49.7%	0.007	0.021
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.23	30.5%	0.16	0.30
Dibenzofuran	0.037	33.5%	0.025	0.049
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.018	--	0.018	0.018
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.011	--	0.011	0.011
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	--	0.004	0.004
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-032			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-032-SO-0.5-2			
Sample Date	7/12/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	20,000	4.58%	19,085	20,915
Antimony	0.15	70.4%	0.044	0.26
Arsenic	5.20	7.46%	4.81	5.59
Barium	161	9.24%	146	176
Beryllium	0.85	4.90%	0.81	0.89
Cadmium	0.14	6.03%	0.13	0.15
Chromium, Total	15.9	7.75%	14.7	17.1
Chromium, Hexavalent	0.43	7.75%	0.39	0.46
Chromium, Trivalent	15.5	7.75%	14.3	16.7
Cobalt	6.10	1.99%	5.98	6.22
Copper	30.7	4.63%	29.3	32.1
Iron	17,100	2.40%	16,689	17,511
Lead	11.9	3.33%	11.5	12.3
Manganese	413	7.15%	383	443
Mercury	0.009	27.4%	0.006	0.011
Nickel	17.5	6.58%	16.3	18.7
Selenium	1.70	19.1%	1.38	2.02
Silver	0.045	9.83%	0.041	0.049
Thallium	0.094	6.56%	0.088	0.10
Vanadium	15.4	3.31%	14.9	15.9
Zinc	84.9	5.42%	80.3	89.5
Other Inorganic Parameters (mg/kg)				
Cyanide	1.20	32.7%	0.81	1.59
Fluoride	519	28.8%	370	668
Essential Nutrients (mg/kg)				
Calcium	17,500	15.1%	14,850	20,150
Magnesium	10,100	2.18%	9,880	10,320
Potassium	1,350	6.91%	1,257	1,443
Sodium	1,170	21.1%	923	1,417
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-032			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-032-SO-0.5-2			
Sample Date	7/12/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.012	47.7%	0.006	0.018
Acenaphthene	0.067	80.9%	0.013	0.12
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.17	82.4%	0.030	0.31
Fluoranthene	1.20	71.4%	0.34	2.06
Fluorene	0.048	74.2%	0.012	0.084
Naphthalene	0.035	28.9%	0.025	0.045
Phenanthrene	0.78	78.1%	0.17	1.39
Total LMW PAHs - 1/2MDL	2.32	74.3%	0.60	4.04
Total LMW PAHs - MDL	2.32	74.3%	0.60	4.04
Total LMW PAHs - Zero	2.31	74.3%	0.60	4.03
Benzo(A)Pyrene	1.20	67.2%	0.39	2.01
Benzo(A)Anthracene	1.10	68.8%	0.34	1.86
Benzo(B)Fluoranthene	1.30	60.1%	0.52	2.08
Benzo(G,H,I)Perylene	0.98	60.8%	0.38	1.58
Benzo(K)Fluoranthene	0.61	64.5%	0.22	1.00
Chrysene	1.20	62.9%	0.44	1.96
Dibenz(A,H)Anthracene	0.27	63.9%	0.098	0.44
Indeno(1,2,3-C,D)Pyrene	1.00	62.0%	0.38	1.62
Pyrene	1.70	72.7%	0.46	2.94
Total HMW PAHs - 1/2MDL	9.36	64.7%	3.30	15.4
Total HMW PAHs - MDL	9.36	64.7%	3.30	15.4
Total HMW PAHs - Zero	9.36	64.7%	3.30	15.4
Total PAHs - 1/2MDL	10.4	68.3%	3.28	17.4
Total PAHs - MDL	10.4	68.3%	3.28	17.5
Total PAHs - Zero	10.4	68.3%	3.28	17.4
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.044	--	0.044	0.044
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.036	--	0.036	0.036

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-032			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-032-SO-0.5-2			
Sample Date	7/12/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.044	--	0.044	0.044
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	41.1%	0.002	0.005
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.014	98.2%	2.52E-04	0.028
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.13	76.1%	0.031	0.23
Dibenzofuran	0.027	70.0%	0.008	0.046
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.023	--	0.023	0.023
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	32.5%	0.002	0.005
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-033			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-033-SO-0-0.5			
Sample Date	7/12/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	36,200	4.68%	34,505	37,895
Antimony	1.00	28.1%	0.72	1.28
Arsenic	8.60	13.8%	7.41	9.79
Barium	262	4.03%	251	273
Beryllium	1.50	6.32%	1.41	1.59
Cadmium	1.60	15.0%	1.36	1.84
Chromium, Total	33.8	10.6%	30.2	37.4
Chromium, Hexavalent	0.90	10.6%	0.81	1.00
Chromium, Trivalent	32.9	10.6%	29.4	36.4
Cobalt	8.20	3.51%	7.91	8.49
Copper	93.3	12.3%	81.8	105
Iron	23,100	3.40%	22,315	23,885
Lead	84.6	48.5%	43.6	126
Manganese	534	5.63%	504	564
Mercury	0.009	54.9%	0.004	0.013
Nickel	62.8	14.5%	53.7	71.9
Selenium	2.60	20.0%	2.08	3.12
Silver	0.16	9.03%	0.15	0.17
Thallium	0.18	14.4%	0.15	0.21
Vanadium	44.5	9.21%	40.4	48.6
Zinc	158	12.7%	138	178
Other Inorganic Parameters (mg/kg)				
Cyanide	0.81	40.2%	0.48	1.14
Fluoride	544	20.5%	432	656
Essential Nutrients (mg/kg)				
Calcium	9,200	10.7%	8,219	10,181
Magnesium	9,350	2.82%	9,086	9,614
Potassium	1,920	6.24%	1,800	2,040
Sodium	3,050	30.7%	2,112	3,988
Pesticides (mg/kg)				
Aldrin	3.95E-04	--	3.95E-04	3.95E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.00E-04	--	3.00E-04	3.00E-04
Alpha Endosulfan	4.55E-04	--	4.55E-04	4.55E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.15E-04	--	3.15E-04	3.15E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.55E-04	--	3.55E-04	3.55E-04
Dieldrin	4.25E-04	--	4.25E-04	4.25E-04
Endosulfan Sulfate	3.80E-04	--	3.80E-04	3.80E-04
Endrin	4.15E-04	--	4.15E-04	4.15E-04
Endrin Aldehyde	4.05E-04	--	4.05E-04	4.05E-04
Endrin Ketone	4.55E-04	--	4.55E-04	4.55E-04
Gamma Bhc (Lindane)	2.95E-04	--	2.95E-04	2.95E-04
Heptachlor	4.20E-04	--	4.20E-04	4.20E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.30E-04	--	4.30E-04	4.30E-04
P,P'-DDE	4.75E-04	--	4.75E-04	4.75E-04
P,P'-DDT	3.35E-04	--	3.35E-04	3.35E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-033			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-033-SO-0-0.5			
Sample Date	7/12/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.78E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.78E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.075	47.1%	0.040	0.11
Acenaphthene	1.50	42.0%	0.87	2.13
Acenaphthylene	0.085	36.1%	0.054	0.12
Anthracene	4.60	37.7%	2.87	6.33
Fluoranthene	42.0	37.3%	26.3	57.7
Fluorene	0.67	34.6%	0.44	0.90
Naphthalene	0.085	44.9%	0.047	0.12
Phenanthrene	18.0	31.0%	12.4	23.6
Total LMW PAHs - 1/2MDL	67.0	35.8%	43.0	91.0
Total LMW PAHs - MDL	67.3	35.8%	43.2	91.3
Total LMW PAHs - Zero	66.8	35.9%	42.8	90.7
Benzo(A)Pyrene	44.0	36.1%	28.1	59.9
Benzo(A)Anthracene	37.0	32.0%	25.1	48.9
Benzo(B)Fluoranthene	50.0	29.8%	35.1	64.9
Benzo(G,H,I)Perylene	37.0	30.8%	25.6	48.4
Benzo(K)Fluoranthene	21.0	31.3%	14.4	27.6
Chrysene	39.0	35.9%	25.0	53.0
Dibenz(A,H)Anthracene	9.10	39.8%	5.48	12.7
Indeno(1,2,3-C,D)Pyrene	40.0	31.1%	27.6	52.4
Pyrene	48.0	39.3%	29.1	66.9
Total HMW PAHs - 1/2MDL	325	26.8%	238	412
Total HMW PAHs - MDL	325	26.8%	238	412
Total HMW PAHs - Zero	325	26.8%	238	412
Total PAHs - 1/2MDL	342	29.6%	241	443
Total PAHs - MDL	342	29.5%	241	443
Total PAHs - Zero	342	29.6%	241	443
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.25	--	0.25	0.25
1,4-Dioxane (P-Dioxane)	0.90	--	0.90	0.90
2,3,4,6-Tetrachlorophenol	0.32	--	0.32	0.32
2,4,5-Trichlorophenol	0.34	--	0.34	0.34
2,4,6-Trichlorophenol	0.095	--	0.095	0.095
2,4-Dichlorophenol	0.080	--	0.080	0.080
2,4-Dimethylphenol	0.75	--	0.75	0.75

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-033			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-033-SO-0-0.5			
Sample Date	7/12/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	2.55	--	2.55	2.55
2,4-Dinitrotoluene	0.14	--	0.14	0.14
2,6-Dinitrotoluene	0.18	--	0.18	0.18
2-Chloronaphthalene	0.075	--	0.075	0.075
2-Chlorophenol	0.085	--	0.085	0.085
2-Methylphenol (O-Cresol)	0.15	--	0.15	0.15
2-Nitroaniline	0.11	--	0.11	0.11
2-Nitrophenol	0.12	--	0.12	0.12
3- And 4- Methylphenol (Total)	0.090	--	0.090	0.090
3,3'-Dichlorobenzidine	0.38	--	0.38	0.38
3-Nitroaniline	0.10	--	0.10	0.10
4,6-Dinitro-2-Methylphenol	0.90	--	0.90	0.90
4-Bromophenyl Phenyl Ether	0.11	--	0.11	0.11
4-Chloro-3-Methylphenol	0.15	--	0.15	0.15
4-Chloroaniline	0.085	--	0.085	0.085
4-Chlorophenyl Phenyl Ether	0.10	--	0.10	0.10
4-Nitroaniline	0.13	--	0.13	0.13
4-Nitrophenol	1.60	--	1.60	1.60
Acetophenone	0.075	44.4%	0.042	0.11
Atrazine	0.15	--	0.15	0.15
Benzaldehyde	0.26	--	0.26	0.26
Benzyl Butyl Phthalate	0.59	--	0.59	0.59
Biphenyl (Diphenyl)	0.29	49.7%	0.14	0.43
Bis(2-Chloroethoxy) Methane	0.11	--	0.11	0.11
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.080	--	0.080	0.080
Bis(2-Chloroisopropyl) Ether	0.14	--	0.14	0.14
Bis(2-Ethylhexyl) Phthalate	0.13	--	0.13	0.13
Caprolactam	0.24	--	0.24	0.24
Carbazole	3.20	30.5%	2.22	4.18
Dibenzofuran	0.23	33.5%	0.15	0.31
Diethyl Phthalate	0.095	--	0.095	0.095
Dimethyl Phthalate	0.10	--	0.10	0.10
Di-N-Butyl Phthalate	0.10	--	0.10	0.10
Di-N-Octylphthalate	0.17	--	0.17	0.17
Hexachlorobenzene	0.14	--	0.14	0.14
Hexachlorobutadiene	0.095	--	0.095	0.095
Hexachlorocyclopentadiene	0.21	--	0.21	0.21
Hexachloroethane	0.13	--	0.13	0.13
Isophorone	0.070	--	0.070	0.070
Nitrobenzene	0.11	--	0.11	0.11
N-Nitrosodi-N-Propylamine	0.12	--	0.12	0.12
N-Nitrosodiphenylamine	0.31	--	0.31	0.31
Pentachlorophenol	0.41	--	0.41	0.41
Phenol	0.11	--	0.11	0.11

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-033			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-033-SO-0.5-2			
Sample Date	7/12/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	14,600	4.58%	13,932	15,268
Antimony	0.43	70.4%	0.13	0.73
Arsenic	5.10	7.46%	4.72	5.48
Barium	128	9.24%	116	140
Beryllium	0.59	4.90%	0.56	0.62
Cadmium	0.28	6.03%	0.26	0.30
Chromium, Total	14.1	7.75%	13.0	15.2
Chromium, Hexavalent	0.38	7.75%	0.35	0.41
Chromium, Trivalent	13.7	7.75%	12.7	14.8
Cobalt	6.40	1.99%	6.27	6.53
Copper	16.9	4.63%	16.1	17.7
Iron	16,400	2.40%	16,006	16,794
Lead	12.1	3.33%	11.7	12.5
Manganese	431	7.15%	400	462
Mercury	0.007	27.4%	0.005	0.009
Nickel	17.1	6.58%	16.0	18.2
Selenium	1.80	19.1%	1.46	2.14
Silver	0.033	9.83%	0.030	0.036
Thallium	0.079	6.56%	0.074	0.084
Vanadium	12.6	3.31%	12.2	13.0
Zinc	52.0	5.42%	49.2	54.8
Other Inorganic Parameters (mg/kg)				
Cyanide	0.15	32.7%	0.10	0.20
Fluoride	152	28.8%	108	196
Essential Nutrients (mg/kg)				
Calcium	19,900	15.1%	16,887	22,913
Magnesium	11,300	2.18%	11,054	11,546
Potassium	921	6.91%	857	985
Sodium	233	21.1%	184	282
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-033			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-033-SO-0.5-2			
Sample Date	7/12/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.004	47.7%	0.002	0.005
Acenaphthene	0.12	80.9%	0.023	0.22
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.36	82.4%	0.063	0.66
Fluoranthene	2.70	71.4%	0.77	4.63
Fluorene	0.045	74.2%	0.012	0.078
Naphthalene	0.004	28.9%	0.003	0.005
Phenanthrene	1.30	78.1%	0.28	2.32
Total LMW PAHs - 1/2MDL	4.54	74.3%	1.17	7.91
Total LMW PAHs - MDL	4.55	74.3%	1.17	7.93
Total LMW PAHs - Zero	4.53	74.3%	1.16	7.89
Benzo(A)Pyrene	3.30	67.2%	1.08	5.52
Benzo(A)Anthracene	2.60	68.8%	0.81	4.39
Benzo(B)Fluoranthene	3.50	60.1%	1.40	5.60
Benzo(G,H,I)Perylene	2.90	60.8%	1.14	4.66
Benzo(K)Fluoranthene	1.50	64.5%	0.53	2.47
Chrysene	2.80	62.9%	1.04	4.56
Dibenz(A,H)Anthracene	0.74	63.9%	0.27	1.21
Indeno(1,2,3-C,D)Pyrene	3.00	62.0%	1.14	4.86
Pyrene	3.20	72.7%	0.87	5.53
Total HMW PAHs - 1/2MDL	23.5	64.7%	8.31	38.8
Total HMW PAHs - MDL	23.5	64.7%	8.31	38.8
Total HMW PAHs - Zero	23.5	64.7%	8.31	38.8
Total PAHs - 1/2MDL	24.6	68.3%	7.78	41.4
Total PAHs - MDL	24.6	68.3%	7.79	41.4
Total PAHs - Zero	24.6	68.3%	7.78	41.4
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.044	--	0.044	0.044
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.036	--	0.036	0.036

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-033			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-033-SO-0.5-2			
Sample Date	7/12/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.044	--	0.044	0.044
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	41.1%	0.002	0.005
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.014	98.2%	2.52E-04	0.028
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.23	76.1%	0.055	0.41
Dibenzofuran	0.018	70.0%	0.005	0.031
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.025	--	0.025	0.025
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	32.5%	0.002	0.005
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-034			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-034-SO-0-0.5			
Sample Date	7/11/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	29,900	4.68%	28,500	31,300
Antimony	2.00	28.1%	1.44	2.56
Arsenic	6.20	13.8%	5.34	7.06
Barium	286	4.03%	274	298
Beryllium	1.40	6.32%	1.31	1.49
Cadmium	0.31	15.0%	0.26	0.36
Chromium, Total	16.7	10.6%	14.9	18.5
Chromium, Hexavalent	0.45	10.6%	0.40	0.49
Chromium, Trivalent	16.3	10.6%	14.5	18.0
Cobalt	6.50	3.51%	6.27	6.73
Copper	23.1	12.3%	20.3	25.9
Iron	17,500	3.40%	16,905	18,095
Lead	50.0	48.5%	25.7	74.3
Manganese	425	5.63%	401	449
Mercury	0.009	54.9%	0.004	0.013
Nickel	21.6	14.5%	18.5	24.7
Selenium	2.50	20.0%	2.00	3.00
Silver	0.25	9.03%	0.23	0.27
Thallium	0.22	14.4%	0.19	0.25
Vanadium	19.8	9.21%	18.0	21.6
Zinc	72.3	12.7%	63.1	81.5
Other Inorganic Parameters (mg/kg)				
Cyanide	0.50	40.2%	0.30	0.70
Fluoride	301	20.5%	239	363
Essential Nutrients (mg/kg)				
Calcium	9,730	10.7%	8,692	10,768
Magnesium	10,500	2.82%	10,204	10,796
Potassium	1,830	6.24%	1,716	1,944
Sodium	1,360	30.7%	942	1,778
Pesticides (mg/kg)				
Aldrin	4.05E-04	--	4.05E-04	4.05E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.05E-04	--	3.05E-04	3.05E-04
Alpha Endosulfan	4.65E-04	--	4.65E-04	4.65E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.25E-04	--	3.25E-04	3.25E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.65E-04	--	3.65E-04	3.65E-04
Dieldrin	4.35E-04	--	4.35E-04	4.35E-04
Endosulfan Sulfate	3.90E-04	--	3.90E-04	3.90E-04
Endrin	4.25E-04	--	4.25E-04	4.25E-04
Endrin Aldehyde	4.15E-04	--	4.15E-04	4.15E-04
Endrin Ketone	4.65E-04	--	4.65E-04	4.65E-04
Gamma Bhc (Lindane)	3.00E-04	--	3.00E-04	3.00E-04
Heptachlor	4.30E-04	--	4.30E-04	4.30E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.40E-04	--	4.40E-04	4.40E-04
P,P'-DDE	4.85E-04	--	4.85E-04	4.85E-04
P,P'-DDT	3.45E-04	--	3.45E-04	3.45E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-034			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-034-SO-0-0.5			
Sample Date	7/11/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.82E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.82E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.090	47.1%	0.048	0.13
Acenaphthene	4.60	42.0%	2.67	6.53
Acenaphthylene	0.11	36.1%	0.067	0.14
Anthracene	15.0	37.7%	9.35	20.6
Fluoranthene	120	37.3%	75.2	165
Fluorene	1.80	34.6%	1.18	2.42
Naphthalene	0.11	44.9%	0.058	0.15
Phenanthrene	52.0	31.0%	35.9	68.1
Total LMW PAHs - 1/2MDL	194	35.8%	124	263
Total LMW PAHs - MDL	194	35.8%	125	263
Total LMW PAHs - Zero	193	35.9%	124	263
Benzo(A)Pyrene	110	36.1%	70.2	150
Benzo(A)Anthracene	100	32.0%	68.0	132
Benzo(B)Fluoranthene	130	29.8%	91.2	169
Benzo(G,H,I)Perylene	90.0	30.8%	62.3	118
Benzo(K)Fluoranthene	47.0	31.3%	32.3	61.7
Chrysene	100	35.9%	64.1	136
Dibenz(A,H)Anthracene	26.0	39.8%	15.6	36.4
Indeno(1,2,3-C,D)Pyrene	100	31.1%	68.9	131
Pyrene	120	39.3%	72.8	167
Total HMW PAHs - 1/2MDL	823	26.8%	602	1,044
Total HMW PAHs - MDL	823	26.8%	602	1,044
Total HMW PAHs - Zero	823	26.8%	602	1,044
Total PAHs - 1/2MDL	887	29.6%	625	1,149
Total PAHs - MDL	887	29.5%	625	1,149
Total PAHs - Zero	886	29.6%	624	1,148
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.31	--	0.31	0.31
1,4-Dioxane (P-Dioxane)	1.10	--	1.10	1.10
2,3,4,6-Tetrachlorophenol	0.39	--	0.39	0.39
2,4,5-Trichlorophenol	0.41	--	0.41	0.41
2,4,6-Trichlorophenol	0.12	--	0.12	0.12
2,4-Dichlorophenol	0.095	--	0.095	0.095
2,4-Dimethylphenol	0.90	--	0.90	0.90

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-034			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-034-SO-0-0.5			
Sample Date	7/11/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	3.10	--	3.10	3.10
2,4-Dinitrotoluene	0.16	--	0.16	0.16
2,6-Dinitrotoluene	0.22	--	0.22	0.22
2-Chloronaphthalene	0.090	--	0.090	0.090
2-Chlorophenol	0.11	--	0.11	0.11
2-Methylphenol (O-Cresol)	0.18	--	0.18	0.18
2-Nitroaniline	0.14	--	0.14	0.14
2-Nitrophenol	0.14	--	0.14	0.14
3- And 4- Methylphenol (Total)	0.11	--	0.11	0.11
3,3'-Dichlorobenzidine	0.46	--	0.46	0.46
3-Nitroaniline	0.12	--	0.12	0.12
4,6-Dinitro-2-Methylphenol	1.10	--	1.10	1.10
4-Bromophenyl Phenyl Ether	0.13	--	0.13	0.13
4-Chloro-3-Methylphenol	0.18	--	0.18	0.18
4-Chloroaniline	0.11	--	0.11	0.11
4-Chlorophenyl Phenyl Ether	0.12	--	0.12	0.12
4-Nitroaniline	0.16	--	0.16	0.16
4-Nitrophenol	1.95	--	1.95	1.95
Acetophenone	0.090	44.4%	0.050	0.13
Atrazine	0.18	--	0.18	0.18
Benzaldehyde	0.31	--	0.31	0.31
Benzyl Butyl Phthalate	0.13	--	0.13	0.13
Biphenyl (Diphenyl)	0.35	49.7%	0.18	0.52
Bis(2-Chloroethoxy) Methane	0.13	--	0.13	0.13
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.095	--	0.095	0.095
Bis(2-Chloroisopropyl) Ether	0.17	--	0.17	0.17
Bis(2-Ethylhexyl) Phthalate	0.16	--	0.16	0.16
Caprolactam	0.30	--	0.30	0.30
Carbazole	11.0	30.5%	7.64	14.4
Dibenzofuran	0.59	33.5%	0.39	0.79
Diethyl Phthalate	0.12	--	0.12	0.12
Dimethyl Phthalate	0.12	--	0.12	0.12
Di-N-Butyl Phthalate	0.12	--	0.12	0.12
Di-N-Octylphthalate	0.21	--	0.21	0.21
Hexachlorobenzene	0.17	--	0.17	0.17
Hexachlorobutadiene	0.12	--	0.12	0.12
Hexachlorocyclopentadiene	0.26	--	0.26	0.26
Hexachloroethane	0.15	--	0.15	0.15
Isophorone	0.090	--	0.090	0.090
Nitrobenzene	0.13	--	0.13	0.13
N-Nitrosodi-N-Propylamine	0.14	--	0.14	0.14
N-Nitrosodiphenylamine	0.37	--	0.37	0.37
Pentachlorophenol	0.50	--	0.50	0.50
Phenol	0.14	--	0.14	0.14

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-034			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-034-SO-0.5-2			
Sample Date	7/11/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	20,300	4.58%	19,371	21,229
Antimony	0.22	70.4%	0.065	0.37
Arsenic	5.30	7.46%	4.90	5.70
Barium	121	9.24%	110	132
Beryllium	0.82	4.90%	0.78	0.86
Cadmium	0.12	6.03%	0.11	0.13
Chromium, Total	16.7	7.75%	15.4	18.0
Chromium, Hexavalent	0.45	7.75%	0.41	0.48
Chromium, Trivalent	16.3	7.75%	15.0	17.5
Cobalt	5.70	1.99%	5.59	5.81
Copper	16.9	4.63%	16.1	17.7
Iron	15,200	2.40%	14,835	15,565
Lead	11.3	3.33%	10.9	11.7
Manganese	363	7.15%	337	389
Mercury	0.008	27.4%	0.006	0.010
Nickel	17.5	6.58%	16.3	18.7
Selenium	1.60	19.1%	1.29	1.91
Silver	0.038	9.83%	0.034	0.042
Thallium	0.11	6.56%	0.10	0.12
Vanadium	15.1	3.31%	14.6	15.6
Zinc	44.8	5.42%	42.4	47.2
Other Inorganic Parameters (mg/kg)				
Cyanide	0.68	32.7%	0.46	0.90
Fluoride	709	28.8%	505	913
Essential Nutrients (mg/kg)				
Calcium	23,400	15.1%	19,857	26,943
Magnesium	11,300	2.18%	11,054	11,546
Potassium	1,880	6.91%	1,750	2,010
Sodium	3,350	21.1%	2,644	4,056
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-034			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-034-SO-0.5-2			
Sample Date	7/11/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.009	47.7%	0.004	0.013
Acenaphthene	0.043	80.9%	0.008	0.078
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.12	82.4%	0.021	0.22
Fluoranthene	0.91	71.4%	0.26	1.56
Fluorene	0.035	74.2%	0.009	0.061
Naphthalene	0.016	28.9%	0.011	0.021
Phenanthrene	0.61	78.1%	0.13	1.09
Total LMW PAHs - 1/2MDL	1.75	74.3%	0.45	3.04
Total LMW PAHs - MDL	1.75	74.3%	0.45	3.05
Total LMW PAHs - Zero	1.74	74.3%	0.45	3.04
Benzo(A)Pyrene	0.89	67.2%	0.29	1.49
Benzo(A)Anthracene	0.71	68.8%	0.22	1.20
Benzo(B)Fluoranthene	1.10	60.1%	0.44	1.76
Benzo(G,H,I)Perylene	0.83	60.8%	0.33	1.33
Benzo(K)Fluoranthene	0.42	64.5%	0.15	0.69
Chrysene	0.91	62.9%	0.34	1.48
Dibenz(A,H)Anthracene	0.23	63.9%	0.083	0.38
Indeno(1,2,3-C,D)Pyrene	0.83	62.0%	0.32	1.34
Pyrene	1.30	72.7%	0.35	2.25
Total HMW PAHs - 1/2MDL	7.22	64.7%	2.55	11.9
Total HMW PAHs - MDL	7.22	64.7%	2.55	11.9
Total HMW PAHs - Zero	7.22	64.7%	2.55	11.9
Total PAHs - 1/2MDL	7.86	68.3%	2.49	13.2
Total PAHs - MDL	7.86	68.3%	2.49	13.2
Total PAHs - Zero	7.85	68.3%	2.49	13.2
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.043	--	0.043	0.043
2,3,4,6-Tetrachlorophenol	0.015	--	0.015	0.015
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.036	--	0.036	0.036

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-034			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-034-SO-0.5-2			
Sample Date	7/11/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.12	--	0.12	0.12
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.043	--	0.043	0.043
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	41.1%	0.002	0.005
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.014	98.2%	2.52E-04	0.028
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.091	76.1%	0.022	0.16
Dibenzofuran	0.018	70.0%	0.005	0.031
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.025	--	0.025	0.025
Di-N-Octylphthalate	0.008	--	0.008	0.008
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.003	32.5%	0.002	0.005
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-035			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-035-SO-0-0.5			
Sample Date	7/11/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	20,100	4.68%	19,159	21,041
Antimony	0.16	28.1%	0.12	0.20
Arsenic	4.80	13.8%	4.14	5.46
Barium	194	4.03%	186	202
Beryllium	0.87	6.32%	0.82	0.92
Cadmium	0.26	15.0%	0.22	0.30
Chromium, Total	14.5	10.6%	13.0	16.0
Chromium, Hexavalent	0.39	10.6%	0.35	0.43
Chromium, Trivalent	14.1	10.6%	12.6	15.6
Cobalt	6.00	3.51%	5.79	6.21
Copper	22.3	12.3%	19.6	25.0
Iron	15,900	3.40%	15,360	16,440
Lead	15.8	48.5%	8.13	23.5
Manganese	403	5.63%	380	426
Mercury	0.026	54.9%	0.012	0.040
Nickel	18.1	14.5%	15.5	20.7
Selenium	1.80	20.0%	1.44	2.16
Silver	0.054	9.03%	0.049	0.059
Thallium	0.11	14.4%	0.094	0.13
Vanadium	13.5	9.21%	12.3	14.7
Zinc	63.0	12.7%	55.0	71.0
Other Inorganic Parameters (mg/kg)				
Cyanide	0.49	40.2%	0.29	0.69
Fluoride	92.8	20.5%	73.7	112
Essential Nutrients (mg/kg)				
Calcium	15,000	10.7%	13,400	16,600
Magnesium	10,400	2.82%	10,107	10,693
Potassium	1,220	6.24%	1,144	1,296
Sodium	166	30.7%	115	217
Pesticides (mg/kg)				
Aldrin	3.90E-04	--	3.90E-04	3.90E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	2.95E-04	--	2.95E-04	2.95E-04
Alpha Endosulfan	4.50E-04	--	4.50E-04	4.50E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.15E-04	--	3.15E-04	3.15E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.55E-04	--	3.55E-04	3.55E-04
Dieldrin	4.20E-04	--	4.20E-04	4.20E-04
Endosulfan Sulfate	3.75E-04	--	3.75E-04	3.75E-04
Endrin	4.10E-04	--	4.10E-04	4.10E-04
Endrin Aldehyde	4.00E-04	--	4.00E-04	4.00E-04
Endrin Ketone	4.50E-04	--	4.50E-04	4.50E-04
Gamma Bhc (Lindane)	2.90E-04	--	2.90E-04	2.90E-04
Heptachlor	4.15E-04	--	4.15E-04	4.15E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.25E-04	--	4.25E-04	4.25E-04
P,P'-DDE	4.70E-04	--	4.70E-04	4.70E-04
P,P'-DDT	3.35E-04	--	3.35E-04	3.35E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-035			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-035-SO-0-0.5			
Sample Date	7/11/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.004	140%	-1.76E-03	0.011
PCB-1260 (Aroclor 1260)	0.004	--	0.004	0.004
PCB-1262 (Aroclor 1262)	0.004	--	0.004	0.004
PCB-1268 (Aroclor 1268)	0.004	--	0.004	0.004
Polychlorinated Biphenyl (PCBs)	0.004	140%	-1.76E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.019	47.1%	0.010	0.027
Acenaphthene	0.70	42.0%	0.41	0.99
Acenaphthylene	0.022	36.1%	0.014	0.029
Anthracene	3.90	37.7%	2.43	5.37
Fluoranthene	22.0	37.3%	13.8	30.2
Fluorene	0.29	34.6%	0.19	0.39
Naphthalene	0.021	44.9%	0.012	0.030
Phenanthrene	8.80	31.0%	6.07	11.5
Total LMW PAHs - 1/2MDL	35.8	35.8%	22.9	48.6
Total LMW PAHs - MDL	35.8	35.8%	23.0	48.6
Total LMW PAHs - Zero	35.7	35.9%	22.9	48.5
Benzo(A)Pyrene	21.0	36.1%	13.4	28.6
Benzo(A)Anthracene	18.0	32.0%	12.2	23.8
Benzo(B)Fluoranthene	23.0	29.8%	16.1	29.9
Benzo(G,H,I)Perylene	18.0	30.8%	12.5	23.5
Benzo(K)Fluoranthene	8.90	31.3%	6.12	11.7
Chrysene	18.0	35.9%	11.5	24.5
Dibenz(A,H)Anthracene	4.90	39.8%	2.95	6.85
Indeno(1,2,3-C,D)Pyrene	19.0	31.1%	13.1	24.9
Pyrene	21.0	39.3%	12.7	29.3
Total HMW PAHs - 1/2MDL	152	26.8%	111	192
Total HMW PAHs - MDL	152	26.8%	111	192
Total HMW PAHs - Zero	152	26.8%	111	192
Total PAHs - 1/2MDL	165	29.6%	116	213
Total PAHs - MDL	165	29.5%	116	213
Total PAHs - Zero	164	29.6%	116	213
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.060	--	0.060	0.060
1,4-Dioxane (P-Dioxane)	0.23	--	0.23	0.23
2,3,4,6-Tetrachlorophenol	0.080	--	0.080	0.080
2,4,5-Trichlorophenol	0.085	--	0.085	0.085
2,4,6-Trichlorophenol	0.024	--	0.024	0.024
2,4-Dichlorophenol	0.020	--	0.020	0.020
2,4-Dimethylphenol	0.19	--	0.19	0.19

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-035			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-035-SO-0-0.5			
Sample Date	7/11/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.65	--	0.65	0.65
2,4-Dinitrotoluene	0.033	--	0.033	0.033
2,6-Dinitrotoluene	0.045	--	0.045	0.045
2-Chloronaphthalene	0.019	--	0.019	0.019
2-Chlorophenol	0.021	--	0.021	0.021
2-Methylphenol (O-Cresol)	0.037	--	0.037	0.037
2-Nitroaniline	0.028	--	0.028	0.028
2-Nitrophenol	0.028	--	0.028	0.028
3- And 4- Methylphenol (Total)	0.022	--	0.022	0.022
3,3'-Dichlorobenzidine	0.095	--	0.095	0.095
3-Nitroaniline	0.025	--	0.025	0.025
4,6-Dinitro-2-Methylphenol	0.23	--	0.23	0.23
4-Bromophenyl Phenyl Ether	0.027	--	0.027	0.027
4-Chloro-3-Methylphenol	0.036	--	0.036	0.036
4-Chloroaniline	0.022	--	0.022	0.022
4-Chlorophenyl Phenyl Ether	0.025	--	0.025	0.025
4-Nitroaniline	0.032	--	0.032	0.032
4-Nitrophenol	0.40	--	0.40	0.40
Acetophenone	0.018	44.4%	0.010	0.026
Atrazine	0.037	--	0.037	0.037
Benzaldehyde	0.065	--	0.065	0.065
Benzyl Butyl Phthalate	0.026	--	0.026	0.026
Biphenyl (Diphenyl)	0.070	49.7%	0.035	0.10
Bis(2-Chloroethoxy) Methane	0.026	--	0.026	0.026
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.020	--	0.020	0.020
Bis(2-Chloroisopropyl) Ether	0.035	--	0.035	0.035
Bis(2-Ethylhexyl) Phthalate	0.033	--	0.033	0.033
Caprolactam	0.060	--	0.060	0.060
Carbazole	1.90	30.5%	1.32	2.48
Dibenzofuran	0.10	33.5%	0.066	0.13
Diethyl Phthalate	0.024	--	0.024	0.024
Dimethyl Phthalate	0.024	--	0.024	0.024
Di-N-Butyl Phthalate	0.025	--	0.025	0.025
Di-N-Octylphthalate	0.043	--	0.043	0.043
Hexachlorobenzene	0.034	--	0.034	0.034
Hexachlorobutadiene	0.024	--	0.024	0.024
Hexachlorocyclopentadiene	0.050	--	0.050	0.050
Hexachloroethane	0.031	--	0.031	0.031
Isophorone	0.018	--	0.018	0.018
Nitrobenzene	0.027	--	0.027	0.027
N-Nitrosodi-N-Propylamine	0.028	--	0.028	0.028
N-Nitrosodiphenylamine	0.075	--	0.075	0.075
Pentachlorophenol	0.10	--	0.10	0.10
Phenol	0.028	--	0.028	0.028

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-035			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-035-SO-0.5-2			
Sample Date	7/11/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	15,800	4.58%	15,077	16,523
Antimony	0.15	70.4%	0.044	0.26
Arsenic	5.60	7.46%	5.18	6.02
Barium	123	9.24%	112	134
Beryllium	0.75	4.90%	0.71	0.79
Cadmium	0.10	6.03%	0.094	0.11
Chromium, Total	14.9	7.75%	13.7	16.1
Chromium, Hexavalent	0.40	7.75%	0.37	0.43
Chromium, Trivalent	14.5	7.75%	13.4	15.6
Cobalt	6.10	1.99%	5.98	6.22
Copper	16.9	4.63%	16.1	17.7
Iron	15,700	2.40%	15,323	16,077
Lead	10.3	3.33%	9.96	10.6
Manganese	415	7.15%	385	445
Mercury	0.058	27.4%	0.042	0.074
Nickel	14.9	6.58%	13.9	15.9
Selenium	1.90	19.1%	1.54	2.26
Silver	0.037	9.83%	0.033	0.041
Thallium	0.094	6.56%	0.088	0.10
Vanadium	13.6	3.31%	13.1	14.1
Zinc	47.6	5.42%	45.0	50.2
Other Inorganic Parameters (mg/kg)				
Cyanide	0.51	32.7%	0.34	0.68
Fluoride	232	28.8%	165	299
Essential Nutrients (mg/kg)				
Calcium	23,700	15.1%	20,112	27,288
Magnesium	11,700	2.18%	11,445	11,955
Potassium	1,260	6.91%	1,173	1,347
Sodium	471	21.1%	372	570
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-035			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-035-SO-0.5-2			
Sample Date	7/11/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.004	47.7%	0.002	0.005
Acenaphthene	0.018	80.9%	0.003	0.033
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.051	82.4%	0.009	0.093
Fluoranthene	0.41	71.4%	0.12	0.70
Fluorene	0.010	74.2%	0.002	0.017
Naphthalene	0.004	28.9%	0.003	0.005
Phenanthrene	0.22	78.1%	0.048	0.39
Total LMW PAHs - 1/2MDL	0.72	74.3%	0.19	1.26
Total LMW PAHs - MDL	0.73	74.3%	0.19	1.28
Total LMW PAHs - Zero	0.71	74.3%	0.18	1.23
Benzo(A)Pyrene	0.40	67.2%	0.13	0.67
Benzo(A)Anthracene	0.32	68.8%	0.100	0.54
Benzo(B)Fluoranthene	0.48	60.1%	0.19	0.77
Benzo(G,H,I)Perylene	0.35	60.8%	0.14	0.56
Benzo(K)Fluoranthene	0.23	64.5%	0.082	0.38
Chrysene	0.37	62.9%	0.14	0.60
Dibenz(A,H)Anthracene	0.096	63.9%	0.035	0.16
Indeno(1,2,3-C,D)Pyrene	0.33	62.0%	0.13	0.53
Pyrene	0.54	72.7%	0.15	0.93
Total HMW PAHs - 1/2MDL	3.12	64.7%	1.10	5.13
Total HMW PAHs - MDL	3.12	64.7%	1.10	5.13
Total HMW PAHs - Zero	3.12	64.7%	1.10	5.13
Total PAHs - 1/2MDL	3.35	68.3%	1.06	5.64
Total PAHs - MDL	3.36	68.3%	1.06	5.66
Total PAHs - Zero	3.34	68.3%	1.06	5.63
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.013	--	0.013	0.013
1,4-Dioxane (P-Dioxane)	0.045	--	0.045	0.045
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.037	--	0.037	0.037

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-035			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-035-SO-0.5-2			
Sample Date	7/11/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.045	--	0.045	0.045
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.007	--	0.007	0.007
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	41.1%	0.002	0.005
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.014	98.2%	2.52E-04	0.028
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.037	76.1%	0.009	0.065
Dibenzofuran	0.005	70.0%	0.001	0.009
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.021	--	0.021	0.021
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.011	--	0.011	0.011
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	32.5%	0.002	0.005
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-036			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-036-SO-0-0.5			
Sample Date	7/15/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	15,100	4.68%	14,393	15,807
Antimony	0.24	28.1%	0.17	0.31
Arsenic	5.30	13.8%	4.57	6.03
Barium	156	4.03%	150	162
Beryllium	0.48	6.32%	0.45	0.51
Cadmium	0.26	15.0%	0.22	0.30
Chromium, Total	15.6	10.6%	14.0	17.2
Chromium, Hexavalent	0.42	10.6%	0.37	0.46
Chromium, Trivalent	15.2	10.6%	13.6	16.8
Cobalt	6.80	3.51%	6.56	7.04
Copper	26.1	12.3%	22.9	29.3
Iron	17,500	3.40%	16,905	18,095
Lead	19.8	48.5%	10.2	29.4
Manganese	558	5.63%	527	589
Mercury	0.008	54.9%	0.004	0.012
Nickel	19.9	14.5%	17.0	22.8
Selenium	1.10	20.0%	0.88	1.32
Silver	0.066	9.03%	0.060	0.072
Thallium	0.099	14.4%	0.085	0.11
Vanadium	13.4	9.21%	12.2	14.6
Zinc	76.8	12.7%	67.0	86.6
Other Inorganic Parameters (mg/kg)				
Cyanide	0.13	40.2%	0.078	0.18
Fluoride	56.3	20.5%	44.7	67.9
Essential Nutrients (mg/kg)				
Calcium	16,200	10.7%	14,472	17,928
Magnesium	8,140	2.82%	7,910	8,370
Potassium	873	6.24%	819	927
Sodium	92.2	30.7%	63.9	121
Pesticides (mg/kg)				
Aldrin	4.05E-04	--	4.05E-04	4.05E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.05E-04	--	3.05E-04	3.05E-04
Alpha Endosulfan	4.65E-04	--	4.65E-04	4.65E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.25E-04	--	3.25E-04	3.25E-04
Beta Endosulfan	5.50E-04	--	5.50E-04	5.50E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.65E-04	--	3.65E-04	3.65E-04
Dieldrin	4.35E-04	--	4.35E-04	4.35E-04
Endosulfan Sulfate	3.90E-04	--	3.90E-04	3.90E-04
Endrin	4.25E-04	--	4.25E-04	4.25E-04
Endrin Aldehyde	4.15E-04	--	4.15E-04	4.15E-04
Endrin Ketone	4.65E-04	--	4.65E-04	4.65E-04
Gamma Bhc (Lindane)	3.00E-04	--	3.00E-04	3.00E-04
Heptachlor	4.30E-04	--	4.30E-04	4.30E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.40E-04	--	4.40E-04	4.40E-04
P,P'-DDE	4.85E-04	--	4.85E-04	4.85E-04
P,P'-DDT	3.45E-04	--	3.45E-04	3.45E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-036			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-036-SO-0-0.5			
Sample Date	7/15/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.50E-04	--	7.50E-04	7.50E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.82E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.82E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.090	47.1%	0.048	0.13
Acenaphthene	0.26	42.0%	0.15	0.37
Acenaphthylene	0.010	36.1%	0.006	0.014
Anthracene	0.41	37.7%	0.26	0.56
Fluoranthene	2.20	37.3%	1.38	3.02
Fluorene	0.26	34.6%	0.17	0.35
Naphthalene	0.31	44.9%	0.17	0.45
Phenanthrene	1.70	31.0%	1.17	2.23
Total LMW PAHs - 1/2MDL	5.24	35.8%	3.36	7.12
Total LMW PAHs - MDL	5.24	35.8%	3.37	7.11
Total LMW PAHs - Zero	5.24	35.9%	3.36	7.12
Benzo(A)Pyrene	1.10	36.1%	0.70	1.50
Benzo(A)Anthracene	0.95	32.0%	0.65	1.25
Benzo(B)Fluoranthene	1.80	29.8%	1.26	2.34
Benzo(G,H,I)Perylene	0.78	30.8%	0.54	1.02
Benzo(K)Fluoranthene	0.68	31.3%	0.47	0.89
Chrysene	1.60	35.9%	1.03	2.17
Dibenz(A,H)Anthracene	0.24	39.8%	0.14	0.34
Indeno(1,2,3-C,D)Pyrene	0.86	31.1%	0.59	1.13
Pyrene	1.40	39.3%	0.85	1.95
Total HMW PAHs - 1/2MDL	9.41	26.8%	6.89	11.9
Total HMW PAHs - MDL	9.41	26.8%	6.89	11.9
Total HMW PAHs - Zero	9.41	26.8%	6.89	11.9
Total PAHs - 1/2MDL	12.8	29.6%	8.99	16.5
Total PAHs - MDL	12.8	29.5%	8.99	16.5
Total PAHs - Zero	12.8	29.6%	8.99	16.5
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.013	--	0.013	0.013
1,4-Dioxane (P-Dioxane)	0.045	--	0.045	0.045
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.037	--	0.037	0.037

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-036			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-036-SO-0-0.5			
Sample Date	7/15/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.008	--	0.008	0.008
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.045	--	0.045	0.045
4-Bromophenyl Phenyl Ether	0.006	--	0.006	0.006
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.007	--	0.007	0.007
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	44.4%	0.002	0.005
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	--	0.005	0.005
Biphenyl (Diphenyl)	0.015	49.7%	0.007	0.022
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.21	30.5%	0.15	0.27
Dibenzofuran	0.15	33.5%	0.100	0.20
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.011	--	0.011	0.011
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	--	0.004	0.004
Nitrobenzene	0.006	--	0.006	0.006
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.10	--	0.10	0.10
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-036			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-036-SO-0.5-2			
Sample Date	7/15/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	23,100	4.58%	22,043	24,157
Antimony	0.18	70.4%	0.053	0.31
Arsenic	4.70	7.46%	4.35	5.05
Barium	302	9.24%	274	330
Beryllium	0.65	4.90%	0.62	0.68
Cadmium	0.18	6.03%	0.17	0.19
Chromium, Total	13.9	7.75%	12.8	15.0
Chromium, Hexavalent	0.37	7.75%	0.34	0.40
Chromium, Trivalent	13.5	7.75%	12.5	14.6
Cobalt	6.70	1.99%	6.57	6.83
Copper	17.7	4.63%	16.9	18.5
Iron	17,600	2.40%	17,177	18,023
Lead	12.4	3.33%	12.0	12.8
Manganese	686	7.15%	637	735
Mercury	0.008	27.4%	0.005	0.010
Nickel	14.2	6.58%	13.3	15.1
Selenium	1.10	19.1%	0.89	1.31
Silver	0.042	9.83%	0.038	0.046
Thallium	0.14	6.56%	0.13	0.15
Vanadium	17.2	3.31%	16.6	17.8
Zinc	65.0	5.42%	61.5	68.5
Other Inorganic Parameters (mg/kg)				
Cyanide	0.11	32.7%	0.074	0.15
Fluoride	87.3	28.8%	62.2	112
Essential Nutrients (mg/kg)				
Calcium	7,350	15.1%	6,237	8,463
Magnesium	6,830	2.18%	6,681	6,979
Potassium	1,010	6.91%	940	1,080
Sodium	106	21.1%	83.7	128
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-036			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-036-SO-0.5-2			
Sample Date	7/15/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.004	47.7%	0.002	0.006
Acenaphthene	0.025	80.9%	0.005	0.045
Acenaphthylene	0.005	62.8%	0.002	0.007
Anthracene	0.036	82.4%	0.006	0.066
Fluoranthene	0.21	71.4%	0.060	0.36
Fluorene	0.022	74.2%	0.006	0.038
Naphthalene	0.010	28.9%	0.007	0.012
Phenanthrene	0.15	78.1%	0.033	0.27
Total LMW PAHs - 1/2MDL	0.46	74.3%	0.12	0.80
Total LMW PAHs - MDL	0.47	74.3%	0.12	0.82
Total LMW PAHs - Zero	0.45	74.3%	0.12	0.79
Benzo(A)Pyrene	0.12	67.2%	0.039	0.20
Benzo(A)Anthracene	0.12	68.8%	0.037	0.20
Benzo(B)Fluoranthene	0.17	60.1%	0.068	0.27
Benzo(G,H,I)Perylene	0.082	60.8%	0.032	0.13
Benzo(K)Fluoranthene	0.057	64.5%	0.020	0.094
Chrysene	0.13	62.9%	0.048	0.21
Dibenz(A,H)Anthracene	0.028	63.9%	0.010	0.046
Indeno(1,2,3-C,D)Pyrene	0.096	62.0%	0.036	0.16
Pyrene	0.25	72.7%	0.068	0.43
Total HMW PAHs - 1/2MDL	1.05	64.7%	0.37	1.73
Total HMW PAHs - MDL	1.05	64.7%	0.37	1.73
Total HMW PAHs - Zero	1.05	64.7%	0.37	1.73
Total PAHs - 1/2MDL	1.34	68.3%	0.42	2.26
Total PAHs - MDL	1.34	68.3%	0.43	2.26
Total PAHs - Zero	1.34	68.3%	0.42	2.25
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.014	--	0.014	0.014
1,4-Dioxane (P-Dioxane)	0.048	--	0.048	0.048
2,3,4,6-Tetrachlorophenol	0.017	--	0.017	0.017
2,4,5-Trichlorophenol	0.018	--	0.018	0.018
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.040	--	0.040	0.040

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-036			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-036-SO-0.5-2			
Sample Date	7/15/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.14	--	0.14	0.14
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.010	--	0.010	0.010
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.005	--	0.005	0.005
2-Methylphenol (O-Cresol)	0.008	--	0.008	0.008
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.005	--	0.005	0.005
3,3'-Dichlorobenzidine	0.020	--	0.020	0.020
3-Nitroaniline	0.006	--	0.006	0.006
4,6-Dinitro-2-Methylphenol	0.048	--	0.048	0.048
4-Bromophenyl Phenyl Ether	0.006	--	0.006	0.006
4-Chloro-3-Methylphenol	0.008	--	0.008	0.008
4-Chloroaniline	0.005	--	0.005	0.005
4-Chlorophenyl Phenyl Ether	0.006	--	0.006	0.006
4-Nitroaniline	0.007	--	0.007	0.007
4-Nitrophenol	0.085	--	0.085	0.085
Acetophenone	0.004	41.1%	0.002	0.006
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.014	--	0.014	0.014
Benzyl Butyl Phthalate	0.006	32.7%	0.004	0.007
Biphenyl (Diphenyl)	0.015	98.2%	2.70E-04	0.030
Bis(2-Chloroethoxy) Methane	0.006	--	0.006	0.006
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.008	--	0.008	0.008
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.013	--	0.013	0.013
Carbazole	0.016	76.1%	0.004	0.028
Dibenzofuran	0.006	70.0%	0.002	0.009
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.006	--	0.006	0.006
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.011	--	0.011	0.011
Hexachloroethane	0.007	--	0.007	0.007
Isophorone	0.004	32.5%	0.003	0.005
Nitrobenzene	0.006	--	0.006	0.006
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.016	--	0.016	0.016
Pentachlorophenol	0.022	--	0.022	0.022
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-037			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-037-SO-0-0.5			
Sample Date	7/15/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	17,200	4.68%	16,395	18,005
Antimony	4.40	28.1%	3.16	5.64
Arsenic	19.6	13.8%	16.9	22.3
Barium	190	4.03%	182	198
Beryllium	0.61	6.32%	0.57	0.65
Cadmium	0.68	15.0%	0.58	0.78
Chromium, Total	35.9	10.6%	32.1	39.7
Chromium, Hexavalent	0.96	10.6%	0.86	1.06
Chromium, Trivalent	34.9	10.6%	31.2	38.6
Cobalt	10.5	3.51%	10.1	10.9
Copper	477	12.3%	418	536
Iron	40,700	3.40%	39,316	42,084
Lead	88.3	48.5%	45.5	131
Manganese	634	5.63%	598	670
Mercury	0.034	54.9%	0.015	0.053
Nickel	46.4	14.5%	39.7	53.1
Selenium	1.20	20.0%	0.96	1.44
Silver	0.69	9.03%	0.63	0.75
Thallium	0.17	14.4%	0.15	0.19
Vanadium	27.6	9.21%	25.1	30.1
Zinc	888	12.7%	775	1,001
Other Inorganic Parameters (mg/kg)				
Cyanide	0.45	40.2%	0.27	0.63
Fluoride	83.4	20.5%	66.3	101
Essential Nutrients (mg/kg)				
Calcium	32,500	10.7%	29,033	35,967
Magnesium	9,120	2.82%	8,863	9,377
Potassium	1,430	6.24%	1,341	1,519
Sodium	364	30.7%	252	476
Pesticides (mg/kg)				
Aldrin	3.90E-04	--	3.90E-04	3.90E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	2.95E-04	--	2.95E-04	2.95E-04
Alpha Endosulfan	4.50E-04	--	4.50E-04	4.50E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.15E-04	--	3.15E-04	3.15E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.50E-04	--	3.50E-04	3.50E-04
Dieldrin	4.20E-04	--	4.20E-04	4.20E-04
Endosulfan Sulfate	3.75E-04	--	3.75E-04	3.75E-04
Endrin	4.10E-04	--	4.10E-04	4.10E-04
Endrin Aldehyde	4.00E-04	--	4.00E-04	4.00E-04
Endrin Ketone	4.50E-04	--	4.50E-04	4.50E-04
Gamma Bhc (Lindane)	2.90E-04	--	2.90E-04	2.90E-04
Heptachlor	4.15E-04	--	4.15E-04	4.15E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.25E-04	--	4.25E-04	4.25E-04
P,P'-DDE	4.70E-04	--	4.70E-04	4.70E-04
P,P'-DDT	3.35E-04	--	3.35E-04	3.35E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-037			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-037-SO-0-0.5			
Sample Date	7/15/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.004	140%	-1.76E-03	0.011
PCB-1260 (Aroclor 1260)	0.004	--	0.004	0.004
PCB-1262 (Aroclor 1262)	0.004	--	0.004	0.004
PCB-1268 (Aroclor 1268)	0.004	--	0.004	0.004
Polychlorinated Biphenyl (PCBs)	0.004	140%	-1.76E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.078	47.1%	0.041	0.11
Acenaphthene	0.37	42.0%	0.21	0.53
Acenaphthylene	0.011	36.1%	0.007	0.015
Anthracene	0.54	37.7%	0.34	0.74
Fluoranthene	7.40	37.3%	4.64	10.2
Fluorene	0.16	34.6%	0.10	0.22
Naphthalene	0.098	44.9%	0.054	0.14
Phenanthrene	3.70	31.0%	2.55	4.85
Total LMW PAHs - 1/2MDL	12.4	35.8%	7.93	16.8
Total LMW PAHs - MDL	12.4	35.8%	7.94	16.8
Total LMW PAHs - Zero	12.4	35.9%	7.92	16.8
Benzo(A)Pyrene	4.50	36.1%	2.87	6.13
Benzo(A)Anthracene	4.10	32.0%	2.79	5.41
Benzo(B)Fluoranthene	7.20	29.8%	5.05	9.35
Benzo(G,H,I)Perylene	3.40	30.8%	2.35	4.45
Benzo(K)Fluoranthene	2.50	31.3%	1.72	3.28
Chrysene	5.90	35.9%	3.78	8.02
Dibenz(A,H)Anthracene	1.00	39.8%	0.60	1.40
Indeno(1,2,3-C,D)Pyrene	3.70	31.1%	2.55	4.85
Pyrene	5.70	39.3%	3.46	7.94
Total HMW PAHs - 1/2MDL	38.0	26.8%	27.8	48.2
Total HMW PAHs - MDL	38.0	26.8%	27.8	48.2
Total HMW PAHs - Zero	38.0	26.8%	27.8	48.2
Total PAHs - 1/2MDL	43.1	29.6%	30.3	55.8
Total PAHs - MDL	43.1	29.5%	30.4	55.8
Total PAHs - Zero	43.1	29.6%	30.3	55.8
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.013	--	0.013	0.013
1,4-Dioxane (P-Dioxane)	0.044	--	0.044	0.044
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.037	--	0.037	0.037

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-037			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-037-SO-0-0.5			
Sample Date	7/15/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.044	--	0.044	0.044
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	44.4%	0.002	0.005
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.019	--	0.019	0.019
Biphenyl (Diphenyl)	0.014	49.7%	0.007	0.021
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.059	--	0.059	0.059
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.60	30.5%	0.42	0.78
Dibenzofuran	0.13	33.5%	0.086	0.17
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.034	--	0.034	0.034
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.011	--	0.011	0.011
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	--	0.004	0.004
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.016	--	0.016	0.016

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-037			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-037-SO-0.5-2			
Sample Date	7/15/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	18,400	4.58%	17,558	19,242
Antimony	0.87	70.4%	0.26	1.48
Arsenic	8.20	7.46%	7.59	8.81
Barium	230	9.24%	209	251
Beryllium	0.64	4.90%	0.61	0.67
Cadmium	0.23	6.03%	0.22	0.24
Chromium, Total	23.0	7.75%	21.2	24.8
Chromium, Hexavalent	0.62	7.75%	0.57	0.66
Chromium, Trivalent	22.4	7.75%	20.6	24.1
Cobalt	6.80	1.99%	6.66	6.94
Copper	73.1	4.63%	69.7	76.5
Iron	20,200	2.40%	19,715	20,685
Lead	23.2	3.33%	22.4	24.0
Manganese	564	7.15%	524	604
Mercury	0.019	27.4%	0.014	0.024
Nickel	20.1	6.58%	18.8	21.4
Selenium	1.10	19.1%	0.89	1.31
Silver	0.17	9.83%	0.15	0.19
Thallium	0.12	6.56%	0.11	0.13
Vanadium	17.1	3.31%	16.5	17.7
Zinc	204	5.42%	193	215
Other Inorganic Parameters (mg/kg)				
Cyanide	0.35	32.7%	0.24	0.46
Fluoride	87.3	28.8%	62.2	112
Essential Nutrients (mg/kg)				
Calcium	11,500	15.1%	9,759	13,241
Magnesium	8,190	2.18%	8,011	8,369
Potassium	1,100	6.91%	1,024	1,176
Sodium	226	21.1%	178	274
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-037			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-037-SO-0.5-2			
Sample Date	7/15/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.011	47.7%	0.006	0.016
Acenaphthene	0.050	80.9%	0.010	0.090
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.093	82.4%	0.016	0.17
Fluoranthene	0.75	71.4%	0.21	1.29
Fluorene	0.039	74.2%	0.010	0.068
Naphthalene	0.015	28.9%	0.011	0.019
Phenanthrene	0.61	78.1%	0.13	1.09
Total LMW PAHs - 1/2MDL	1.57	74.3%	0.40	2.74
Total LMW PAHs - MDL	1.58	74.3%	0.41	2.75
Total LMW PAHs - Zero	1.57	74.3%	0.40	2.73
Benzo(A)Pyrene	0.39	67.2%	0.13	0.65
Benzo(A)Anthracene	0.35	68.8%	0.11	0.59
Benzo(B)Fluoranthene	0.57	60.1%	0.23	0.91
Benzo(G,H,I)Perylene	0.48	60.8%	0.19	0.77
Benzo(K)Fluoranthene	0.24	64.5%	0.085	0.39
Chrysene	0.53	62.9%	0.20	0.86
Dibenz(A,H)Anthracene	0.12	63.9%	0.043	0.20
Indeno(1,2,3-C,D)Pyrene	0.45	62.0%	0.17	0.73
Pyrene	0.93	72.7%	0.25	1.61
Total HMW PAHs - 1/2MDL	4.06	64.7%	1.43	6.69
Total HMW PAHs - MDL	4.06	64.7%	1.43	6.69
Total HMW PAHs - Zero	4.06	64.7%	1.43	6.69
Total PAHs - 1/2MDL	5.05	68.3%	1.60	8.50
Total PAHs - MDL	5.06	68.3%	1.60	8.51
Total PAHs - Zero	5.05	68.3%	1.60	8.50
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.013	--	0.013	0.013
1,4-Dioxane (P-Dioxane)	0.045	--	0.045	0.045
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.037	--	0.037	0.037

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-037			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-037-SO-0.5-2			
Sample Date	7/15/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.008	--	0.008	0.008
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.045	--	0.045	0.045
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.007	--	0.007	0.007
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	41.1%	0.002	0.005
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.019	32.7%	0.013	0.025
Biphenyl (Diphenyl)	0.014	98.2%	2.52E-04	0.028
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.060	76.1%	0.014	0.11
Dibenzofuran	0.027	70.0%	0.008	0.046
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.011	--	0.011	0.011
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.011	--	0.011	0.011
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	32.5%	0.002	0.005
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-038			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-038-SO-0-0.5			
Sample Date	7/14/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	26,800	4.68%	25,545	28,055
Antimony	8.60	28.1%	6.19	11.0
Arsenic	31.3	13.8%	27.0	35.6
Barium	221	4.03%	212	230
Beryllium	0.97	6.32%	0.91	1.03
Cadmium	0.82	15.0%	0.70	0.94
Chromium, Total	36.8	10.6%	32.9	40.7
Chromium, Hexavalent	0.98	10.6%	0.88	1.09
Chromium, Trivalent	35.8	10.6%	32.0	39.6
Cobalt	13.5	3.51%	13.0	14.0
Copper	887	12.3%	778	996
Iron	66,700	3.40%	64,433	68,967
Lead	144	48.5%	74.1	214
Manganese	731	5.63%	690	772
Mercury	0.008	54.9%	0.003	0.012
Nickel	51.6	14.5%	44.1	59.1
Selenium	1.10	20.0%	0.88	1.32
Silver	1.30	9.03%	1.18	1.42
Thallium	0.22	14.4%	0.19	0.25
Vanadium	38.6	9.21%	35.0	42.2
Zinc	1,720	12.7%	1,501	1,939
Other Inorganic Parameters (mg/kg)				
Cyanide	0.021	40.2%	0.013	0.029
Fluoride	507	20.5%	403	611
Essential Nutrients (mg/kg)				
Calcium	45,700	10.7%	40,825	50,575
Magnesium	8,830	2.82%	8,581	9,079
Potassium	2,110	6.24%	1,978	2,242
Sodium	1,970	30.7%	1,364	2,576
Pesticides (mg/kg)				
Aldrin	3.95E-04	--	3.95E-04	3.95E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.00E-04	--	3.00E-04	3.00E-04
Alpha Endosulfan	4.55E-04	--	4.55E-04	4.55E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.20E-04	--	3.20E-04	3.20E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.60E-04	--	3.60E-04	3.60E-04
Dieldrin	4.25E-04	--	4.25E-04	4.25E-04
Endosulfan Sulfate	3.80E-04	--	3.80E-04	3.80E-04
Endrin	4.15E-04	--	4.15E-04	4.15E-04
Endrin Aldehyde	4.05E-04	--	4.05E-04	4.05E-04
Endrin Ketone	4.55E-04	--	4.55E-04	4.55E-04
Gamma Bhc (Lindane)	2.95E-04	--	2.95E-04	2.95E-04
Heptachlor	4.20E-04	--	4.20E-04	4.20E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.30E-04	--	4.30E-04	4.30E-04
P,P'-DDE	4.75E-04	--	4.75E-04	4.75E-04
P,P'-DDT	3.40E-04	--	3.40E-04	3.40E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-038			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-038-SO-0-0.5			
Sample Date	7/14/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.78E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.78E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.044	47.1%	0.023	0.065
Acenaphthene	0.26	42.0%	0.15	0.37
Acenaphthylene	0.033	36.1%	0.021	0.045
Anthracene	0.54	37.7%	0.34	0.74
Fluoranthene	6.30	37.3%	3.95	8.65
Fluorene	0.14	34.6%	0.091	0.19
Naphthalene	0.083	44.9%	0.046	0.12
Phenanthrene	3.00	31.0%	2.07	3.93
Total LMW PAHs - 1/2MDL	10.4	35.8%	6.67	14.1
Total LMW PAHs - MDL	10.4	35.8%	6.68	14.1
Total LMW PAHs - Zero	10.4	35.9%	6.67	14.1
Benzo(A)Pyrene	4.20	36.1%	2.68	5.72
Benzo(A)Anthracene	3.50	32.0%	2.38	4.62
Benzo(B)Fluoranthene	7.20	29.8%	5.05	9.35
Benzo(G,H,I)Perylene	5.70	30.8%	3.95	7.45
Benzo(K)Fluoranthene	2.60	31.3%	1.79	3.41
Chrysene	6.00	35.9%	3.85	8.15
Dibenz(A,H)Anthracene	1.30	39.8%	0.78	1.82
Indeno(1,2,3-C,D)Pyrene	5.70	31.1%	3.93	7.47
Pyrene	4.30	39.3%	2.61	5.99
Total HMW PAHs - 1/2MDL	40.5	26.8%	29.6	51.4
Total HMW PAHs - MDL	40.5	26.8%	29.6	51.4
Total HMW PAHs - Zero	40.5	26.8%	29.6	51.4
Total PAHs - 1/2MDL	43.7	29.6%	30.8	56.6
Total PAHs - MDL	43.7	29.5%	30.8	56.6
Total PAHs - Zero	43.7	29.6%	30.8	56.6
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.044	--	0.044	0.044
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.036	--	0.036	0.036

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-038			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-038-SO-0-0.5			
Sample Date	7/14/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.044	--	0.044	0.044
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	44.4%	0.002	0.005
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.14	--	0.14	0.14
Biphenyl (Diphenyl)	0.014	49.7%	0.007	0.021
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.064	--	0.064	0.064
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.48	30.5%	0.33	0.63
Dibenzofuran	0.095	33.5%	0.063	0.13
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.045	--	0.045	0.045
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	--	0.004	0.004
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-038			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-038-SO-0.5-2			
Sample Date	7/14/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	14,900	4.58%	14,218	15,582
Antimony	0.48	70.4%	0.14	0.82
Arsenic	6.20	7.46%	5.74	6.66
Barium	158	9.24%	143	173
Beryllium	0.59	4.90%	0.56	0.62
Cadmium	0.30	6.03%	0.28	0.32
Chromium, Total	17.4	7.75%	16.1	18.7
Chromium, Hexavalent	0.47	7.75%	0.43	0.50
Chromium, Trivalent	16.9	7.75%	15.6	18.2
Cobalt	6.00	1.99%	5.88	6.12
Copper	47.7	4.63%	45.5	49.9
Iron	16,700	2.40%	16,299	17,101
Lead	29.3	3.33%	28.3	30.3
Manganese	474	7.15%	440	508
Mercury	0.008	27.4%	0.006	0.010
Nickel	18.4	6.58%	17.2	19.6
Selenium	1.10	19.1%	0.89	1.31
Silver	0.27	9.83%	0.24	0.30
Thallium	0.11	6.56%	0.10	0.12
Vanadium	12.7	3.31%	12.3	13.1
Zinc	123	5.42%	116	130
Other Inorganic Parameters (mg/kg)				
Cyanide	0.73	32.7%	0.49	0.97
Fluoride	207	28.8%	147	267
Essential Nutrients (mg/kg)				
Calcium	23,200	15.1%	19,687	26,713
Magnesium	9,630	2.18%	9,420	9,840
Potassium	1,040	6.91%	968	1,112
Sodium	352	21.1%	278	426
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-038			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-038-SO-0.5-2			
Sample Date	7/14/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.097	47.7%	0.051	0.14
Acenaphthene	0.40	80.9%	0.076	0.72
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.44	82.4%	0.078	0.80
Fluoranthene	3.70	71.4%	1.06	6.34
Fluorene	0.18	74.2%	0.047	0.31
Naphthalene	0.087	28.9%	0.062	0.11
Phenanthrene	2.70	78.1%	0.59	4.81
Total LMW PAHs - 1/2MDL	7.61	74.3%	1.96	13.3
Total LMW PAHs - MDL	7.61	74.3%	1.96	13.3
Total LMW PAHs - Zero	7.60	74.3%	1.96	13.3
Benzo(A)Pyrene	2.10	67.2%	0.69	3.51
Benzo(A)Anthracene	1.90	68.8%	0.59	3.21
Benzo(B)Fluoranthene	2.70	60.1%	1.08	4.32
Benzo(G,H,I)Perylene	2.80	60.8%	1.10	4.50
Benzo(K)Fluoranthene	1.10	64.5%	0.39	1.81
Chrysene	2.50	62.9%	0.93	4.07
Dibenz(A,H)Anthracene	0.58	63.9%	0.21	0.95
Indeno(1,2,3-C,D)Pyrene	2.60	62.0%	0.99	4.21
Pyrene	3.70	72.7%	1.01	6.39
Total HMW PAHs - 1/2MDL	20.0	64.7%	7.05	32.9
Total HMW PAHs - MDL	20.0	64.7%	7.05	32.9
Total HMW PAHs - Zero	20.0	64.7%	7.05	32.9
Total PAHs - 1/2MDL	24.8	68.3%	7.85	41.7
Total PAHs - MDL	24.8	68.3%	7.85	41.7
Total PAHs - Zero	24.8	68.3%	7.85	41.7
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.013	--	0.013	0.013
1,4-Dioxane (P-Dioxane)	0.045	--	0.045	0.045
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.037	--	0.037	0.037

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-038			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-038-SO-0.5-2			
Sample Date	7/14/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.008	--	0.008	0.008
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.017	--	0.017	0.017
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.045	--	0.045	0.045
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.007	--	0.007	0.007
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	41.1%	0.002	0.005
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.014	98.2%	2.52E-04	0.028
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.29	76.1%	0.069	0.51
Dibenzofuran	0.11	70.0%	0.033	0.19
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.011	--	0.011	0.011
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	32.5%	0.002	0.005
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.027	--	0.027	0.027

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-039			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-039-SO-0-0.5			
Sample Date	7/14/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	14,900	4.68%	14,202	15,598
Antimony	0.11	28.1%	0.079	0.14
Arsenic	4.50	13.8%	3.88	5.12
Barium	158	4.03%	152	164
Beryllium	0.60	6.32%	0.56	0.64
Cadmium	0.082	15.0%	0.070	0.094
Chromium, Total	12.9	10.6%	11.5	14.3
Chromium, Hexavalent	0.35	10.6%	0.31	0.38
Chromium, Trivalent	12.6	10.6%	11.2	13.9
Cobalt	6.30	3.51%	6.08	6.52
Copper	15.8	12.3%	13.9	17.7
Iron	16,100	3.40%	15,553	16,647
Lead	12.0	48.5%	6.18	17.8
Manganese	480	5.63%	453	507
Mercury	0.013	54.9%	0.006	0.020
Nickel	13.4	14.5%	11.5	15.3
Selenium	1.10	20.0%	0.88	1.32
Silver	0.036	9.03%	0.033	0.039
Thallium	0.087	14.4%	0.075	0.099
Vanadium	12.3	9.21%	11.2	13.4
Zinc	48.2	12.7%	42.1	54.3
Other Inorganic Parameters (mg/kg)				
Cyanide	0.048	40.2%	0.029	0.067
Fluoride	60.9	20.5%	48.4	73.4
Essential Nutrients (mg/kg)				
Calcium	13,200	10.7%	11,792	14,608
Magnesium	8,960	2.82%	8,707	9,213
Potassium	875	6.24%	820	930
Sodium	143	30.7%	99.0	187
Pesticides (mg/kg)				
Aldrin	4.05E-04	--	4.05E-04	4.05E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.05E-04	--	3.05E-04	3.05E-04
Alpha Endosulfan	4.65E-04	--	4.65E-04	4.65E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.25E-04	--	3.25E-04	3.25E-04
Beta Endosulfan	5.50E-04	--	5.50E-04	5.50E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.65E-04	--	3.65E-04	3.65E-04
Dieldrin	4.35E-04	--	4.35E-04	4.35E-04
Endosulfan Sulfate	3.90E-04	--	3.90E-04	3.90E-04
Endrin	4.25E-04	--	4.25E-04	4.25E-04
Endrin Aldehyde	4.15E-04	--	4.15E-04	4.15E-04
Endrin Ketone	4.65E-04	--	4.65E-04	4.65E-04
Gamma Bhc (Lindane)	3.00E-04	--	3.00E-04	3.00E-04
Heptachlor	4.30E-04	--	4.30E-04	4.30E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.40E-04	--	4.40E-04	4.40E-04
P,P'-DDE	4.85E-04	--	4.85E-04	4.85E-04
P,P'-DDT	3.45E-04	--	3.45E-04	3.45E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-039			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-039-SO-0-0.5			
Sample Date	7/14/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.50E-04	--	7.50E-04	7.50E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.82E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.82E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.009	47.1%	0.005	0.014
Acenaphthene	0.036	42.0%	0.021	0.051
Acenaphthylene	0.004	36.1%	0.003	0.006
Anthracene	0.058	37.7%	0.036	0.080
Fluoranthene	0.46	37.3%	0.29	0.63
Fluorene	0.024	34.6%	0.016	0.032
Naphthalene	0.013	44.9%	0.007	0.019
Phenanthrene	0.30	31.0%	0.21	0.39
Total LMW PAHs - 1/2MDL	0.90	35.8%	0.58	1.23
Total LMW PAHs - MDL	0.91	35.8%	0.58	1.23
Total LMW PAHs - Zero	0.90	35.9%	0.58	1.22
Benzo(A)Pyrene	0.34	36.1%	0.22	0.46
Benzo(A)Anthracene	0.26	32.0%	0.18	0.34
Benzo(B)Fluoranthene	0.42	29.8%	0.29	0.55
Benzo(G,H,I)Perylene	0.42	30.8%	0.29	0.55
Benzo(K)Fluoranthene	0.16	31.3%	0.11	0.21
Chrysene	0.36	35.9%	0.23	0.49
Dibenz(A,H)Anthracene	0.095	39.8%	0.057	0.13
Indeno(1,2,3-C,D)Pyrene	0.38	31.1%	0.26	0.50
Pyrene	0.44	39.3%	0.27	0.61
Total HMW PAHs - 1/2MDL	2.88	26.8%	2.10	3.65
Total HMW PAHs - MDL	2.88	26.8%	2.10	3.65
Total HMW PAHs - Zero	2.88	26.8%	2.10	3.65
Total PAHs - 1/2MDL	3.35	29.6%	2.36	4.34
Total PAHs - MDL	3.35	29.5%	2.36	4.35
Total PAHs - Zero	3.35	29.6%	2.36	4.34
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.044	--	0.044	0.044
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.036	--	0.036	0.036

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-039			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-039-SO-0-0.5			
Sample Date	7/14/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.044	--	0.044	0.044
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	44.4%	0.002	0.005
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	--	0.005	0.005
Biphenyl (Diphenyl)	0.014	49.7%	0.007	0.021
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.037	30.5%	0.026	0.048
Dibenzofuran	0.013	33.5%	0.009	0.017
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	--	0.004	0.004
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-039			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-039-SO-0.5-2			
Sample Date	7/14/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	23,000	4.58%	21,948	24,052
Antimony	0.82	70.4%	0.24	1.40
Arsenic	6.20	7.46%	5.74	6.66
Barium	116	9.24%	105	127
Beryllium	0.79	4.90%	0.75	0.83
Cadmium	0.46	6.03%	0.43	0.49
Chromium, Total	20.5	7.75%	18.9	22.1
Chromium, Hexavalent	0.55	7.75%	0.51	0.59
Chromium, Trivalent	20.0	7.75%	18.4	21.5
Cobalt	6.20	1.99%	6.08	6.32
Copper	42.9	4.63%	40.9	44.9
Iron	17,400	2.40%	16,982	17,818
Lead	52.6	3.33%	50.8	54.4
Manganese	364	7.15%	338	390
Mercury	0.009	27.4%	0.006	0.011
Nickel	35.3	6.58%	33.0	37.6
Selenium	0.95	19.1%	0.77	1.13
Silver	0.26	9.83%	0.23	0.29
Thallium	0.12	6.56%	0.11	0.13
Vanadium	18.8	3.31%	18.2	19.4
Zinc	145	5.42%	137	153
Other Inorganic Parameters (mg/kg)				
Cyanide	0.29	32.7%	0.20	0.38
Fluoride	503	28.8%	358	648
Essential Nutrients (mg/kg)				
Calcium	23,600	15.1%	20,027	27,173
Magnesium	8,670	2.18%	8,481	8,859
Potassium	1,540	6.91%	1,434	1,646
Sodium	1,420	21.1%	1,121	1,719
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-039			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-039-SO-0.5-2			
Sample Date	7/14/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.080	47.7%	0.042	0.12
Acenaphthene	0.71	80.9%	0.14	1.28
Acenaphthylene	0.029	62.8%	0.011	0.047
Anthracene	1.20	82.4%	0.21	2.19
Fluoranthene	10.0	71.4%	2.86	17.1
Fluorene	0.45	74.2%	0.12	0.78
Naphthalene	0.20	28.9%	0.14	0.26
Phenanthrene	6.10	78.1%	1.34	10.9
Total LMW PAHs - 1/2MDL	18.8	74.3%	4.83	32.7
Total LMW PAHs - MDL	18.8	74.3%	4.83	32.7
Total LMW PAHs - Zero	18.8	74.3%	4.83	32.7
Benzo(A)Pyrene	8.20	67.2%	2.69	13.7
Benzo(A)Anthracene	6.70	68.8%	2.09	11.3
Benzo(B)Fluoranthene	10.0	60.1%	3.99	16.0
Benzo(G,H,I)Perylene	12.0	60.8%	4.71	19.3
Benzo(K)Fluoranthene	3.50	64.5%	1.24	5.76
Chrysene	8.40	62.9%	3.11	13.7
Dibenz(A,H)Anthracene	2.60	63.9%	0.94	4.26
Indeno(1,2,3-C,D)Pyrene	11.0	62.0%	4.18	17.8
Pyrene	9.80	72.7%	2.67	16.9
Total HMW PAHs - 1/2MDL	72.2	64.7%	25.5	119
Total HMW PAHs - MDL	72.2	64.7%	25.5	119
Total HMW PAHs - Zero	72.2	64.7%	25.5	119
Total PAHs - 1/2MDL	80.9	68.3%	25.6	136
Total PAHs - MDL	80.9	68.3%	25.6	136
Total PAHs - Zero	80.9	68.3%	25.6	136
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.024	--	0.024	0.024
1,4-Dioxane (P-Dioxane)	0.085	--	0.085	0.085
2,3,4,6-Tetrachlorophenol	0.030	--	0.030	0.030
2,4,5-Trichlorophenol	0.032	--	0.032	0.032
2,4,6-Trichlorophenol	0.009	--	0.009	0.009
2,4-Dichlorophenol	0.008	--	0.008	0.008
2,4-Dimethylphenol	0.070	--	0.070	0.070

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-039			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-039-SO-0.5-2			
Sample Date	7/14/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.24	--	0.24	0.24
2,4-Dinitrotoluene	0.013	--	0.013	0.013
2,6-Dinitrotoluene	0.017	--	0.017	0.017
2-Chloronaphthalene	0.008	--	0.008	0.008
2-Chlorophenol	0.008	--	0.008	0.008
2-Methylphenol (O-Cresol)	0.014	--	0.014	0.014
2-Nitroaniline	0.011	--	0.011	0.011
2-Nitrophenol	0.011	--	0.011	0.011
3- And 4- Methylphenol (Total)	0.009	--	0.009	0.009
3,3'-Dichlorobenzidine	0.036	--	0.036	0.036
3-Nitroaniline	0.010	--	0.010	0.010
4,6-Dinitro-2-Methylphenol	0.085	--	0.085	0.085
4-Bromophenyl Phenyl Ether	0.010	--	0.010	0.010
4-Chloro-3-Methylphenol	0.014	--	0.014	0.014
4-Chloroaniline	0.008	--	0.008	0.008
4-Chlorophenyl Phenyl Ether	0.010	--	0.010	0.010
4-Nitroaniline	0.012	--	0.012	0.012
4-Nitrophenol	0.16	--	0.16	0.16
Acetophenone	0.007	41.1%	0.004	0.010
Atrazine	0.014	--	0.014	0.014
Benzaldehyde	0.025	--	0.025	0.025
Benzyl Butyl Phthalate	0.088	32.7%	0.059	0.12
Biphenyl (Diphenyl)	0.028	98.2%	4.95E-04	0.055
Bis(2-Chloroethoxy) Methane	0.010	--	0.010	0.010
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.008	--	0.008	0.008
Bis(2-Chloroisopropyl) Ether	0.013	--	0.013	0.013
Bis(2-Ethylhexyl) Phthalate	0.013	--	0.013	0.013
Caprolactam	0.023	--	0.023	0.023
Carbazole	0.88	76.1%	0.21	1.55
Dibenzofuran	0.23	70.0%	0.069	0.39
Diethyl Phthalate	0.009	--	0.009	0.009
Dimethyl Phthalate	0.010	--	0.010	0.010
Di-N-Butyl Phthalate	0.010	--	0.010	0.010
Di-N-Octylphthalate	0.016	--	0.016	0.016
Hexachlorobenzene	0.013	--	0.013	0.013
Hexachlorobutadiene	0.009	--	0.009	0.009
Hexachlorocyclopentadiene	0.020	--	0.020	0.020
Hexachloroethane	0.012	--	0.012	0.012
Isophorone	0.007	32.5%	0.005	0.009
Nitrobenzene	0.010	--	0.010	0.010
N-Nitrosodi-N-Propylamine	0.011	--	0.011	0.011
N-Nitrosodiphenylamine	0.029	--	0.029	0.029
Pentachlorophenol	0.039	--	0.039	0.039
Phenol	0.011	--	0.011	0.011

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-040			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-040-SO-0-0.5			
Sample Date	7/13/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	22,000	4.68%	20,970	23,030
Antimony	0.54	28.1%	0.39	0.69
Arsenic	5.70	13.8%	4.91	6.49
Barium	120	4.03%	115	125
Beryllium	0.75	6.32%	0.70	0.80
Cadmium	0.63	15.0%	0.54	0.72
Chromium, Total	28.9	10.6%	25.8	32.0
Chromium, Hexavalent	0.77	10.6%	0.69	0.86
Chromium, Trivalent	28.1	10.6%	25.2	31.1
Cobalt	6.50	3.51%	6.27	6.73
Copper	29.9	12.3%	26.2	33.6
Iron	17,700	3.40%	17,098	18,302
Lead	45.4	48.5%	23.4	67.4
Manganese	405	5.63%	382	428
Mercury	0.009	54.9%	0.004	0.013
Nickel	42.8	14.5%	36.6	49.0
Selenium	1.10	20.0%	0.88	1.32
Silver	0.55	9.03%	0.50	0.60
Thallium	0.13	14.4%	0.11	0.15
Vanadium	20.1	9.21%	18.2	22.0
Zinc	101	12.7%	88.2	114
Other Inorganic Parameters (mg/kg)				
Cyanide	0.23	40.2%	0.14	0.32
Fluoride	349	20.5%	277	421
Essential Nutrients (mg/kg)				
Calcium	23,500	10.7%	20,993	26,007
Magnesium	10,500	2.82%	10,204	10,796
Potassium	1,750	6.24%	1,641	1,859
Sodium	1,240	30.7%	859	1,621
Pesticides (mg/kg)				
Aldrin	3.95E-04	--	3.95E-04	3.95E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.00E-04	--	3.00E-04	3.00E-04
Alpha Endosulfan	4.55E-04	--	4.55E-04	4.55E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.20E-04	--	3.20E-04	3.20E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.60E-04	--	3.60E-04	3.60E-04
Dieldrin	4.25E-04	--	4.25E-04	4.25E-04
Endosulfan Sulfate	3.80E-04	--	3.80E-04	3.80E-04
Endrin	4.15E-04	--	4.15E-04	4.15E-04
Endrin Aldehyde	4.05E-04	--	4.05E-04	4.05E-04
Endrin Ketone	4.55E-04	--	4.55E-04	4.55E-04
Gamma Bhc (Lindane)	2.95E-04	--	2.95E-04	2.95E-04
Heptachlor	4.20E-04	--	4.20E-04	4.20E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.30E-04	--	4.30E-04	4.30E-04
P,P'-DDE	4.75E-04	--	4.75E-04	4.75E-04
P,P'-DDT	3.40E-04	--	3.40E-04	3.40E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-040			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-040-SO-0-0.5			
Sample Date	7/13/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.78E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.78E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.46	47.1%	0.24	0.68
Acenaphthene	3.80	42.0%	2.20	5.40
Acenaphthylene	0.043	36.1%	0.027	0.058
Anthracene	5.00	37.7%	3.12	6.88
Fluoranthene	35.0	37.3%	21.9	48.1
Fluorene	2.50	34.6%	1.63	3.37
Naphthalene	1.30	44.9%	0.72	1.88
Phenanthrene	27.0	31.0%	18.6	35.4
Total LMW PAHs - 1/2MDL	75.1	35.8%	48.2	102
Total LMW PAHs - MDL	75.1	35.8%	48.3	102
Total LMW PAHs - Zero	75.1	35.9%	48.1	102
Benzo(A)Pyrene	23.0	36.1%	14.7	31.3
Benzo(A)Anthracene	19.0	32.0%	12.9	25.1
Benzo(B)Fluoranthene	30.0	29.8%	21.0	39.0
Benzo(G,H,I)Perylene	26.0	30.8%	18.0	34.0
Benzo(K)Fluoranthene	9.90	31.3%	6.80	13.0
Chrysene	25.0	35.9%	16.0	34.0
Dibenz(A,H)Anthracene	5.70	39.8%	3.43	7.97
Indeno(1,2,3-C,D)Pyrene	25.0	31.1%	17.2	32.8
Pyrene	38.0	39.3%	23.1	52.9
Total HMW PAHs - 1/2MDL	202	26.8%	148	256
Total HMW PAHs - MDL	202	26.8%	148	256
Total HMW PAHs - Zero	202	26.8%	148	256
Total PAHs - 1/2MDL	246	29.6%	173	319
Total PAHs - MDL	246	29.5%	174	319
Total PAHs - Zero	246	29.6%	173	319
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.13	--	0.13	0.13
1,4-Dioxane (P-Dioxane)	0.45	--	0.45	0.45
2,3,4,6-Tetrachlorophenol	0.16	--	0.16	0.16
2,4,5-Trichlorophenol	0.17	--	0.17	0.17
2,4,6-Trichlorophenol	0.047	--	0.047	0.047
2,4-Dichlorophenol	0.039	--	0.039	0.039
2,4-Dimethylphenol	0.37	--	0.37	0.37

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-040			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-040-SO-0-0.5			
Sample Date	7/13/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	1.25	--	1.25	1.25
2,4-Dinitrotoluene	0.065	--	0.065	0.065
2,6-Dinitrotoluene	0.090	--	0.090	0.090
2-Chloronaphthalene	0.038	--	0.038	0.038
2-Chlorophenol	0.042	--	0.042	0.042
2-Methylphenol (O-Cresol)	0.070	--	0.070	0.070
2-Nitroaniline	0.055	--	0.055	0.055
2-Nitrophenol	0.055	--	0.055	0.055
3- And 4- Methylphenol (Total)	0.044	--	0.044	0.044
3,3'-Dichlorobenzidine	0.19	--	0.19	0.19
3-Nitroaniline	0.049	--	0.049	0.049
4,6-Dinitro-2-Methylphenol	0.44	--	0.44	0.44
4-Bromophenyl Phenyl Ether	0.050	--	0.050	0.050
4-Chloro-3-Methylphenol	0.070	--	0.070	0.070
4-Chloroaniline	0.043	--	0.043	0.043
4-Chlorophenyl Phenyl Ether	0.050	--	0.050	0.050
4-Nitroaniline	0.065	--	0.065	0.065
4-Nitrophenol	0.80	--	0.80	0.80
Acetophenone	0.036	44.4%	0.020	0.052
Atrazine	0.075	--	0.075	0.075
Benzaldehyde	0.13	--	0.13	0.13
Benzyl Butyl Phthalate	0.050	--	0.050	0.050
Biphenyl (Diphenyl)	0.14	49.7%	0.070	0.21
Bis(2-Chloroethoxy) Methane	0.050	--	0.050	0.050
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.039	--	0.039	0.039
Bis(2-Chloroisopropyl) Ether	0.070	--	0.070	0.070
Bis(2-Ethylhexyl) Phthalate	0.065	--	0.065	0.065
Caprolactam	0.12	--	0.12	0.12
Carbazole	3.20	30.5%	2.22	4.18
Dibenzofuran	1.30	33.5%	0.86	1.74
Diethyl Phthalate	0.047	--	0.047	0.047
Dimethyl Phthalate	0.048	--	0.048	0.048
Di-N-Butyl Phthalate	0.050	--	0.050	0.050
Di-N-Octylphthalate	0.085	--	0.085	0.085
Hexachlorobenzene	0.065	--	0.065	0.065
Hexachlorobutadiene	0.047	--	0.047	0.047
Hexachlorocyclopentadiene	0.11	--	0.11	0.11
Hexachloroethane	0.060	--	0.060	0.060
Isophorone	0.036	--	0.036	0.036
Nitrobenzene	0.050	--	0.050	0.050
N-Nitrosodi-N-Propylamine	0.055	--	0.055	0.055
N-Nitrosodiphenylamine	0.15	--	0.15	0.15
Pentachlorophenol	0.20	--	0.20	0.20
Phenol	0.055	--	0.055	0.055

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-040			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-040-SO-0.5-2			
Sample Date	7/13/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	15,000	4.58%	14,314	15,686
Antimony	0.14	70.4%	0.041	0.24
Arsenic	4.40	7.46%	4.07	4.73
Barium	139	9.24%	126	152
Beryllium	0.55	4.90%	0.52	0.58
Cadmium	0.12	6.03%	0.11	0.13
Chromium, Total	27.6	7.75%	25.5	29.7
Chromium, Hexavalent	0.74	7.75%	0.68	0.80
Chromium, Trivalent	26.9	7.75%	24.8	28.9
Cobalt	6.40	1.99%	6.27	6.53
Copper	15.4	4.63%	14.7	16.1
Iron	16,500	2.40%	16,104	16,896
Lead	14.1	3.33%	13.6	14.6
Manganese	451	7.15%	419	483
Mercury	0.008	27.4%	0.006	0.010
Nickel	22.5	6.58%	21.0	24.0
Selenium	0.97	19.1%	0.79	1.15
Silver	0.029	9.83%	0.026	0.032
Thallium	0.091	6.56%	0.085	0.097
Vanadium	13.5	3.31%	13.1	13.9
Zinc	50.9	5.42%	48.1	53.7
Other Inorganic Parameters (mg/kg)				
Cyanide	0.082	32.7%	0.055	0.11
Fluoride	136	28.8%	96.9	175
Essential Nutrients (mg/kg)				
Calcium	12,100	15.1%	10,268	13,932
Magnesium	9,410	2.18%	9,205	9,615
Potassium	1,110	6.91%	1,033	1,187
Sodium	195	21.1%	154	236
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-040			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-040-SO-0.5-2			
Sample Date	7/13/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.096	47.7%	0.050	0.14
Acenaphthene	0.86	80.9%	0.16	1.56
Acenaphthylene	0.015	62.8%	0.006	0.024
Anthracene	1.40	82.4%	0.25	2.55
Fluoranthene	7.10	71.4%	2.03	12.2
Fluorene	0.69	74.2%	0.18	1.20
Naphthalene	0.32	28.9%	0.23	0.41
Phenanthrene	6.50	78.1%	1.42	11.6
Total LMW PAHs - 1/2MDL	17.0	74.3%	4.37	29.6
Total LMW PAHs - MDL	17.0	74.3%	4.37	29.6
Total LMW PAHs - Zero	17.0	74.3%	4.37	29.6
Benzo(A)Pyrene	4.40	67.2%	1.44	7.36
Benzo(A)Anthracene	3.90	68.8%	1.22	6.58
Benzo(B)Fluoranthene	5.00	60.1%	2.00	8.00
Benzo(G,H,I)Perylene	4.80	60.8%	1.88	7.72
Benzo(K)Fluoranthene	2.00	64.5%	0.71	3.29
Chrysene	4.30	62.9%	1.59	7.01
Dibenz(A,H)Anthracene	0.94	63.9%	0.34	1.54
Indeno(1,2,3-C,D)Pyrene	4.70	62.0%	1.78	7.62
Pyrene	6.40	72.7%	1.75	11.1
Total HMW PAHs - 1/2MDL	36.4	64.7%	12.9	60.0
Total HMW PAHs - MDL	36.4	64.7%	12.9	60.0
Total HMW PAHs - Zero	36.4	64.7%	12.9	60.0
Total PAHs - 1/2MDL	48.3	68.3%	15.3	81.3
Total PAHs - MDL	48.3	68.3%	15.3	81.3
Total PAHs - Zero	48.3	68.3%	15.3	81.3
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.044	--	0.044	0.044
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.036	--	0.036	0.036

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-040			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-040-SO-0.5-2			
Sample Date	7/13/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.044	--	0.044	0.044
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	41.1%	0.002	0.005
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.037	98.2%	6.66E-04	0.073
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.76	76.1%	0.18	1.34
Dibenzofuran	0.36	70.0%	0.11	0.61
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	32.5%	0.002	0.005
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-041			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-41-SO-0-0.5			
Sample Date	7/16/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	15,500	4.68%	14,774	16,226
Antimony	0.53	28.1%	0.38	0.68
Arsenic	5.90	13.8%	5.08	6.72
Barium	117	4.03%	112	122
Beryllium	0.51	6.32%	0.48	0.54
Cadmium	0.51	15.0%	0.43	0.59
Chromium, Total	20.4	10.6%	18.2	22.6
Chromium, Hexavalent	0.55	10.6%	0.49	0.60
Chromium, Trivalent	19.9	10.6%	17.8	22.0
Cobalt	7.10	3.51%	6.85	7.35
Copper	45.7	12.3%	40.1	51.3
Iron	19,400	3.40%	18,741	20,059
Lead	36.1	48.5%	18.6	53.6
Manganese	523	5.63%	494	552
Mercury	0.008	54.9%	0.004	0.012
Nickel	31.1	14.5%	26.6	35.6
Selenium	1.10	20.0%	0.88	1.32
Silver	0.12	9.03%	0.11	0.13
Thallium	0.096	14.4%	0.082	0.11
Vanadium	13.9	9.21%	12.6	15.2
Zinc	137	12.7%	120	154
Other Inorganic Parameters (mg/kg)				
Cyanide	0.19	40.2%	0.11	0.27
Fluoride	84.3	20.5%	67.0	102
Essential Nutrients (mg/kg)				
Calcium	15,600	10.7%	13,936	17,264
Magnesium	7,680	2.82%	7,463	7,897
Potassium	990	6.24%	928	1,052
Sodium	136	30.7%	94.2	178
Pesticides (mg/kg)				
Aldrin	4.00E-04	--	4.00E-04	4.00E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.05E-04	--	3.05E-04	3.05E-04
Alpha Endosulfan	4.60E-04	--	4.60E-04	4.60E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.25E-04	--	3.25E-04	3.25E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.65E-04	--	3.65E-04	3.65E-04
Dieldrin	4.30E-04	--	4.30E-04	4.30E-04
Endosulfan Sulfate	3.85E-04	--	3.85E-04	3.85E-04
Endrin	4.20E-04	--	4.20E-04	4.20E-04
Endrin Aldehyde	4.10E-04	--	4.10E-04	4.10E-04
Endrin Ketone	4.60E-04	--	4.60E-04	4.60E-04
Gamma Bhc (Lindane)	3.00E-04	--	3.00E-04	3.00E-04
Heptachlor	4.25E-04	--	4.25E-04	4.25E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.35E-04	--	4.35E-04	4.35E-04
P,P'-DDE	4.80E-04	--	4.80E-04	4.80E-04
P,P'-DDT	3.45E-04	--	3.45E-04	3.45E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-041			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-41-SO-0-0.5			
Sample Date	7/16/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.80E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.80E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.093	47.1%	0.049	0.14
Acenaphthene	0.31	42.0%	0.18	0.44
Acenaphthylene	0.004	36.1%	0.003	0.006
Anthracene	0.59	37.7%	0.37	0.81
Fluoranthene	4.50	37.3%	2.82	6.18
Fluorene	0.26	34.6%	0.17	0.35
Naphthalene	0.28	44.9%	0.15	0.41
Phenanthrene	3.10	31.0%	2.14	4.06
Total LMW PAHs - 1/2MDL	9.14	35.8%	5.86	12.4
Total LMW PAHs - MDL	9.14	35.8%	5.87	12.4
Total LMW PAHs - Zero	9.13	35.9%	5.86	12.4
Benzo(A)Pyrene	3.50	36.1%	2.23	4.77
Benzo(A)Anthracene	3.00	32.0%	2.04	3.96
Benzo(B)Fluoranthene	4.40	29.8%	3.09	5.71
Benzo(G,H,I)Perylene	3.90	30.8%	2.70	5.10
Benzo(K)Fluoranthene	1.90	31.3%	1.31	2.49
Chrysene	3.90	35.9%	2.50	5.30
Dibenz(A,H)Anthracene	1.00	39.8%	0.60	1.40
Indeno(1,2,3-C,D)Pyrene	3.80	31.1%	2.62	4.98
Pyrene	5.60	39.3%	3.40	7.80
Total HMW PAHs - 1/2MDL	31.0	26.8%	22.7	39.3
Total HMW PAHs - MDL	31.0	26.8%	22.7	39.3
Total HMW PAHs - Zero	31.0	26.8%	22.7	39.3
Total PAHs - 1/2MDL	35.6	29.6%	25.1	46.2
Total PAHs - MDL	35.6	29.5%	25.1	46.2
Total PAHs - Zero	35.6	29.6%	25.1	46.2
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.012	--	0.012	0.012
1,4-Dioxane (P-Dioxane)	0.043	--	0.043	0.043
2,3,4,6-Tetrachlorophenol	0.015	--	0.015	0.015
2,4,5-Trichlorophenol	0.016	--	0.016	0.016
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.036	--	0.036	0.036

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-041			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-41-SO-0-0.5			
Sample Date	7/16/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.12	--	0.12	0.12
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.018	--	0.018	0.018
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.043	--	0.043	0.043
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	44.4%	0.002	0.005
Atrazine	0.007	--	0.007	0.007
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.029	--	0.029	0.029
Biphenyl (Diphenyl)	0.014	49.7%	0.007	0.021
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.44	30.5%	0.31	0.57
Dibenzofuran	0.17	33.5%	0.11	0.23
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.019	--	0.019	0.019
Di-N-Octylphthalate	0.008	--	0.008	0.008
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.010	--	0.010	0.010
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.003	--	0.003	0.003
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-041			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-41-SO-0.5-2			
Sample Date	7/16/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	21,200	4.58%	20,230	22,170
Antimony	0.25	70.4%	0.074	0.43
Arsenic	5.20	7.46%	4.81	5.59
Barium	270	9.24%	245	295
Beryllium	0.71	4.90%	0.68	0.74
Cadmium	0.17	6.03%	0.16	0.18
Chromium, Total	15.2	7.75%	14.0	16.4
Chromium, Hexavalent	0.41	7.75%	0.38	0.44
Chromium, Trivalent	14.8	7.75%	13.6	15.9
Cobalt	6.60	1.99%	6.47	6.73
Copper	30.7	4.63%	29.3	32.1
Iron	18,400	2.40%	17,958	18,842
Lead	14.8	3.33%	14.3	15.3
Manganese	658	7.15%	611	705
Mercury	0.009	27.4%	0.006	0.011
Nickel	15.3	6.58%	14.3	16.3
Selenium	1.10	19.1%	0.89	1.31
Silver	0.059	9.83%	0.053	0.065
Thallium	0.11	6.56%	0.10	0.12
Vanadium	17.1	3.31%	16.5	17.7
Zinc	92.1	5.42%	87.1	97.1
Other Inorganic Parameters (mg/kg)				
Cyanide	0.14	32.7%	0.094	0.19
Fluoride	79.1	28.8%	56.3	102
Essential Nutrients (mg/kg)				
Calcium	10,200	15.1%	8,656	11,744
Magnesium	7,480	2.18%	7,317	7,643
Potassium	1,010	6.91%	940	1,080
Sodium	175	21.1%	138	212
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-041			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-41-SO-0.5-2			
Sample Date	7/16/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.008	47.7%	0.004	0.012
Acenaphthene	0.022	80.9%	0.004	0.040
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.016	82.4%	0.003	0.029
Fluoranthene	0.28	71.4%	0.080	0.48
Fluorene	0.012	74.2%	0.003	0.021
Naphthalene	0.010	28.9%	0.007	0.013
Phenanthrene	0.18	78.1%	0.039	0.32
Total LMW PAHs - 1/2MDL	0.53	74.3%	0.14	0.93
Total LMW PAHs - MDL	0.55	74.3%	0.14	0.96
Total LMW PAHs - Zero	0.51	74.3%	0.13	0.89
Benzo(A)Pyrene	0.18	67.2%	0.059	0.30
Benzo(A)Anthracene	0.16	68.8%	0.050	0.27
Benzo(B)Fluoranthene	0.28	60.1%	0.11	0.45
Benzo(G,H,I)Perylene	0.13	60.8%	0.051	0.21
Benzo(K)Fluoranthene	0.091	64.5%	0.032	0.15
Chrysene	0.21	62.9%	0.078	0.34
Dibenz(A,H)Anthracene	0.009	63.9%	0.003	0.015
Indeno(1,2,3-C,D)Pyrene	0.14	62.0%	0.053	0.23
Pyrene	0.30	72.7%	0.082	0.52
Total HMW PAHs - 1/2MDL	1.50	64.7%	0.53	2.47
Total HMW PAHs - MDL	1.51	64.7%	0.53	2.49
Total HMW PAHs - Zero	1.49	64.7%	0.53	2.46
Total PAHs - 1/2MDL	1.74	68.3%	0.55	2.94
Total PAHs - MDL	1.77	68.3%	0.56	2.99
Total PAHs - Zero	1.72	68.3%	0.54	2.89
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.013	--	0.013	0.013
1,4-Dioxane (P-Dioxane)	0.046	--	0.046	0.046
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.038	--	0.038	0.038

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-041			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-41-SO-0.5-2			
Sample Date	7/16/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.008	--	0.008	0.008
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.005	--	0.005	0.005
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.045	--	0.045	0.045
4-Bromophenyl Phenyl Ether	0.006	--	0.006	0.006
4-Chloro-3-Methylphenol	0.008	--	0.008	0.008
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.007	--	0.007	0.007
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.004	41.1%	0.002	0.005
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.015	98.2%	2.61E-04	0.029
Bis(2-Chloroethoxy) Methane	0.006	--	0.006	0.006
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.022	76.1%	0.005	0.039
Dibenzofuran	0.005	70.0%	0.001	0.009
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.005	--	0.005	0.005
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.011	--	0.011	0.011
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	32.5%	0.002	0.005
Nitrobenzene	0.006	--	0.006	0.006
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.016	--	0.016	0.016
Pentachlorophenol	0.021	--	0.021	0.021
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-042			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-042-SO-0-0.5			
Sample Date	7/18/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	24,100	4.68%	22,972	25,228
Antimony	3.60	28.1%	2.59	4.61
Arsenic	14.9	13.8%	12.8	17.0
Barium	153	4.03%	147	159
Beryllium	1.00	6.32%	0.94	1.06
Cadmium	0.89	15.0%	0.76	1.02
Chromium, Total	29.5	10.6%	26.4	32.6
Chromium, Hexavalent	0.79	10.6%	0.71	0.87
Chromium, Trivalent	28.7	10.6%	25.7	31.7
Cobalt	7.50	3.51%	7.24	7.76
Copper	345	12.3%	303	387
Iron	30,300	3.40%	29,270	31,330
Lead	83.1	48.5%	42.8	123
Manganese	470	5.63%	444	496
Mercury	0.021	54.9%	0.009	0.033
Nickel	55.7	14.5%	47.6	63.8
Selenium	0.86	20.0%	0.69	1.03
Silver	0.69	9.03%	0.63	0.75
Thallium	0.14	14.4%	0.12	0.16
Vanadium	21.5	9.21%	19.5	23.5
Zinc	751	12.7%	656	846
Other Inorganic Parameters (mg/kg)				
Cyanide	0.030	40.2%	0.018	0.042
Fluoride	632	20.5%	502	762
Essential Nutrients (mg/kg)				
Calcium	28,800	10.7%	25,728	31,872
Magnesium	7,240	2.82%	7,036	7,444
Potassium	1,530	6.24%	1,434	1,626
Sodium	2,470	30.7%	1,711	3,229
Pesticides (mg/kg)				
Aldrin	4.10E-04	--	4.10E-04	4.10E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.05E-04	--	3.05E-04	3.05E-04
Alpha Endosulfan	4.70E-04	--	4.70E-04	4.70E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.30E-04	--	3.30E-04	3.30E-04
Beta Endosulfan	5.50E-04	--	5.50E-04	5.50E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.70E-04	--	3.70E-04	3.70E-04
Dieldrin	4.40E-04	--	4.40E-04	4.40E-04
Endosulfan Sulfate	3.95E-04	--	3.95E-04	3.95E-04
Endrin	4.30E-04	--	4.30E-04	4.30E-04
Endrin Aldehyde	4.20E-04	--	4.20E-04	4.20E-04
Endrin Ketone	4.70E-04	--	4.70E-04	4.70E-04
Gamma Bhc (Lindane)	3.00E-04	--	3.00E-04	3.00E-04
Heptachlor	4.35E-04	--	4.35E-04	4.35E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.45E-04	--	4.45E-04	4.45E-04
P,P'-DDE	4.90E-04	--	4.90E-04	4.90E-04
P,P'-DDT	3.50E-04	--	3.50E-04	3.50E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-042			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-042-SO-0-0.5			
Sample Date	7/18/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.50E-04	--	7.50E-04	7.50E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	140%	-1.84E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.84E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.098	47.1%	0.052	0.14
Acenaphthene	0.30	42.0%	0.17	0.43
Acenaphthylene	0.009	36.1%	0.005	0.012
Anthracene	0.50	37.7%	0.31	0.69
Fluoranthene	6.60	37.3%	4.14	9.06
Fluorene	0.13	34.6%	0.085	0.18
Naphthalene	0.17	44.9%	0.094	0.25
Phenanthrene	3.50	31.0%	2.41	4.59
Total LMW PAHs - 1/2MDL	11.3	35.8%	7.26	15.4
Total LMW PAHs - MDL	11.3	35.8%	7.27	15.4
Total LMW PAHs - Zero	11.3	35.9%	7.24	15.4
Benzo(A)Pyrene	4.10	36.1%	2.62	5.58
Benzo(A)Anthracene	3.10	32.0%	2.11	4.09
Benzo(B)Fluoranthene	5.40	29.8%	3.79	7.01
Benzo(G,H,I)Perylene	6.30	30.8%	4.36	8.24
Benzo(K)Fluoranthene	2.20	31.3%	1.51	2.89
Chrysene	4.80	35.9%	3.08	6.52
Dibenz(A,H)Anthracene	1.40	39.8%	0.84	1.96
Indeno(1,2,3-C,D)Pyrene	5.50	31.1%	3.79	7.21
Pyrene	5.90	39.3%	3.58	8.22
Total HMW PAHs - 1/2MDL	38.7	26.8%	28.3	49.1
Total HMW PAHs - MDL	38.7	26.8%	28.3	49.1
Total HMW PAHs - Zero	38.7	26.8%	28.3	49.1
Total PAHs - 1/2MDL	44.5	29.6%	31.4	57.7
Total PAHs - MDL	44.5	29.5%	31.4	57.7
Total PAHs - Zero	44.5	29.6%	31.3	57.7
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.025	--	0.025	0.025
1,4-Dioxane (P-Dioxane)	0.090	--	0.090	0.090
2,3,4,6-Tetrachlorophenol	0.031	--	0.031	0.031
2,4,5-Trichlorophenol	0.033	--	0.033	0.033
2,4,6-Trichlorophenol	0.010	--	0.010	0.010
2,4-Dichlorophenol	0.008	--	0.008	0.008
2,4-Dimethylphenol	0.075	--	0.075	0.075

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-042			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-042-SO-0-0.5			
Sample Date	7/18/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.25	--	0.25	0.25
2,4-Dinitrotoluene	0.013	--	0.013	0.013
2,6-Dinitrotoluene	0.018	--	0.018	0.018
2-Chloronaphthalene	0.008	--	0.008	0.008
2-Chlorophenol	0.009	--	0.009	0.009
2-Methylphenol (O-Cresol)	0.015	--	0.015	0.015
2-Nitroaniline	0.011	--	0.011	0.011
2-Nitrophenol	0.011	--	0.011	0.011
3- And 4- Methylphenol (Total)	0.009	--	0.009	0.009
3,3'-Dichlorobenzidine	0.037	--	0.037	0.037
3-Nitroaniline	0.010	--	0.010	0.010
4,6-Dinitro-2-Methylphenol	0.090	--	0.090	0.090
4-Bromophenyl Phenyl Ether	0.011	--	0.011	0.011
4-Chloro-3-Methylphenol	0.014	--	0.014	0.014
4-Chloroaniline	0.009	--	0.009	0.009
4-Chlorophenyl Phenyl Ether	0.010	--	0.010	0.010
4-Nitroaniline	0.013	--	0.013	0.013
4-Nitrophenol	0.16	--	0.16	0.16
Acetophenone	0.007	44.4%	0.004	0.010
Atrazine	0.015	--	0.015	0.015
Benzaldehyde	0.025	--	0.025	0.025
Benzyl Butyl Phthalate	0.037	--	0.037	0.037
Biphenyl (Diphenyl)	0.028	49.7%	0.014	0.042
Bis(2-Chloroethoxy) Methane	0.011	--	0.011	0.011
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.008	--	0.008	0.008
Bis(2-Chloroisopropyl) Ether	0.014	--	0.014	0.014
Bis(2-Ethylhexyl) Phthalate	0.013	--	0.013	0.013
Caprolactam	0.024	--	0.024	0.024
Carbazole	0.57	30.5%	0.40	0.74
Dibenzofuran	0.097	33.5%	0.065	0.13
Diethyl Phthalate	0.010	--	0.010	0.010
Dimethyl Phthalate	0.010	--	0.010	0.010
Di-N-Butyl Phthalate	0.010	--	0.010	0.010
Di-N-Octylphthalate	0.017	--	0.017	0.017
Hexachlorobenzene	0.014	--	0.014	0.014
Hexachlorobutadiene	0.010	--	0.010	0.010
Hexachlorocyclopentadiene	0.021	--	0.021	0.021
Hexachloroethane	0.012	--	0.012	0.012
Isophorone	0.007	--	0.007	0.007
Nitrobenzene	0.011	--	0.011	0.011
N-Nitrosodi-N-Propylamine	0.011	--	0.011	0.011
N-Nitrosodiphenylamine	0.030	--	0.030	0.030
Pentachlorophenol	0.040	--	0.040	0.040
Phenol	0.033	--	0.033	0.033

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-042			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-042-SO-0.5-2			
Sample Date	7/18/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	18,500	4.58%	17,654	19,346
Antimony	0.13	70.4%	0.038	0.22
Arsenic	4.40	7.46%	4.07	4.73
Barium	256	9.24%	232	280
Beryllium	0.79	4.90%	0.75	0.83
Cadmium	0.23	6.03%	0.22	0.24
Chromium, Total	15.2	7.75%	14.0	16.4
Chromium, Hexavalent	0.41	7.75%	0.38	0.44
Chromium, Trivalent	14.8	7.75%	13.6	15.9
Cobalt	6.20	1.99%	6.08	6.32
Copper	20.7	4.63%	19.7	21.7
Iron	15,800	2.40%	15,421	16,179
Lead	17.1	3.33%	16.5	17.7
Manganese	654	7.15%	607	701
Mercury	0.026	27.4%	0.019	0.033
Nickel	16.5	6.58%	15.4	17.6
Selenium	0.82	19.1%	0.66	0.98
Silver	0.13	9.83%	0.12	0.14
Thallium	0.098	6.56%	0.092	0.10
Vanadium	15.0	3.31%	14.5	15.5
Zinc	69.7	5.42%	65.9	73.5
Other Inorganic Parameters (mg/kg)				
Cyanide	0.26	32.7%	0.18	0.34
Fluoride	99.2	28.8%	70.7	128
Essential Nutrients (mg/kg)				
Calcium	18,300	15.1%	15,529	21,071
Magnesium	7,610	2.18%	7,444	7,776
Potassium	974	6.91%	907	1,041
Sodium	339	21.1%	268	410
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-042			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-042-SO-0.5-2			
Sample Date	7/18/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.031	47.7%	0.016	0.046
Acenaphthene	0.16	80.9%	0.030	0.29
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.21	82.4%	0.037	0.38
Fluoranthene	2.40	71.4%	0.69	4.11
Fluorene	0.086	74.2%	0.022	0.15
Naphthalene	0.041	28.9%	0.029	0.053
Phenanthrene	1.30	78.1%	0.28	2.32
Total LMW PAHs - 1/2MDL	4.23	74.3%	1.09	7.38
Total LMW PAHs - MDL	4.24	74.3%	1.09	7.38
Total LMW PAHs - Zero	4.23	74.3%	1.09	7.37
Benzo(A)Pyrene	1.50	67.2%	0.49	2.51
Benzo(A)Anthracene	1.20	68.8%	0.37	2.03
Benzo(B)Fluoranthene	1.80	60.1%	0.72	2.88
Benzo(G,H,I)Perylene	1.30	60.8%	0.51	2.09
Benzo(K)Fluoranthene	0.78	64.5%	0.28	1.28
Chrysene	1.60	62.9%	0.59	2.61
Dibenz(A,H)Anthracene	0.32	63.9%	0.12	0.52
Indeno(1,2,3-C,D)Pyrene	1.30	62.0%	0.49	2.11
Pyrene	2.60	72.7%	0.71	4.49
Total HMW PAHs - 1/2MDL	12.4	64.7%	4.38	20.4
Total HMW PAHs - MDL	12.4	64.7%	4.38	20.4
Total HMW PAHs - Zero	12.4	64.7%	4.38	20.4
Total PAHs - 1/2MDL	14.8	68.3%	4.69	24.9
Total PAHs - MDL	14.8	68.3%	4.69	24.9
Total PAHs - Zero	14.8	68.3%	4.69	24.9
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.013	--	0.013	0.013
1,4-Dioxane (P-Dioxane)	0.046	--	0.046	0.046
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.038	--	0.038	0.038

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-042			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-042-SO-0.5-2			
Sample Date	7/18/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.008	--	0.008	0.008
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.005	--	0.005	0.005
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.045	--	0.045	0.045
4-Bromophenyl Phenyl Ether	0.006	--	0.006	0.006
4-Chloro-3-Methylphenol	0.008	--	0.008	0.008
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.007	--	0.007	0.007
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.012	41.1%	0.007	0.017
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.015	98.2%	2.61E-04	0.029
Bis(2-Chloroethoxy) Methane	0.006	--	0.006	0.006
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.20	76.1%	0.048	0.35
Dibenzofuran	0.042	70.0%	0.013	0.071
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.014	--	0.014	0.014
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.011	--	0.011	0.011
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	32.5%	0.002	0.005
Nitrobenzene	0.006	--	0.006	0.006
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.016	--	0.016	0.016
Pentachlorophenol	0.021	--	0.021	0.021
Phenol	0.006	--	0.006	0.006

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-043			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-043-SO-0-0.5			
Sample Date	7/18/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	32,300	4.68%	30,788	33,812
Antimony	1.30	28.1%	0.94	1.66
Arsenic	7.20	13.8%	6.20	8.20
Barium	136	4.03%	131	141
Beryllium	0.98	6.32%	0.92	1.04
Cadmium	0.53	15.0%	0.45	0.61
Chromium, Total	23.8	10.6%	21.3	26.3
Chromium, Hexavalent	0.64	10.6%	0.57	0.70
Chromium, Trivalent	23.2	10.6%	20.7	25.6
Cobalt	6.40	3.51%	6.18	6.62
Copper	104	12.3%	91.2	117
Iron	20,000	3.40%	19,320	20,680
Lead	46.2	48.5%	23.8	68.6
Manganese	422	5.63%	398	446
Mercury	0.023	54.9%	0.010	0.036
Nickel	44.7	14.5%	38.2	51.2
Selenium	0.73	20.0%	0.58	0.88
Silver	1.10	9.03%	1.00	1.20
Thallium	0.14	14.4%	0.12	0.16
Vanadium	20.9	9.21%	19.0	22.8
Zinc	284	12.7%	248	320
Other Inorganic Parameters (mg/kg)				
Cyanide	0.27	40.2%	0.16	0.38
Fluoride	534	20.5%	424	644
Essential Nutrients (mg/kg)				
Calcium	22,200	10.7%	19,832	24,568
Magnesium	8,210	2.82%	7,978	8,442
Potassium	1,510	6.24%	1,416	1,604
Sodium	2,100	30.7%	1,454	2,746
Pesticides (mg/kg)				
Aldrin	3.95E-04	--	3.95E-04	3.95E-04
Alpha Bhc (Alpha Hexachlorocyclohexane)	3.00E-04	--	3.00E-04	3.00E-04
Alpha Endosulfan	4.55E-04	--	4.55E-04	4.55E-04
Beta Bhc (Beta Hexachlorocyclohexane)	3.20E-04	--	3.20E-04	3.20E-04
Beta Endosulfan	5.00E-04	--	5.00E-04	5.00E-04
cis-Chlordane	5.50E-04	--	5.50E-04	5.50E-04
Delta BHC (Delta Hexachlorocyclohexane)	3.60E-04	--	3.60E-04	3.60E-04
Dieldrin	4.25E-04	--	4.25E-04	4.25E-04
Endosulfan Sulfate	3.80E-04	--	3.80E-04	3.80E-04
Endrin	4.15E-04	--	4.15E-04	4.15E-04
Endrin Aldehyde	4.05E-04	--	4.05E-04	4.05E-04
Endrin Ketone	4.55E-04	--	4.55E-04	4.55E-04
Gamma Bhc (Lindane)	2.95E-04	--	2.95E-04	2.95E-04
Heptachlor	4.20E-04	--	4.20E-04	4.20E-04
Heptachlor Epoxide	6.50E-04	--	6.50E-04	6.50E-04
Methoxychlor	7.00E-04	--	7.00E-04	7.00E-04
P,P'-DDD	4.30E-04	--	4.30E-04	4.30E-04
P,P'-DDE	4.75E-04	--	4.75E-04	4.75E-04
P,P'-DDT	3.40E-04	--	3.40E-04	3.40E-04

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-043			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-043-SO-0-0.5			
Sample Date	7/18/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	0.010	--	0.010	0.010
trans-Chlordane	7.00E-04	--	7.00E-04	7.00E-04
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.004	--	0.004	0.004
PCB-1221 (Aroclor 1221)	0.004	--	0.004	0.004
PCB-1232 (Aroclor 1232)	0.004	--	0.004	0.004
PCB-1242 (Aroclor 1242)	0.004	--	0.004	0.004
PCB-1248 (Aroclor 1248)	0.004	--	0.004	0.004
PCB-1254 (Aroclor 1254)	0.005	140%	-1.78E-03	0.011
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	140%	-1.78E-03	0.011
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.047	47.1%	0.025	0.069
Acenaphthene	0.37	42.0%	0.21	0.53
Acenaphthylene	0.009	36.1%	0.005	0.012
Anthracene	1.00	37.7%	0.62	1.38
Fluoranthene	10.0	37.3%	6.27	13.7
Fluorene	0.25	34.6%	0.16	0.34
Naphthalene	0.094	44.9%	0.052	0.14
Phenanthrene	4.30	31.0%	2.97	5.63
Total LMW PAHs - 1/2MDL	16.1	35.8%	10.3	21.8
Total LMW PAHs - MDL	16.1	35.8%	10.3	21.8
Total LMW PAHs - Zero	16.1	35.9%	10.3	21.8
Benzo(A)Pyrene	8.50	36.1%	5.43	11.6
Benzo(A)Anthracene	6.80	32.0%	4.62	8.98
Benzo(B)Fluoranthene	9.80	29.8%	6.88	12.7
Benzo(G,H,I)Perylene	11.0	30.8%	7.61	14.4
Benzo(K)Fluoranthene	3.90	31.3%	2.68	5.12
Chrysene	10.0	35.9%	6.41	13.6
Dibenz(A,H)Anthracene	2.50	39.8%	1.50	3.50
Indeno(1,2,3-C,D)Pyrene	9.50	31.1%	6.54	12.5
Pyrene	9.70	39.3%	5.88	13.5
Total HMW PAHs - 1/2MDL	71.7	26.8%	52.5	90.9
Total HMW PAHs - MDL	71.7	26.8%	52.5	90.9
Total HMW PAHs - Zero	71.7	26.8%	52.5	90.9
Total PAHs - 1/2MDL	77.9	29.6%	54.9	101
Total PAHs - MDL	77.9	29.5%	54.9	101
Total PAHs - Zero	77.9	29.6%	54.9	101
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.025	--	0.025	0.025
1,4-Dioxane (P-Dioxane)	0.085	--	0.085	0.085
2,3,4,6-Tetrachlorophenol	0.031	--	0.031	0.031
2,4,5-Trichlorophenol	0.033	--	0.033	0.033
2,4,6-Trichlorophenol	0.010	--	0.010	0.010
2,4-Dichlorophenol	0.008	--	0.008	0.008
2,4-Dimethylphenol	0.070	--	0.070	0.070

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-043			
Depth interval (ft)	0.00-0.50			
Sample Name	CFISS-043-SO-0-0.5			
Sample Date	7/18/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.25	--	0.25	0.25
2,4-Dinitrotoluene	0.013	--	0.013	0.013
2,6-Dinitrotoluene	0.018	--	0.018	0.018
2-Chloronaphthalene	0.008	--	0.008	0.008
2-Chlorophenol	0.009	--	0.009	0.009
2-Methylphenol (O-Cresol)	0.014	--	0.014	0.014
2-Nitroaniline	0.011	--	0.011	0.011
2-Nitrophenol	0.011	--	0.011	0.011
3- And 4- Methylphenol (Total)	0.009	--	0.009	0.009
3,3'-Dichlorobenzidine	0.037	--	0.037	0.037
3-Nitroaniline	0.010	--	0.010	0.010
4,6-Dinitro-2-Methylphenol	0.085	--	0.085	0.085
4-Bromophenyl Phenyl Ether	0.011	--	0.011	0.011
4-Chloro-3-Methylphenol	0.014	--	0.014	0.014
4-Chloroaniline	0.009	--	0.009	0.009
4-Chlorophenyl Phenyl Ether	0.010	--	0.010	0.010
4-Nitroaniline	0.013	--	0.013	0.013
4-Nitrophenol	0.16	--	0.16	0.16
Acetophenone	0.007	44.4%	0.004	0.010
Atrazine	0.015	--	0.015	0.015
Benzaldehyde	0.025	--	0.025	0.025
Benzyl Butyl Phthalate	0.73	--	0.73	0.73
Biphenyl (Diphenyl)	0.028	49.7%	0.014	0.042
Bis(2-Chloroethoxy) Methane	0.010	--	0.010	0.010
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.008	--	0.008	0.008
Bis(2-Chloroisopropyl) Ether	0.014	--	0.014	0.014
Bis(2-Ethylhexyl) Phthalate	0.013	--	0.013	0.013
Caprolactam	0.024	--	0.024	0.024
Carbazole	0.82	30.5%	0.57	1.07
Dibenzofuran	0.12	33.5%	0.080	0.16
Diethyl Phthalate	0.010	--	0.010	0.010
Dimethyl Phthalate	0.010	--	0.010	0.010
Di-N-Butyl Phthalate	0.052	--	0.052	0.052
Di-N-Octylphthalate	0.017	--	0.017	0.017
Hexachlorobenzene	0.013	--	0.013	0.013
Hexachlorobutadiene	0.009	--	0.009	0.009
Hexachlorocyclopentadiene	0.021	--	0.021	0.021
Hexachloroethane	0.012	--	0.012	0.012
Isophorone	0.007	--	0.007	0.007
Nitrobenzene	0.011	--	0.011	0.011
N-Nitrosodi-N-Propylamine	0.011	--	0.011	0.011
N-Nitrosodiphenylamine	0.030	--	0.030	0.030
Pentachlorophenol	0.040	--	0.040	0.040
Phenol	0.011	--	0.011	0.011

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-043			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-043-SO-0.5-2			
Sample Date	7/18/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
TAL Metals (mg/kg)				
Aluminum	17,300	4.58%	16,508	18,092
Antimony	0.15	70.4%	0.044	0.26
Arsenic	4.10	7.46%	3.79	4.41
Barium	206	9.24%	187	225
Beryllium	0.84	4.90%	0.80	0.88
Cadmium	0.19	6.03%	0.18	0.20
Chromium, Total	19.7	7.75%	18.2	21.2
Chromium, Hexavalent	0.53	7.75%	0.49	0.57
Chromium, Trivalent	19.2	7.75%	17.7	20.7
Cobalt	6.00	1.99%	5.88	6.12
Copper	29.3	4.63%	27.9	30.7
Iron	14,800	2.40%	14,445	15,155
Lead	15.5	3.33%	15.0	16.0
Manganese	560	7.15%	520	600
Mercury	0.027	27.4%	0.020	0.034
Nickel	20.4	6.58%	19.1	21.7
Selenium	0.80	19.1%	0.65	0.95
Silver	0.086	9.83%	0.078	0.094
Thallium	0.090	6.56%	0.084	0.096
Vanadium	13.6	3.31%	13.1	14.1
Zinc	69.9	5.42%	66.1	73.7
Other Inorganic Parameters (mg/kg)				
Cyanide	0.13	32.7%	0.088	0.17
Fluoride	225	28.8%	160	290
Essential Nutrients (mg/kg)				
Calcium	18,500	15.1%	15,699	21,301
Magnesium	9,150	2.18%	8,950	9,350
Potassium	1,030	6.91%	959	1,101
Sodium	537	21.1%	424	650
Pesticides (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-043			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-043-SO-0.5-2			
Sample Date	7/18/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
Polychlorinated Biphenyls (PCBs) (mg/kg)				
PCB-1016 (Aroclor 1016)	0.005	--	0.005	0.005
PCB-1221 (Aroclor 1221)	0.005	--	0.005	0.005
PCB-1232 (Aroclor 1232)	0.005	--	0.005	0.005
PCB-1242 (Aroclor 1242)	0.005	--	0.005	0.005
PCB-1248 (Aroclor 1248)	0.005	--	0.005	0.005
PCB-1254 (Aroclor 1254)	0.005	29.2%	0.003	0.006
PCB-1260 (Aroclor 1260)	0.005	--	0.005	0.005
PCB-1262 (Aroclor 1262)	0.005	--	0.005	0.005
PCB-1268 (Aroclor 1268)	0.005	--	0.005	0.005
Polychlorinated Biphenyl (PCBs)	0.005	29.2%	0.003	0.006
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)				
2-Methylnaphthalene	0.030	47.7%	0.016	0.044
Acenaphthene	0.14	80.9%	0.027	0.25
Acenaphthylene	0.004	62.8%	0.002	0.007
Anthracene	0.28	82.4%	0.049	0.51
Fluoranthene	2.20	71.4%	0.63	3.77
Fluorene	0.12	74.2%	0.031	0.21
Naphthalene	0.067	28.9%	0.048	0.086
Phenanthrene	1.40	78.1%	0.31	2.49
Total LMW PAHs - 1/2MDL	4.24	74.3%	1.09	7.39
Total LMW PAHs - MDL	4.25	74.3%	1.09	7.40
Total LMW PAHs - Zero	4.24	74.3%	1.09	7.38
Benzo(A)Pyrene	1.30	67.2%	0.43	2.17
Benzo(A)Anthracene	1.10	68.8%	0.34	1.86
Benzo(B)Fluoranthene	1.80	60.1%	0.72	2.88
Benzo(G,H,I)Perylene	1.20	60.8%	0.47	1.93
Benzo(K)Fluoranthene	0.63	64.5%	0.22	1.04
Chrysene	1.50	62.9%	0.56	2.44
Dibenz(A,H)Anthracene	0.25	63.9%	0.090	0.41
Indeno(1,2,3-C,D)Pyrene	1.30	62.0%	0.49	2.11
Pyrene	2.10	72.7%	0.57	3.63
Total HMW PAHs - 1/2MDL	11.2	64.7%	3.94	18.4
Total HMW PAHs - MDL	11.2	64.7%	3.94	18.4
Total HMW PAHs - Zero	11.2	64.7%	3.94	18.4
Total PAHs - 1/2MDL	13.6	68.3%	4.30	22.9
Total PAHs - MDL	13.6	68.3%	4.31	22.9
Total PAHs - Zero	13.6	68.3%	4.30	22.9
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.013	--	0.013	0.013
1,4-Dioxane (P-Dioxane)	0.044	--	0.044	0.044
2,3,4,6-Tetrachlorophenol	0.016	--	0.016	0.016
2,4,5-Trichlorophenol	0.017	--	0.017	0.017
2,4,6-Trichlorophenol	0.005	--	0.005	0.005
2,4-Dichlorophenol	0.004	--	0.004	0.004
2,4-Dimethylphenol	0.037	--	0.037	0.037

Appendix J2
Summary of RSD-Adjusted Results for Non-Replicate ISS Soil Samples
Baseline Ecological Risk Assessment
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Location Name	CFISS-043			
Depth interval (ft)	0.50-2.00			
Sample Name	CFISS-043-SO-0.5-2			
Sample Date	7/18/2016			
Constituent	**Result Value**	**RSD**	**RSD Lower**	**RSD Upper**
2,4-Dinitrophenol	0.13	--	0.13	0.13
2,4-Dinitrotoluene	0.007	--	0.007	0.007
2,6-Dinitrotoluene	0.009	--	0.009	0.009
2-Chloronaphthalene	0.004	--	0.004	0.004
2-Chlorophenol	0.004	--	0.004	0.004
2-Methylphenol (O-Cresol)	0.007	--	0.007	0.007
2-Nitroaniline	0.006	--	0.006	0.006
2-Nitrophenol	0.006	--	0.006	0.006
3- And 4- Methylphenol (Total)	0.004	--	0.004	0.004
3,3'-Dichlorobenzidine	0.019	--	0.019	0.019
3-Nitroaniline	0.005	--	0.005	0.005
4,6-Dinitro-2-Methylphenol	0.044	--	0.044	0.044
4-Bromophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Chloro-3-Methylphenol	0.007	--	0.007	0.007
4-Chloroaniline	0.004	--	0.004	0.004
4-Chlorophenyl Phenyl Ether	0.005	--	0.005	0.005
4-Nitroaniline	0.006	--	0.006	0.006
4-Nitrophenol	0.080	--	0.080	0.080
Acetophenone	0.008	41.1%	0.004	0.011
Atrazine	0.008	--	0.008	0.008
Benzaldehyde	0.013	--	0.013	0.013
Benzyl Butyl Phthalate	0.005	32.7%	0.003	0.007
Biphenyl (Diphenyl)	0.014	98.2%	2.52E-04	0.028
Bis(2-Chloroethoxy) Methane	0.005	--	0.005	0.005
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004	--	0.004	0.004
Bis(2-Chloroisopropyl) Ether	0.007	--	0.007	0.007
Bis(2-Ethylhexyl) Phthalate	0.007	--	0.007	0.007
Caprolactam	0.012	--	0.012	0.012
Carbazole	0.19	76.1%	0.045	0.33
Dibenzofuran	0.065	70.0%	0.019	0.11
Diethyl Phthalate	0.005	--	0.005	0.005
Dimethyl Phthalate	0.005	--	0.005	0.005
Di-N-Butyl Phthalate	0.018	--	0.018	0.018
Di-N-Octylphthalate	0.009	--	0.009	0.009
Hexachlorobenzene	0.007	--	0.007	0.007
Hexachlorobutadiene	0.005	--	0.005	0.005
Hexachlorocyclopentadiene	0.011	--	0.011	0.011
Hexachloroethane	0.006	--	0.006	0.006
Isophorone	0.004	32.5%	0.002	0.005
Nitrobenzene	0.005	--	0.005	0.005
N-Nitrosodi-N-Propylamine	0.006	--	0.006	0.006
N-Nitrosodiphenylamine	0.015	--	0.015	0.015
Pentachlorophenol	0.020	--	0.020	0.020
Phenol	0.006	--	0.006	0.006

Notes:

--: Not Applicable or not measured or calculated
Gray: Non-detect result replaced by 1/2 the MDL
HMW - High molecular weight
LMW - Low molecular weight
MDL: Method Detection Limit
mg/kg - milligram per kilogram
PAH - Polycyclic Aromatic Hydrocarbons
PCB - Polychlorinated Biphenyls
RSD: Relative Standard Deviation
The mean value derived from the RSDs of 4 triplicate ISS samples. See Roux Data Summary Report (Roux, 2019).
RSD Lower: Measured result adjusted downwards by the RSD.
RSD Upper: Measured result adjusted upwards by the RSD.
SVOC - Semi-volatile organic compound
TAL - Target Analyte List
TCL - Target Compound List