Record of Decision
for the
Anaconda Aluminum Company
Columbia Falls Reduction Plant Site
Flathead County, Montana

United States Environmental Protection Agency
Region 8

United States Environmental Protection Agency

Part I – Declaration

Site Name and Location

The U.S. Environmental Protection Agency (EPA)—in consultation with the Montana Department of Environmental Quality (DEQ)—is issuing this Record of Decision (ROD) for remediation of the Anaconda Aluminum Company, Columbia Falls Reduction Plant (also known as the Columbia Falls Aluminum Company [CFAC] plant) Superfund Site in Flathead County, Montana. The site is on the north side of the Flathead River, immediately east of Columbia Falls, Montana, in the northwestern portion of the state. Glacier National Park is 20 miles to the northeast and Kalispell, Montana, is 20 miles to the south. EPA's Comprehensive Environmental Response, Compensation, and Liability Information System identification number for the site is MTD057561763.

The site has not been divided into operable units; however, there are six decision units (DUs) to address specific media and areas of the site. The Selected Remedy presented in Part II applies to the entire site and all six DUs.

Statement of Basis and Purpose

This ROD addresses contamination resulting from the former production of aluminum at the site. The Selected Remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 and, to the extent practicable, the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). The decision is based on the Administrative Record file for the site.

This ROD is issued by EPA Region 8, the lead agency, and DEQ, the support agency. DEQ concurs on the Selected Remedy presented herein.

Assessment of Site

The Selected Remedy presented herein is necessary to protect the public health and welfare and the environment from actual or threatened releases of hazardous substances into the environment. It will achieve this goal by breaking the exposure pathways, associated with contaminants, in parts of the site impacted by activities related to the production of aluminum. This includes contaminated soils, groundwater, sediments, and surface water in the site's six DUs.

Description of Selected Remedy

The Selected Remedy uses a remedial strategy that emphasizes sitewide consolidation and encapsulation of contaminant sources to eliminate exposure pathways, reduce the transfer of contaminants of concern (COCs) to groundwater underlying the site, and bring concentrations in seeps near the Flathead River into compliance with standards for ecological receptors. It ensures that low-intensity recreational site users and commercial workers have no more than a 1E-5 chance of contracting cancer from ingestion and inhalation of on-site soils and that those users are also protected against non-cancer effects from inhalation and ingestion of surface soils.

The feasibility study (FS) evaluated 22 remedial alternatives for the six DUs, after combining DUs 1 and 6. During the FS phase, treatment options were largely screened out in the technology screening process, as was off-site disposal. Technologies that were evaluated in detail included excavation, capping in place, phytoremediation, slurry walls, permeable reactive barriers (PRBs), groundwater extraction (with treatment if needed), and hydraulic controls. In 2021, a removal action was performed at DU5, which eliminated the source of contamination. As a result, DU5 was combined with DU1/DU6 in the Proposed Plan and now in this ROD. The alternative that best met the remedial goals and Superfund evaluation criteria was chosen for each DU or DU combination, as shown in the graphic at the right.

Landfills DU1/ Groundwater DU6/River Area DU5	• Alternatives 4A (Modified) and 2 (River Area)
Landfills DU2	• Alternative 2
Soils DU3	• Alternative 4
North Percolation Ponds DU4	• Alternative 4

Controls will be used to ensure that engineered elements of the remedy are not damaged. They will prevent the use of groundwater that poses human or ecological risks, limit access to private property, and allow low-intensity open space/recreational use or industrial/commercial use as permitted by the landowner. Specific institutional controls (ICs) and engineering controls (ECs) will be identified in remedial design. EPA anticipates that ICs will include community awareness and engagement efforts (e.g., ads, handouts, other educational materials) and land-use restrictions (e.g., deed restrictions). Engineering controls will likely include posted warnings and fencing. EPA will work closely with DEQ and representatives of Flathead County in the remedial design process to ensure that the controls selected will be implementable and will achieve the desired results.

Statutory Determinations

The Selected Remedy meets the mandates of CERCLA §121 and, to the extent practicable, the NCP. It is protective of human health and the environment, complies with all federal and state requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and uses permanent solutions and alternative treatment technologies to the maximum extent practicable.

The Selected Remedy does not satisfy the statutory preference for treatment to address principal threats posed by a site. EPA determined that the site source materials do not represent a principal threat, thus eliminating the expectation for treatment of these source materials. The source materials can be reliably contained and present a relatively low risk in the event of exposure.

Because the remedy will potentially result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after initiation of the remedial action, and at a minimum of every 5 years thereafter, to ensure that the remedy is or will be protective of human health and the environment. The five-year reviews will focus on areas where waste is capped and contained on-site and on the site groundwater, surface water, and porewater quality as evaluated under long-term monitoring.

ROD Data Certification Checklist

The following information is included in the decision summary section of this ROD. Additional information can be found in the Administrative Record file for this ROD.

1. COCs and their respective concentrations (Section 5).
2. Baseline risks represented by the COCs (Section 7).
3. Cleanup levels established for COCs and the basis for these levels (Section 8).
4. Discussion of principal threat wastes (Section 11).
5. Current and reasonably anticipated future land use assumptions used in the baseline risk assessment (Section 6).
6. Potential land use that will be available as a result of the Selected Remedy (Section 12).
7. Estimated capital, annual operation and maintenance, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 12).
8. Key factors that led to selecting the remedy (Sections 10, 11, and 12).

Authorizing Signatures

KATHLEEN BECKER Digitally signed by KATHLEEN BECKER Date: 2025.01.10 10:06:23 -07'00'

K.C. Becker, Regional Administrator — Date

U.S. Environmental Protection Agency Region 8

Signed by:

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01/10/2025

Sonja Nowakowski, Director — Date

Montana Department of Environmental Quality

Part II – Decision Summary

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Acronyms and Initializations

AOC	area of concern
ARAR	Applicable Relevant and Appropriate Requirement
BERA	baseline ecological risk assessment
BHHRA	baseline human health risk assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFAC	Columbia Falls Aluminum Company, LLC
CLP	Community Liaison Panel
COC	contaminant of concern
COPC	contaminant of potential concern
COPEC	chemical of potential ecological concern
CSF	cancer slope factor
CSM	conceptual site model
DEQ	Montana Department of Environmental Quality
DU	decision unit
EC	engineering control
ELCR	estimated lifetime cancer risk
EPA	U.S. Environmental Protection Agency
ESV	ecological screening value
FS	feasibility study
LMW PAH	low molecular weight PAH
HI	Hazard Index
HMW PAH	high molecular weight PAH
HQ	Hazard Quotient
IC	institutional control
IPaC	Information for Planning and Consultation
ISM	incremental sampling methodology
MCL	maximum contaminant level
MPDES	Montana Pollutant Discharge Elimination System
NOAEL	no-observed-adverse-effect level
NOEC	no-observed-effect concentration
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PDI	pre-design investigation
PPRTV	provisional peer-reviewed toxicity value
PRB	permeable reactive barrier
PRP	potentially responsible party
PV	present value
RAO	remedial action objectives
RBSSL	risk-based soil screening level
RCRA	Resource Conservation and Recovery Act
RfC	reference concentration

RfD	reference dose
RI	remedial investigation
RME	reasonable maximum exposure
Roux	Roux Environmental Engineering and Geology
RSL	regional screening level
SPL	spent potliner
TASC	Technical Assistance Services for Communities
URF	unit risk factor
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
m^3	cubic meter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
%	percent
µg/L	micrograms per liter

Section 1
Site Name, Location, and Description

Per EPA guidance (EPA 1999), this section provides basic information about the site:

- **Name and Location** – Anaconda Aluminum Company Columbia Falls Reduction Plant at the eastern end of Aluminum Drive, Columbia Falls, Flathead County, Montana, 59912
- **Comprehensive Environmental Response, Compensation, and Liability Information System Identification Number** – MTD057561763
- **Lead Agency** – EPA
- **Support Agency** – DEQ
- **Source of Cleanup Monies** – Potentially responsible party (PRP) settlement
- **Site Type** – Industrial facility, former primary aluminum reduction facility

Following Superfund guidance, *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (EPA 1999), the ROD contains three parts:

- Part I – Declaration
- Part II – Decision Summary
- Part III – Responsiveness Summary

Part II summarizes the work leading to the decision and includes:

- Section 1 – Site Name, Location, and Description
- Section 2 – Site History and Enforcement Activities
- Section 3 – Community Participation
- Section 4 – Scope and Role of Operable Unit
- Section 5 – Summary of Site Characteristics
- Section 6 – Current and Potential Future Land and Resource Use
- Section 7 – Summary of Site Risks
- Section 8 – Remedial Action Objectives
- Section 9 – Description of Alternatives
- Section 10 – Summary of Comparative Analysis of Alternatives
- Section 11 – Principal Threat Wastes
- Section 12 – Selected Remedy
- Section 13 – Statutory Determinations
- Section 14 – Documentation of Significant Changes
- Section 15 – References

The Anaconda Aluminum Company Columbia Falls Reduction Plant, also known as the CFAC plant, is 2 miles northeast of Columbia Falls in Flathead County, Montana (Figure 1-1). It covers approximately 1,340 acres north of the Flathead River, a fishery that includes the federally designated threatened bull trout and the federally sensitive Westslope cutthroat trout (Roux Environmental Engineering and Geology [Roux] 2020a). EPA's initial site evaluation indicated that groundwater and surface water at the site contain various COCs, including cyanide, fluoride, and various metals.

The CFAC plant operated between 1955 and 2009 and created significant quantities of spent potliner material (SPL), a federally listed hazardous waste, as a byproduct of the aluminum smelting process. SPL material contains cyanide compounds that can leach into groundwater.

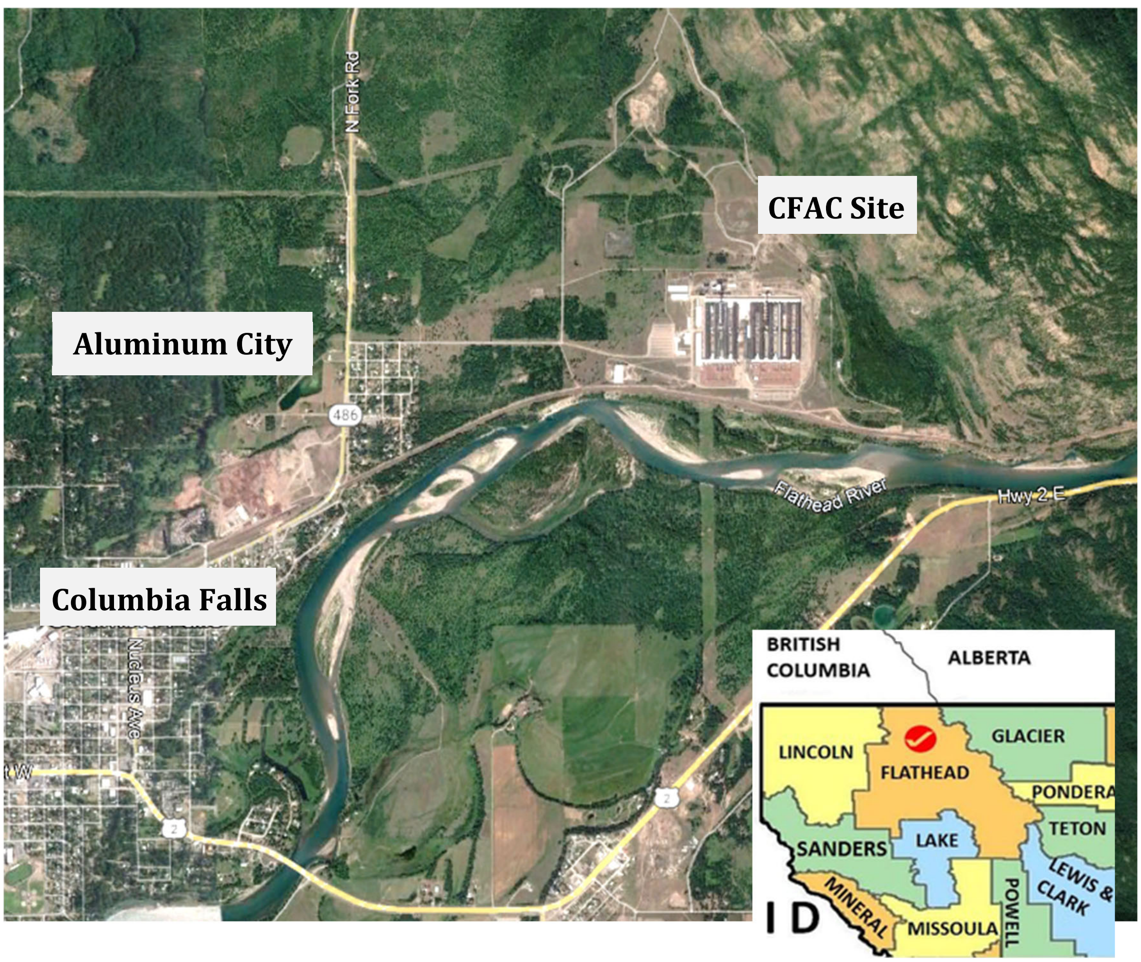


Figure 1-1. CFAC Site Location Map

Section 2
Site History and Enforcement Activities

2.1 Activities Leading to Current Problems

Industrial development began at the site in the 1950s, when the Anaconda Copper Mining Company purchased the property and built the existing aluminum reduction facility (Roux 2015a). The site was a major producer of aluminum for half a century. The nearby Hungry Horse Dam provided an inexpensive and ready source of electricity.

The primary aluminum reduction facility operated from 1955 until 2009 under different owners and operators as follows:

- 1955 to 1978 – Anaconda Aluminum Company/The Anaconda Company
- 1978 to 1985 – Atlantic Richfield Company
- 1985 to 1999 – Montana Aluminum Investor's Corporation
- 1999 to present – Columbia Falls Aluminum Company, LLC (CFAC)

The facility was in operation for decades before the enactment of the Resource Conservation and Recovery Act (RCRA) or of CERCLA. Aluminum production was suspended in 2009, and CFAC announced the permanent closure of the facility in 2015, after operating the facility since aquiring it in 1999.

The south end of the site includes the switch yard jointly owned by CFAC and the Bonneville Power Administration, and the mainline of the Burlington Northern Santa Fe Railway (Roux 2015a).

Waste was generated at the site in various forms:

- **SPL.** Aluminum production generated several waste products, most notably SPL, a carbon layer bonded to brick containing fluoride, sodium, aluminum, and cyanide. Cyanide and fluoride in SPL can leach into groundwater. Initially, SPL was disposed of on-site at the West Landfill, Center Landfill, and East Landfill. After 1990, SPL was taken off-site for disposal.
- **Air Emissions.** Air emissions included particulate fluoride, hydrogen fluoride, and polycyclic aromatic hydrocarbons (PAHs) from the paste plant and aluminum reduction facility. Wet scrubbers, an air pollution control device that uses a liquid to remove contaminants from air emissions, removed pollution from smelting until 1976. They were replaced with dry scrubbers in 1980.
- **Sludge.** Wastewater from the paste plant wet scrubbers was discharged to the North Percolation Ponds. The aluminum reduction facility wet scrubbers operated until 1976. Sludge analysis showed the makeup of the wet scrubber sludge was approximately 80

percent (%) calcium fluoride and also contained calcium oxide, magnesium oxide, sodium oxide, and iron oxide. The sludge was landfilled on-site at the Wet Scrubber Sludge Pond.

- **Liquid Waste.** Liquid waste from the aluminum reduction process and stormwater was discharged to several percolation ponds. Wastewater was discharged indirectly to groundwater through infiltation through the percolation ponds under a state-issued permit.

2.2 Federal, State, and Local Investigations and Removals

Federal, state, and local site investigations and removal or remedial actions conducted to date under CERCLA and under other environmental authorities are summarized below and detailed in the *Remedial Investigation/Feasibility Study Work Plan* (Roux 2015a).

- **1980 Evaluation of Potential Landfill Locations.** CFAC contractors evaluated potential locations for the East Landfill. The investigation included a review of the regulatory framework for constructing a hazardous waste landfill, site history, and an environmental investigation that included aquifer tests, piezometer installation, test pits, a well inventory, test well (TW-7) installation, groundwater level measurements, and water quality samples. Test pits were excavated to map soils and to examine soils at the existing landfills. Soil samples were collected from the test pits and nine piezometers were installed at the test pits to evaluate shallow aquifers. The results were summarized in a Phase 1 report (Hydrometrics 1980).

- **1984 Preliminary Site Assessment.** The Montana Department of Health and Environmental Sciences conducted a preliminary site assessment. The report indicated that hazardous wastes were generated on-site (including spent halogenated and non-halogenated solvents). Solid waste generated on-site included SPL, basement sweepings, and air pollution control dusts (Roux 2015a).

- **1985 Hydrogeological Evaluation.** CFAC contracted an evaluation to satisfy the requirements of the 1984 Montana Groundwater Pollution Control System permit. The investigation evaluated the quality and quantity of groundwater beneath the site, flow direction, and potential for off-site impacts, and provided recommendations for waste management. Groundwater elevations were measured and water quality samples were collected quarterly from 1982 to 1985. Hydrometrics (1985) concluded that the Main Plant had a limited effect on groundwater and surface water near the plant. Measurable cyanide and fluoride concentrations were observed in groundwater in TW-1 and TW-2 (downgradient of the North Percolation Ponds). Data showed a decreasing trend attributed to the cessation of cathode soaking pits. Fluoride concentrations above 1 milligram per liter (mg/L) and cyanide (typically lower than 10 micrograms per liter [µg/L]) were observed in both the North Percolation Ponds and South Percolation Ponds. Hydrometrics concluded that no additional waste management practices were necessary (Roux 2015a).

- **1988 Site Analytical Results Report.** An EPA contractor (Ecology and Environment, Inc.) conducted an investigation to characterize hydrogeologic conditions and the nature of contaminants, and to quantify the possible release of contaminants off-site. The investigation scope included collecting nine groundwater, five soil, seven surface water, and nine sediment samples. Ecology and Environment, Inc. prepared a site investigations analytical report (Ecology and Environment, Inc. 1988). After reviewing the report, EPA classified the site as No Further Remedial Action Planned (Roux 2015a).

- **1989 Comprehensive Environmental Cleanup and Responsibility Act Priority List.** DEQ evaluated and listed the site under Montana's State Superfund statute. The site was ranked as Referred to Another Program for Regulation. The site has been regulated under a 1984 Montana Groundwater Pollution Control System permit for groundwater discharge, and subsequently under a 1993 Montana Pollutant Discharge Elimination System (MPDES) permit for groundwater discharge to a seep near the Flathead River (Roux 2015a).

- **1991 Polychlorinated Biphenyl (PCB) Removal.** A transformer fire in the West Rectifier Yard resulted in the release of an estimated 4,000 gallons of dielectric fluid containing PCBs. Olympus Environmental excavated the PCB-impacted soil and shipped it to an approved off-site disposal facility.

- **1992 Hydrogeological Data Summary Report.** Hydrometrics was contracted to summarize hydrological data collected since the 1985 hydrogeological evaluation and to develop a compliance plan to meet discharge requirements for the seepage of shallow groundwater to the Flathead River. Data from 1985 through 1991 were summarized in a hydrogeological data summary report (Hydrometrics 1992) that concluded that aluminum production has had a limited effect on surface and groundwater quality near the plant.

  - Downgradient of the North Percolation Ponds, there was a measurable increase in fluoride and cyanide attributed to discharge from cathode soaking pits (in use from 1964 to 1977). Concentrations decreased over time and were monitored under an MPDES permit.

  - The South Percolation Ponds contained fluoride above 1 mg/L and minor cyanide concentrations (less than 10 µg/L). Routine sampling at the downgradient Flathead River has shown no measurable increase in fluoride or cyanide.

  - Shallow groundwater containing cyanide was discharging to the Flathead River through seeps along the bank of a backwater area roughly 0.25 miles downstream of the South Percolation Ponds. Low levels (less than 10 µg/L) of cyanide were occasionally observed in the Flathead River backwater slough immediately downstream of the South Percolation Ponds. Since 1988, total cyanide concentrations have consistently been below laboratory detection limits. Based on the observed rate of seepage and measured concentrations, the seepage of shallow groundwater was characterized as posing little to no threat to human health and the environment.

- **1993 Hydrological Conditions at the Closed Landfill, Sludge Pond, and Well Number 5.** An investigation was conducted to determine the source(s) of cyanide to the Flathead River and to assess the potential to intercept groundwater before the seep as requested by the Montana Department of Health and Environmental Sciences Water Quality Bureau. The report (Hydrometrics 1993) concluded that the West Landfill was a source of cyanide to groundwater. Groundwater from TW-17 (downgradient of the West Landfill) had elevated cyanide, fluoride, pH, and total dissolved solids. Aquifer testing showed that groundwater from the Central Landfill Area generally flows southeast, toward well PW-5. Cyanide concentrations decrease with distance downgradient of the West Landfill, toward the seeps along the Flathead River and PW-5, indicating dispersion and dilution are occurring (Roux 2015a).

- **1994 PCB Removal.** Two capacitors in the West Rectifier Yard exploded and spilled 3 to 4 gallons of "pure PCBs" (CFAC 1994). Olympus Environmental remediated this additional PCB contamination (Roux 2015a).
- **1994 Stormwater Pollution Prevention Plan.** CFAC submitted a stormwater pollution prevention plan to the State of Montana.
- **1996 EPA and DEQ Investigation.** EPA and the DEQ (successor to the Montana Department of Health and Environmental Sciences) Water Quality Bureau inspected the site to determine the validity of MPDES Permit MT-0030066. Flowing seeps were observed along the Flathead River, south and east of the plant. EPA reported that the seeps continued along the riverbank for over 1,000 feet and that many would be covered up during high flow. A report concluded that the seeps were probably groundwater from underneath the CFAC plant, and that groundwater had been affected by past operations and practices as evidenced by cyanide and fluoride concentrations (Roux 2015a).
- **1998 Suspected SPL Removal from Wet Scrubber Sludge Pond Landfill.** At the request of the DEQ's Permitting and Compliance Division of Air and Water Management Bureau, CFAC removed pot diggings material that had been disposed of on the surface of the closed Wet Scrubber Sludge Pond in July (Weston 2014). Post-excavation samples had detections of cyanide several orders of magnitude less than the EPA Region 8 Residential Risk-Based Criteria of 1,600 ppm (Weston 2014). The state declared no further action in October (Roux 2015a).
- **2001 EPA/DEQ Waste Characterization Investigation.** EPA was concerned with hazardous waste streams based on previous experience at another Montana smelter. Toxicity characteristic leaching procedure samples from the CFAC site were collected from numerous CFAC waste streams. No unexpected hazardous waste was found (Roux 2015a).
- **2003 CFAC Environmental Issues Investigation.** Current and former CFAC employees were interviewed in response to allegations regarding historical disposal practices. A former employee reported groundwater in the West Landfill. This was not confirmed by interviews with other employees or the work performed by Hydrometrics. A former employee also reported improper disposal of SPL north of Production Well 5, near the South Asbestos Landfill. Other former employees agreed that SPL was placed in the area but was later removed. Several pieces of carbon were seen in the area during an inspection (Roux 2015a).
- **2013 to 2014 EPA Site Reassessment.** In 2013, Weston completed an investigation on behalf of EPA. The results were summarized in a report (Weston 2014). Sixty-eight groundwater, surface water, sediment, and soil samples were collected on-site and in the surrounding areas, with the following results (Roux 2015a):

- On-site samples indicated a release of metals and inorganics in groundwater, metals and inorganics in surface water, cyanide and fluoride in sediments, and fluoride in soils greater than background levels and/or human health and/or ecological screening levels owing to historic plant processes.
- Source areas include the landfills and waste pond (groundwater) and the North and South Percolation Ponds (surface water and sediment).
- Residential wells had concentrations of some parameters above background, but only cyanide (111 µg/L and 18.5 µg/l) exceeded the EPA tap water human health screening level of 1.5 µg/L. Cyanide was below the EPA maximum contaminant level (MCL) of 200 µg/L.
- Cyanide exceeded background levels and all of the Superfund Chemical Data Matrix and DEQ aquatic life water quality standards in a Cedar Creek surface water sample. Manganese, sodium, zinc, and fluoride were more than three times greater than background levels in Flathead River surface water.
- Cyanide and fluoride were more than three times greater than background levels in Flathead River sediment, and fluoride was more than three times greater than background in soil.
- No volatile organic compounds or semivolatile organic compounds were detected in groundwater.

- **2014 Residential Well Sampling.** Two rounds of sampling occurred following the site reassessment. Sampling was conducted in April and November. Fluoride was detected in five drinking water wells in April, but none in November. Concentrations were less than 190 µg/L. Cyanide was not detected in April or November.
- **2014 and 2015 Whole Effluent Toxicity Acute Toxicity Testing.** As a condition of its MPDES permit, CFAC sampled the Seep and Flathead River to determine toxicity. Groundwater discharging to the river and the Flathead River itself passed the tests indicating no acute toxicity (Roux 2015a).
- **2015 Montana Hazardous Waste Act Administrative Order on Consent.** DEQ, CFAC, and Calbag entered into an Administrative Order on Consent (State of Montana Docket No HW-15-01) to address the potential that CFAC or Calbag might violate the hazardous waste accumulation and storage time limits after decommissioning of the aluminum reduction cells under the Montana Hazardous Waste Act.
- **2016 EPA National Priorities List Listing.** The site was added to EPA's National Priorities List in September.
- **2015 Notice of Violation.** DEQ issued a violation letter to CFAC in October regarding the 2015 Administrative Order and the Montana Solid Waste Management Act. The letter cited a failure to submit a revised removal, transportation, and off-site plan and schedule; failure to

determine if certain materials were hazardous; and failure to remove those materials prior to approval of the revised plan.

- **2015 to 2020 Remedial Investigation (RI).** CFAC conducted the RI and submitted the RI report (Roux 2020a) to EPA.
- **2020 to 2021 South Percolation Ponds Removal Action.** CFAC performed a removal action to remove impacted sediments from the South Percolation Ponds and allow the Flathead River to migrate naturally into its northern side channel (Roux 2021b).
- **2021 FS.** CFAC completed the FS and submitted the FS report (Roux 2021a) to EPA.
- **2023 Proposed Plan.** EPA issued the Proposed Plan (EPA 2023) for cleanup on June 1, 2023.
- **2025 ROD.** EPA issued the ROD in January 2025.

2.3 History of CERCLA Enforcement Activities

The history of CERCLA enforcement activities and/or status of past or pending lawsuits pertaining to site cleanup) is as follows:

- **November 2014.** EPA issued CERCLA section 104(e) information requests to the PRPs (CFAC and the Atlantic Richfield Company). The PRPs provided written responses to EPA's information requests.
- **June 2015.** EPA sent general notice and demand letters to the PRPs (CFAC and the Atlantic Richfield Company).
- **November 2015.** EPA notified the state and federal natural resource trustees pursuant to CERCLA section 104(b)(2), 42 U.S.C. § 9604(b)(2).
- **November 2015.** EPA and CFAC entered into an Administrative Settlement Agreement and Order on Consent for CFAC to perform a site RI/FS, CERLCA Docket No. 08-2016-0002.
- **July 2020.** EPA and CFAC entered into an Administrative Order for CFAC to conduct a CERCLA removal action, CERLCA Docket No. 08-2020-0002.
- **June 30, 2021.** EPA issued a notice of work completion to CFAC for work completed pursuant to the RI/FS.
- **October 2021.** EPA issued a notice of work completion to CFAC for work completed pursuant to the removal action.

Section 3
Community Participation

NCP Section 300.430(f)(3) establishes public participation activities that the lead agency must conduct throughout this process. CERCLA and NCP requirements were met in the remedy selection process. Public outreach was provided throughout the duration of the project, often in conjunction with outreach provided by CFAC. Outreach relevant to the Proposed Plan and ROD is listed below.

- **Reports.** The final RI and FS reports were made available to the public on EPA's website (in 2021 and 2022, respectively). A copy of each report was also placed at the local repository (the ImagineIF Library in Columbia Falls).
- **Fact Sheets**
  - **Post-RI/FS Overview.** EPA developed the *Big Things Are Happening at The Columbia Falls Aluminum Company Superfund Site* fact sheet to post on the EPA website, distribute at the Farmer's Market and public meetings, and have available at the local information repository. The fact sheet announced the upcoming opportunities to talk to EPA and the general plan for releasing a Proposed Plan and ROD.
  - **RI/FS Fact Sheet.** EPA developed the *Recap of the Remedial Investigation and Feasibility Study* in September 2022 to summarize the highlights of the RI and FS and to provide a useful accompaniment to the public meeting for the RI and FS (on September 14, 2022). EPA provided links to the documents on the site website.
  - **Proposed Plan Fact Sheet.** EPA developed *EPA Issues Its Proposed Plan for Cleanup for the Columbia Falls Aluminum Company Superfund Site*, a fact sheet that explained the purpose of the Proposed Plan, the public comment period, and how the public could provide written or oral comment.
- **Public Meetings and Local Appearances**
  - **RI/FS Recap Public Meeting.** The RI and FS reports were the topic of five public meetings held by EPA in Columbia Falls during the RI/FS. The last meeting occurred in September 2022.
  - **Columbia Falls Community Market Meet and Greet.** EPA staffed a booth at the local Columbia Falls Community Market on August 11 and September 15, 2022, to meet the public, hand out fact sheets, and answer questions.
  - **Community Liaison Panel (CLP) Meetings**. EPA and DEQ participated in regular meetings held by CFAC during the RI/FS as part of CFAC's community engagement plan. EPA attended 13 of 14 CLP meetings from May 2015 to July 2023. EPA also conferred with concerned citizens throughout the RI/FS process.

- **Proposed Plan.** The Proposed Plan for cleanup was issued by EPA on June 1, 2023. It was made available at the local repository and on EPA's website.
- **Advertisements.** Ads were placed in the newspapers of record for the area (*Daily Inter Lake, Flathead Tribune*, and *Hungry Horse News*) that announced the purpose, location, time, and date of the upcoming public meeting for the Proposed Plan and the locations where the public could obtain or access the plan.
- **Public Comment Period.** The public comment period was originally set at 60 days (June 1 to July 31, 2023). It was extended after the public meeting for an additional 30 days (August 31, 2023) based on requests from several individuals at the public meeting.
- **Public Meeting for the Proposed Plan.** The public meeting was held in Columbia Falls in the middle of the public comment period to present the Proposed Plan for cleanup to a broad audience. The meeting included a presentation by EPA, followed by a question-and-answer session and an opportunity to provide oral comment. The meeting was recorded by a court reporter.
- **Technical Assistance Services for Communities (TASC).** EPA arranged for independent public assistance with understanding technical aspects of the Proposed Plan by engaging a contractor to lead four local public meetings (two on June 21 and two on July 12, 2023) specifically tailored to the Proposed Plan. Attendance ranged from 2 to 20 people. The TASC contractor also submitted to EPA a list of comments on the Proposed Plan.

The comment period closed on August 31, 2023. EPA and DEQ evaluated the comments received and began to prepare the ROD for release in March 2024. In a January 18 letter to EPA and DEQ, the Coalition for a Clean CFAC (CCC) requested that the EPA "order a time-out to the proposed issuing of a Final Record of Decision." The request was repeated in a letter on February 26 and October 9, 2024. EPA also received two letters (August 13 and October 8, 2024) from the Confederated Salish and Kootenai Tribes (CSKT) requesting that the ROD be delayed for further review of the Proposed Plan.

Community outreach activities conducted by EPA after pausing the release of the ROD and prior to issuing the ROD include:

- **Written Responses to CCC and CSKT letters**. EPA responded in depth to the letters written by both the CCC and the CSKT. The original letters and EPA's responses are part of the Administrative Record.
- **Face-to-Face Interaction with the CCC.** EPA and DEQ met with the CCC in March 2024 to discuss their concerns and develop an approach to "enhanced community engagement."
- **Face-to-Face Interaction in the Community.** EPA and DEQ hosted or participated in public events (open houses, a site tour, and office hours) on April 24 and 25, June 12, July 17, August 13, and September 18, 2024, to listen to the public and to answer questions about the site and proposed remedy. A meet and greet was held at the local farmer's market in June 2024.

- **Face-to-Face Interaction with the CSKT**. On June 11, 2024, EPA attended an update meeting with the CSKT Tribal Council that addressed the CFAC and Smurfit Stone Superfund sites. The update was requested by the CSKT at the open house held in Columbia Falls on April 25, 2024. On September 17, 2024, EPA's Regional Administrator traveled to the Pablo headquarters of the CSKT to conduct tribal consultation with the Tribal Council.

- **Informational Flyers**. Pausing the release of the ROD also paused EPA's response to comments received during the public comment period, as the Responsiveness Summary is part of the ROD. To provide information while the release of the ROD was on hold, EPA developed and issued eight fact sheets between April and September 2024 that addressed questions raised during the comment period. These fact sheets are available at www.epa.gov/superfund/columbia-falls. Titles include:

  - *Did EPA check to see how cleanup was done at other aluminum sites?*
  - *Why was offsite disposal eliminated early in the feasibility study process*?
  - *Where is contamination found at the CFAC site and what is the risk?*
  - *EPA removed the waste at the Milltown Dam near Missoula. Why not at CFAC?*
  - *Can a Superfund site be redeveloped?*
  - *What's in the CFAC site landfills? Does it matter for cleanup?*
  - *How was the site boundary chosen?*
  - *Why and how will the slurry wall be used at CFAC?*

In January 2025, with concurrence from DEQ, EPA made the decision to move forward with the ROD. EPA issued a fact sheet and a press release announcing the selection of the remedy and the signing of the ROD.

This ROD documents the selected remedy and, as such, the general requirements for the next phase of the Superfund process—remedial design and remedial action. It includes EPA's responses to comments received during the Proposed Plan's 90-day public comment period (Part III – Responsiveness Summary). All documents that are part of the Proposed Plan Administrative Record are housed at EPA Region 8 in Denver, Colorado; at the EPA Records Center in Helena, Montana; and on the EPA website for the site.

Section 4
Scope and Role of Operable Unit

The site has not been divided into multiple operable units. Thus, the remedial decision described herein applies to the entire site.

Section 5
Summary of Site Characteristics

This section contains a general discussion of site characteristics that make up the conceptual site model (CSM). It describes the physical characteristics of the site, where contamination exists, and how and where it moves. It includes:

- Site Overview (size, setting, climate, geology, hydrogeology, geography, and topography)
- Site Features
- Overview of Site Contamination
- Migration Routes
- FS Decision Units

Additional details are provided in the RI report, *Remedial Investigation Report, Columbia Falls Aluminum Company, LLC* (Roux 2020a). Detailed discussion of exposure media, exposure pathways, and receptors is provided in Section 7.

5.1 Overview of the Site

5.1.1 Size

Preliminary site boundaries were established in the RI/FS work plan (Roux 2015a) and are shown in Figure 5-1. The site consists of approximately 1,340 acres bounded by Cedar Creek Reservoir to the north, Teakettle Mountain to the east, Flathead River to the south, and Cedar Creek to the west.

5.1.2 Site Setting

The site is on the north side of the Flathead River, 2 miles east of Columbia Falls (population 5,651) in the northwestern portion of the state (Figure 1-1). The address is 2000 Aluminum Drive. Access is by way of Aluminum Drive and North Fork Road (County Road 486). Glacier National Park is 20 miles to the northeast and Kalispell (population 26,500) is 20 miles to the south.

The site and surrounding area to the west and south slope south-southwest toward the Flathead River. The East Landfill is the highest site feature. To the east and north are Teakettle Mountain and the mountains of Glacier National Park beyond. The tracks of the Burlington Northern Santa Fe Railroad run between the Main Plant Area and the river.

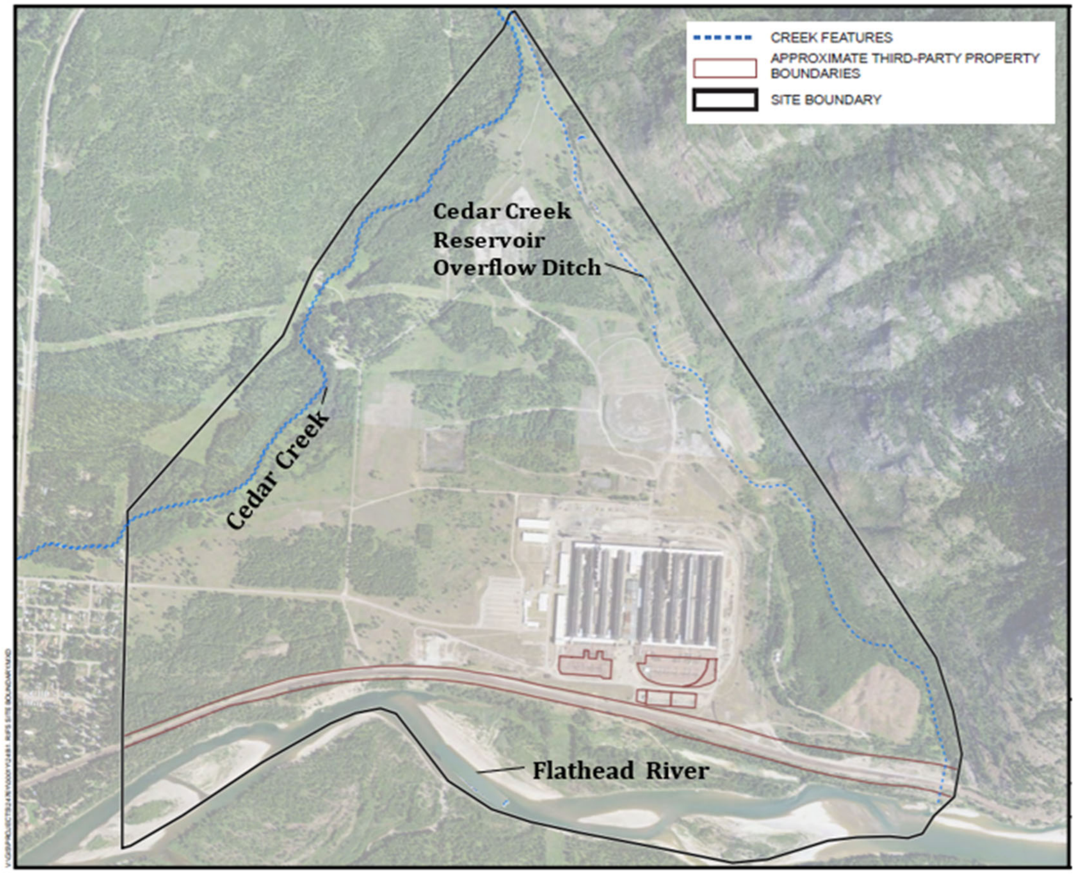


Figure 5-1. CFAC Site Boundary

Buildings and industrial facilities associated with former operations included offices, warehouses, laboratories, mechanical shops, paste plant, coal tar pitch tanks, pump houses, casting garage, and the potline facility. Decommissioning of industrial facilities was completed in 2019, leaving the administration building, main warehouse, two ancillary warehouses, and a fabrication shop.

The Main Plant Area included buildings historically used for production of aluminum and various support buildings, warehouses, and storage areas, specifically:

- Potline buildings where aluminum was smelted
- Casting house, mechanical shops, paste plant, rod mill, and warehouses adjacent to the potline buildings
- Rectifier yards

Site features are discussed in Section 5.2.

5.1.3 Climate

The site has a mid-hemisphere latitude and intermontane setting that results in wide seasonal climatic swings. Average annual precipitation in the region ranges from 10 to 21 inches, depending on the year. Greater precipitation at higher elevations is common and much of that precipitation is stored as snow. The regional climate is modified maritime, and much of the precipitation is influenced by moist air masses from the Pacific Ocean that travel from west to east. Dry, cold air masses often move in the north to south direction from Canada. Mean annual temperature for nearby Kalispell is 44 degrees Fahrenheit.

Monthly data collected from the Glacier International Airport station indicate that most precipitation occurs in early winter and late spring. From 2008 to 2018, the maximum monthly precipitation most often occurred in June and the minimum most often occurred in August. July through September were the driest months over the period and June was the wettest. Based on data from the Western Regional Climate Center, prevailing winds in the area, as measured at the airport, are from the south and southeast (Western Regional Climate Center 2018).

5.14 Geology and Major Fracture Zones

The site is in the northeast section of the Kalispell Valley, which is part of the Northern Rocky Mountain Physiographic Province (Fennemen 1931). The Kalispell Valley runs northwest to southeast and is roughly 15 miles wide near the site. The valley was formed by late Paleocene to Eocene folding and thrust faulting combined with shaping by the middle Wisconsinite Cordilleran and Alpine Glaciation (Konizeski et al. 1968). The Cordilleran Ice Sheet advanced south into the valley from the northwest and combined with the Flathead Alpine Glacier originating in Glacier National Park. Glacial recession formed features such as the Flathead River in the unconsolidated glacial drift.

The mountains bordering the Kalispell Valley are predominantly metamorphosed Proterozoic sedimentary rock of the Ravalli group, lower belt series (Konizeski et al. 1968). The rock is typically gray to greenish-gray argillite and light gray quartzite. Based on interpretation of site well logs, the depth to bedrock varies from 150 feet to greater than 300 feet depending on proximity to the neighboring mountains and the Flathead River. In eastern areas near Teakettle Mountain, the depth to bedrock is likely less than 150 feet. In the southern portion of the site, near the Flathead River, depth to bedrock may be significantly deeper than 300 feet. Sitewide, the general slope is in the south-southwest direction toward the Flathead River.

The site is 0.5 miles northwest of Badrock Canyon, through which the Flathead River flows west and then south toward Flathead Lake. Teakettle Mountain is on the east border and is comprised mostly of Precambrian sedimentary strata of the Ravalli Group. Under the site, stratigraphy varies because of the heterogeneous nature of glacial and alluvial deposits.

Most of the soil at the site has been designated as glacial till and alluvium, which extends from the base of Teakettle Mountain through the western boundary. Fluvial deposits occur along the southern boundary and within the floodplain of the Flathead River. Mountainous land and glacial till are apparent along Teakettle Mountain on the eastern boundary of the site. Multiple plates of geologic cross sections are presented in the RI report (Roux 2020a).

5.1.5 Hydrogeology/Hydrology

The site is in the Flathead River-Columbia Falls watershed. It is bordered by surface water features on each side, including the Flathead River to the south, Cedar Creek to the west, Cedar Creek

Reservoir to the north, and Cedar Creek Reservoir Overflow Ditch to the east (Figure 5-1). Detailed hydrogeologic cross sections are presented in the RI report (Roux 2020a). The Flathead River is a tributary to the Columbia River, which flows into the Pacific Ocean. The North Fork of the Flathead River originates in British Columbia. The Middle Fork originates in the Bob Marshall Wilderness south of Glacier National Park. The confluence of the North Fork and Middle Fork is about 10 miles upstream of the site, north of Coram. The South Fork joins the main stem of the Flathead River at the entrance of Badrock Canyon about 2 miles upstream of the site. The Flathead River flows west through Badrock Canyon toward Columbia Falls, where its course is then southerly toward Flathead Lake (E&E 1988). At the site, the drainage area of the Flathead River is approximately 4,470 square miles, which includes the drainage area of Cedar Creek to the west.

The U.S. Geological Survey (USGS) maintains three gauging stations nearby on the Flathead River. The closest station is 3 miles to the southwest, near Columbia Falls (USGS Station #12363000). Two stations are about 10 miles to the north/northeast (the North Fork station on the Flathead River and the Middle Fork station west of Glacier Park [USGS Stations #12355500 and #12358500, respectively]). From 2008 to 2018, at the Columbia Falls USGS station, the average minimum yearly discharge was 3,317 cubic feet per second and was most often in October and January.

Regional groundwater is typically recharged from numerous reservoirs, ponds, streams, and lakes and also by infiltration of precipitation. Groundwater may also discharge to surface water bodies. Spring snowmelt and increased seasonal precipitation causes high flow in the Flathead River and the river recharges groundwater. In late summer, dry weather lowers the river stage so that the Flathead River becomes a gaining stream (Konizeski et al. 1968).

Cedar Creek originates north of the site in the area contributing to Cedar Creek Reservoir. At the outlet of the reservoir, the upgradient catchment area is 12.5 square miles. From the outlet, Cedar Creek flows about 3 miles southwest toward Columbia Falls. The elevation of Cedar Creek is higher than site groundwater elevations, indicating that the creek is a losing stream. A tributary to Cedar Creek bisects the northern area of the site. This intermittent feature runs along the eastern side of the Industrial Landfill and joins Cedar Creek about 0.5 miles southwest of the Industrial Landfill. The feature was not observed during the RI, but surface water ponding and wetland vegetation were observed in the area south and southeast of the Industrial Landfill. The source of the ponding was attributed to seeps in the nearby cliff.

Cedar Creek Reservoir Overflow Ditch flows intermittently in spring and regulates flow for Cedar Creek and the Cedar Creek Reservoir (Hydrometrics 1985). Some surface water runoff originating from the East Landfill and the Sanitary Landfill, as well as runoff from the western flank of Teakettle Mountain, flows to Cedar Creek Reservoir Overflow Ditch. Excluding potential upgradient contributions from Cedar Creek Reservoir, Cedar Creek Reservoir Overflow Ditch has a catchment area of about 2 square miles. About 20% of this catchment area originates on-site and the remaining extends to the peak of Teakettle Mountain to the east. Like Cedar Creek, the elevation of Cedar Creek Reservoir Overflow Ditch is higher than surrounding groundwater elevations on-site, indicating that the ditch is a losing stream.

Monitoring wells installed for the RI provided a better understanding of site geology, which forms the hydrogeologic framework for understanding groundwater elevations, groundwater flow, and contaminant migration at the site. The upper hydrogeologic unit consists of glacial outwash and alluvium and is present throughout the site. Although the soil matrix varies, this unit has a high permeability. It is underlain by glacial till, which has a lower permeability compared to the glacial outwash and alluvium, with the exception of lenses of sand and gravel within the till that forms the lower hydrogeologic unit. Site stratigraphy as defined by the completion of 52 new monitoring wells (44 in Phase I and 8 in Phase II) to supplement the existing 20 wells, depicts a well-defined plume of contaminants migrating toward the Flathead River, not Aluminum City. Hydraulic conductivity, as determined by slug test data in monitoring wells, is high (11 feet per day).

5.1.6 Areas of Archeological or Historical Importance

There are no known areas of archeological or historical importance within the disturbed area of the site.

5.1.7 Community Characteristics

Columbia Falls borders the Flathead River. It was first settled in 1891, in anticipation of the arrival of the Great Northern Railway and was officially incorporated in 1909. The U.S. Census population estimate for July 2022 was 5,655, with roughly 1,900 households, 35% of which had children under the age of 18. The median household income is $56,860, and no households reported speaking a non-English language at home as their primary language. Local government consists of a mayor and six council members who are elected to 4-year terms. The Columbia Falls School District has a high school, junior high school, and two elementary schools.

Columbia Falls is about a mile from the Flathead National Forest boundary, 15 miles from Kalispell, and 17 miles from Glacier National Park. The city has a total area of 2.05 square miles (Roux 2020a). The city has a public library, swimming facility, and 28-acre park with over 900 feet of river frontage (River's Edge Park). EPA has held public meetings in the town hall and the high school auditorium. The public library houses the local information repository.

5.2 Site Features

Several features were identified during the data review conducted to develop the RI/FS work plan. These include landfills, percolation ponds, buildings, operational areas, and surface water features (Figure 5-2).

5.2.1 Central Landfills Area and Industrial Landfill

Landfills were operated at the site from shortly after 1955 when the smelter was opened until 2009.

5.2.1.1 West Landfill

The West Landfill operated from sometime around 1963 (based on review of historical aerial photographs) until 1980. It received SPL and other wastes (Roux 2015b), though SPL disposal was discontinued in 1970 when the Center Landfill was constructed.

The West Landfill is approximately 7.8 acres and is unlined. It is reported to be 35 feet below grade, rising to 14 feet above grade on the eastern side and over 30 feet above grade on the western side. The West Landfill was closed in 1981 and capped with a geosynthetic cap (Hypalon) in 1994.

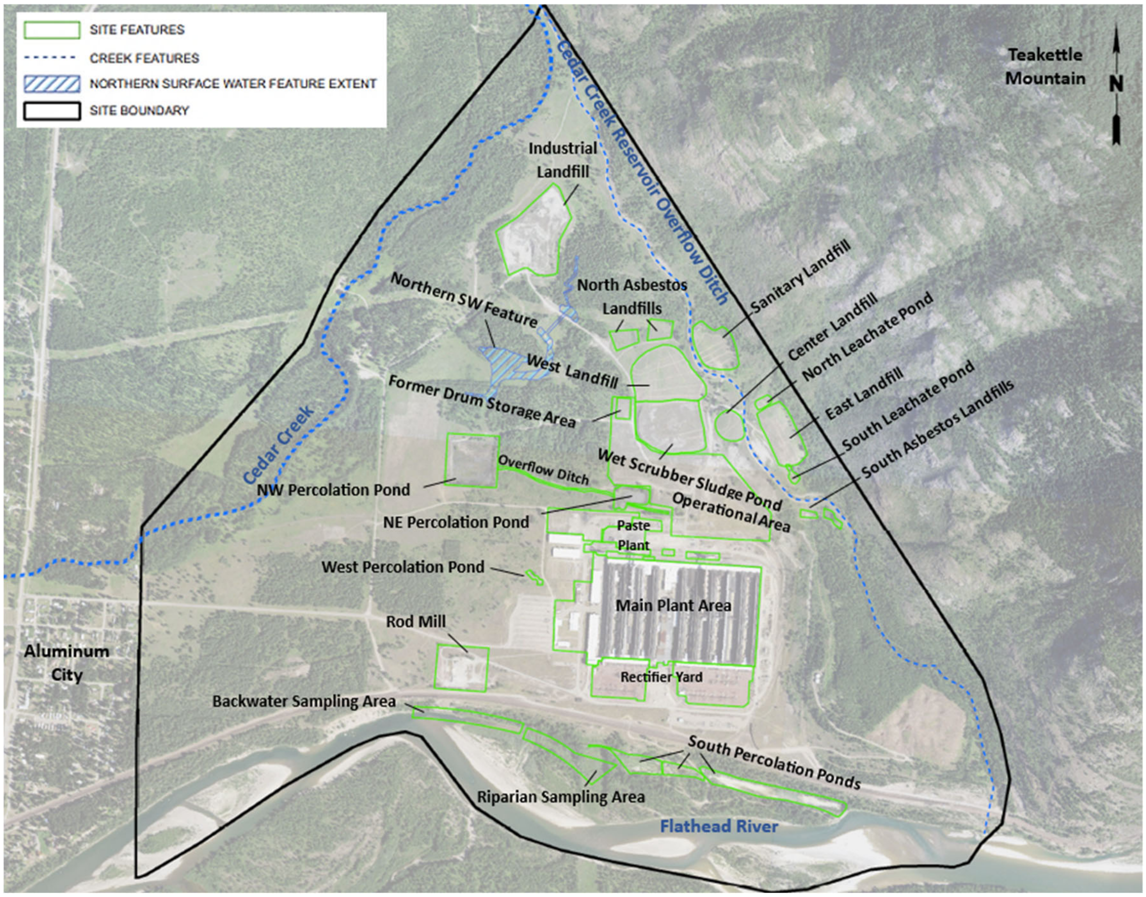


Figure 5-2. CFAC Site Features

There is uncertainty concerning the volume of wastes present within the West Landfill; one source cites an average depth of waste with the landfill to be 30 feet while another indicates 48 feet. Additionally, significant volumes of leachate may have migrated to the low-water table when the West Landfill was uncapped, thus increasing the volume of wastes. The FS estimates the volume of wastes within the West Landfill range from approximately 378,000 to 604,000 cubic yards.

5.2.1.2 Wet Scrubber Sludge Pond

Wet scrubbers were used to reduce air pollution from the reduction plant's exhaust gases from 1955 to 1976. They were replaced by dry scrubbers in 1980. Sludge generated by the wet scrubbers was disposed of in the Wet Scrubber Sludge Pond, which is approximately 10.8 acres and immediately south of the West Landfill. The depth of waste material is estimated to be 30 feet and the estimated volume of wastes in the Wet Scrubber Sludge Pond is 522,000 cubic yards. An earthen cap was place on top of the Wet Scrubber Sludge Pond in 1981.

5.2.1.3 Center Landfill

The Center Landfill was constructed in 1970 as an above grade facility and was operated for the disposal of SPL until 1980 when the East Landfill was constructed. It is approximately 1.8 acres in size, is about 15 feet above grade, and is estimated to contain 44,000 cubic yards of wastes. It was closed in 1980 and capped with a 6-inch clay cap overlain by 18 inches of till to support vegetation and protect the clay cap. A monitoring well (CFMW-017) was installed through the Center Landfill in 1980. The borehole that this well was installed in is suspected to be a secondary source of groundwater contamination, as discussed in Section 3 of Appendix A of the FS.

5.2.1.4 East Landfill

The East Landfill was built in 1980 with a clay liner. The East Landfill is approximately 2.4 acres, constructed above grade to a height of around 30 feet, and was capped with a 6-inch clay layer, a geosynthetic membrane liner, and an 18-inch vegetated till cover in 1990. This landfill included two lined leachate collection ponds to collect leachate and stormwater runoff. Both collection ponds were closed in the early 1990s.

5.2.1.5 Industrial Landfill

The Industrial Landfill is in the northern portion of the site and was active from the 1980s until 2009, then active again in 2020 and 2021 when excavated sediments from the South Percolation Ponds were placed into it. The Industrial Landfill is approximately 12.4 acres and its height ranges from 10 to 20 feet above the surrounding grade. The landfill received nonhazardous wastes and debris.

5.2.1.6 Sanitary Landfill

The Sanitary Landfill reportedly has a clay liner and began operations in the early 1980s to dispose of Class II and III solid wastes generated at the plant (Hydrometrics 1992). The 1992 report describes Class II and III solid wastes as mixed decomposable, wood waste, and inert materials. The 1992 report also notes that the Sanitary Landfill was filled in 1982 and subsequently capped and closed.

5.2.1.7 Asbestos Landfills

CFAC began disposing of asbestos-containing materials at several locations within the site in the late 1970s as exposure to asbestos became a nationwide health concern. As shown in Figure 5-2, two separate areas referred to as the North Asbestos Landfill and South Asbestos Landfill were developed and in use from 1993 to 2009. The depth of these asbestos landfills is suspected to be no more than 5 feet. All the asbestos landfill disposal units have a soil cover and are vegetated.

5.2.2 Percolation Ponds

The process of aluminum reduction requires significant quantities of water, which is why primary aluminum reduction facilities are mostly located along major rivers or other large surface water bodies. Wastewater generated by plant operations were disposed into a network of percolation ponds.

5.2.2.1 North Percolation Ponds

There are two interconnected percolation ponds comprising the North Percolation Ponds. The Northeast Percolation Pond is approximately 2 acres and has a maximum depth of 14 feet below ground surface. Waste (black carbonaceous materials) thickness in this pond ranges from 0.5 to 2 feet. It historically received wastewater from the cathode soaking pits, and currently receives stormwater. The Northwest Percolation Pond is approximately 8 acres and has a maximum depth of 22 feet below ground surface. It received overflow from the Northeast Percolation Ponds, and similarly contains approximately 0.5 to 2 feet of waste material. The two ponds were connected by a 1,440-foot-long unlined ditch.

5.2.2.2 South Percolation Ponds

The South Percolation Ponds were a series of three ponds constructed in a side channel of the Flathead River. They were constructed in the early 1960s when a dam was built to prevent the river from flowing into the channel. Wastewater and stormwater from the plant flowed into the three ponds via a concrete pipe.

In 2020 and 2021, 23,450 cubic yards of impacted sediments were removed from the South Percolation Ponds and were disposed in the Industrial Landfill. A temporary 1-foot soil cover was placed on the landfilled sediments. A sheet pile wall, riprap bank, and berms separating the three ponds were also removed to allow the Flathead River to naturally migrate back into the side channel. All disturbed areas above the high-water elevation of the Flathead River were revegetated.

5.2.2.3 West Percolation Pond

The West Percolation Pond covered 0.05 acres and was located north of the main parking lot west of the plant. It received stormwater from the parking lots, and boiler blowdown from the fabrication shop, warehouse, and change house.

5.2.3 Main Plant Area

The Main Plant Area included the former potline buildings where aluminum was produced, as well as several support buildings, warehouses, and storage areas. Decommissioning of the industrial facilities was completed in 2019. The administration building, main warehouse, two ancillary warehouses, and fabrication shop were left standing to facilitate site redevelopment.

5.2.3.1 Potline Buildings

There were 10 pot rooms comprising the former potline buildings. Courtyards and several support buildings were located in between the pot rooms, including air ventilation structures equipped with dry scrubbers. Other support buildings included the casting house, offices, garages, and a briquette storage area. Prior to 1978, cathode soaking pits were located in the Main Plant Area to cool pots. The exact location of these pits is unknown.

5.2.3.2 Paste Plant

The paste plant was north of the main plant. It manufactured anode briquettes from petroleum coke and coal tar pitch for use in the pots. Other buildings associated with briquette manufacturing included the petroleum coke unloading building, petroleum coke silo, paste plant wet scrubber (replaced by a dry scrubber in 1999), coal tar pitch tanks, and coal tar pitch unloading shed (Roux 2015a).

5.2.3.3 Rod Mill

A rod mill was in the southwestern portion of the Main Plant Area and was used for the first decade of plant operations. Thereafter, it was used for storage. In the 1990s, it was used for storage of hazardous wastes, including SPL and PCBs (Roux 2015a).

5.2.3.4 Rectifier Yards

Two rectifier yards were located south of the main plant. The western rectifier yard was decommissioned. A portion of the eastern rectifier yards remains active and is owned by the

Bonneville Power Administration. Transformers and capacitors in the rectifier yards historically used transformer oil that contained PCBs. That oil was removed in the 1990s.

5.2.3.5 Operational Area

Plant operations were conducted north of the Main Plant Area as seen in historical aerial photographs. Operations included the former drum storage area. Grab samples were taken during the RI and a 43-acre area was further targeted for investigation using the incremental sampling methodology (ISM) to collect surface soil samples.

5.2.4 Surface Water Features

Site surface water bodies are the Flathead River, Cedar Creek, Cedar Creek Reservoir Overflow Ditch, and an unnamed seasonal surface water body referred to in the RI report as the Northern Surface Water Feature (Figure 5-2).

5.2.4.1 Flathead River

The hydrology of the Flathead River was described earlier in Section 5.1.5. Groundwater seepage from the steep banks below the site to the Flathead River was documented along roughly 2,680 linear feet and was permitted as an outfall in 1994 under the MPDES. This seepage area (Seep Area) was later subdivided in the RI into three units: Backwater Seep Sampling Area, South Percolation Ponds, and Riparian Sampling Area. The Backwater Seep Sampling Area is the western portion of the Seep Area that was historically sampled under the MPDES permit and was further sampled in the RI. The South Percolation Ponds represent the central portion of the Seep Area. The Riparian Sampling Area, a well-vegetated area west of the South Percolation Ponds, included a small stream that discharged to the Backwater Seep Sampling Area.

5.2.4.2 Cedar Creek and Cedar Creek Reservoir Overflow Ditch

Cedar Creek is the main surface water drainage that flows through the site. It originates north of the site in the area contributing to the Cedar Creek Reservoir (Roux 2020a). From the reservoir outlet, Cedar Creek flows approximately 3 miles south-west toward the City of Columbia Falls. The creek elevation is higher than groundwater elevations within the site, indicating that it is a losing stream. The RI notes the presence of an unnamed tributary to Cedar Creek that lies east of the Industrial Landfill and joins Cedar Creek approximately a half mile below that landfill.

5.2.4.3 Northern Surface Water Feature

The Northern Surface Water Feature is an intermittent surface water body between Cedar Creek and Cedar Creek Reservoir Overflow Ditch south of the Industrial Landfill. It is likely a pothole depression developed by past glacial activity that seasonally is infiltrated with groundwater during snowmelt and increased precipitation events. The substrate is predominantly grass covered with areas of channelization which help direct groundwater from the seeps from a nearby cliff.

5.3 Overview of Site Contamination

The RI examined potential contaminant sources: landfills, percolation ponds, plant drainage systems, the former drum storage area, underground and aboveground storage tanks, and waste and raw materials storage and handling areas. It evaluated the potential exposure pathways from the preliminary CSM (ambient air, groundwater, surface water and sediments, and soil, as well as porewater.

The RI was conducted in two phases:

- Phase I (2016 and 2017) included soil gas samples, geophysics, Geoprobe samples, monitoring wells, sediment, and surface water samples, and groundwater samples.
- Phase II (2018 and 2019) included soil borings, wells, sediment samples, sediment porewater samples, surface water samples, and groundwater samples. A background study was conducted of off-site soil, sediment, and surface water.

RI data were collected from multiple rounds under varying conditions to develop a complete characterization of the nature and extent of contamination (Figure 5-3).

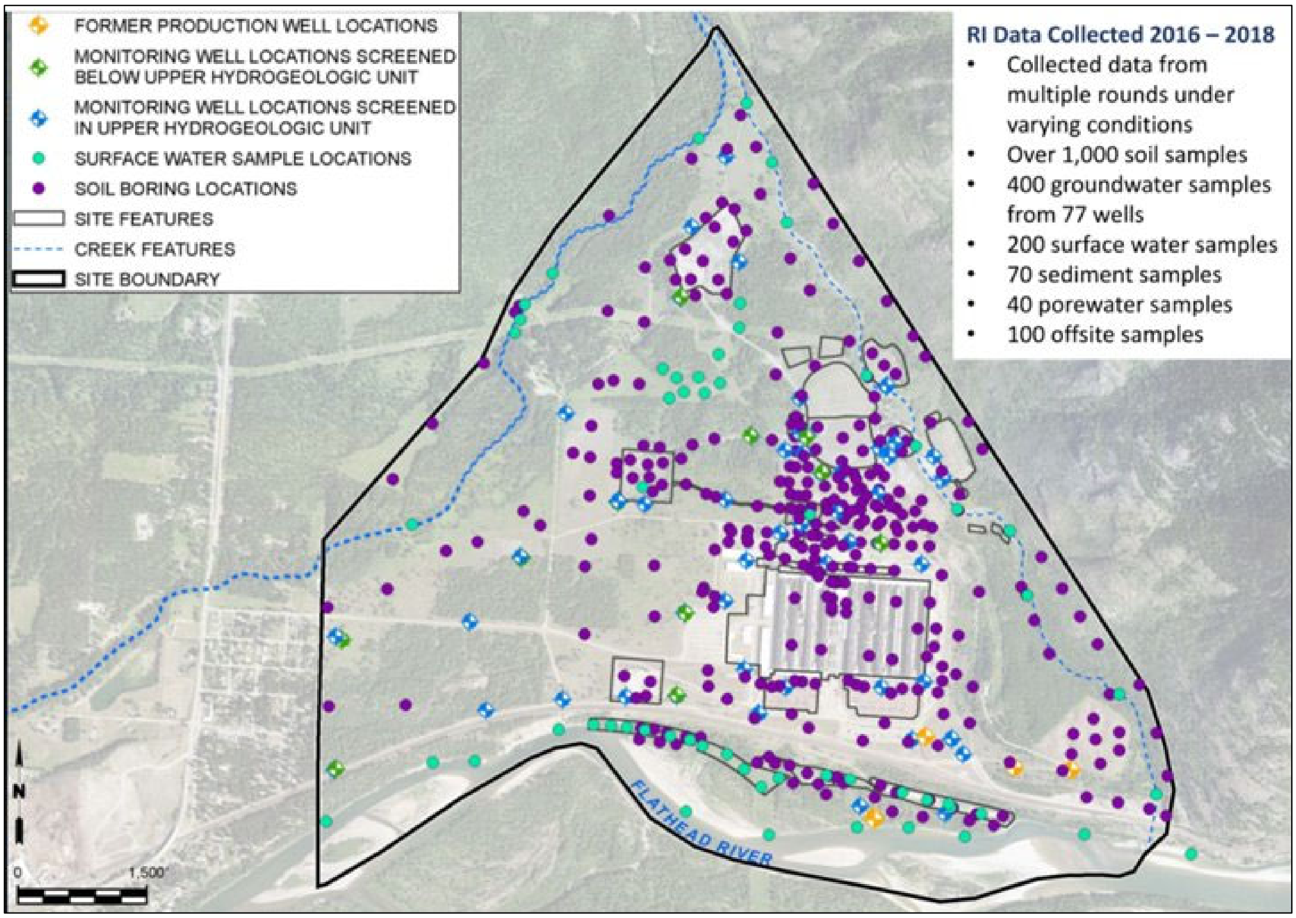


Figure 5-3. Extent of RI Sampling

The RI report (Roux 2020a) documented that:

- Fluoride and cyanide are present in groundwater, and the primary sources are the West Landfill and Wet Scrubber Sludge Pond. The East Landfill is a secondary contributing source.
- PAHs are present in shallow soils at the North Percolation Ponds, Effluent Ditch, and Main Plant Area.

- Metals are present in shallow soils at the North Percolation Ponds, Main Plant Area, and all landfills.
- Contamination is present in the percolation ponds, Backwater Seep, and Riparian Area.
- COCs in the Flathead River were mostly non-detect or similar to background concentrations due to the volume of water in the river.

The highest concentrations of COCs were typically found in the exposure areas that correspond to former industrial areas of the site, including the Main Plant Area, the North Percolation Ponds, and the Central Landfills Area. Cyanide and fluoride were identified as the primary COCs in groundwater based on the frequency of detection and exceedance of water quality standards, as well as the contribution to estimated site risks.

5.3.1 Contaminant Types and Affected Media

5.3.1.1 Cyanide

Cyanide occurs in multiple forms in the environment. In water, it can occur in strong and weak metal-cyanide complexes, as cyanate or thiocyanate, organocyanides, or free cyanide. In solid phases, cyanides can occur in simple metal cyanide solids, complexes with alkali earth metals, or in complexes with other metals (Jaszczak et al. 2017). The occurrence and distribution of cyanide at industrial sites and mines has been well studied. At aluminum smelter sites, strong iron-cyanide complexes (ferro- and ferricyanide) are the dominant species due to their abundance in the source material as well as due to the abundance of iron that can complex with cyanide (Dzombak et al. 2005). Only 10% or less of the cyanide at smelter sites was found to exist as weak metal-cyanide complexes or as free cyanide. At the CFAC site, the observed concentrations of free cyanide, on average, constitute about 8% of the total cyanide present in groundwater.

In general, several studies have shown that iron-cyanide complexes and free cyanide are mobile in groundwater under neutral to alkaline conditions, and in soils with low clay content (such as the soils that comprise the upper hydrogeologic unit beneath the site). Groundwater in the vicinity of the landfills has been observed to be slightly to highly alkaline, with several wells exhibiting pH greater than 9. Thus, cyanide mobility is consistent with the site-specific geochemical conditions. Acidic pH of less than 5, the presence of iron and aluminum oxides, and the presence of clay material tend to increase adsorption of metal cyanide complexes (Dzombak et al. 2005).

5.3.1.2 Fluoride

Fluoride is naturally abundant in soils and contained in the minerals apatite, fluorite, and cryolite, as well as micaceous clay materials. Potassium fluoride and sodium fluoride are soluble salts that contain fluoride. Similarly, fluoride is often naturally present in groundwater owing to the presence of soil and rocks rich in fluoride. As a result, research has identified water with high concentrations of naturally occurring fluoride is often found near the foot of mountains (Yadav et al. 2018). Fluoride, not attributable to any anthropogenic source, is ubiquitous throughout the Flathead Valley water supply wells at an average concentration of 160 μg/L (Roux 2020a). Cryolite and sodium fluoride are common feedstocks for aluminum smelters and, as a result, fluoride accumulates within waste materials generated from the smelting process. Studies of wet scrubber sludge indicated that the sludge is 80% calcium fluoride on a dry weight basis.

Fluoride minerals and salts have a wide range of solubilities in water. Calcium fluoride, cryolite, and sodium fluoride have reported solubilities of 16 mg/L, 420 mg/L, and 40,000 mg/L, respectively (Yadav et al. 2018). These solubilities and the high fluoride content within the SPL and scrubber sludge help to explain why the West Landfill and Wet Scrubber Sludge Pond Landfill are the primary source of fluoride in groundwater at the site.

5.3.1.3 PAHs

PAHs are a group of hydrophobic, organic compounds that contain at least two condensed aromatic ring structures. When a PAH has three or less condensed aromatic rings, it is considered a low molecular weight (LMW) PAH. When it has four or more aromatic rings, it is considered a high molecular weight (HMW) PAH (EPA 2007). During the production of aluminum using the Hall-Héroult process, carbon anodes and cathodes are used to conduct electricity through the alumina to produce molten aluminum.

The coal tar pitch and coke used to create carbon anodes and cathodes contain multiple PAH compounds. Most PAHs do not dissolve in water but bind to sediment and soil particles. When sediments become suspended in water, PAHs can be transported with the sediment. PAHs are mainly adsorbed because of their hydrophobicity, especially to the soil organic matter (Karickhoff et al. 2002) and are poorly water soluble. Factors such as chemical structure, total concentration, and bioavailability influence the mobility of PAHs in the soil. In general, LMW PAHs have a higher water solubility and are more chemically or microbially degradable. In contrast, HMW PAHs have a higher hydrophobicity and toxicity and a lower solubility, and therefore persist longer in the environment (Karickhoff et al. 2002).

The differences in water solubility and sorption behavior result in a higher potential for mobility of LMW PAHs (such as naphthalene) relative to the potential mobility of HMW PAHs (such as benzo[a]pyrene). PAHs are present in soil and are at the highest concentrations in the source areas described above. However, PAHs were generally non-detect in both groundwater and surface water samples collected sitewide as part of the RI, indicating that PAHs are stable in soil and are not migrating via groundwater and surface water pathways. These findings are consistent with characteristics of PAHs described above.

5.3.1.4 PCBs

PCBs are a group of human-made organic chemicals consisting of carbon, hydrogen, and chlorine atoms. They have no known taste or smell, and range in consistency from an oil to a waxy solid. PCBs belong to a broad family of human-made organic chemicals known as chlorinated hydrocarbons. PCBs were domestically manufactured from 1929 until manufacturing was banned in 1979. They have a range of toxicity. Because of their non-flammability, chemical stability, high boiling point, and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications, including in electrical, heat transfer, and hydraulic equipment. PCBs do not readily break down in the environment. They can remain for long periods, cycling between air, water, and soil.

5.3.1.5 Metals

All soils naturally contain trace levels of metals. Thus, the presence of metals in soil is not solely indicative of contamination. The concentration of metals in uncontaminated soil is primarily related to the geology of the parent material from which the soil was formed.

Immobilization of metals, by mechanisms of adsorption and precipitation, will often prevent movement of metals to groundwater. Metal-soil interaction is such that when metals are introduced at the surface, downward transportation does not occur to any great extent unless the metal retention capacity of the soil is overloaded, or metal interaction with the associated waste matrix enhances mobility. Changes in soil environmental conditions over time, such as the degradation of the organic waste matrix or changes in pH, oxidation-reduction potential, or soil solution composition due to various remediation schemes or to natural weathering processes, also may enhance metal mobility.

Metals in soil solution are subject to mass transfer out of the system by leaching to groundwater, plant uptake, or volatilization. At the same time, metals participate in chemical reactions with the soil solid phase. The concentration of metals in the soil solution, at any given time, is governed by a number of interrelated processes, including inorganic and organic complexation, oxidation/reduction reactions, precipitation/dissolution reactions, and adsorption/desorption reactions (McLean and Bledsoe 1992).

At the site, metals were generally not found to be contributing to groundwater impacts except for immediately downgradient of the landfills where most exceedances of EPA/DEQ groundwater standards occurred.

5.3.2 Source Areas

The RI identified the following site features as potential COC source areas:

- Main Plant Area
- Landfills
- Percolation Ponds
- Former Drum Storage Area

5.3.2.1 Main Plant Area

PAHs, cyanide, and fluoride are the primary COCs in soil in the Main Plant Area based on the frequency and magnitude of exceedances of screening levels. However, these soil concentrations do not appear to be a significant source of cyanide and fluoride in groundwater. Despite the widespread occurrence of PAHs in soil across the area and the exceedances of various screening criteria, PAHs were generally non-detect in groundwater in all sampling rounds.

Concentrations of cyanide and fluoride in groundwater in and downgradient (south) of the Main Plant Area were less than those measured in wells upgradient (north) of the Main Plant Area near the landfills, suggesting that the Main Plant soils are not a significant source of the cyanide and fluoride concentrations seen in groundwater. If the soils were a significant source, an increase in cyanide and fluoride concentrations in groundwater would be expected.

5.3.2.2 Landfills

The existing and RI data indicate that West Landfill and Wet Scrubber Sludge Pond are the primary sources of cyanide and fluoride in groundwater at the site. The contaminant distribution maps (Figures 5-4 and 5-5) indicate that the highest cyanide and fluoride concentrations in groundwater originating at these two features. This is consistent across all six rounds of sampling. Adjacent to the West Landfill and Wet Scrubber Sludge Pond, groundwater elevations in the upper hydrogeologic unit can fluctuate more than 70 feet seasonally. Cyanide and fluoride emanate from this source area and migrate in south/south-westerly direction from the landfills toward the Flathead River.

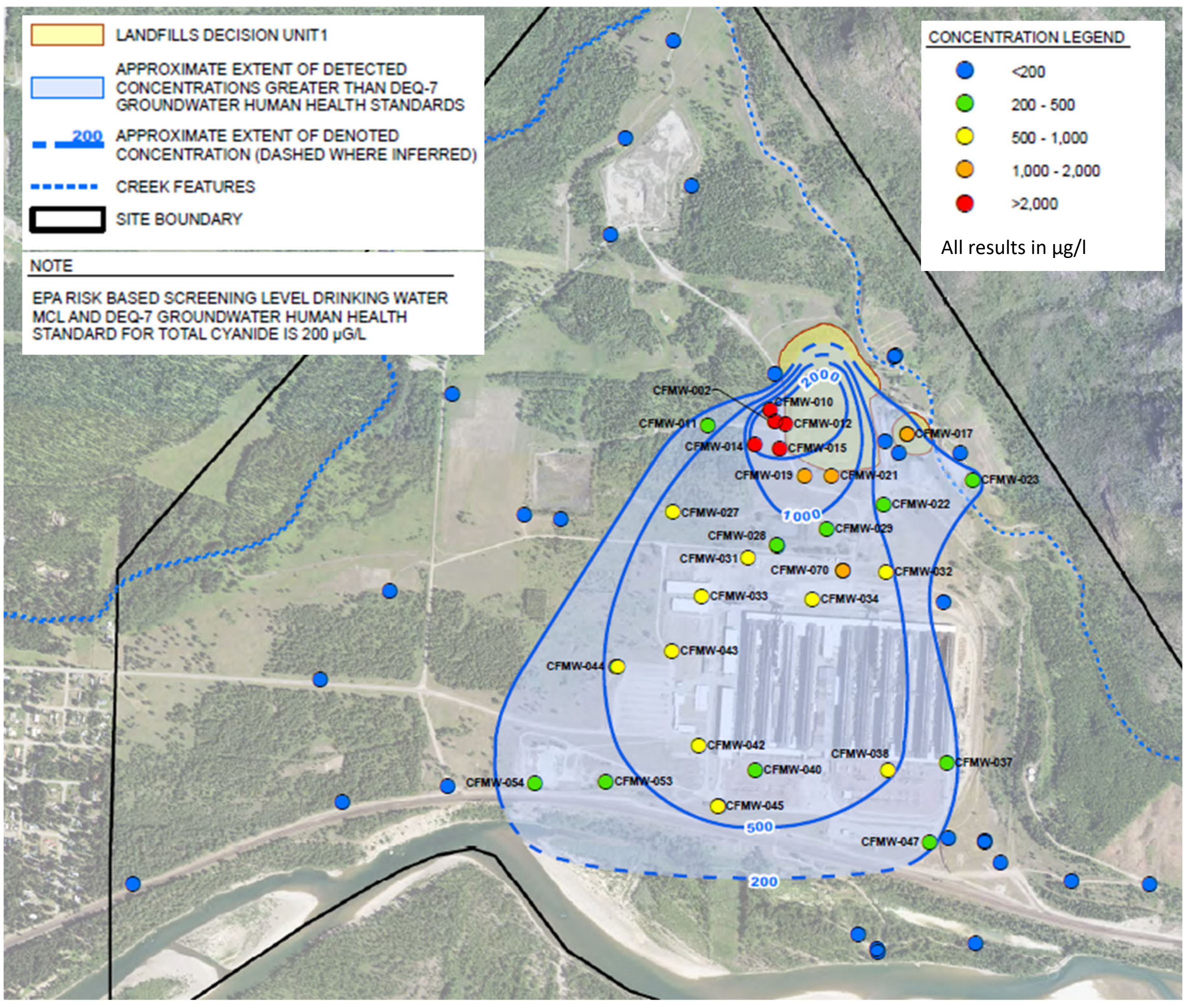


Figure 5-4. Distribution of Total Cyanide Concentrations in Upper Hydrogeologic Unit (µg/L)

The Center Landfill is a suspected secondary source area for elevated cyanide and fluoride concentrations in groundwater, based on concentrations in one monitoring well, which was installed through the Center Landfill cap in 1980, in an initial sampling event during the RI. RI results indicate that the Industrial Landfill, East Landfill, and Sanitary Landfill are not significant contributing sources to the cyanide and fluoride in groundwater.

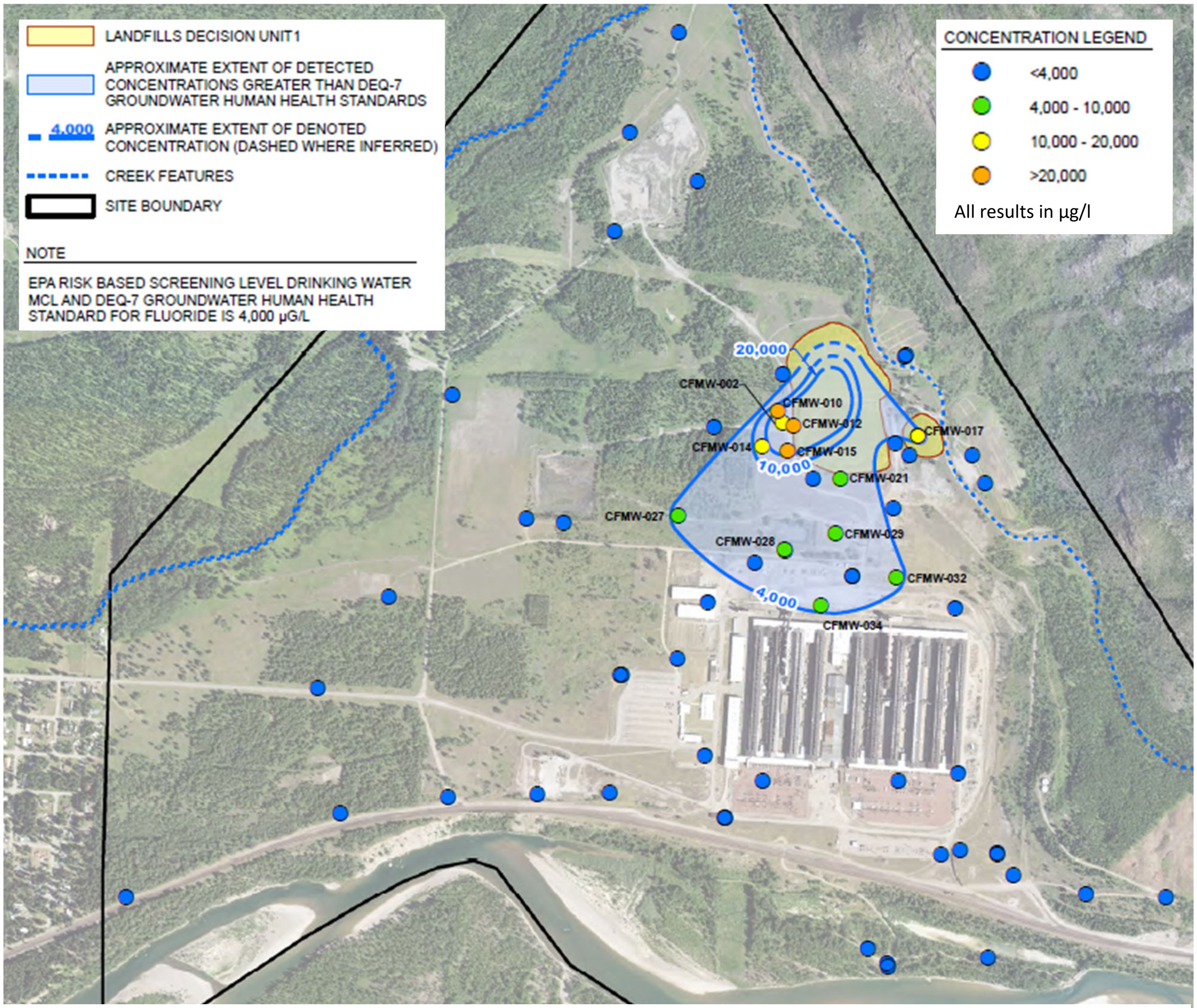


Figure 5-5. Distribution of Total Fluoride Concentrations in Upper Hydrogeologic Unit (µg/L)

5.3.2.3 Percolation Ponds

As discussed in Section 2.1, the North Percolation Ponds consist of two connected percolation ponds: the Northeast Percolation Pond and the Northwest Percolation Pond. The Northeast Percolation Pond and its influent ditch contained among the highest concentrations of cyanide and PAHs in soil and sediment, followed by the effluent ditch, and the Northwest Percolation Pond. However, concentrations of cyanide and fluoride in groundwater downgradient (south) of the North Percolation Ponds are less than those measured in wells upgradient of the ponds. This continued decrease in concentrations as groundwater flows beneath the ponds suggests that the ponds are not a significant source of the cyanide and fluoride concentrations observed in groundwater. If the ponds were a significant source, an increase in cyanide and fluoride concentrations would be expected. Additionally, although semivolatile organic compounds were detected frequently in North Percolation Ponds soil, they were not detected in any groundwater monitoring wells immediately downgradient from the North Percolation Ponds, indicating that the semivolatile organic compounds in soil in this area are not a source of contamination to groundwater.

However, it's likely that the soils/sediments within the North Percolation Pond are the source of the COCs in the surface water from the pond. The South Percolation Ponds are no longer a source of contamination at the site because sediments containing barium and PAHs were removed in 2020 and placed into the Industrial Landfill.

5.3.2.4 Former Drum Storage Area

In the Former Drum Storage Area, cyanide and fluoride were detected at elevated concentrations in surface and shallow samples but decreased by an order of magnitude with increasing depth. Thus, this feature may be a contributing source to the elevated cyanide and fluoride concentrations in groundwater that appear to originate beneath this area and the West Landfill and Wet Scrubber Sludge Pond. However, the decrease in concentrations with depth and the absence of any observed waste materials suggest that any contribution from this area to groundwater contamination are much less than the contribution from the adjacent landfills.

5.3.3 Nature and Extent of Contamination

5.3.3.1 Cyanide and Fluoride

Cyanide concentrations in soil across the site ranged from less than 0.02 to 137 milligrams per kilogram (mg/kg). The highest concentrations of cyanide in soil were generally found in the former industrial and operational areas of the site including the Central Landfills Area, Main Plant Area, and North Percolation Ponds, as well as the South Percolation Ponds and Backwater Seep Sampling Area. Concentrations of cyanide in the South Percolation Ponds are higher than those in the Main Plant Area and Central Landfills Area but are generally within the same order of magnitude. Outside of the Former Drum Storage Area, concentrations of cyanide in soil in the Central Landfills Area were generally similar to or less than those observed in the other industrial areas of the site. Concentrations of cyanide observed in the undeveloped areas of the site, the Industrial Landfill Area, and the Flathead River Area are similar to the range of background concentrations (Roux 2020a).

As described in Volume II of the *Phase II Site Characterization Data Summary Report* (Roux 2020a), which contains the baseline human health risk assessment (BHHRA) and the baseline ecological risk assessment (BERA), concentrations of COCs generally decrease with increasing depth. The surface soil interval (0 to 0.5 feet) generally has the greatest COC concentrations. The average concentration of total cyanide generally decreased with increasing depth.

Cyanide and fluoride were identified as the primary COCs in groundwater based on the frequency of detection and exceedance of water quality standards, and the contribution to estimated risks at the site. Concentrations were highest adjacent to the primary source areas within the Plume Core Area (footprint of elevated concentrations of cyanide and fluoride in upper hydrogeologic unit groundwater), including the West Landfill and Wet Scrubber Sludge Pond. Cyanide and fluoride emanate from this source area and migrate in south/south-westerly direction from the aforementioned landfills toward the Flathead River. Total cyanide and fluoride concentrations in groundwater in the upper hydrogeologic unit decrease with increasing distance from the landfills. Cyanide and fluoride concentrations measured in monitoring wells outside of the Plume Core Area were less than one-half of the MCL (200 and 4,000 μg/L, respectively) in all six rounds of sampling, and are typically non-detect or at background concentrations adjacent to Aluminum City.

Fluoride concentrations in soil across the site ranged from less than 0.014 to 810 mg/kg, with the highest concentrations in the Main Plant, North Percolation Ponds, and Central Landfills Area. A single high detection was found in the Industrial Landfill Area. Outside of these areas, fluoride concentrations were less than those observed in the industrial areas and typically ranged between 1 to 20 mg/kg. Concentrations of fluoride in background areas were generally less than concentrations on-site, with the exception of Background Reference Area #4, which is within the same order of magnitude (1 to 10 mg/kg) as the undeveloped areas, Flathead River Area, South Percolation Ponds, and most of the Industrial Landfill Area.

Varying concentrations of cyanide were measured downgradient of the West Landfill/Wet Scrubber Sludge Pond in the area around the Northeast Percolation Pond and to the west of the Main Plant buildings. An area of typically lower cyanide concentrations was observed immediately south and southwest of the Northeast Percolation Pond. This may be attributable to increased recharge to the upper hydrogeologic unit in this area, as stormwater from the concrete-covered Main Plant Area is directed into the Northeast Percolation Pond. The size of the lower concentration area varies between events.

5.3.3.2 PAHs

For presentation purposes, benzo(a)pyrene was selected as an indicator analyte for PAHs because it was the most frequently detected at elevated concentrations, and it is the PAH that contributes most to estimated risk in each exposure area. Benzo(a)pyrene concentrations in soil range from less than 0.001 to 2,000 mg/kg, with the highest concentrations in the North Percolation Ponds and Main Plant Area. Concentrations of benzo(a)pyrene were generally similar throughout the Central Landfills Area, Industrial Landfill Area, South Percolation Ponds, and Eastern Undeveloped Area, with the exception of a few high concentrations in the Central Landfills Area and Industrial Landfill Area. Benzo(a)pyrene concentrations were lowest within the Northcentral and Western Undeveloped Areas, the Flathead River Area, and the Backwater Seep Sampling Area. Within these areas, concentrations were similar to, or within the same order of magnitude as, background reference areas. The average concentration of benzo(a)pyrene generally decreased with increasing depth as summarized below.

Semivolatile organic compounds were detected in less than 6% of groundwater samples collected from monitoring wells screened in the upper hydrogeologic unit throughout the RI. In general, semivolatile organic compounds are not impacting groundwater quality across the site, with the exception of isolated detections in a few monitoring wells.

RI results indicated that the Northeast Percolation Pond and its influent ditch typically contained among the highest concentrations of PAHs in sediment, followed by the effluent ditch, and the Northwest Percolation Pond. The soils/sediments within the North Percolation Pond appear to be the source of the PAHs in the pond surface water. Concentrations of benzo(a)pyrene in sediment and surface water are highest in the North Percolation Ponds, followed by the Backwater Seep Sampling Area.

5.3.3.3 Metals

The areal distribution of the detected metals is widespread across the site. Sixteen different metals were detected at frequencies between 90 and 100% of the samples collected. It should be noted that all of the metals detected can be found as naturally occurring substances in the environment. Based on their frequency of detection and magnitude of concentrations, select metals are indicative of naturally occurring substances in the environment, as documented via the background investigation in the *Phase II Site Characterization Data Summary Report* (Roux 2020a, Volume II). However, the areal distribution of metal detections and the magnitude of metal concentrations around certain site features indicate that concentrations of some metals are in part a result of the former operations. This is most evident for the North Percolation Pond Area, and to a lesser extent for soil samples from within the Main Plant, Central Landfills, and Industrial Landfill Areas.

The RI results confirmed that many metals that can naturally occur in the environment were detected frequently in groundwater samples. Barium, calcium, potassium, and sodium were detected in 100% of groundwater samples (six rounds). The highest concentrations were limited to monitoring wells downgradient of the West Landfill and Wet Scrubber Sludge Pond. Total concentrations of antimony, arsenic, barium, lead, mercury, and thallium were detected at elevated concentrations in surface water samples. Thirteen different metals were detected in 100% of sediment samples collected during the RI. Aluminum and arsenic were detected at the highest concentrations in sediment.

5.3.3.4 PCBs

PCBs were detected in 2% of all soil samples. The most commonly detected type of PCB was Aroclor 1254. Aroclor 1254 was observed in one surface sample from CFSB-227 in the Central Landfills Area at 1.2 mg/kg; and four shallow samples from CFSB-224, one surface and one shallow sample from CFSB-227, and one shallow sample from CFSB-229, all in the Central Landfills Area within the footprint of the Operational Area south of the West Scrubber Sludge Pond. Aroclor 1254 was also detected in three surface samples and in one shallow sample collected west of the West Rectifier Yard within the Main Plant Area. PCBs were not detected in any sediment samples.

5.4 Migration Routes

Groundwater is the primary migration pathway for the potential transport of COCs from the various source areas, and cyanide and fluoride are the primary COCs in considering contaminant migration and fate and transport. All other primary COCs identified in soil, sediment, or surface water samples within the source areas appear to be stable and not migrating at levels of concern based upon risk assessment results.

5.4.1 Migration Potential in Soil

Cyanide, fluoride, PAHs, and metals are present in soils sitewide. The migration potential of these COCs in soil is low, as evidenced by the decrease in concentrations with depth in samples collected during the RI. PAHs were non-detect in all groundwater samples, indicating that the transfer of PAHs from soil to groundwater is negligible as PAHs are typically bound to soils. Metals were detected in monitoring wells immediately downgradient of the landfills but not in wells further downgradient, indicating that metals are adsorbed or precipitated into soil.

Mobility varies dependent on a number of factors (such as pH and redox potential), but the type of COCs found at the site (heavy metals, PCBs, PAHs) are less mobile in the solid phase. There is no evidence of vertical migration to groundwater, other than the identified primary groundwater source areas (West Landfill and Wet Scrubber Sludge Pond). The potential for migration to surface water exists via mechanical transport via overland flow in stormwater runoff, but that contribution, if present, appears to be minimal.

5.4.2 Migration Potential in Surface Water

Migration of site contaminants into surface water has been documented where seeps discharge to a backwater area of the Flathead River. Concentrations of cyanide and fluoride in this area exceed EPA MCLs and DEQ-7 water quality standards. They also have been high enough to pose unacceptable ecological risk in surface water and porewater. Once these COCs enter the Flathead River, the concentrations are below the level of detection or at background levels. No elevated concentrations of site COCs have been detected in the river adjacent to the site. COCs have also migrated via surface water in the human-made overflow ditch between the Northwest and Northeast Percolation Ponds.

5.4.3 Migration Potential in Groundwater

The six rounds of RI groundwater sampling documented a consistent pattern of migration (Figures 5-4 and 5-5) from the primary sources (West Landfill and Wet Scrubber Sludge Pond). Cyanide migrates in a south/southwesterly direction from the primary sources toward the Flathead River. Total cyanide concentrations in groundwater in the upper hydrogeologic unit decrease with increasing distance from the landfills. Cyanide concentrations are typically non-detect in the north, west, and south-west portions of the site (near Aluminum City) during all rounds of sampling.

Fluoride migration is also in a south/southwesterly direction toward the Flathead River. Within the western and northern portions of the site (Figure 5-5), detections of fluoride in groundwater are similar to the average concentration of fluoride in public water and community water supply wells in the Flathead Valley (160 μg/L). Cyanide and fluoride concentrations in monitoring wells outside of the plume contours are less than one-half of their respective MCLs.

Total cyanide was detected frequently in upper hydrogeologic zone monitoring wells. Detected concentrations of free cyanide were less than detected concentrations of total cyanide in all upper hydrogeologic unit groundwater samples, and on average comprised less than 8% of the total cyanide. During all six rounds of sampling, total cyanide and fluoride concentrations in groundwater decreased with depth in the upper hydrogeologic unit, indicating that there is limited vertical migration and that cyanide and fluoride are primarily migrating horizontally within the upper hydrogeologic unit. In groundwater samples below upper hydrogeologic unit, total cyanide was generally non-detect.

In summary:

- The West Landfill and Wet Scrubber Sludge Pond are the primary sources of the cyanide and fluoride in groundwater.
- The Center Landfill and Former Drum Storage Area are potentially contributing sources, but to a much lesser degree than the West Landfill and Wet Scrubber Sludge Pond.

- The Northern Percolation Ponds and Main Plant Area do not appear to be potential source areas, and any contribution from these areas is negligible relative to the primary source areas.
- In the western and northern portions of the site, the detections of fluoride in groundwater are similar to regional concentrations in public and community water supply wells. Detected concentrations of free cyanide, on average, comprised less than 8% of the total cyanide.

5.4.4 Migration to the Flathead River

The CSKT is a site stakeholder and has treaty-reserved rights in aquatic resources, including the right to take and eat fish from the Flathead River. The remedial investigation, BERA, and BHHRA were developed for the site under EPA direction and show that site-related contaminants do not contribute unacceptable risk to fish in the Flathead River (see below). Additional risk information is provided in Section 7.

- **Surface water**. Concentrations of cyanide, barium, and aluminum exceed surface water ecological risk screening levels at the Backwater Seep Sampling Area and Riparian Area. However, the screening levels were not exceeded in surface water collected from the Flathead River. None of the other contaminants associated with site source areas (arsenic, fluoride, nickel, selenium, benzo[a]pyrene, manganese, sodium, zinc, and copper) exceeded screening levels at the Backwater Seep Sampling Area, the Riparian Area, or surface water from the Flathead River.
- **Sediment**. The RI found no evidence of contaminated sediments in the Flathead River. Even so, EPA required the removal of contaminated sediments in the South Percolation Ponds under the 2020-2021 removal action. This action was completed successfully, and EPA engaged the CSKT in the process.
- **Ecological impacts to fish**. The risk assessments summarized and analyzed the potential effects of site contaminants on fish. Under MPDES permit for Outfall 0006, CFAC conducted 18 whole effluent toxicity testing studies on a quarterly basis from 2014 to 2019 to evaluate the potential toxic effects in the Backwater Seep Sampling Area to the Fathead Minnow and the daphnid, species that are both sensitive to cyanide exposure. Results indicate that cyanide and other contaminants had no significant toxic effect on the Fathead Minnow. The 50 percent or greater dilution of discharging groundwater with surface water from the Flathead River would mitigate any short-term effects on the survival of representative fish and invertebrates (BERA pages 116-117).
- **Human health impacts from consuming fish**. The BHHRA assessed human consumption of fish from the Backwater Seep Sampling Area and the Flathead River. Bioaccumulation of COCs in fish was included in calculations of cumulative cancer risk and non-cancer risk of fish ingestion. Cumulative cancer risk was below both the EPA de minimis level of 1 x 10-6 (one in one million) for cancer risk and the hazard index of 1, indicating that human consumption of fish does not present unacceptable risk.

5.5 FS DUs

The FS work plan (Roux 2020b) identified DUs with common elements or conditions to evaluate COCs specific to an environmental media and/or area of the site (Figure 5-6).

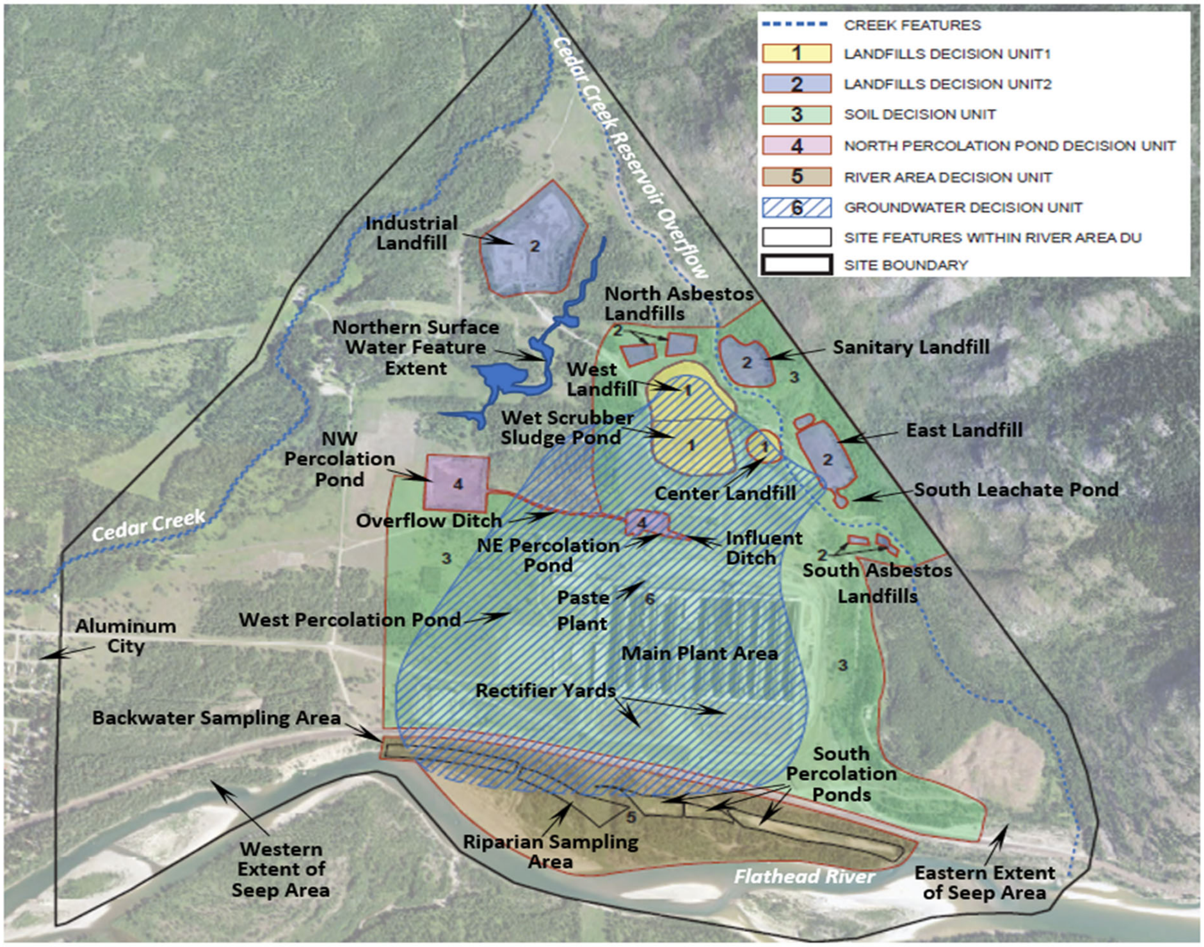


Figure 5-6. Decision Units and Other Site Features

- **Landfills DU1.** This DU includes the suspected sources of groundwater contamination at the site. It is defined as the West Landfill, Wet Scrubber Sludge Pond, Center Landfill, and shallow soils (0 to 2 feet) within the footprint of these landfills.
- **Landfills DU2.** This DU is limited to waste disposal areas that were determined not to be sources of site groundwater contamination. They include the East Landfill, Industrial Landfill, Sanitary Landfill, and Asbestos Landfills.
- **Soil DU3.** This DU consists of the impacted soils identified during the RI and is defined as the soil within the Main Plant Area, ISM Grid Area, and areas surrounding the waste management units in the Central Landfills Area exposure area (including the Former Drum Storage Area). The depth of impacted soils in the DU is based on human health (0 to 12 feet) and ecological risk (0 to 2 feet).

- **North Percolation Ponds DU4.** This DU consists of impacted soils and sediments in the Northeast Percolation Pond and its influent ditch, Northwest Percolation Pond, and the 1,440-foot-long overflow ditch.
- **River Area DU5.** This DU consisted of three areas of concern evaluated under the RI: South Percolation Ponds (removed during the 2020 to 2021 removal action), Backwater Seep Sampling Area, and Riparian Sampling Area. As described in the RI report, the Seep Area is where groundwater discharges along the steep banks along the Flathead River for over 1,000 feet. The Backwater Seep Sampling Area is an area along the Seep Area where impacted groundwater discharges to a backwater of the Flathead River. The Riparian Sampling Area is an area where impacted groundwater discharges along a backchannel of the Flathead River.
- **Groundwater DU6.** This is a plume of groundwater contamination in the upper hydrogeologic unit as defined by 6 rounds of sampling conducted during the RI.

The DU terminology developed in the FS is used to describe the media and COCs of interest for ecological or human health risk at each DU (Table 5-1). DU6 is not included in the table because the groundwater in the upper hydrogeologic area beneath the site is not currently used and will not be used in the future. Thus, there is no viable exposure pathway.

Section 6
Current and Potential Future Land and Resource Uses

6.1 Land Uses

Land use at the site has traditionally been industrial or commercial, although there are currently no active manufacturing or commercial activities. CFAC keeps a limited on-site staff for maintenance of the remaining buildings and infrastructure, including the existing landfills. Local authorities are responsible for zoning processes and have not adopted a future land use plan for the site. In the absence of a definitive local plan, the FS identifies potential future uses as commercial, industrial, and recreational to determine risk at the site. Based on the location, flat land, and remaining post-decommissioning infrastructure, the foreseeable future use of the Main Plant Area is industrial or commercial. Landfills would remain industrial. Areas near the river likely would remain recreational and land in the undeveloped areas of the site north and west of the existing footprint of former operations could be developed or could remain as open space or wildlife habitat.

6.1.1 Current On-Site Land Use

On-site uses are currently restricted to EPA-directed Superfund activities and ongoing maintenance of the site.

6.1.2 Current Adjacent/Surrounding Land Uses

The nearest residences are adjacent to the southwest site boundary, approximately 0.8 miles west of the historical footprint of site operations, in the neighborhood known as Aluminum City (Figure 5-2). The nearest wells used for drinking water are in that neighborhood.

The county includes large areas of public land managed by the U.S. Forest Service and the Bureau of Land Management. Public land use includes recreational (e.g., hiking, hunting, all-terrain vehicle operation) and industrial (e.g., logging, hazardous fuel management, other forest management activities). Most public land is open to future mineral development under the General Mining Law, including claim staking, mineral exploration, and potential mine development.

6.1.3 Reasonably Anticipated Future Land Uses

A summary of the anticipated future use for each area is described below.

- **Main Plant Area.** Because of the distance from residential areas, flat land, and remaining post decommissioning infrastructure, future use likely will be industrial/commercial.
- **North Percolation Pond.** Based on topography, future use likely will be industrial stormwater management.

- **Central Landfills Area and Industrial Landfill.** Based on features associated with past waste management and disposal, future use likely will be industrial (landfill management, inspection, and maintenance).
- **Eastern Undeveloped Area.** Because of limited accessibility from steepness of the terrain, landfills on the northern portion, Teakettle Mountain in the eastern portion, the main rail line and the Flathead River in the southern portion, and the Main Plant Area west of the area, future use likely will be industrial or undeveloped.
- **Northcentral Undeveloped Area.** Because of the proximity to landfills and presence of the Northern Surface Water Feature, future use of this area likely will be industrial or undeveloped.
- **Western Undeveloped Area.** Based on proximity to existing residential development, vegetative habitat, and the main rail right-of-way immediately south of the area, future use of this area could be industrial, commercial, residential, or undeveloped for recreational use/wildlife habitat.
- **Flathead River Area.** Future use of the Flathead River likely will be recreational.
- **South Percolation Pond Area, Backwater Seep Sampling Area, and Riparian Sampling Area.** Because of the steep relief and backwater, this area likely will remain undeveloped. Recreational users of the Flathead River may use the area for recreation.

6.2 Groundwater and Surface Water Uses

Information on groundwater and surface water use is provided below to give a more complete picture of the site.

6.2.1 Current Groundwater Use

There is no current groundwater use at the site. Groundwater typically flows to the southwest away from Teakettle Mountain and toward the Central Landfills Area. From there, flow continues to the southwest until it reaches the relatively flat site center, before shifting south toward the Flathead River. In the Western Undeveloped Area (which includes roadways and mixed vegetation in the western third of the site and no former operational activities) groundwater flows southeast, away from Aluminum City and toward the Flathead River. Production wells provided groundwater for industrial operations and for potable water. Power to these wells was terminated during decommissioning which rendered on-site wells non-operational. The nearest drinking wells are in Aluminum City.

6.2.2 Current Surface Water Use

The site has four primary surface water bodies (Section 5.2.4): the Flathead River, Cedar Creek, Cedar Creek Reservoir Overflow Ditch, and the Northern Surface Water Feature. Surface water features specific to the Flathead River include the Seep Area, Backwater Seep, and Riparian Area. The Flathead River is used for recreational activities, such as boating, floating, kayaking, hunting, fishing, and bird-watching. Trespassers are known to access portions of the site for recreational purposes, including all-terrain vehicle riding, hunting, and fishing.

6.2.3 Potential Future Groundwater Use

Future on-site groundwater use will likely be restricted based on where groundwater contamination is found. Uses of groundwater that pose unacceptable human or ecological risks will be prohibited.

6.2.4 Potential Future Surface Water Use

Future surface water use is expected to be similar to the current uses designated by Montana water quality regulations. The Flathead River is classified as a Class 1 surface water. Class 1 surface waters are capable of supporting recreational use and have been declared navigable or are capable of supporting specific kinds of commercial activity including commercial outfitting with multi-person watercraft.

Section 7
Summary of Site Risks

7.1 Summary of the Human Health Risk Assessment

The BHHRA provides estimates of site risks if no remedial action were to be collected at the site. It provides the basis for action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the BHHRA.

7.1.1 Exposure Assessment

Exposure is the process by which receptors come into contact with contaminants in the environment. It includes exposure media, exposure pathways, and human populations of potential concern at the site as well as the quantification of exposures and derivation of the exposure point concentrations used in the risk characterization.

7.1.1.1 Conceptual Site Exposure Model

Included in the BHHRA is a review of the site conceptual exposure model and discussion of exposure pathways for exposure areas (Figures 7-1 and 7-2). Exposure areas were defined considering both the current and reasonable anticipated future land use and considering the types of habitats present. The boundaries of each exposure area were developed using professional judgment, and considered site characteristics, current and potential future receptors, and the distribution of contaminants of potential concern (COPCs) identified in the RI. Exposure areas are shown on Figure 7-3. A summary of the anticipated future use for each area is described in Section 6.1.3.

7.1.1.2 Exposure Pathways

Exposure pathways were evaluated for both current and reasonably anticipated future use for each exposure area. In general, the medium-specific pathways evaluated for each potential receptor are as follows:

- Trespassers and recreation trespassers (all-terrain vehicle riders) exposed to soil, surface water, and sediments
- Industrial or commercial workers exposed to soils and groundwater
- Construction workers exposed to soils and groundwater
- Residents exposed to soils and groundwater[1]

[1] The BHHRA evaluated residential exposure in the Western Undeveloped Area and included an assessment of the cumulative potential residential risks from exposure to soils and upper hydrogeologic groundwater (see BHHRA: Section 6.1.7, Western Undeveloped Area). In addition, the BHHRA assessed the cumulative potential residential risks from exposure to the plume core area groundwater as well as sitewide groundwater in the below upper hydrogeologic unit (see BHHRA: Section 6.1.13, Additional Groundwater Evaluation).

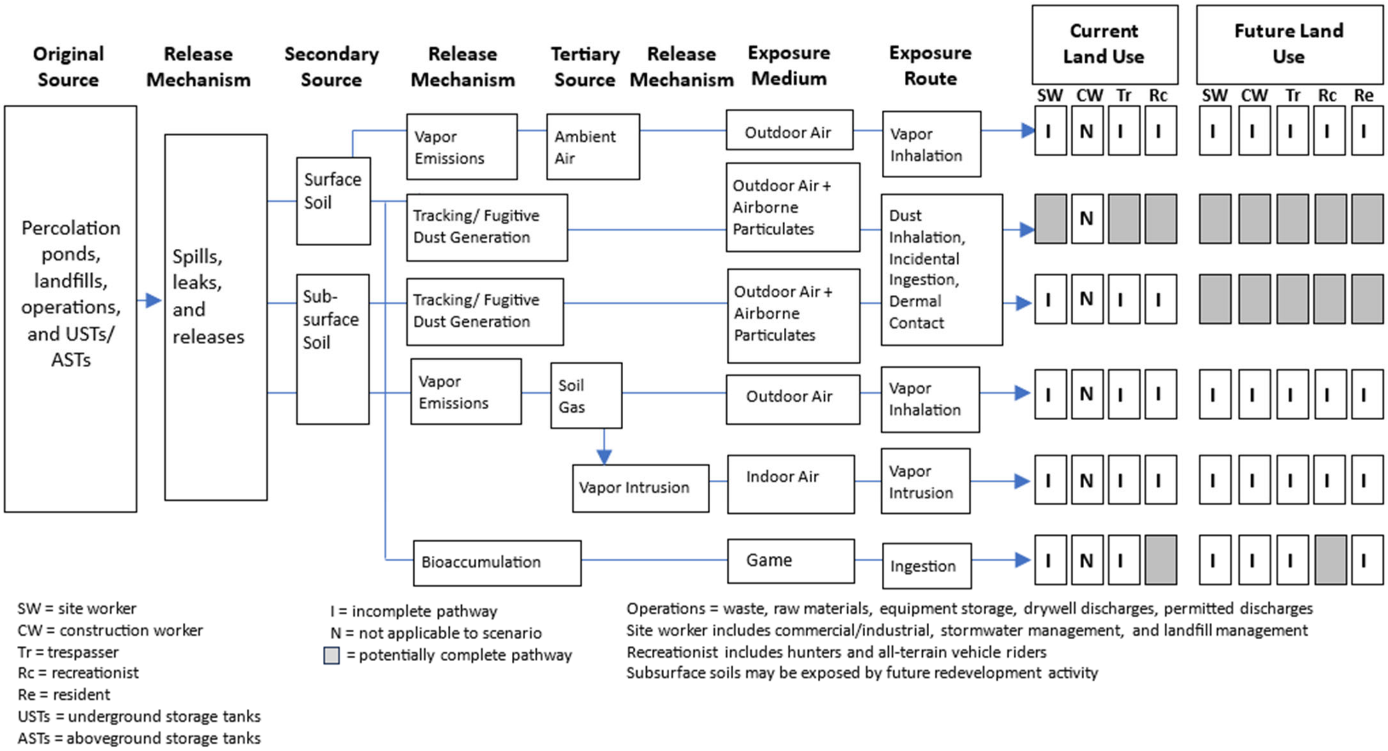


Figure 7-1. Human Health Exposure Pathways – Soil and Biota

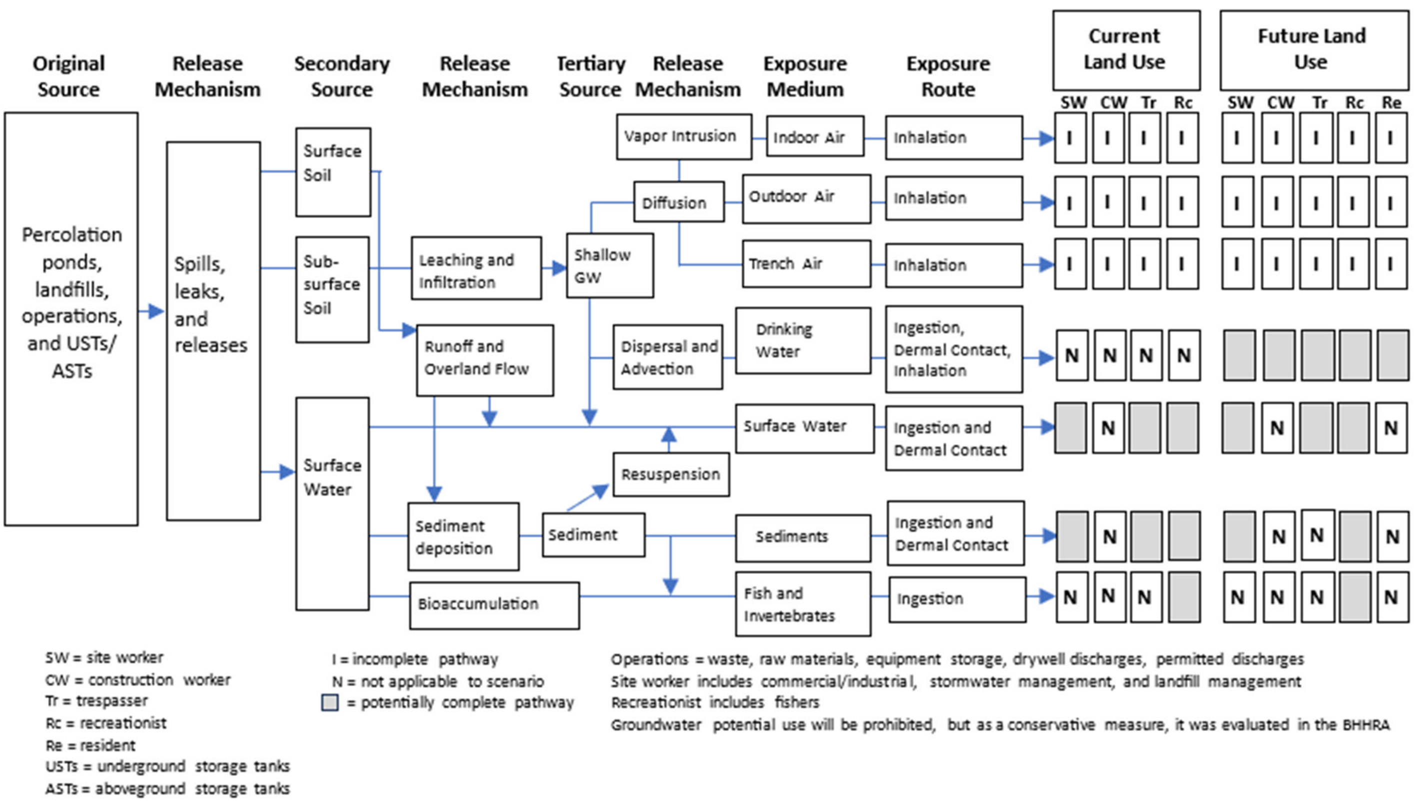


Figure 7-2. Human Health Exposure Pathways – GW, Surface Water, Sediments, and Biota

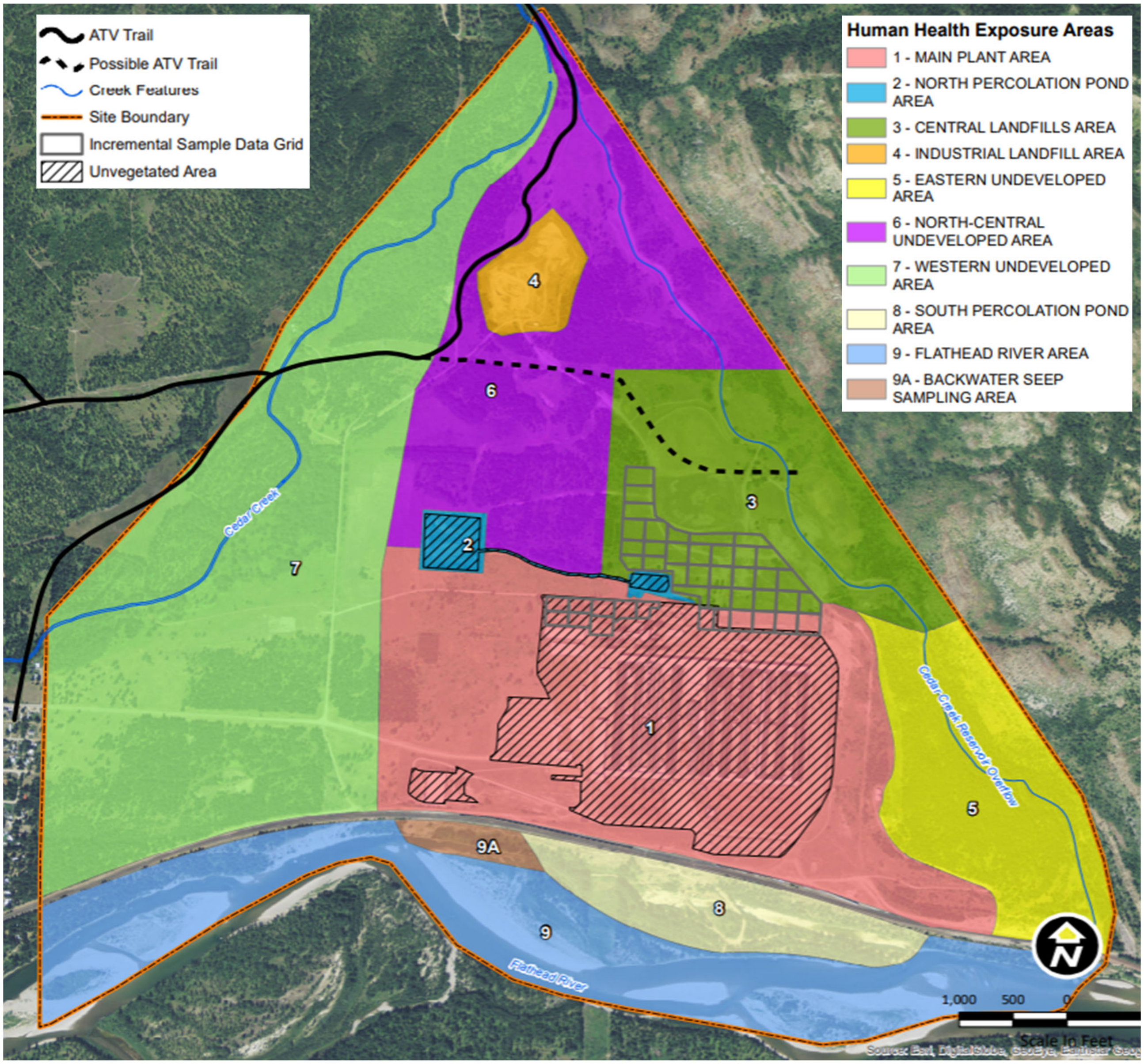


Figure 7-3. Human Health Exposure Areas

- Recreationists (e.g., hunters and fishers) exposed to biota, soils, surface water, and sediments
  - EPA residential soil regional screening levels (RSLs)
  - EPA protection of groundwater risk-based soil screening levels (RBSSLs)
  - DEQ risk-based screening level (RBSL) for residential surface soil, depth to water less than 10 feet

Additional details regarding pathways and routes of exposure evaluated are provided in Section 2.5 of the BHHRA (Roux 2020a).

7.1.1.3 Chemical of Potential Concern Selection

COPCs for the BHHRA were selected on an exposure area basis for soil, groundwater, surface water, and sediment. COPCs were selected by comparing maximum concentrations to screening levels. Screening levels were compiled using the following sources:

- Soil
  - EPA RSLs
  - EPA RBSSLs
  - DEQ RBSL for residential surface soil, depth to water less than 10 feet
- Groundwater
  - EPA tapwater RSLs
  - DEQ-7 human health numeric water quality standards
  - EPA drinking water MCLs
- Surface Water
  - EPA tapwater RSLs
  - DEQ-7

Risk-based screening levels were based on a target cancer risk of 1E-06 and target noncancer Hazard Index (HI) of 0.1.

7.1.1.4 Exposure Parameters

The exposure assumptions were based on EPA default reasonable maximum exposure (RME) assumptions unless site-specific RME scenarios were determined to be more appropriate based on professional judgment that included input from individuals knowledgeable of current site use. RME is defined as the highest exposure that could reasonably be expected to occur for a given exposure pathway at the site. Details regarding the exposure assumptions, equations, and models are included as Section 4.2 of the BHHRA.

7.1.2 Toxicity Assessment

The purpose of the toxicity assessment is to determine the relationship between the dose of a COPC taken into the body, and the probability that an adverse effect will result from that dose. The primary sources of toxicity values used in the risk assessment were based on the EPA Superfund hierarchy of human health toxicity values. Sources of toxicity values in order of preference are as follows:

- EPA Integrated Risk Information System
- Provisional peer-reviewed reference toxicity values (PPRTVs)

- Agency for Toxic Substances and Disease Registry's Minimal Risk Levels
- California Environmental Protection Agency Office of Environmental Health Hazard Assessment risk assessment health values
- Other sources (screening values from the Provisional Peer-Reviewed Toxicity Value Appendix and other specific individual toxicity values, and the EPA Superfund program Health Effects Assessment Summary Table)

Quantitative estimates of the toxicity of COPCs include two sets of values: one for carcinogenic effects and one for non-carcinogenic effects as discussed in the following sections. Table 7-1 presents the cancer and non-cancer toxicity information for site COCs.

7.1.2.1 Cancer Effects

For carcinogenic effects, the EPA assumes a non-threshold toxicological mechanism that assumes there is no level of exposure that does not pose a probability that an adverse effect will result from that dose. For carcinogenic effects, EPA (EPA 2005a) assigns a weight-of-evidence descriptor to each COPC, and if applicable, a cancer slope factor (CSF) or unit risk factor (URF) is subsequently calculated. The weight-of-evidence descriptor is based on the likelihood that the COPC is a human carcinogen. The following are the weight-of-evidence descriptors:

- **Carcinogenic to humans.** Convincing epidemiologic evidence demonstrating causality between human exposure and cancer, or exceptionally when there is strong epidemiological evidence, extensive animal evidence, knowledge of the mode of action, and information that the mode of action is anticipated to occur in humans and progress to tumors.
- **Likely to be carcinogenic to humans.** Available tumor effects and other key data are adequate to demonstrate carcinogenic potential to humans but does not reach the weight-of-evidence for the descriptor of carcinogenic to humans.
- **Suggestive evidence of carcinogenic potential.** Evidence from human or animal data is suggestive of carcinogenicity, which raises a concern for carcinogenic effects but is judged not sufficient for a stronger conclusion.
- **Inadequate information to assess carcinogenic potential.** Available data are judged inadequate to perform an assessment.
- **Not likely to be carcinogenic to humans.** Available data are robust for deciding that there is no basis for human hazard concern.

EPA determines CSFs for oral exposure and URFs for inhalation exposure for those chemicals that are known or likely human carcinogens. The CSFs and URFs are upper-bound estimates of the excess cancer risk due to continuous exposure to a COPC averaged throughout the course of a 70-year lifetime. A CSF has units of 1/mg of COPC/kg of body weight/day, or $(mg/kg\text{-}day)^{-1}$. A URF is expressed in units of 1/µg of COPC/cubic meter (m^3) of air or $(\mu g/m^3)^{-1}$. The basis of CSFs and URFs are data from lifetime animal bioassays, although human data are used when available.

7.1.2.2 Non-Cancer Effects

Toxicity criteria for non-carcinogens assume that there is a threshold effects level, below which adverse health effects are not expected to occur. Non-carcinogenic effects, such as organ damage or reproductive effects are evaluated by reference doses (RfDs) for oral exposure, or reference concentrations (RfCs) for inhalation exposure. The basis of a chronic RfD or RfC calculation is usually the highest dose that result in a no-observed-adverse-effect level (NOAEL) after chronic (usually lifetime) exposure in animal experiments. The NOAEL is then divided by a safety factor, and occasionally an additional modifying factor, to obtain the RfD or RfC. Uncertainty factors are typically factors of 10 that account for interspecies variation and sensitive human populations. Additional factors of 10 are included in the uncertainty factor if the RfD or RfC is based on the lowest observed adverse effect level instead of the NOAEL, or an experiment that includes a less-than-lifetime exposure. In addition, the noncarcinogenic dose-response values include the source and primary target organ, which is the organ that is affected at the lowest dose and experiences critical organ effects.

7.1.3 Risk Characterization

The BHHRA evaluated potential human health risks to receptors at the site using data collected during the RI investigation activities. Data collected from each exposure area were used to characterize potential risks to current and future receptors. These receptors included industrial workers (industrial worker, landfill management worker, stormwater management worker), construction workers, recreational trespassers (all-terrain vehicle rider and hunter), adolescent trespassers, adolescent, and adult recreationist (boaters, floaters, and fisher), and residents (adult and child). The BHHRA included an evaluation of potential exposures to COPCs in soil, surface water, sediment, and groundwater, as well as the potential exposure to COPCs in fish (i.e., uptake of COPCs in surface water) by the recreationist (fisher) and exposure to COPCs in venison (i.e., uptake of COPCs in soil) by recreational trespassers (hunter).

Tables 9-1 through 9-35 and Appendices I and J of the BHHRA presented the calculated cumulative risks for each receptor by COPC in each potentially complete exposure scenario identified in the conceptual site exposure model. Table 7-2 (Table 9-36 of the BHHRA) presents a summary of the cancer risks and non-cancer hazards for each receptor.

7.1.3.1 Exposure Areas That Do Not Pose Risks Due to Site-Related Contamination

The conditions in the following exposure areas at the site do not pose an estimated lifetime cancer risk (ELCR) above de minimis levels or potential for non-cancer effects due to the presence of site-related COCs. These exposure areas include:

- Northcentral Undeveloped Area
- Eastern Undeveloped Area
- Western Undeveloped Area
- South Percolation Pond Area
- Flathead River Area

- Backwater Seep Sampling Area

Risk characterization results for the three undeveloped areas (i.e., Eastern, Western, and Northcentral Undeveloped Areas) indicate an ELCR above 1E-06 or a non-cancer risk (HI greater than 1) for exposure to surface soil. However, in each case, the risk was due to the presence of arsenic or manganese in soil, both of which were found in background soil samples at comparable concentrations. Therefore, these are not attributable to site-related contamination, but rather to naturally occurring background conditions.

7.1.3.2 Exposure Areas That Pose Risks Due to Site-Related Contamination

The conditions in the following exposure areas at the site pose cancer risks above de minimis levels or non-cancer effects due to the presence of site-related COCs:

- North Percolation Pond Area
- Main Plant Area
- Central Landfills Area
- Industrial Landfill Area
- Plume Core Area

The key conclusions with respect to each of the above areas are presented below.

North Percolation Pond Area

This area presents high potential risk within the site, with a calculated cumulative cancer risk of 1E-04 for a stormwater management work scenario and 5E-05 for a trespasser scenario. For each scenario, the primary risk driver is exposure to PAHs within the pond. The BHHRA results indicate no potential for non-cancer risk effects due to COCs in the North Percolation Pond Area.

Main Plant Area

Risks in the Main Plant Area were calculated using both discrete and ISM soil sampling data. Using the discrete data, the calculated cumulative cancer risks ranged from 6E-07 for the trespasser scenario to 8E-06 for the industrial worker scenario. Discrete samples were collected across the entirety of the Main Plant Area (290 acres). Using the ISM data, the calculated cumulative cancer risks range from 2E-06 for the construction worker and trespasser scenario to 2E-05 for the industrial worker scenario. The ISM data were collected from a limited portion of the site (a combined 43 acres between the Central Landfills Area and Main Plant Area). This area exhibits some potential non-cancer effects with the HI of 4 (developmental, nervous, and thyroid target organ systems) for both the industrial and construction worker. PAHs in soil are the primary risk driver for cancer risks and non-cancer hazards in the Main Plant Area.

Central Landfills Area

Risk in the Central Landfills Area was calculated using both discrete and ISM soil sampling data. Using the discrete data, the calculated cumulative cancer risks range from 6E-07 for the trespasser scenario to 1E-05 for the landfill management worker scenario. Discrete samples were collected across the entirety of the Central Landfills Area (128 acres). Using the ISM data, the calculated cumulative cancer risks range from 2E-06 for the trespasser scenario to 3E-05 for the landfill management worker. The ISM data were collected from a limited portion of the site (a combined 43 acres between the Central Landfills Area and Main Plant Area). PAHs in soil are the primary risk driver for the Central Landfills Area. The BHHRA results indicate no potential for non-cancer risk effects due to COCs in the Central Landfills Area.

Industrial Landfill Area

The calculated cumulative cancer risks range from 2E-06 for the trespasser scenario to 1E-05 for the landfill management worker scenario. PAHs in soil are the primary risk driver for the Industrial Landfill Area. The BHHRA results indicate no potential for non-cancer risk effects due to COCs in the Industrial Landfill Area.

Groundwater Plume Core Area

The BHHRA evaluated risk associated with exposure to groundwater within the Plume Core Area under a residential exposure scenario to provide a conservative evaluation of potential health risk in the absence of any future site controls. The Plume Core Area was defined based upon evaluation of the cyanide and fluoride extents in groundwater within the upper hydrogeologic unit. Within this area, the calculated non-cancer HIs for future adult exposure to cyanide, free cyanide, and fluoride are 7E+01, 2E+00, and 5E+00, respectively; and cumulative non-cancer HI is 8E+01. The calculated non-cancer HIs for future child exposure to cyanide, free cyanide, and fluoride are 1E+02, 4E+00, and 9E+00, respectively, and cumulative HI is 1E+02. The results indicate potential for non-cancer effects if groundwater within the Plume Core Area were to be used as a source of drinking water.

In addition to the non-cancer effects, the results of the BHHRA indicate a calculated cumulative cancer risk of 2E-04 for lifetime exposure (including exposure as a child, adolescent and adult) to arsenic in groundwater under a future residential exposure scenario.

7.1.4 Uncertainty Discussion

The procedures and assumptions used to assess potential human health risks in the BHHRA were subject to a wide variety of uncertainties. However, the presence of uncertainty is inherent in the risk assessment process, from the sampling and analysis of chemicals in environmental media, to the assessment of exposure and toxicity, and risk characterization. An analysis of uncertainty associated with the risk estimates and characterization was conducted in a semiquantitative approach and was used to address potential data gaps. Typically, uncertainty exists in characterization of the nature and extent of contamination, in environmental fate and transport modeling, in the magnitude and duration of exposure of various receptors, and in toxicological values used to characterize risks or hazards. Accordingly, site investigations and evaluations include a discussion of the likely bias and magnitude of errors associated with uncertainties in estimating the risk. Risk characterization, including a well-performed uncertainty analysis, place the risk estimates in the proper perspective for informed decision-making.

Accordingly, it is important to note that the risks presented in the BHHRA are based on conservative assumptions in order to be protective of human health and to bias risk estimates toward overestimation of risk rather than underestimation. Because of this conservative bias, actual risks are likely to be less than the estimates. Details regarding the uncertainty analysis are provided in Section 6.3 of the BHHRA.

7.2. Summary of Ecological Risk Assessment

The BERA provides estimates of site risks if no remedial action were to be taken at the site. It provides the basis for action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action.

7.2.1 Environmental Setting

The site is in the Stillwater-Swan Wooded Valley ecoregion. Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources. Stillwater-Swan Wooded Valley is positioned west of the Canadian Rockies in the Northern Rockies area. The valley floor has an elevation of about 3,300 feet above mean sea level. Aquatic, terrestrial, and transitional habitats are present.

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

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

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

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

7.2.2 Exposure Assessment

Exposure is the process by which receptors come into contact with contaminants in the environment. It includes exposure media, exposure pathways, and ecological populations of potential concern at the site as well as the quantification of exposures and derivation of the exposure point concentrations used in the risk characterization.

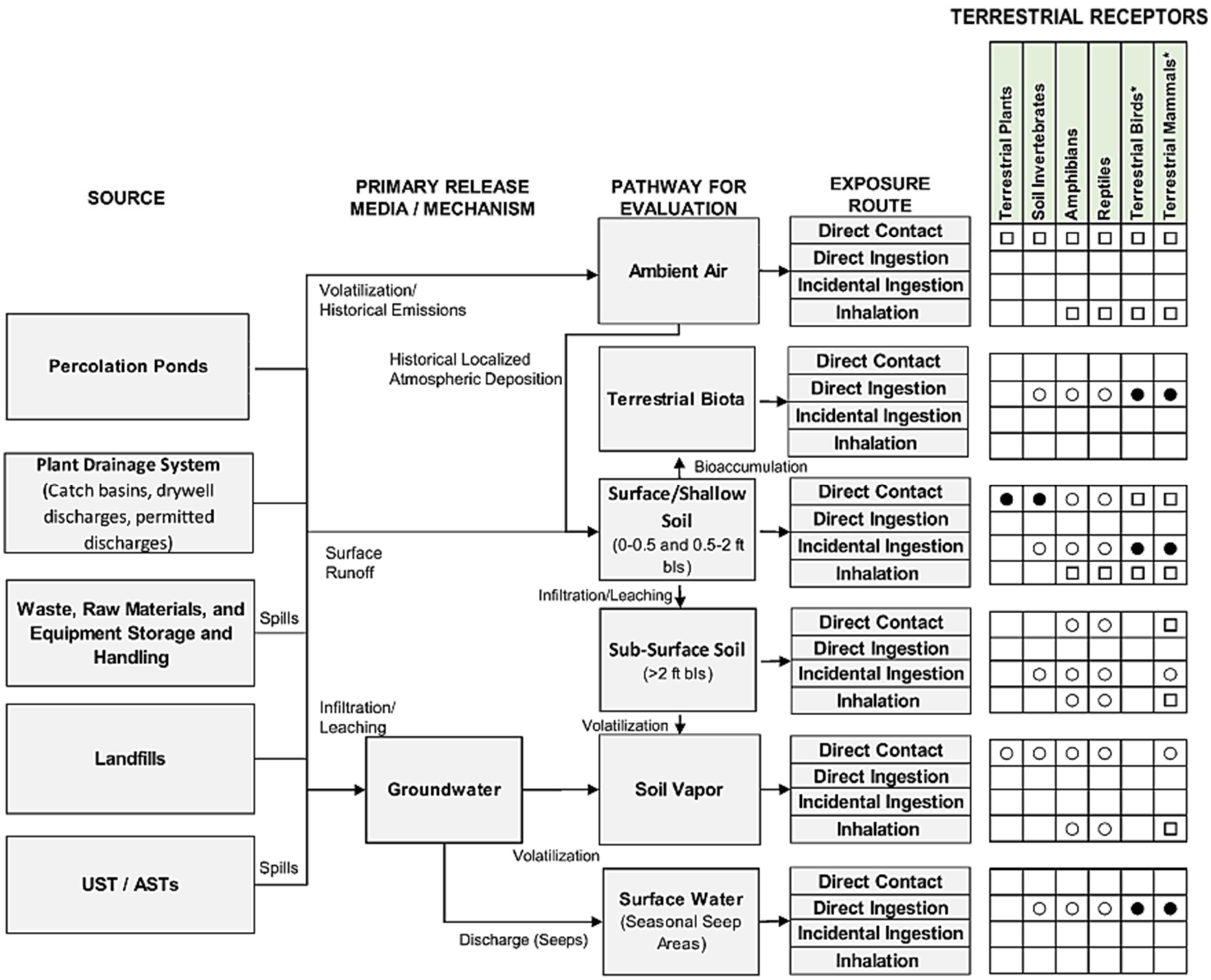
7.2.2.1 Conceptual Site Exposure Model, Exposure Areas, and Receptors

The type of impacted environmental media varies among the different ecological exposure areas and associated habitats, and may include surface water, sediments (including porewater), and soil. Ecological receptor exposure pathways to constituents within the impacted environmental media include ingestion (direct and incidental), and to a lesser extent direct contact and inhalation. The exposure media and pathways identified in the site conceptual exposure model are presented in Figure 7-4 (terrestrial exposure areas), Figure 7-5 (transitional exposure areas), and Figure 7-6 (aquatic exposure areas).

Ecological exposure areas were developed and grouped into three broad categories based on habitat types:

- Terrestrial Exposure Areas: Dry, upland areas that may support aboveground and/or belowground terrestrial flora and fauna
  - Main Plant Area
  - Central Landfills Area
  - Industrial Landfill Area
  - Eastern Undeveloped Area
  - Northcentral Undeveloped Area
  - Western Undeveloped Area
  - Flathead River Riparian Areas[2]

[2] The Flathead River Riparian Area is a terrestrial exposure area that includes the terrestrial environmental south of the railroad and up to the Flathead River. This area does not include aquatic exposure areas (i.e., Flathead Riparian Area Channel, Backwater Seep Sampling Area) or transitional exposure areas (i.e., South Percolation Ponds) in the surrounding area.



(from Roux 2020a)

Notes:

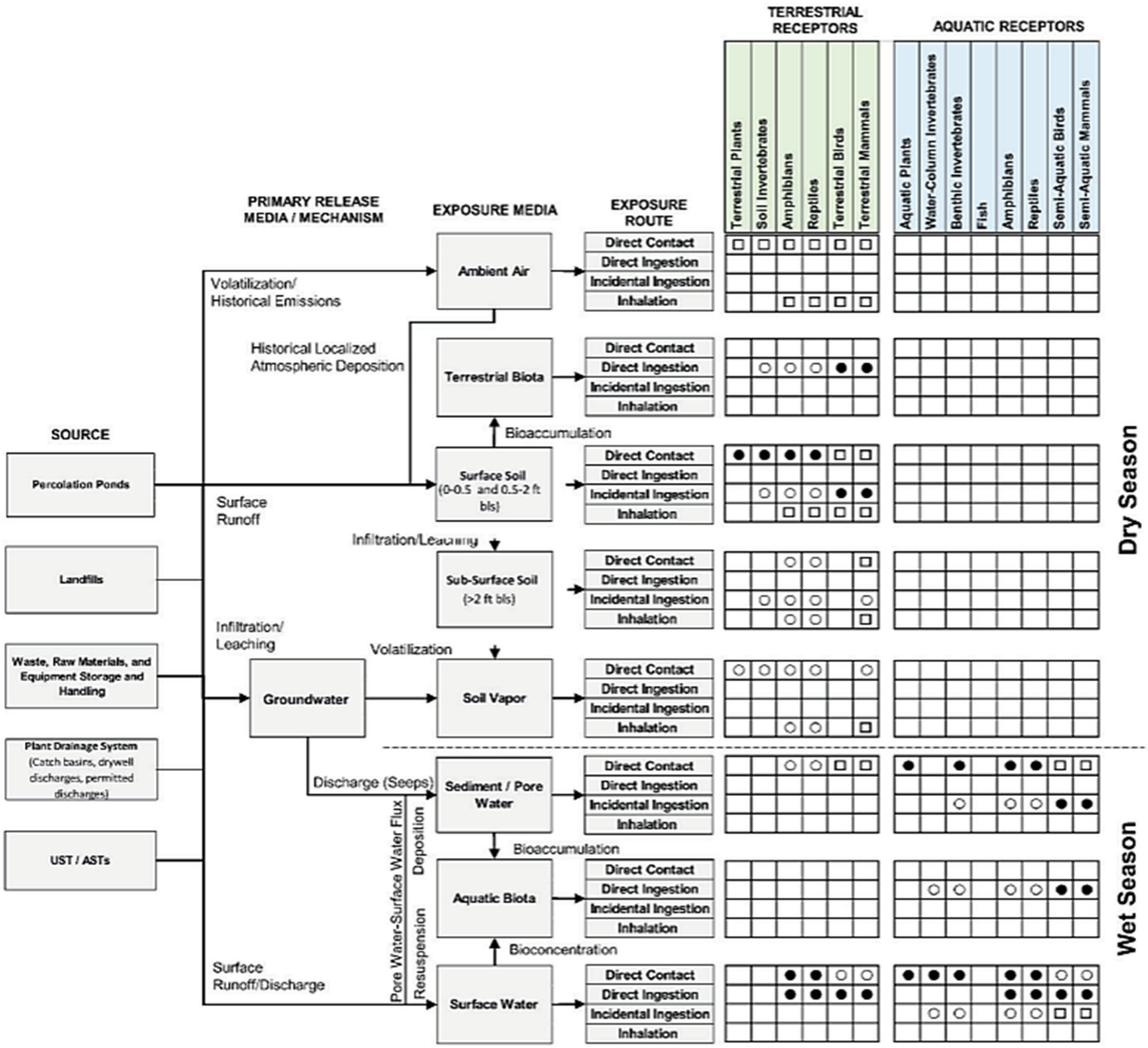
Solid circles (●) represent exposure pathways that are considered potentially complete.

Open circles (○) represent potential exposure pathways that are not quantifiable.

Open squares (□) represent potential exposure pathways that are likely insignificant.

*Includes semi-aquatic birds and mammals, where applicable.

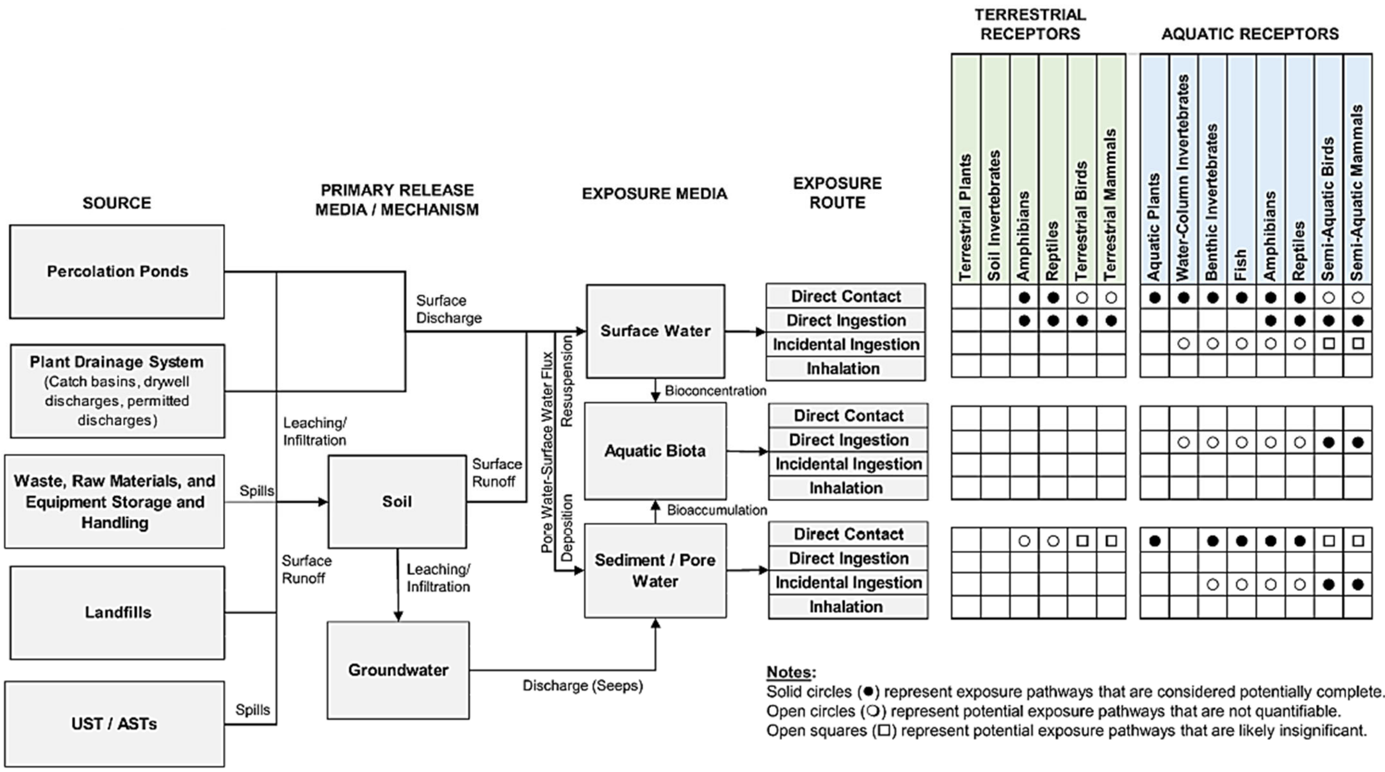
Figure 7-4. Terrestrial Exposure Areas



(from Roux 2020a)

Notes:
Solid circles (●) represent exposure pathways that are considered potentially complete.
Open circles (○) represent potential exposure pathways that are not quantifiable.
Open squares (□) represent potential exposure pathways that are likely insignificant.
Permanent aquatic communities (e.g., fish communities) are not likely to be established in transitional exposure areas.

Figure 7-5. Transitional Exposure Areas



(from Roux 2020a)

Figure 7-6. Aquatic Exposure Areas

- Transitional Exposure Areas: Characterized by intermittent or seasonal surface water inundation that may support aquatic or terrestrial receptors, depending on the time of year
  - North Percolation Pond Area
  - South Percolation Ponds
  - Cedar Creek Reservoir Overflow Ditch
  - Northern Surface Water Feature
- Aquatic Exposure Areas: Characterized by perennial or near-perennial inundation with water and physical habitats that can support aquatic receptor species
  - Flathead River Area[3]
  - Flathead River Riparian Area Channel[4]

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[3] The Flathead River Area is an aquatic exposure area that includes the main channel of the Flathead River.
[4] The Flathead River Riparian Area Channel is an aquatic exposure area that is surrounded by the Flathead River Riparian Area.

- Cedar Creek Area

Figure 7-6 presents the ecological exposure areas at the site. The types of impacted environmental media vary among the different ecological exposure areas and associated habitats, and could include surface water, sediments (including porewater sediment), and soil. Ecological receptor exposure pathways to constituents within the impacted environmental media include ingestion (direct and incidental), and to a lesser extent, direct contact, and inhalation.

Aquatic receptors of concern that may use habitats within aquatic and/or transitional exposure areas include plants, invertebrates, fish, herptiles, and semiaquatic birds and mammals. Terrestrial receptors of concern that may use habitats within transitional and/or terrestrial exposure areas include plants, invertebrates, herptiles, and terrestrial birds and mammals.

Several surrogate species were identified as representative species to evaluate exposure to mammalian and avian receptors based on feeding guild.

Six federally threatened (or proposed threatened) species were identified by U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC). These species include the following: Canada lynx (*Lynx canadensis*), grizzly bear (*Ursus arctos horribilis*), North American wolverine (*Gulo gulo luscus*), yellow-billed cuckoo (*Coccyzus americanus*), bull trout (*Salvelinus confluentus*), and Spalding's catchfly (*Silene spaldingii*). The USFWS IPaC also indicated that critical habitats for the federally threatened bull trout and eight migratory USFWS Birds of Conservation Concern may occur at the site.

7.2.2.2 Chemical of Potential Ecological Concern Selection

The chemical of potential ecological concern (COPEC) screening process was conducted in two primary steps. First, the comprehensive dataset for the RI, for each exposure area, was screened against the most conservative ecological screening values (ESVs). Second, a refined COPEC screening process was conducted to identify those constituents that are most likely to drive risk management decision-making for the site. The intent of the refinement step was to focus and streamline the overall risk assessment process. Specific elements of COPEC refinement include consideration of the following:

- Use of refined ESVs: Alternative ESVs that are protective of chronic exposure but represent a broader range of protective no-observed-effect concentration (NOEC) endpoints are considered to provide context for the potential ecological risk associated with COPECs identified in the initial screening step, and to focus evaluation of COPECs in the BERA.

- Background concentrations: COPECs in exposure areas at concentrations that are not significantly different from background concentrations may represent regional conditions that are not related to site activities or are not likely to drive risk in the BERA.

- Frequency of detection: COPECs that are infrequently detected (less than 5%) are not likely to ultimately drive risk management decisions in the BERA process. The magnitude and spatial patterns of exceedances of ESVs and background threshold values were considered as part of the refinement of infrequently detected COPECs to ensure that discontinuous and isolated soil hot spots (limited areas of elevated COC concentrations is soils) were not overlooked.

- Dietary considerations: COPECs that serve as essential nutrients (e.g., calcium, iron, magnesium, sodium, and potassium) typically pose little threat to ecological receptors when present in concentrations that allow them to function as nutrients. However, calcium received special consideration due to its potential presence at elevated concentrations due to its generation in historical waste streams at the site.

COPECs retained because they lacked ESVs, or non-detected analytes with method detection levels exceeding conservative ESVs, were reevaluated in the refined COPEC screening uncertainty section as part of the BERA Problem Formulation.

7.2.3 Ecological Effects Assessment

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

Based on the problem formulation and site conceptual exposure models, assessment endpoints, risk questions, and measurement endpoints were formulated for the terrestrial, transitional, and aquatic exposure areas. A summary of the risk questions and measurement endpoints selected for each assessment endpoint is provided in BERA Table 5-1, 5-2, and 5-3. In general, the assessment endpoints consist of the survival, growth, and reproduction of populations to support the maintenance of viable and functional communities in the various exposure areas.

Assessment endpoints include potential exposure to special status species (threatened or proposed threatened) that were identified by the USFWS IPaC query. Consistent with EPA's ecological risk assessment guidance, potential exposure to threatened species is evaluated based on the individual level of organization, as opposed to population level. Measurement endpoints for threatened species is based on comparisons of estimated daily doses to NOAEL toxicity reference value. Further evaluation of the assessment endpoints for special status species was conducted as part of the BERA Problem Formulation. Additional considerations for these assessment endpoints include an assessment of the potential for special status species to occur in site exposure areas based on documented occurrences and the potential for suitable habitat to support the special status species.

7.2.4 Ecological Risk Characterization

The BERA risk characterization presented risk estimates for direct contact and ingestion pathways and characterized risk for individual exposure areas within the terrestrial, transitional, and aquatic habitat categories. The findings of the BERA are summarized in this section to clearly identify the assessment procedures used, the potential risks identified, and the uncertainties associated with the conclusions. The BERA findings are evaluated for each ecological exposure area to support area-specific recommendations to guide risk management decision-making for the site.

7.2.4.1 Terrestrial Exposure Areas

The overall results of the BERA for the terrestrial exposure areas are presented in Table 7-3 (Table 8-1 of the BERA) and are summarized below.

Exposure Areas That Do Not Pose Risks Due to Site-Related Contamination – Terrestrial

Current conditions in the following terrestrial exposure areas at the site are not likely to result in adverse ecological effects resulting from exposure to site-related COCs:

- Eastern Undeveloped Area
- Northcentral Undeveloped Area
- Western Undeveloped Area
- Flathead River Riparian Area

Exposure Areas That Pose Risks Due to Site-Related Contamination – Terrestrial

Current conditions in the following terrestrial exposure areas at the site have the potential to result in adverse effects to terrestrial receptors:

- Main Plant Area
- Central Landfills Area
- ISM Grid Area (the Operational Area)
- Industrial Landfill Area

The key conclusions with respect to each of the above areas are presented below.

Main Plant Area

Risk estimates for the Main Plant Area, particularly in the northcentral portion of this exposure area, indicate the potential for adverse effects associated with exposure to PAHs in soil within localized areas proximal to former operations. Direct contact exposure to PAHs in the Main Plant Area may result in adverse direct contact effects to terrestrial invertebrates in these localized areas. Exposure estimates for PAHs in soil resulted in wildlife ingestion Hazard Quotient $(HQ)_{LOAEL}$ values that exceeded 1 for two avian receptors (the American woodcock and yellow-billed cuckoo), primarily due to the modeled ingestion of terrestrial invertebrates. In the northern portion of the Main Plant Area within the Operational Area footprint, there is potential for adverse effects for small mammals including the short-tailed shrew (exposure greater than the HQ_{LOAEL} at 5 of 90 stations) and meadow vole (exposure greater than the HQ_{LOAEL} at 9 of 90 stations).

Central Landfills Area

Risk estimates for the Central Landfills Area indicate the limited potential for adverse effects associated with exposure to PAHs and select metals, including copper, in soil within localized areas near the former Wet Scrubber Sludge Pond. The direct contact evaluation indicates that potential risk to soil invertebrates and terrestrial plants is low, although localized areas of PAHs and one elevated copper result at CFSB-002 (7,260 mg/kg) resulted in some NOEC and LOEC exceedances. Wildlife ingestion models indicate the potential for adverse effects to two avian receptors (the American woodcock and yellow-billed cuckoo) and short-tailed shrew associated with exposure to copper, PAHs, and Aroclor 1254 assuming conservative exposure assumptions. Wildlife exposure to copper and PAHs were influenced by localized sampling locations with elevated concentrations. Similar to the Main Plant Area, it is not likely that yellow-billed cuckoo would be exposed at estimated doses due to its rarity in Montana and the absence of basic habitat requirements in the Central Landfills Area. The modeled ingestion of terrestrial invertebrate prey items was the critical exposure pathway for wildlife receptors.

Incremental Sampling Methodology Grid

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

Industrial Landfill Area

Risk estimates for the Industrial Landfill Area indicate the limited potential for adverse effects associated with exposure to PAHs and select metals in soil. Risk estimates for the Industrial Landfill Area indicate limited potential for adverse effects associated with direct contact exposure to soil invertebrates and terrestrial plants. Wildlife ingestion models indicate estimated doses of nickel (American woodcock and short-tailed shrew) and HMW PAHs (American woodcock and yellow-billed cuckoo) resulting in HQ_{LOAEL} values from 1 to 5 in the Industrial Landfill Area, primarily due to the modeled ingestion of terrestrial invertebrate prey items. As a result, nickel and PAHs in soil at the Industrial Landfills Area represent a moderate risk to ecological receptors due to direct contact and indirect ingestion exposure pathways. Based on these findings, the potential for adverse effects to ecological receptors exposed to soil in localized areas of the Main Plant Area, Central Landfills Area, ISM Grid, and Industrial Landfill Area cannot be entirely dismissed under current conditions.

7.2.4.2 Transitional Exposure Areas

Transitional exposure areas were evaluated assuming both dry (terrestrial) and inundated (semiaquatic/aquatic) conditions. The overall results of the BERA for the transitional exposure areas are presented in Table 7-4 (Table 8-2 of the BERA; terrestrial scenario) and Table 7-5 (Table 8-3 of the BERA; aquatic scenario) and are summarized below.

Exposure Areas That Do Not Pose Risks Due to Site-Related Contamination – Transitional

Current conditions in the following transitional exposure areas at the site are not likely to result in adverse ecological effects resulting from the exposure to site-related COCs:

- Cedar Creek Reservoir Overflow Ditch
- Northern Surface Water Feature

Exposure Areas That Pose Risks Due to Site-Related Contamination – Transitional

Current conditions in the following transitional exposure areas at the site have the potential to result in adverse effects to ecological receptors:

- North Percolation Pond Area
- South Percolation Ponds

The key conclusions with respect to each of the above areas are presented below.

North Percolation Pond

Risk estimates for the North Percolation Pond Area indicate the potential for adverse effects based on exposure through direct contact and wildlife ingestion pathways. The greatest potential for adverse direct contact effects is associated with exposure to cyanide, fluoride, metals, and PAHs during inundated conditions in the Northeast Pond. Under dry scenarios, exposure to PAHs in soil exceeded NOEC values protective of soil invertebrates. Elevated risks associated with direct and indirect ingestion by wildlife receptors were also observed in the North Percolation Pond based on the results of the food chain modeling. Based on the risk estimates presented in the BERA, exposure to waste related COCs in multiple media in the North Percolation Ponds has the potential to adversely affect ecological receptors.

South Percolation Ponds

The potential for adverse effects associated with constituents in media at the South Percolation Ponds is considered minimal under dry scenarios, but moderate under inundated scenarios due to potential adverse effects associated with direct contact with cyanide, metals, and PAHs in surface water. During periods of inundation, exposure to cyanide and select metals in surface water has the greatest potential for adverse effects to temporary aquatic communities via direct contact exposure pathways. Risk associated with direct and indirect ingestion by wildlife receptors in South Percolation Pond media is minimal based on the results of the food chain modeling.

7.2.4.3 Aquatic Exposure Areas

The overall results of the BERA for the aquatic exposure areas are presented in Table 7-6 (Table 8-4 of the BERA) and are summarized in this section.

Exposure Areas That Do Not Pose Risks Due to Site-Related Contamination – Aquatic

The conditions in one aquatic exposure area and a portion of another do not pose significant potential for adverse ecological effects resulting from the presence of site-related COCs. These exposure areas include:

- Flathead River (excluding the Backwater Seep Sampling Area)
- Cedar Creek

Exposure Areas That Pose Risks Due to Site-Related Contamination – Aquatic

Exposure conditions in two aquatic exposure areas indicate the potential for adverse ecological effects due to direct contact pathways:

- Flathead River – Backwater Seep Sampling Area
- Flathead River Riparian Area Channel

The key conclusions with respect to these areas are presented below.

Flathead River – Backwater Seep Sampling Area

The evaluation of Flathead River sediment, sediment porewater, and surface water data indicate that the greatest potential for ecological exposure to site-related constituents is associated with direct contact exposure within the Backwater Seep Sampling Area, and areas where groundwater containing cyanide and fluoride discharges to surface water. Surface water exposure was greatest to cyanide (total and free), barium, and aluminum, with greater concentrations observed in the Backwater Seep Sampling Area and adjacent stations immediately downstream of the Backwater Seep Sampling Area (CFSWP-026 through CFSWP-028). Attenuation of surface water concentrations occurs rapidly with increasing distance from the Backwater Seep Sampling Area, particularly during periods of elevated discharge within the Flathead River. Outside of the stations within the Backwater Seep Sampling Area and stations along the shoreline immediately downstream of the Backwater Seep Sampling Area (CFSWP-026 through CFSWP-028), free and total cyanide concentrations did not exceed chronic NRWQC- and DEQ-7-based benchmarks, respectively, in multiple rounds of surface water sampling events. This finding indicates that the potential area of exposure to aquatic receptors at concentrations exceeding NOECs and LOECs based on NRWQC (free cyanide) and DEQ (total cyanide) benchmarks is spatially limited to a groundwater–surface water mixing zone along the shoreline within and immediately adjacent to the Backwater Seep Sampling Area. Potential risks associated with direct and incidental wildlife ingestion pathways are considered to be minimal in the Backwater Seep Sampling Area.

Flathead River Riparian Area Channel

The evaluation of sediment and surface water data in the Flathead River Riparian Area Channel indicate the potential for adverse effects associated with direct contact exposure of aquatic receptors to cyanide (total and free), fluoride, and metals (i.e., aluminum, barium, copper, and iron) in surface water. Surface water data indicate potential exposure to COCs may be influenced by groundwater discharge associated with the Backwater Seep Sampling Area and surface discharge from the South Percolation Ponds. A temporal analysis of COC concentrations in surface water indicates that the greatest chronic exposure to cyanide in the Flathead River Riparian Area Channel likely occurs during periods of elevated discharge within the Flathead River.

7.2.5 Uncertainty Discussion

A critical component of the BERA is the analysis of uncertainty that is inherent in the ERA process. A thorough uncertainty analysis is necessary to understand how potential uncertainty may affect the risk estimates and associated risk characterization that may be used to support risk management decision-making. Section 7 of the BERA provides an evaluation of the uncertainty associated with each of the following factors, including an assessment of whether the uncertainty would contribute to potential over- or underestimation of risk.

- Adequacy, representativeness, and quality of sampling data
- Temporal variability in exposure
- Exposure to pathways not included
- Potential exposure to constituents not detected in the datasets
- Potential exposure to constituents lacking ecotoxicity data
- Background evaluation methods
- Appropriateness of variables used in the dose rate models
- Uncertainty associated with the HQ method of estimating risk
- Uncertainty associated with acid volatile sulfide-simultaneously extracted metals results
- Calculation of HQs for large home range receptors
- Incremental and discrete soil sample results in the Operational Area

As with the BHHRA, the BERA presented the potential ecological risks using an RME approach that used conservative estimates and assumptions coupled with more realistic scenarios to ensure that actual site risks are not underestimated. Conservative assumptions regarding exposure concentrations, bioavailability of constituents, receptor selection/presence at a given exposure area, uptake of constituents into food and prey items, and the selection of benchmarks used to assess potential toxicity result in an estimate of ecological risk that is more likely to be overestimated than underestimated.

Section 8
Remedial Action Objectives

8.1 Remedial Action Objectives

Remedial action objectives (RAOs) are qualitative statements that describe what a remedial action is intended to accomplish at a site. RAOs serve as the design basis for many of the remedial alternatives which will be presented in the next section, and they facilitate the five-year review determination of protectiveness of human health and the environment.

RAOs can be specific to certain COCs, environmental media, and the exposure pathways and receptors to be protected. RAOs can take into consideration both current and future land use, as well as groundwater and surface water beneficial use designations. Based on the results of the risk assessments, preliminary RAOs were identified in collaboration with DEQ. The final RAOs were presented in the FS after legal review by both agencies. Additional modifications were made to the final RAOs in the Proposed Plan and are presented below, based on reasonable anticipated future use of each exposure area.

8.1.1 Solid Media

- Prevent ingestion, direct contact, and inhalation of contaminated soils and sediments that would result in unacceptable risk (cancer risk of 1E-5 or HQ>1) to human on-site receptors (workers [industrial, construction, stormwater, and landfill management]/trespassers) from arsenic and PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-c,d)pyrene) under reasonably anticipated future land uses using remedial goals in the ROD (Table 8-1).

- Eliminate exceedances of Montana DEQ-7 groundwater standards (Table 8-2) by reducing migration of arsenic, total cyanide, and fluoride from contaminated soils and wastes to groundwater.

- Eliminate unacceptable risk to aquatic receptors from direct contact with or ingestion of surface water or porewater by reducing migration of metals (aluminum, barium, cadmium, copper, iron, and zinc), cyanide, fluoride, and PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, fluoranthene, and indeno(1,2,3-C,D)pyrene) thereby eliminating exceedances of Montana DEQ-7 aquatic life criteria (Table 8-2).

- Eliminate unacceptable risk (LOEC- or LOAEL-based HQs greater than 1) for terrestrial and transitional ecological receptors by reducing ingestion of and direct contact with elevated concentrations of metals (barium, copper, nickel, selenium, thallium, vanadium, and zinc) and LMW/HMW PAHs and Aroclor 1254 from contaminated surficial and shallow soils using remedial goals in the ROD (Table 8.3).

- Eliminate ingestion and direct contact that would result in unacceptable risk (LOEC- or LOAEL-based HQs greater than 1)for aquatic and semi-aquatic ecological receptors by reducing contact with metals (barium, cadmium, lead, nickel, selenium, vanadium, and zinc), and LMW/HMW PAHs from contaminated surficial and shallow soils and sediments using remedial goals in the ROD (Table 8.3).

8.1.2 Groundwater

- Reduce total cyanide, fluoride, and arsenic concentrations in groundwater in the upper hydrogeologic unit that exceed Montana DEQ-7 standards, prevent further degradation of groundwater, and prevent expansion of the groundwater plume into groundwater that meets Montana DEQ-7 standards (Table 8-2).

- Prevent unacceptable risk to human receptors from ingestion of, or direct contact with, groundwater contaminated with arsenic, cyanide, and fluoride in excess of Montana DEQ-7 standards (Table 8-2).

- Eliminate exceedances of Montana DEQ-7 aquatic life criteria in surface water and porewater that can result in unacceptable risks to aquatic organisms through direct contact with or ingestion of contaminated water by reducing migration of cyanide in groundwater (Table 8-2).

8.1.3 Surface Water

- Reduce metals (aluminum, cadmium, copper, iron, and zinc), total cyanide, fluoride, and PAH (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-C,D)pyrene) concentrations in River Area DU5 surface water and sediment porewater to the aquatic life criteria identified in Montana DEQ-7 (Table 8-2) as applied to State of Montana B-1 class waters.

8.2 Remedial Goals

Remedial goals are target concentrations used to develop, evaluate, and select remedial alternatives. They are the numbers used to measure whether the RAOs are being met. Ideally, a remedy that achieves the remedial goals will comply with state and federal applicable relevant and appropriate requirements (ARARs) and reduce risk to levels that satisfy the NCP requirements for protection of human health and the environment.

8.2.1 Development of Preliminary Remedial Goals in the FS

Preliminary remedial goals (PRGs) were developed using the exposure assumptions from the BHHRA and BERA to be protective of the most sensitive receptor in a given exposure area based on the current and likely future use of that exposure area. In general, human health PRGs are risk-based values that, if not achieved, would result in a cancer risk of 1E-05 or a target HQ of 1 or greater. Similarly, ecological PRGs are risk-based values that, if not achieved, would result in a lowest observed effect concentration (LOEC) or lowest observed adverse effect level (LOAEL) -based HQ greater than 1 for ecological receptors. In addition, chemical-specific ARARs were also identified as PRGs where appropriate (i.e., groundwater, surface water, and sediment porewater) and are presented in Appendix A.

For the application of human health PRGs, consideration of potential receptors and exposure scenarios will be based on current and reasonably anticipated future use (e.g., industrial, commercial, residential) and activities (e.g., intermittent inspections versus full time commercial/industrial work) within human health exposure areas. For the application of ecological PRGs, consideration of potential receptor groups will be based on the availability of ecological habitats under current and reasonably anticipated future land use. The application of ecological PRGs within exposure areas will also consider the size of the home (foraging) range of the most sensitive wildlife receptor used as the basis for an ecological PRG, including small home range receptors. Ecological PRGs for small home range receptors will be applied on a point-by-point basis to understand the frequency and distribution of exceedances to evaluate the need for remedial action.

As discussed in the technical memorandums for PRG development (Appendices A and B of the FS work plan), the calculated, site-specific, risk-based PRGs for COCs in soil/sediment should not be regarded as not-to exceed values. Rather, based on the conservative assumptions and endpoints used in calculations, the calculated, site-specific PRGs for COCs in soil/sediment represent a conservative estimate of the average concentration that receptors could be exposed to that would be expected to result in minimal risk. As such, they need not be applied on a point-by-point basis and will instead by applied by the exposure point concentration (EPC) method. Using the EPC method, attainment of human health and ecological PRGs will generally be based on achieving EPCs calculated as the 95 percent upper confidence limit of the mean concentration (95UCLmean) that are equal to or less than human health or ecological PRGs within the respective exposure areas. This scenario may result (and often does) in constituents remaining in place within some limited areas at concentrations that exceed the calculated PRG. The exposure area as a whole would achieve protection of human health (i.e., cancer risk less than 1E-05, target HQ less than 1) and the environment (i.e., LOEC- and LOAEL-based HQ less than or equal to 1).

The EPC method described above for soil/sediment is not applicable for ARARs-based standards which will be considered “not-to-exceed” PRG values, excluding statutorily allowable exceedances, and will be applied on a point-by-point basis. At this site, groundwater and surface water PRGs are predominantly based on ARARs. In addition, PRGs based on background threshold values and PRGs for small home range receptors will be applied on a point-by-point basis to understand the frequency and distribution of exceedances to evaluate the need for remedial action and will not be compared to 95UCLmean EPCs. At this Site, the EPC method for calculated, site-specific PRGs pertain to risk-based PRGs (i.e., excluding PRGs based on background threshold values and PRGs for small home range receptors) for soil and sediment, for which ARARs do not exist.

The PRGs developed in the FS have been incorporated as remedial goals in this ROD and are discussed below.

8.2.2 Remedial Goals for Groundwater, Surface Water, and Sediment Porewater

Chemical-specific ARARs (DEQ-7 standards) were identified as human health remedial goals for groundwater and surface water (Table 8-2). Sediment porewater is addressed by the surface water standard. Barium is a COC in surface water but has no DEQ-7 aquatic life standard, so the remedial goal for barium in those surface water and sediment porewater is based on site-specific ecological risk and is 220 µg/L (chronic) and 2,000 µg/L (acute).

8.2.3 Remedial Goals for Soils and Sediment

Risk-based remedial goals were developed for soils and sediments to be protective of the most sensitive receptor in a given exposure area based on current and likely future use given a cancer risk of 1E-05 or target HQ less than 1, whichever is lower (Table 8-1). Remedial goals will vary by area depending on the human receptor present in each location. Table 8-3 provides the ecological remedial goals based on LOEC- and LOAEL-based HQs less than or equal to 1. Maps depicting locations with exceedances of PRGs for small range receptors are provided in Appendix B of the FS.

Section 9
Description of Alternatives

This section provides a brief explanation of the remedial alternatives developed for the five DUs and a comparison of their similarities and differences. These two elements allow the comparative analysis of alternatives in Section 10 to focus on the differences or similarities among alternatives with respect to the nine Superfund evaluation criteria.

Proven remedial technologies and process options were used in the FS to develop remedial alternatives for cleanup. Remedial technologies to address site groundwater contamination (FS Section 4) included in situ treatment, ex situ treatment, and containment (extraction wells, slurry walls, covers/caps, grout curtains, and sheet piling). Ex situ technologies are generally paired with groundwater extraction and treatment (pump and treat).

Results of the in situ technology screening analysis for groundwater are detailed in the FS (pages 90 to 96) and are briefly summarized in Figure 9-1. Screening also eliminated certain soil technologies that were determined to be infeasible or impracticable, such as off-site disposal.

Technologies that were not screened out were used to develop remedial alternatives for further evaluation. Those alternatives are presented in the description of remedy components below. EPA used information from the FS report and the NCP criteria to develop the Proposed Plan's Preferred Alternative for public comment.

Four in situ technologies were screened: groundwater performance monitoring, PRBs, chemical oxidation, and enhanced bioremediation.

- **Two technologies were screened out.** Chemical oxidation is complex and cost-prohibitive for large areas with low-concentration goals, and it is not effective for fluoride. Enhanced bioremediation is not effective for fluoride and for the complexed cyanide at the site.
- **Two treatment technologies moved forward and were incorporated into remedial options.** PRBs are limited to the River Area (cyanide is the only COC) as they cannot treat the combination of fluoride and cyanide found elsewhere. Groundwater performance monitoring regularly evaluates groundwater quality.

Seven ex situ technologies were screened.

- **Alkaline hydrolysis was screened out** as it is not effective for fluoride and requires high pressure and temperature.
- **Six treatment technologies moved forward and were retained for potential use.** They are adsorption, coagulation/flocculation/precipitation, ion exchange, reverse osmosis, photolysis (ferrocyanide only), and constructed wetlands.
- **In joint DU1/DU6, Alternatives 5A and 5B use traditional ex situ treatment** with a combination of one or more of the retained technologies (to be finalized in design). Flow rates for Alternatives 5A and 5B are too high for constructed wetlands. However, wetlands were included for use where occasional pumping was needed to maintain an inward gradient within a slurry wall (Alternatives 4A, 4B, and 4C).

Figure 9-1. Groundwater Treatment Technology Screening

9.1 Description of Remedy Components

The alternatives evaluated for each DU are described below. Costs are presented as estimated present value (PV) costs and also as 30-year totals for operation and maintenance. Cost estimates have an accuracy of minus 30% to plus 50%. Costs provided in Section 9 are as presented in the FS and Proposed Plan.

9.1.1 Landfills DU1/Groundwater DU6

The West Landfill and Wet Scrubber Sludge Pond in DU1, with an estimated 1.2 million cubic yards of contaminated waste, are the primary source of groundwater contamination in DU6, so these two DUs and their proposed remedies strongly influence each other.

Accordingly, DU1 and DU6 were addressed jointly in the FS and have the most remedial alternatives (12 collectively).

The 12 alternatives evaluated in the FS for DU1/DU6 are:

- Alternative 1: No Action
- Alternative 2: Containment via Capping and Groundwater Performance Monitoring
- Alternative 3A: Containment via Capping and Upgradient Slurry Wall
- Alternative 3B: Containment via Capping and Upgradient Slurry Wall with Downgradient PRB
- Alternative 3C: Containment via Capping, Upgradient Slurry Wall, and Downgradient Extraction
- Alternative 4A: Containment via Capping and Fully Encompassing Slurry Wall
- Alternative 4B: Containment via Capping, Fully Encompassing Slurry Wall, and Downgradient PRB
- Alternative 4C: Containment via Capping, Fully Encompassing Slurry Wall, and Downgradient Extraction
- Alternative 5A: Containment via Capping and Hydraulic Control at the Source Area
- Alternative 5B: Containment via Capping and Downgradient Hydraulic Control
- Alternative 5C: Containment via Capping and Hydraulic Control at the Source Area and Downgradient
- Alternative 6: Excavation with On-Site Consolidation

Most alternatives share one or more common elements. All remedial alternatives (excluding Alternatives 1 and 6) would use ICs and ECs to prevent exposure to human and ecological receptors. For all alternatives except Alternative 1, ICs would prevent or minimize human exposure to impacted groundwater.

Treatment of extracted groundwater is included in several alternatives and would use one or more technologies (such as adsorption, coagulation/flocculation/precipitation, constructed wetlands, photolysis, electrocoagulation, ion exchange, and/or reverse osmosis). Treatment decisions would be made in the design phase, as approved by EPA.

9.1.1.1 Alternative 1: No Action

- No action

Estimated Capital Costs: $0
Estimated Operation and Maintenance Costs: $1,859,250 (30 years) and $769,050 (PV)
Estimated Total Alternative Cost: $769,050 (PV)

The Superfund law requires EPA to retain a no further action alternative as a baseline for comparison to other alternatives. Costs are for inspection and maintenance of existing caps on the West Landfill, the Wet Scrubber Sludge Pond, and the Center Landfill and maintenance of existing fencing.

9.1.1.2 Alternative 2: Containment via Capping and Groundwater Performance Monitoring

- Low-permeability caps
- Groundwater performance monitoring
- ICs and ECs

Estimated Capital Costs: $11,478,683
Estimated Operation and Maintenance Costs: $6,537,000 (30 years) and $2,703,930 (PV)
Estimated Total Alternative Cost: $14,182,613 (PV)

In-Place Capping

A low-permeability membrane cap or geosynthetic clay liner would be installed at the Wet Scrubber Sludge Pond and the Center Landfill to prevent the infiltration of water (Figure 9-2). All caps, including the existing cap at the West Landfill, would be inspected and maintained.

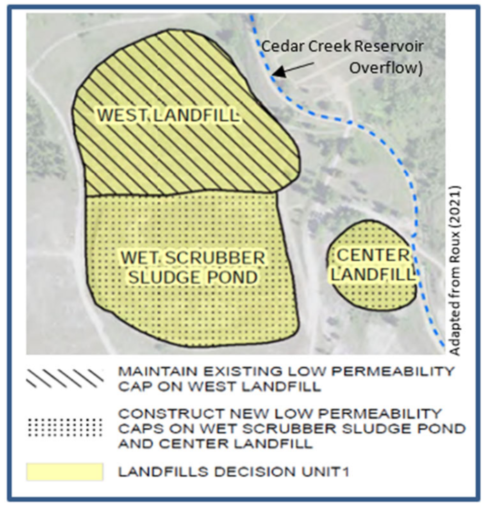

Figure 9-2. DU1/DU6 Alternative 2

Groundwater Performance Monitoring

Groundwater performance monitoring will be conducted to evaluate how well attenuation processes such as dilution and adsorption reduce contaminant concentrations after source control measures have been constructed. Monitoring at or around each waste management unit will be conducted for COCs and other parameters and would assess remedy performance. Monitoring would occur in June and October for the first 5 years to document high- and low-water conditions, with a potential for annual monitoring thereafter. Monitoring would continue until the remedial action objectives are achieved or for a minimum of 30 years.

ICs and ECs

Landfill ICs would include property restrictions for the Landfills DU1 waste management units to prevent activities that could compromise the function or integrity of the caps/containment systems or result in potential exposure to receptors. ECs would include fencing and signage around waste management perimeters to restrict access to human receptors and some ecological receptors.

Groundwater ICs would include property restrictions to prohibit water use and might include designation of a Controlled Groundwater Area to prevent potable use of the contaminated groundwater.

Five-Year Reviews

Reviews would be conducted every 5 years to ensure continued performance of the remedy, consistent with Superfund requirements.

9.1.1.3 Alternative 3A: Containment via Capping and Upgradient Slurry Wall

- Low-permeability caps
- Upgradient slurry wall
- Groundwater performance monitoring and ICs and ECs (as for Alternative 2)

Estimated Capital Costs: $25,012,360
Estimated Operation and Maintenance Costs: $6,537,000 (30 years) and $2,703,930 (PV)
Estimated Total Alternative Cost: $27,716,290 (PV)

This alternative is identical to Alternative 2, except for the addition of a slurry wall immediately upgradient of the West Landfill and Wet Scrubber Sludge Pond (Figure 9-3) to divert uncontaminated groundwater and surface water runoff around the source area, thereby preventing contamination of additional material.

These waste management units are the primary sources of contaminants to groundwater. The Center Landfill would not be included in the footprint of the slurry wall because wells associated with the landfill meet preliminary remedial goals. The slurry wall would be placed at depths of 100 to 125 feet in a location upgradient of the waste management units.

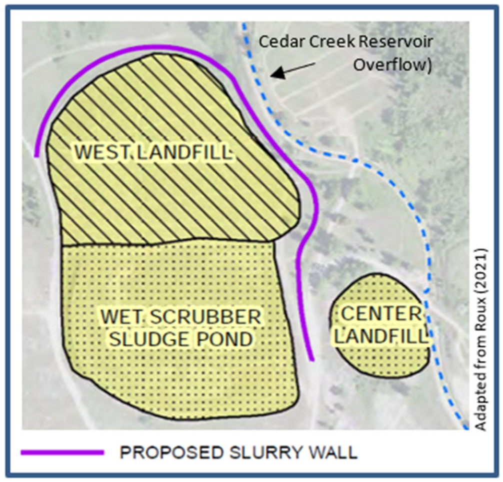

Figure 9-3. DU1/DU6 Alternative 3A

9.1.1.4 Alternative 3B: Containment via Capping and Upgradient Slurry Wall with Downgradient PRB

- Low-permeability caps
- Upgradient slurry wall
- Downgradient PRB
- Groundwater performance monitoring and ICs and ECs (as for Alternative 2)

Estimated Capital Costs: $75,093,899
Estimated Operation and Maintenance Costs: $6,837,000 (30 years) and $2,828,020 (PV)
Estimated Total Alternative Cost: $77,921,920 (PV)

This alternative is identical to Alternative 3A, except for the addition of a PRB (Figure 9-4) north of the Burlington Northern Santa Fe rail tracks to treat cyanide in groundwater before it can discharge to River Area seeps and porewater. The PRB would be about 3,785 feet long and 24 to 36 inches wide, extend 60 to 130 feet below ground surface, and would span the downgradient extent of the cyanide plume where concentrations exceed the preliminary remedial goal of 200 µg/L. The PRB would have a design life of 30 years.

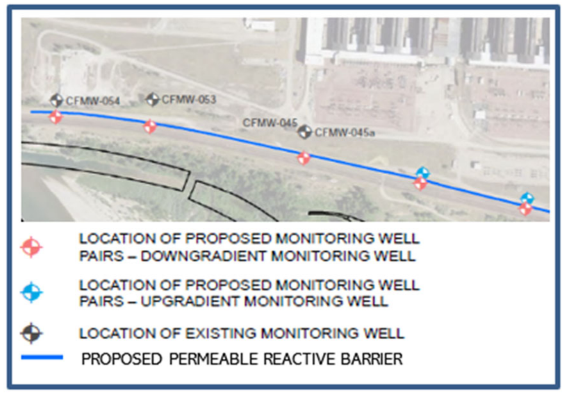

Figure 9-4. Downgradient Component of DU1/DU6 Alternatives 3B, 4B, and 5B

9.1.1.5 Alternative 3C: Containment via Capping, Upgradient Slurry Wall, and Downgradient Extraction

- Low-permeability caps
- Upgradient slurry wall
- Downgradient groundwater extraction and treatment of cyanide
- Groundwater performance monitoring and ICs and ECs (as for Alternative 2)

Estimated Capital Costs: $36,981,109
Estimated Operation and Maintenance Costs: $61,110,600 (30 years) and $25,277,465 (PV)
Estimated Alternative Cost: $62,258,574 (PV)

This alternative is identical to Alternative 3A, except for the addition of extraction wells (Figure 9-5) north of the Burlington Northern Santa Fe rail tracks to treat cyanide in groundwater before it can further migrate and discharge to River Area seeps and porewater. Groundwater would be pumped to an aboveground treatment system where it would be treated by physical and chemical processes. Treated groundwater would be recharged back to the hydrogeologic system using infiltration basins in accordance with federal and state standards.

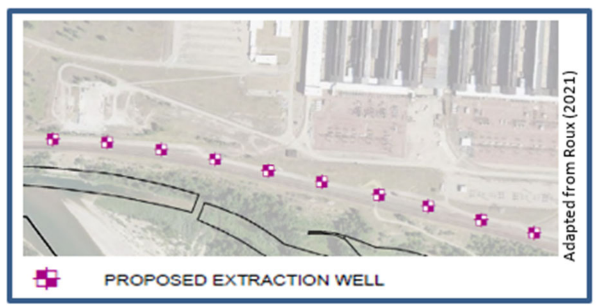

Figure 9-5. Downgradient Component of DU1/DU6 Alternatives 3C, 4C, and 5C

9.1.1.6 Alternative 4A: Containment via Capping and Fully Encompassing Slurry Wall

- Low-permeability caps
- Fully encompassing slurry wall
- Groundwater performance monitoring and ICs and ECs (as for Alternative 2)

Estimated Total Capital Costs: $38,999,937
Estimated Operation and Maintenance Costs: $16,059,000 (30 years) and $6,642,560 (PV)
Estimated Total Alternative Cost: $45,642,497 (PV)

This alternative is identical to Alternative 2 with the addition of a slurry wall (Figure 9-6). The slurry wall *fully encompasses* the West Landfill and Wet Scrubber Sludge Pond, creating a containment cell and containing contaminated groundwater at the source area.

Groundwater levels would be monitored to assess direction of groundwater flow across the barrier. An inward flow would show that contaminated groundwater has no potential to migrate out of the cell. Lacking that, the potential for groundwater movement and contaminant migration would be closely monitored and evaluated to ensure that contamination does not migrate out of the cell. If necessary, wells inside the slurry wall could provide groundwater extraction. Pumping required to maintain an inward gradient, if any, is expected to be periodic and minimal given that the cell would be designed and constructed in a manner to prevent entry of water. Extracted groundwater would be treated and discharged.

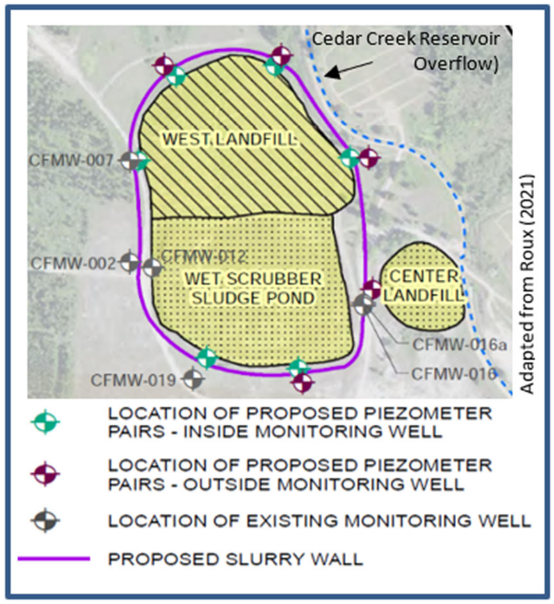

Figure 9-6. DU1/DU6 Alternative 4A

9.1.1.7 Alternative 4B: Containment via Capping, Fully Encompassing Slurry Wall, and Downgradient PRB

- Low-permeability caps
- Fully encompassing slurry wall
- Downgradient PRB
- Groundwater performance monitoring and ICs and ECs (as for Alternative 2).

Estimated Capital Costs: $89,081,476
Estimated Operation and Maintenance Costs: $16,059,000 (30 years) and $6,642,560 (PV)
Estimated Total Alternative Cost: $95,724,036 (PV)

This alternative is identical to Alternative 4A, except for the addition of a PRB north of Burlington Northern Santa Fe rail tracks to treat cyanide in groundwater prior to discharge at the River Area seeps, as described and shown in Alternative 3B (Figure 9-4).

9.1.1.8 Alternative 4C: Containment via Capping, Fully Encompassing Slurry Wall, and Downgradient Extraction

- Low-permeability caps
- Fully encompassing slurry wall
- Downgradient groundwater extraction and treatment of cyanide
- Groundwater performance monitoring and ICs and ECs (see Alternative 2)

Estimated Capital Costs: $49,025,609
Estimated Operation and Maintenance Costs: $61,110,600 (30 years) and $25,277,465 (PV)
Estimated Total Alternative Cost: $74,303,074 (PV)

This alternative is identical Alternative 4A, except for the addition of extraction wells north of the Burlington Northern Santa Fe rail tracks to treat cyanide in groundwater prior to discharge at the Seep. Extracted groundwater would be treated and discharged as described and shown for Alternative 3C (Figure 9-5).

9.1.1.9 Alternative 5A: Containment via Capping and Hydraulic Control at the Source Area

- Low-permeability caps
- Hydraulic control at the source area. through extraction of groundwater
- Groundwater extraction and treatment of cyanide
- Groundwater performance monitoring and ICs and ECs (as for Alternative 2)

Estimated Capital Costs: $38,582,066
Estimated Operation and Maintenance Costs: $69,351,000 (30 years) and $28,685,981 (PV)
Estimated Total Alternative Cost: $67,268,047 (PV)

This alternative has no slurry walls and is the same as Alternative 2 with the addition of hydraulic control at the source area (Figure 9-7) to capture contaminated groundwater prior to migration. Extraction wells would be installed immediately downgradient of DU1. Lessening the migration of contaminants from the source area would reduce the rate of contaminant loading to the hydrogeologic system.

Groundwater performance monitoring and other monitoring would document contaminant concentrations in groundwater, surface water, and porewater. Extracted groundwater would be treated and disposed (similar to Alternative 3C).

Additional investigation of aquifer characteristics, vertical extent of cyanide and fluoride, pump tests, and numerical modeling would be needed to finalize the number, locations, configurations, and pumping rates of the extraction wells.

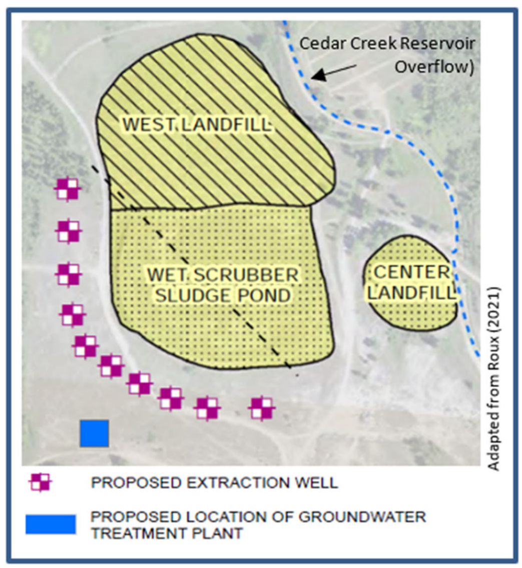

Figure 9-7. DU1/DU6 Alternative 5A

9.1.1.10 Alternative 5B: Containment via Capping and Downgradient Hydraulic Control

- Low-permeability caps
- Downgradient hydraulic control and treatment of cyanide in extracted groundwater

- Groundwater performance monitoring and ICs and ECs (as for Alternative 2)

Estimated Capital Costs: $23,447,432
Estimated Operation and Maintenance Costs: $61,110,600 (30 years) and $25,277,465 (PV)
Estimated Total Alternative Cost: $48,724,897 (PV)

This is identical to Alternative 5A, except that the extraction wells are located farther downgradient (north of the Burlington Northern Santa Fe rail tracks) as described for Alternative 3C (Figure 9-5). There are no wells near DU1.

9.1.1.11 Alternative 5C: Containment via Capping and Hydraulic Control at the Source Area and Downgradient

- Low-permeability caps
- Hydraulic control at source area and downgradient
- Treatment of extracted groundwater
- Groundwater performance monitoring and ICs and ECs (as for Alternative 2)

Estimated Capital Costs: $47,986,164
Estimated Operation and Maintenance Costs: $122,082,000 (30 years) and $50,497,352 (PV)
Estimated Total Alternative Cost: $98,483,516 (PV)

This alternative combines alternatives 5A and 5B, with extraction wells in two locations: immediately downgradient of DU1 (Figure 9-7) and farther downgradient (north of the Burlington Northern Santa Fe rail tracks) (Figure 9-5).

9.1.1.12 Alternative 6: Excavation with On-Site Consolidation

- Excavate contaminated waste and soil and consolidate on-site
- Low-permeability cap on the Central Landfills Area
- Groundwater performance monitoring and ICs and ECs (as for Alternative 2)

Estimated Capital Costs: $157,765,708
Estimated Operation and Maintenance Costs: $18,918,000 (30 years) and $7,825,141 (PV)
Estimated Total Alternative Cost: $165,590,849 (PV)

This is the only alternative for DU1/DU6 to include excavation of contaminated waste and soil (Figure 9-8)**.** Source material from the West Landfill and Wet Scrubber Sludge Ponds, including wastes and underlying soils contributing to groundwater contamination, would be excavated and consolidated in a newly

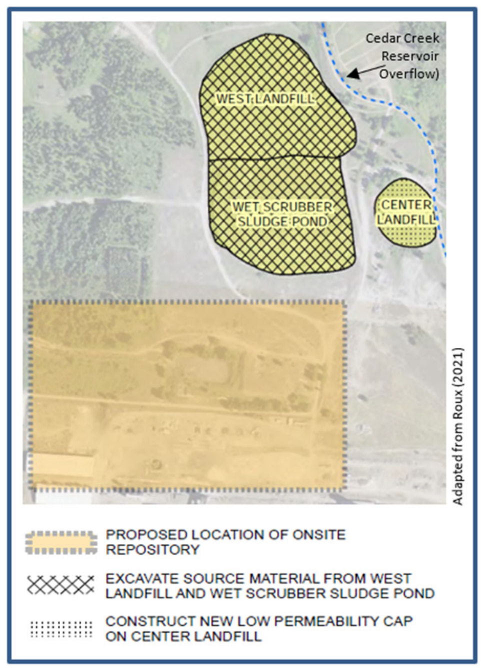

Figure 9-8. DU1/DU6 Alternative 6

constructed on-site repository meeting substantive RCRA Subtitle C requirements for modern hazardous waste impoundments.

Excavated areas would be backfilled and compacted to restore a positive grade and topography. Fill material could be sourced on-site, imported, or a combination of the two. The areas would be revegetated. Disposal volumes are estimated at 820,000 cubic yards for the West Landfill and 575,000 cubic yards for the Wet Scrubber Sludge Pond.

A low-permeability membrane cap or geosynthetic clay liner cap would be installed on the Center Landfill under this alternative. Groundwater Performance Monitoring and five-year reviews would be the same as for Alternative 5A. ICs and ECs would be used for the Center Landfill and the newly constructed repository.

9.1.2 Landfills DU2

The two alternatives evaluated for DU2 are:

- Alternative 1: No Action
- Alternative 2: Containment via Capping

9.1.2.1 Alternative 1: No Action

- No action

Estimated Capital Costs: $0
Estimated Operation and Maintenance Costs: $1,928,550 (30 years) and $797,715 (PV)
Estimated Total Alternative Cost: $797,715 (PV)

No further action would be taken. Costs are for maintenance of the existing caps on the East Landfill and Sanitary Landfill, maintenance of the existing soil covers on the Asbestos Landfills, and maintenance of existing fences to limit access.

9.1.2.2 Alternative 2: Containment via Capping

- Maintain existing caps on East Landfill and Sanitary Landfill
- Cap the Industrial Landfill
- Improve existing soil covers at the Asbestos Landfills
- ICs and ECs

Estimated Capital Costs: $6,169,608
Estimated Operation and Maintenance Costs: $1,928,550 (30 years) and $797,715 (PV)
Estimated Total Alternative Cost (PV): $6,967,323

A low-permeability membrane cap or geosynthetic clay liner cap would be installed at the Industrial Landfill after grading and on-site consolidation of excavated materials from other DUs (Figure 9-9). Existing soil cover at the Asbestos Landfills would be improved and the existing cap at Sanitary Landfill would be maintained.

ICs would include deed restrictions for the waste management units to prevent activities that could compromise the function or integrity of the caps/containment systems or result in potential exposure to receptors. Agricultural or residential use would be prohibited on waste management units. ECs such as fencing and signage around the perimeter of the would restrict access to human receptors and some ecological receptors. Reviews would be conducted once every 5 years to ensure continued performance of the remedy.

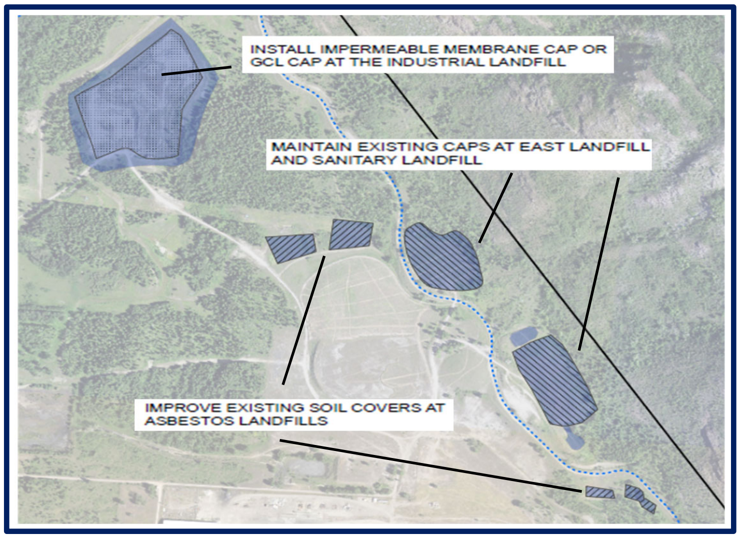

Figure 9-9. DU2 Alternative 2

9.1.3 Soils DU3

The four alternatives evaluated for DU3 are:

- Alternative 1: No Action
- Alternative 2: Covers with Hot Spot Excavation
- Alternative 3: In-Place Phytoremediation with Hot Spot Excavation
- Alternative 4: Excavation with On-Site Consolidation

Differences between the alternatives are essentially what to cover, excavate, or phytoremediate. There are seven areas of concern (AOCs) with impacted surficial and shallow soils within DU3. The estimated area and volume of impacted soil in AOCs A through G are 7.6 acres and 25,670 cubic yards, respectively. The exact extents of the AOCs will be delineated during remedial design.

9.1.3.1 Alternative 1: No Action

- No action

Estimated Capital Costs: $0
Estimated Operation and Maintenance Costs: $0
Estimated Total Alternative Cost: $0 (PV)

9.1.3.2 Alternative 2: Covers with Hot Spot Excavation

- Covers with hot spot excavation
- ICs and ECs

Estimated Capital Costs: $1,267,440
Estimated Operation and Maintenance Costs: $819,240 (30 years) and $338,866 (PV)
Estimated Total Alternative Cost: $1,606,306 (PV)

A soil cover would be installed for select areas (AOCs C through E) to prevent contact with impacted soil (Figure 9-10). ICs in cover areas would ensure that covers are maintained, or acceptable alternative covers (such as buildings or pavement) are constructed as part of any future development. Discontinuous and isolated soil hot spots (limited areas of elevated COC concentrations is soils) outside of cover footprints would be excavated as needed. Excavated materials could be consolidated underneath the covers, if appropriate, or disposed of on-site at an existing waste disposal facility or a new, agency-approved, engineered repository selected during remedial design.

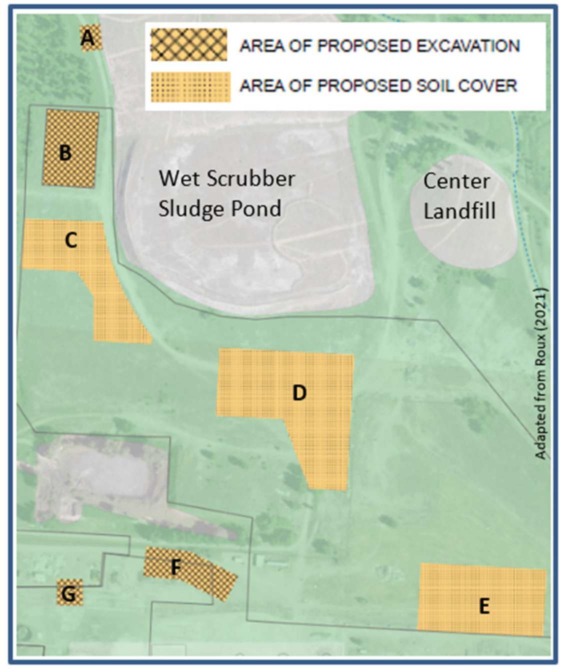

Figure 9-10. DU3 Alternative 2

Impacted material in the Former Drum Storage Area (B) (roughly 2,800 cubic yards) would be excavated and at an existing waste disposal facility or a new, agency-approved, engineered repository selected during remedial design.

Impacted material in AOCs A, F, and G (approximately 2,800 cubic yards) would be excavated and disposed of at an existing waste disposal facility or a new, agency-approved, engineered repository selected during remedial design or consolidated within AOCs C through E underneath a soil cover.

ECs encompassing the footprints of the soil covers would prevent intrusive activities and damage to the covers. ICs may include deed restrictions to ensure future development is consistent with and does not compromise the effectiveness of the remedy. Construction of acceptable alternative covers (such as buildings or pavement) as part of future development would be consistent with this alternative.

9.1.3.3 Alternative 3: In-Place Phytoremediation with Hot Spot Excavation

- Covers with hot spot excavation
- Phytoremediation in place
- ICs and ECs

Estimated Capital Costs: $775,851
Estimated Operation and Maintenance Costs: $563,953 (30 years) and $396,097 (PV)
Estimated Total Alternative Cost: $1,171,948 (PV)

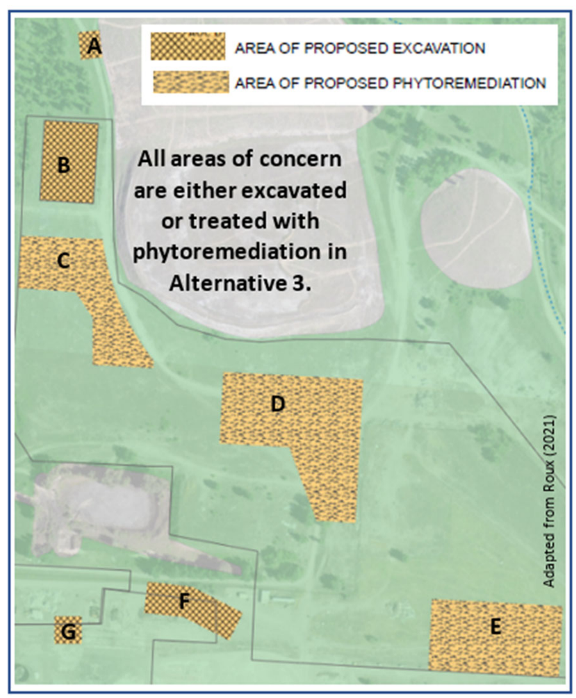

Figure 9-11. DU3 Alternative 3

PAH-impacted material in AOCs C through E would be treated in place by phytoremediation (Figure 9-11).

Discontinuous or isolated soil hot spots outside of the treatment footprints would be excavated, as needed. Excavated materials would be consolidated within treatment areas, if appropriate, or disposed at an existing waste disposal facility or a new, agency-approved, engineered repository selected during remedial design. ICs and ECs would be used to protect phytoremediation areas until treatment is complete.

9.1.3.4 Alternative 4: Excavation with On-Site Consolidation

- Excavate contaminated soils
- Consolidate soils on-site

Estimated Capital Costs: $1,237,989
Estimated Operation and Maintenance Costs: $0
Estimated Total Alternative Cost: $1,237,989 (PV)

All impacted material exceeding small range receptor preliminary remedial goals and/or resulting in exceedances of preliminary remedial goals would be excavated (roughly 25,000 cubic yards) (Figure 9-12) with disposal on-site at an existing waste disposal facility or a new, agency-approved, on-site engineered repository selected during remedial design.

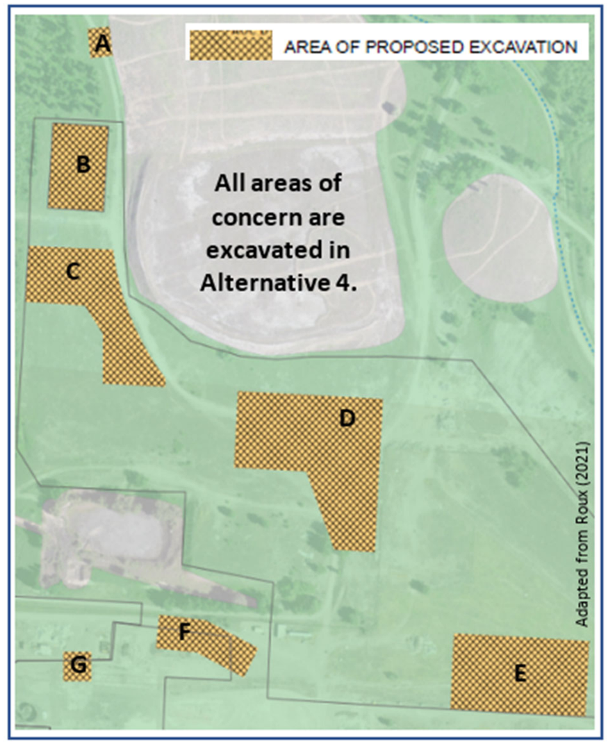

Figure 9-12. DU3 Alternative 4

9.1.4 North Percolation Ponds DU4

The four alternatives evaluated for this DU are:

- Alternative 1: No Action
- Alternative 2: Limited Excavation with Covers
- Alternative 3: Excavation with Cover
- Alternative 4: Excavation with On-Site Consolidation

The primary difference between the alternatives is the amount of excavation.

9.1.4.1 Alternative 1: No Action

- No action

Estimated Capital Costs: $0
Estimated Operation and Maintenance Costs: $0
Estimated Alternative Cost: $0

9.1.4.2 Alternative 2: Limited Excavation with Covers

- Limited excavation with covers
- ICs and ECs

Estimated Capital Costs: $2,493,668
Estimated Operation and Maintenance Costs: $1,536,000 (30 years) and $635,343 (PV)
Estimated Total Alternative Cost: $3,129,010 (PV)

Stormwater pipes leading to the North Percolation Pond system would be decommissioned and contaminated material in the ditches flowing to and from the ponds would be excavated and consolidated in the Northeast Percolation Pond (Figure 9-13). Soil covers would be installed at both percolation ponds to prevent contact with impacted material. Physical solidification of sludge and sediment may be needed to support the soil covers.

Deed restrictions would restrict development and fencing would prevent exposure to human receptors and some ecological receptors. A commercial use designation would reflect assumptions in the risk assessments.

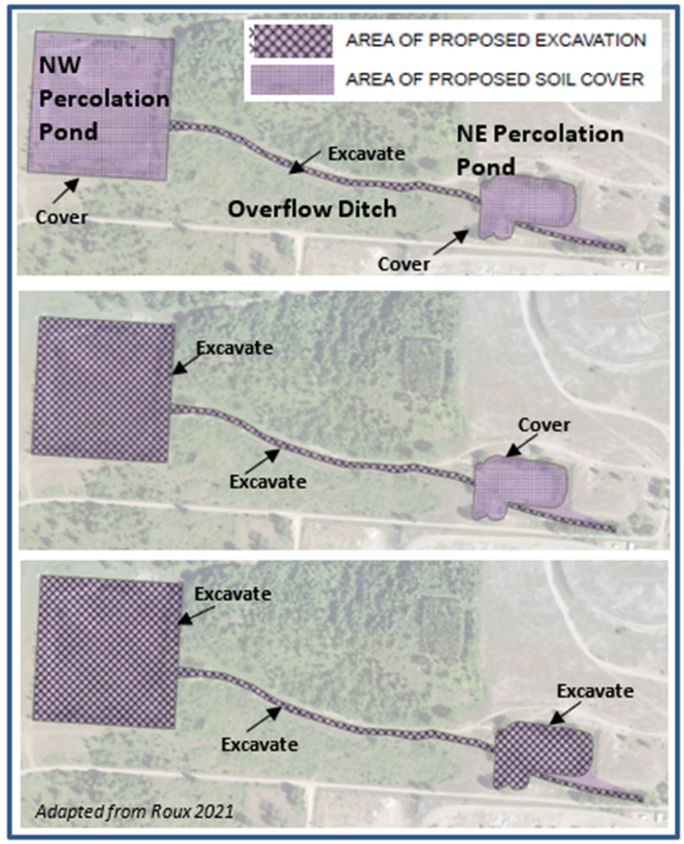

Figure 9-13. DU4 Alternatives 2, 3, and 4 (top to bottom)

9.1.4.3 Alternative 3: Excavation with Cover

- Excavation with cover
- ICs and ECs

Estimated Capital Costs: $1,972,829
Estimated Operation and Maintenance Costs: $902,400 (30 years) and $373,264 (PV)
Estimated Total Alternative Cost: $2,346,093 (PV)

This alternative is identical to Alternative 2 except that **impacted material in the Northwest Percolation Pond would be excavated** (Figure 9-13). Material would be consolidated in the Northeast Percolation Pond which would receive a soil cover.

9.1.4.4 Alternative 4: Excavation with On-Site Consolidation

- Excavation
- On-site consolidation

Estimated Capital Costs: $2,286,195
Estimated Operation and Maintenance Costs: $0
Estimated Total Alternative Cost: $2,286,195 (PV)

Alternative 4 is identical to Alternative 2 except that ***all* impacted material that exceeds preliminary remedial goals (about 35,180 cubic yards) would be excavated** (Figure 9-13) with disposal on-site at an existing waste disposal facility or a new, agency-approved, on-site engineered repository selected during remedial design. This includes impacted materials from the ditches and both percolation ponds. To eliminate the influx of COCs, stormwater influent pipes from or to the North Percolation Pond system would be decommissioned.

9.1.5 River Area DU5

The Superfund removal action at the South Percolation Ponds was completed in 2021 and cost approximately $1,660,000 (Roux 2021b). The pipe that transported stormwater into the South Percolation Pond system was decommissioned, and impacted sediment in the South Percolation Ponds was excavated and disposed at the Industrial Landfill.

Long-term monitoring would be conducted for DU5 to document the reduction of total cyanide concentrations in surface water and free cyanide concentrations in porewater (Figure 9-14). The decrease in cyanide concentrations will depend on the effectiveness of groundwater remediation (DU1/DU6 alternatives previously described). Initial monitoring would also include surface water metal COCs that exceed preliminary remedial goals (aluminum, barium, copper, and iron) to demonstrate that the South Percolation Pond removal action eliminated the source of aluminum and other metals to surface water in DU5.

Other metals (arsenic, lead, mercury, and thallium), fluoride, and PAHs, which have exceeded the DEQ-7 surface water standards for human health in at least one sample, would be monitored until agency approval to stop is granted.

Long-term monitoring would be performed in June and October for the first 5 years to document high- and low-water conditions. The frequency of monitoring may then be reduced to an annual basis. Monitoring would continue until the remedial action objectives are achieved or for a minimum of 30 years. Details would be identified in remedial design.

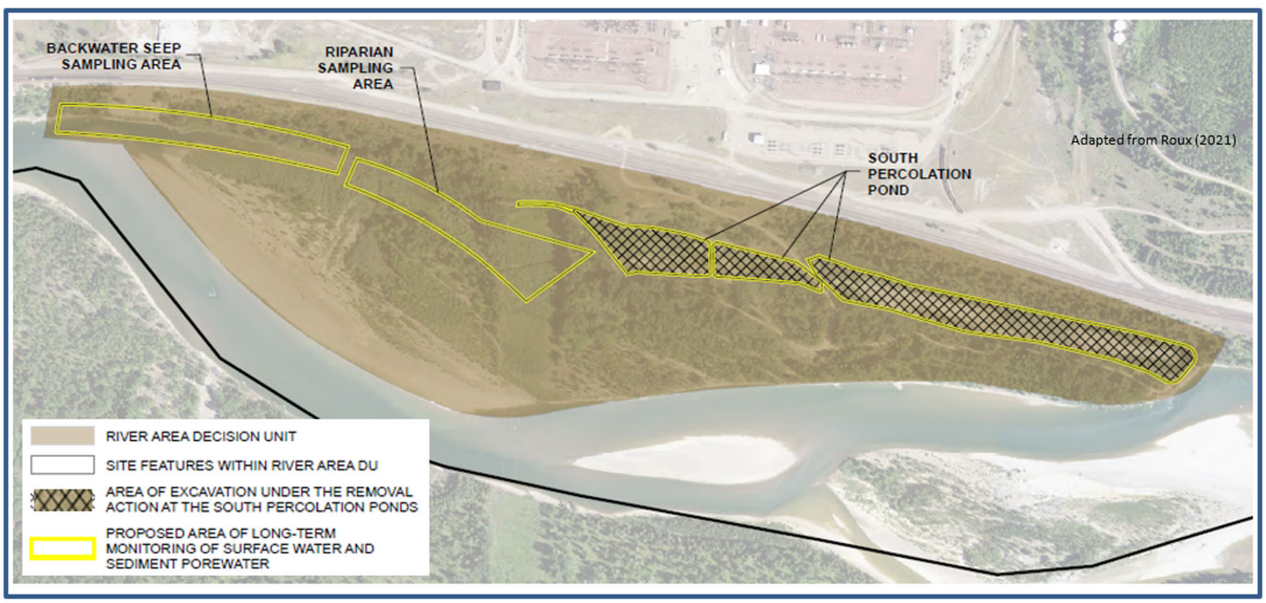

Figure 9-14. Depiction of River Area DU5

9.2 Common Elements and Distinguishing Features of Each Alternative

The following describes common elements and distinguishing features unique to each response option for each DU or DU combination. ARARs, long-term reliability, waste management/disposal, time for construction, time to reach goals, and costs are addressed briefly. These elements are discussed in greater detail in the evaluation of retained alternatives (Section 10). Because the remedy for DU5 was completed after the FS (with the exception of long-term monitoring) it is not included in this subsection.

9.2.1 Landfills DU1/Groundwater DU6

All of the alternatives, except no action, include containment by installation of low permeability caps to eliminate a direct contact pathway and prevent infiltration of precipitation. They use long-term performance monitoring to assess results of the remedial action and use ICs/ECs to protect the remedy (Figure 9-15).

- Alternative 1 (no further action) and Alternative 6 (excavation and on-site consolidation) represent the two opposing ends of the remedial spectrum. Alternative 1 takes no further action and Alternative 6 seeks to remove and contain the primary contaminant source.
- Alternative 2 uses capping, long-term monitoring, and ICs/ECs as described in Section 9-1. Alternatives 3, 4, and 5 build on Alternative 2 and seek to control the plume and limit or eliminate contaminant loading to the plume. They rely on four additional technologies (slurry walls, hydraulic controls, PRBs, and downgradient extraction) alone or in combination.

Remedy Component	Alternative											
	1	2	3			4			5			6
			A	B	C	A	B	C	A	B	C	
No further action	●											
Containment by capping		●	●	●	●	●	●	●	●	●	●	●
Performance Monitoring		●	●	●	●	●	●	●	●	●	●	●
Institutional and engineering controls		●	●	●	●	●	●	●	●	●	●	●
Upgradient slurry wall			●	●	●							
Downgradient PRB				●			●					
Downgradient extraction					●			●		●	●	
Fully encompassing slurry wall						●	●	●				
Hydraulic control at source area									●		●	
Excavation with on-site consolidation												●

Figure 9-15. DU1/DU6 Alternatives Components

- Alternatives 3A, 3B, and 3C use an upgradient slurry wall to limit the amount of groundwater entering the source area.
    - Alternative 3B adds a PRB downgradient of the source to treat contaminants that would otherwise leave the source area.
    - Alternative 3C adds downgradient extraction rather than a PRB to prevent contaminated groundwater from leaving the source area.
- Alternatives 4A, 4B, and 4C use a fully encapsulating slurry wall instead of an upgradient slurry wall to limit the flow of groundwater entering *and* leaving the source area.

  - Alternative 4B (like Alternative 3B) adds a PRB downgradient of the source to treat contaminants that would otherwise leave the source area.
  - Alternative 4C (like Alternative 3C) adds downgradient extraction rather than a PRB to prevent contaminated groundwater from leaving the source area.
- Alternatives 5A, 5B, and 5C use groundwater pumping instead of slurry walls or PRBs to control groundwater in the source area.
  - Alternative 5A relies on hydraulic control at the source area to capture groundwater prior to migration.
  - Alternative 5B uses downgradient extraction.
  - Alternative 5C uses *both* hydraulic control at the source area and downgradient extraction.
- Alternative 1 would not meet ARARs for ecological receptors in DU5 and Alternative 2 does not address the soil contamination. The remaining alternatives would be capable of meeting the ARARs (Section 10 and Appendix A)
- Alternative 6 is the only alternative to require significant handling and excavation of wastes, much of which are anticipated to be highly unstable due to contact with water. Excavated wastes would be disposed on-site in a newly constructed, agency-approved on-site repository that meets the substantive requirements of RCRA Subtitle C for disposal facilities. In contrast, waste management and disposal for Alternatives 3, 4, and 5 would be limited to management of wastes generated by treatment of extracted groundwater.
- Estimated time to construct the remedy varies from 1 to 5 years, with Alternative 6 taking the longest. The implementability of alternatives using PRB technology (Alternatives 3B and 4B) is a concern given the depth and scale needed to install and operate the technology. Implementability is also a concern with Alternatives 5A and 5C which use hydraulic control in the source area, as flow rates vary greatly which would require a large and complex treatment system for cyanide, fluoride, and arsenic.
- Estimated time to reach remedial goals related to the quality of water in DU5 seeps is 4 to 5 years. As with the time to construct, the effectiveness of alternatives using PRB technology (Alternative 3B and 4B) is a concern. There are also concerns about the effectiveness of the alternatives that rely solely on a groundwater treatment system (Alternatives 5A and 5C).
- Long-term performance monitoring would be required for all alternatives.
- ICs/ECs would be required for Alternatives 2, 3, 4, and 5. Alternative 6 would remove the source area through excavation, but ICs/ECs would be needed to protect the disposal location.
- Estimated PV costs range from $769,050 for Alternative 1 to $165,590,849 for Alternative 6.

9.2.2 Landfills DU2

Alternatives for DU2 are limited to no further action (Alternative 1) and containment by capping (Alternative 2) (Figure 9-16). They share no common elements.

- The estimated time for construction is one season for Alternative 2, and the remedial goals are expected to be met within two years. Alternative 1 would not meet remedial goals.
- ICs/ECs are required for Alternative 2 to maintain the cap.

Remedy Component	Alternative	
	1	2
No further action	●	
Containment by capping		●
Institutional and engineering controls		●

Figure 9-16. DU2 Alternative Components

- Alternative 2 is significantly more expensive that Alternative 1 (PV costs of $6,967,323 vs $797,715).

9.2.3 Soils DU3

DU3 Alternatives 2, 3, and 4 address risk from contaminated soils through options that vary in the number of AOCs excavated and the treatment of those AOCs that are not excavated (Figure 9-17).

- Alternatives 2 and 3 excavate only the four AOCs (A, B, F, and G) that are hot spots. Alternative 2 installs a soil cover over the three remaining AOCs (C, D, and E) while Alternative 3 uses phytoremediation to treat PAH-contamination in soil in place in those AOCs. Alternative 4 excavates all seven AOCs.

Remedy Component	Alternative			
	1	2	3	4
No action	●			
Covers with hot spot excavation		●	●	
In situ phytoremediation			●	
Excavation with on-site consolidation				●
Institutional and engineering controls		●	●	

Figure 9-17. DU3 Alternative Components

- Excavated wastes (Alternatives 2 and 4) would be consolidated in an existing waste disposal facility on-site or at a new, agency-approved, engineered repository selected during remedial design.
- The estimated time for construction of Alternatives 2, 3, or 4 is one season. The estimated time to meet remedial goals ranges from 2 to 10 years, with Alternative 3 taking the longest, as the effectiveness of the phytoremediation technology in this application is unknown.
- ICs/ECs would be required for Alternative 2 to maintain the cover and for Alternative 3 to protect the phytoremediation. They are not required for Alternative 4 as contaminated soils are excavated and consolidated in an existing landfill. However, ICs/ECs would be required at that consolidation location.
- Estimated PV costs range from $1,171,948 (Alternative 3) to $1,606,306 (Alternative 2). The additional excavation cost for Alternative 4 is less that the cost of ICs/ECs associated with leaving the contamination in place. The Alternative 1 cost for DU3 is $0.

9.2.4 North Percolation Ponds DU4

DU4 Alternatives 2, 3, and 4 address risk from contaminated soils through options that range from minimal to total excavation of three features (northwest and northeast percolation ponds and the overflow ditch) (Figure 9-18). Soil covers are used on these three areas where excavation does not occur.

- Alternative 2 would require the least excavation and consolidation of contaminated soil and Alternative 4 would require the most. Alternative 2 excavates only the overflow ditch and installs a soil cover over both percolation ponds. Alternative 3 increases the area to be excavated by also excavating the Northwest Percolation Pond. Alternative 4 excavates both ponds and the overflow ditch.

Remedy Component	Alternative			
	1	2	3	4
No action	•			
Limited excavation with covers		•		
Excavation with cover			•	
Excavation with on-site consolidation				•
Institutional and engineering controls		•	•	

Figure 9-18. DU4 Alternative Components

- Excavated wastes would be consolidated on-site in an existing waste disposal facility or at a new, agency-approved, engineered repository selected during remedial design.
- For Alternatives 2, 3, and 4, the estimated time for construction is one season and the estimated time to meet remedial goals is 2 years.
- ICs/ECs would be required for Alternatives 2 and 3 to maintain the soil cover. They are not required for Alternative 4 as contaminated soils are excavated and consolidated on-site. However, ICs/ECs would be required at that consolidation location.
- Estimated PV costs range from $2,286,195 (Alternative 4) to $3,129,010 (Alternative 2). As with DU3, the additional total excavation in alternative 4 is less than the cost of ICs/ECs associated with leaving the contamination in place (Alternatives 2 and 3). The Alternative 1 cost for DU4 is $0.

9.3 Expected Outcomes of Each Alternative

The land at the site is privately owned and the area is not zoned. Current land use is industrial and open space. Depending on the combination of alternatives used across the DUs, future land use could include commercial, industrial, or open space/recreational. Some members of the community have expressed a desire for a wildlife corridor through the property and local government is interested in regaining some of the tax base lost when the facility shut down.

The time needed to reach remedial goals varies by DU and the alternative used to achieve clean up and is discussed below.

- Where caps are used to prevent direct contact with contaminated soils and to limit vertical infiltration of precipitation through the source area to groundwater, remedial goals would be met in 4 to 5 years and future use would need to be protective of the remediation through the use of ICs/ECs. These alternatives are: DU1/DU6 Alternatives 2, 3, 4, and 5.

- Where caps are used to prevent direct contact with contaminated soils, remedial goals related to soils would be met quickly (within 2 years) and future use would need to be protective of the remediation through the use of ICs/ECs. These alternatives are: DU2 Alternative 2, DU3 Alternative 2, and DU4 Alternatives 2 and 3.
- Where phytoremediation is used to treat soils (DU3 Alternative 3), remedial goals may not be met for 10 years or more; but, if the technology were successful, land use would be unrestricted.
- For all DUs, future use for Alternative 1 would remain restricted as direct contact with contaminated soils would not be prevented through capping, excavation, or phytoremediation.
- For DU5, where the remediation is complete except for long-term monitoring, future land use is anticipated to be unrestricted open space/recreational.

Groundwater is not anticipated to meet drinking water standards for the foreseeable future and there is a lack of infrastructure for municipal water supply systems, so future residential use is unlikely.

Section 10
Summary of Comparative Analysis of Alternatives

Superfund law provides nine criteria by which to compare remedial alternatives in the FS (Figure 10-1). The criteria fall into three groups:

- Threshold
- Primary Balancing
- Modifying

Each remedial alternative (except No Action) must meet the threshold criteria. Primary balancing criteria are used to weigh major trade-offs among alternatives. Consistent with EPA guidance, the overall effectiveness of the alternatives is determined by evaluating the first three primary balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; and short-term effectiveness.

Relative performance against these criteria was evaluated in the FS (Roux 2021a) and the results are summarized below and shown in Table 10-1. The scores have no independent value and are only meaningful when compared to other alternatives. The total possible score is 100 with a range of 0 to 20 for each criterion.

Modifying criteria are state and public acceptance and are not addressed in the FS but are evaluated after public comment is received on the Proposed Plan. Additional information about volumes of waste, time to complete, and cost is provided in Table 10-2.

	Criteria	Description
Threshold	**Overall protection of human health and the environment**	Does an alternative eliminate, reduce, or control threats to public health and the environment through controls or treatment?
	Compliance with ARARs	Does an alternative meet federal, state, and tribal environmental statutes, regulations, and other requirements, or is a waiver is justified?
Primary Balancing	**Long-term effectiveness and permanence**	Can an alternative maintain protection of human health and the environment over time?
	Reduction through treatment	Is treatment used to reduce harmful effects, a contaminant's ability to migrate and the amount of contamination remaining after remedy implementation?
	Short-term effectiveness	How much time is needed to implement an alternative and what risks are posed to workers, residents, and the environment during that time?
	Implement-ability	Is the alternative technically and administratively feasible, (are materials and services readily available)?
	Cost	What are estimated costs?
Modifying	**State acceptance**	Does the state agree with EPA's analyses and recommendations?
	Community acceptance	Does the community agree with EPA's analyses and Preferred Alternative? *Comments received are an important indicator of community acceptance.*

Figure 10-1. Superfund Evaluation Criteria

To identify the most viable candidates for comparative analysis, the FS rescreened the 12 remedial alternatives for DU1/DU6 based on consideration of effectiveness, implementability, and relative cost. Alternatives 2, 3B, 4B, 5A, and 5C were removed from further consideration and scoring.

The rationale for the removal of these alternatives is as follows:

- Alternative 2 does not address soils under the West Landfill that likely contribute to groundwater contamination, nor does it include groundwater treatment to mitigate impacts to ecological receptors in River Area DU5. As such, it may not satisfy the threshold criteria.
- Alternatives 3B and 4B include a downgradient PRB and there are concerns with the effectiveness and implementability of that technology at the depth and scale that would be needed.
- Alternatives 5A and 5C include hydraulic control at the source area and/or downgradient at the Burlington Northern Santa Fe tracks and there are effectiveness and implementability concerns relating to the treatment of cyanide, fluoride, and arsenic in groundwater. Given the very high and seasonally variable flow rates, the treatment system would be very large, complex, and difficult to operate effectively.

Alternatives remaining for DU1/DU6 are: Alternative 1 No Action; Alternative 3A Containment via Capping and Upgradient Slurry Wall; Alternative 3C Containment via Capping, Upgradient Slurry Wall, and Downgradient Extraction; Alternative 4A Containment via Capping and Fully Encompassing Slurry Wall; Alternative 4C Containment via Capping, Fully Encompassing Slurry Wall, and Downgradient Extraction; Alternative 5B Containment via Capping and Downgradient Hydraulic Control; and Alternative 6 Excavation with On-Site Consolidation.

10.1 Threshold Criteria

10.1.1 Overall Protection of Human Health and the Environment

- **Landfills DU1/Groundwater DU6.** All retained remedial alternatives, with the exception of Alternative 1 (No Action), are protective based on current land and groundwater use as well as reasonably expected future uses. Alternative 1 would not be protective as the direct contact exposure routes, including exposure to impacted soil by small range receptors and to impacted surface water and porewater by ecological receptors in DU5, would remain complete. Exposure pathways to impacted soil would be eliminated by removal under Alternative 6 (Excavation with On-Site Consolidation) or through capping under all other active, retained alternatives. Exposure pathways to impacted surface water and porewater in DU5 would be mitigated by source control measures under all alternatives but Alternative 1, and/or by downgradient groundwater treatment under Alternatives 3C, 4C, and 5B.
- **Landfills DU2.** Alternative 1 is not protective. Alternative 2 (containment via capping) is protective of human health and the environment based on current land use as well as reasonably expected future uses.
- **Soils DU3.** All the remedial alternatives, with the exception of Alternative 1, are protective of human health and the environment based on current land use as well as reasonably expected future land uses. Under Alternative 1 the direct contact exposure route to impacted soil would remain complete. Alternative 2 (Covers with Hot Spot Excavation) would be protective by eliminating exposure pathways through containment while Alternatives 3 (In Situ Phytoremediation with Hot Spot Excavation) and 4 (Excavation with On-Site Consolidation)

would be protective by eliminating exposure pathways through treatment or removal, respectively. This threshold criterion would be fully met by Alternatives 2, 3, and 4.

- **North Percolation Ponds DU4.** Alternative 1 is not protective as the direct contact exposure route to impacted soil/sediment would remain complete. Alternatives 2, 3, and 4 are protective based on current land use and reasonably expected future uses. Alternatives 2 (Limited Excavation with Covers) and 3 (Excavation with Cover) eliminate exposure pathways through removal and containment while Alternative 4 (Excavation with On-Site Consolidation) eliminates exposure pathways through removal. This threshold criterion would be fully met by Alternatives 2, 3, and 4.

- **River Area DU5.** Alternative 1 is irrelevant as the 2020 to 2021 removal action was completed. This action removed contaminated sediments from the South Percolation Ponds and was implemented to be protective of the environment with future long-term monitoring under Alternative 2. DU5 does not pose a contamination risk to human health.

10.1.2. Compliance with ARARs

- **Landfills DU1/Groundwater DU6.** Alternative 1 does not comply with ARARs as no action would be taken to address COCs in DU1/DU6 in exceedance of standards. Alternatives 3A, 3C, 4A, 4C, 5B, and 6 would comply with state and federal chemical-specific ARARs. Alternative 5B would be unlikely to achieve ARARs within the plume footprint downgradient of the waste management units and upgradient of the extraction wells and would require an ARAR waiver for groundwater. Alternative 6 would likely result in an increase in concentrations of COCs downgradient of DU1, both within and potentially beyond the current extent of the plume. However, short-term exemptions could be authorized by the agencies to comply with this chemical-specific ARAR. The active alternatives would be designed to comply with action- and location-specific ARARs, as applicable.

- **Landfills DU2.** Alternative 1 does not comply with ARARs. Although there are no chemical-specific ARARs for soil, Alternative 2 would meet remedial action objectives and would be designed to comply with action- and location-specific ARARs, as applicable.

- **Soils DU3.** There are no chemical-specific ARARs for soil, therefore this threshold criterion would be fully met by all alternatives. However, Alternative 1 would not meet RAOs and remedial goals as no action would be taken to address COCs currently present in DU3 in exceedance of remedial goals. All active alternatives would meet these RAOs. In addition, the active alternatives would be designed to comply with action- and location-specific ARARs.

- **North Percolation Ponds DU4.** All the remedial alternatives, with the exception of Alternative 1 (No Action), would comply with State and Federal chemical-specific ARARs. There are no chemical-specific ARARs for soil/sediment, however all active alternatives would meet RAOs. Alternative 1 would not meet chemical-specific ARARs or soil/sediment RAOs as no action would be taken to address COCs now present in exceedance of standards and/or RGs. Active alternatives would be designed to comply with action- and location-specific ARARs. This threshold criterion would be fully met by Alternatives 2, 3, and 4.

- **River Area DU5.** Alternative 1 does not comply with ARARs. Alternative 2 would satisfy ARARs. Although there are no chemical-specific ARARs for soil or sediment, long-term surface water and sediment porewater monitoring would meet the remedial action objectives and would be designed to comply with action- and location-specific ARARs, as applicable.

10.2 Primary Balancing Criteria

Alternatives that met threshold criteria were evaluated for overall effectiveness (long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, and short-term effectiveness), implementability, and cost. Because DUs 2 and 5 had only one alternative beyond no action (Alternative 2), they were evaluated but not scored in the FS.

10.2.1 Long-Term Effectiveness and Permeance

- **Landfills DU1/Groundwater DU6**. Alternative 1 (No Action) is not effective in the long term because potential risks would not be managed or reduced. The other alternatives (excluding Alternative 6) would reduce the magnitude of residual risk by capping impacted soil with clean material to eliminate the direct contact exposure pathway and associated risks. Maintenance, as well as reliance on ICs, would prevent intrusive activities and damage to the cap. Alternative 6 would reduce risk by removing impacted material and would not need ECs/ICs, but would require maintenance ICs at the newly constructed on-site repository to ensure performance of the low-permeability cap and leachate collection system. Successful implementation of DU1/DU6 alternatives would result in an ELCR below 1E-05 and an HQ below 1 in DU1 for both human health and ecological receptors.

  All active alternatives would reduce risk in groundwater, surface water, and porewater over time through natural attenuation. Low-permeability caps would prevent infiltration of precipitation and runoff through the surface of the landfill and the underlying impacted materials, preventing/reducing leaching of COCs to groundwater. The active alternatives (excluding Alternative 5B) each have an additional source control measure beyond capping of waste management units to reduce risk and increase the adequacy and reliability of controls. Compared to Alternative 1, the active alternatives offer higher long-term effectiveness and permanence.

  For Alternatives 3A through 4C, the slurry wall component of each alternative would provide long-term effectiveness as documented in numerous studies and evaluations including reports from dozens of Superfund sites and many large-scale civil infrastructure projects. In 1998, EPA evaluated subsurface engineered barriers at 36 sites and found that 25 generally performed as designed and significantly improved the quality of groundwater and surface water.

  Seven of the sites had insufficient data to determine long-term performance and four of the sites had leaks detected (EPA 1998). Barriers with documented leaks were repaired and their effectiveness was restored. The FS technology screening concluded that most engineered waste containment barrier systems that have been designed, constructed, operated, and maintained in accordance with current statutory regulations and requirements (as of 2007 when the study was published) have thus far provided environmental protection at or above specified levels (National Research Council 2007). A properly designed slurry wall should continue to perform over time and be compatible with the groundwater COCs and not subject to significant degradation. As such, the slurry wall should maintain low permeability for the long term.

Alternative 3A uses an upgradient slurry wall to divert clean groundwater around the West Landfill and Wet Scrubber Sludge Pond, reducing leaching of COCs to groundwater and the associated mass flux of contamination from beneath the waste management units. Alternative 4A uses a fully encompassing slurry wall around the West Landfill and the Wet Scrubber Sludge Pond to contain contaminated groundwater within the footprint of the waste management units and prevent contaminant mass flux from beyond the containment cell. This would cut off the source of contamination to groundwater, giving this alternative greater long-term effectiveness and permanence than the upgradient slurry wall.

The additional source control measure of downgradient groundwater extraction and treatment (Alternatives 3C and 4C) would treat cyanide in groundwater at a location 300 to 400 feet upgradient of DU5. Downgradient groundwater extraction and treatment is considered an adequate and reliable control, however in the long term it is expected that the slurry wall component of these alternatives would control the source area such that downgradient groundwater treatment would not substantially increase the long-term effectiveness and permanence of those alternatives.

Alternative 5B would implement the downgradient groundwater extraction and treatment described above without an additional source control measure beyond the capping of the waste management units. Alternative 6 would achieve source control by removing waste material and underlying impacted soil from the West Landfill and Wet Scrubber Sludge Pond. This would prevent leaching of COCs to groundwater and would significantly reduce the potential for future migration of COCs, giving this alternative the greatest long-term effectiveness and permanence. Alternative 6 would only achieve long-term effectiveness and permanence if all source material contributing to groundwater contamination, including impacted underlying soils, is removed. Following successful implementation of any of the active, retained alternatives, the magnitude of residual risk would be less than target risk levels set by DEQ-7 standards.

- **Landfills DU2.** Capping of impacted material (Alternative 2) is an adequate and reliable method to contain impacted material and to eliminate the direct contact exposure pathway and its associated risks.

- **Soils DU3.** Alternative 2 would reduce the magnitude of residual risk by covering impacted material that exceeds remedial goals with clean material and eliminating the direct contact exposure pathway and its associated risks. Covers require maintenance as well as reliance on ICs/ECs to prevent intrusive activities into impacted material and damage to the cover. Alternative 3 would reduce residual risk by treating PAH-impacted material via phytoremediation, which would eliminate the need for IC/ECs. Alternative 3 ranked highest for the reduction of toxicity, mobility, or volume, but scored lower for short-term effectiveness (10 years to complete) and implementability (imported materials and a possible pilot study). Alternative 4 would reduce risk by removing impacted material that exceeds remedial goals. ICs/ECs would not be needed. Successful implementation of all active alternatives would result in an ELCR below 1E-05 and an HQ below 1 for both human health and ecological receptors. Permanent treatment or removal of the impacted materials under Alternatives 3 and 4, respectively, would give the highest degree of long-term effectiveness and permanence. Alternative 2 would achieve a similar degree of long-term effectiveness, however the reduction in exposure potential would be reversed if ICs and cover are not maintained.

- **North Percolation Ponds DU4.** Alternative 1 (No Action) is not considered to be effective in the long term because potential risks would not be managed; no reduction in the magnitude of residual risk would be achieved, and no additional controls would be implemented to control these risks. All other retained alternatives (Alternatives 2, 3, and 4) offer high long-term effectiveness and permanence as described below. Alternatives 2 and 3 reduce risk by covering impacted material, effectively eliminating the direct contact exposure pathway and the associated risks. Covers would be of the same type and thickness and would require maintenance as well as reliance on ICs to prevent intrusive activities and damage to the cover. Alternative 4 would reduce risk by removing impacted material and would not require ICs/ECs. Successful implementation of these alternatives would result in an ELCR below 1E-05 and an HQ below 1 for both human health and ecological receptors. By permanently removing impacted materials from the DU, Alternative 4 scored highest for long-term effectiveness and permanence. Alternatives 2 and 3 achieve a similar degree of long-term effectiveness and permanence, but long-term management of residuals would be greater in Alternative 2 (10 acres) than Alternative 3 (2 acres).

- **River Area DU5.** Routine sampling and analysis of surface water and sediment porewater would demonstrate progress toward achieving remedial action objectives. The 2020-2021 Superfund removal action minimized potential exposure to impacted soil/sediment material. Long-term monitoring of surface water and sediment porewater would protect ecological receptors by ensuring continued reductions of cyanide concentrations.

10.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

- **Landfills DU1/Groundwater DU6**. Alternative 1 (No Action) offers no reduction in toxicity, mobility, or volume of hazardous materials in DU1 or DU6. Several alternatives implement treatment of groundwater to reduce the toxicity of groundwater (the source of contamination to surface water and porewater in DU5).
    - Downgradient groundwater extraction and treatment (Alternatives 3C and 4C) would provide cyanide treatment of groundwater at a location approximately 300 feet upgradient of DU5. Treating downgradient groundwater for cyanide would reduce toxicity in this source surface water and porewater contamination in DU5. The reduction in groundwater toxicity from groundwater extraction and treatment would be irreversible.
    - Downgradient groundwater extraction and treatment (Alternative 5B) would treat a continuous, high flow rate of contaminated groundwater for cyanide, reducing the toxicity in groundwater downgradient and, subsequently, surface water and porewater in the River Area DU. Extraction and treatment downgradient only would not reduce the mobility of COCs in groundwater beneath the site. The reduction in groundwater toxicity from groundwater extraction and treatment would be irreversible.
- **Landfills DU2.** Neither of the alternatives reduces toxicity, mobility, or volume of hazardous materials through treatment.
- **Soils DU3.** Alternative 3 is the only alternative that would use treatment (phytoremediation) to reduce toxicity, mobility, or volume of hazardous materials and all PAH-impacted material would be treated to concentrations below remedial goals.
- **North Percolation Ponds DU4.** None of the alternatives reduce toxicity, mobility, or volume of hazardous materials through treatment.
- **River Area DU5.** Neither of the alternatives reduces toxicity, mobility, or volume of hazardous materials through treatment.

10.2.3 Short-Term Effectiveness

Landfills DU1/Groundwater DU6. Alternative 1 (No Action) does not meet RAOs. Under the remaining alternatives (excluding Alternative 6), impacts to community are not anticipated or are expected to be limited to increased truck traffic. Hazards could be mitigated with traffic control plans and community notifications. ECs would be used to reduce dust, vapors, and noise and best practices would reduce risks to workers. Minimal potential risks to the environment are anticipated during construction of the waste management unit caps assuming implementation of adequate erosion controls. Slurry wall construction alternatives (Alternatives 3A, 3C, 4A, and 4C) would have moderate impacts by way of air emissions and material consumption). Groundwater extraction and treatment alternatives (Alternatives 3C, 4C, and 5B) would have significant environmental impacts during operation of the groundwater treatment system affecting the sustainability consideration of these alternatives, including substantial energy consumption and considerable material consumption and waste generation over the lifetime of these alternatives.

For Alternative 6 new repository would be closer than the existing waste management units to the Flathead River and/or Aluminum City, increasing the potential for exposure to emissions and reducing the contaminant buffer zone. Potential exposure risks to workers are greater due to disturbance of hazardous source material in the West Landfill and Wet Scrubber Sludge Pond. Potential exposure would be via direct contact and could also include cyanide gas exposure. Level C PPE would be required, and workers would need to avoid heavy equipment hazards and hazards associated with deep excavation. The significantly longer period of construction significantly increases the risk of serious safety incidents in comparison to the other alternatives. Excavation would result in significant air emissions and energy consumption. Alternative 6 is the only alternative to disturb the existing waste management units. During remedial action implementation (estimated to take 4 to 5 years), large-scale open excavation of the West Landfill and Wet Scrubber Sludge Pond would expose the waste and contaminated soil to precipitation and runoff over a multi-year period, resulting in leaching of contaminants and further degradation of groundwater which would be in contravention of the RAO that states: "prevent further degradation of groundwater that exceeds Montana DEQ-7 standards (i.e., ensure no actions are taken that could increase concentrations of COCs within the contaminant plume)." While best practices would be employed to limit the size of and/or cover the open excavation in between construction seasons, infiltration from precipitation, surface runoff, or spring snowmelt would not be eliminated, further contributing to groundwater degradation.

The RAOs include: (1) eliminate exposure to impacted material resulting in exceedances of remedial goals; (2) eliminate ingestion of or direct contact with groundwater containing COCs in excess of Montana DEQ-7 standards; (3) reduce concentrations of COCs in groundwater within the upper hydrogeologic unit to levels below Montana DEQ-7 standards; and (4) reduce migration of cyanide in groundwater that results in exceedances of Montana DEQ-7 aquatic life criteria in surface water and porewater in DU5. Under the active alternatives (excluding Alternative 6), the first RAO would be met immediately following cap construction and establishment of ICs, which are estimated to be completed within 3 years.

Under Alternative 6, the first RAO would be met following completion of remedial construction and establishment of ICs, which are estimated to be completed within 4 to 5 years. For all active, retained alternatives, the second RAO would be met when ICs are established, which is estimated to be within 1 year. The third and fourth RAOs would be met the quickest under an alternative with complete source control and downgradient groundwater treatment (Alternative 4C). Alternatives with a fully encompassing slurry wall only (Alternative 4A) or both an upgradient slurry wall and downgradient groundwater treatment (Alternative 3C would meet the third and fourth RAOs in the next quickest timeframe. Alternative 3A (upgradient slurry wall, only) would take longer to meet the third and fourth RAOs. Alternative 5B (downgradient hydraulic control) would achieve the fourth RAO in a relatively short timeframe, comparable to that of Alternatives 3C and 4C, but does not have an additional source control measure beyond caps on the waste management units. Under Alternative 5B, achievement of RAOs (including ARARs) would be unlikely within the plume footprint downgradient of the waste management units and upgradient of the extraction wells and an ARAR waiver for groundwater would be needed. A comprehensive long-term monitoring program would monitor groundwater in the plume footprint.

Alternative 5B would take longer to meet the third RAO listed above than the other active, retained alternatives.

- **Landfills DU2.** Alternative 2 (Containment by capping) would eliminate exposure pathways in DU2 upon construction of caps and establishment of ICs (2 years). All activities would be conducted on-site with minimal impacts to the community or workers.

- **Soils DU3.** Alternative 1 (No Action) does not attain the criterion because it would not meet the RAOs. RAOs would be achieved for Alternatives 2 and 4 immediately following construction and establishment of ICs, which should be completed within 2 years. Under Alternative 3, RAOs are expected to be met following successful completion of the phytoremediation treatment (about 10 years). Alternatives 2 and 4 scored higher than Alternative 3 for this reason. For all alternatives, community impacts are not anticipated. ECs would be used to mitigate dust, vapors, and noise. Minimal impacts to the environment are anticipated assuming use of adequate erosion controls. Alternative 4 would have more potential risks to workers because it would involve the most intrusive work and associated exposure risk.

- **North Percolation Ponds DU4.** Alternative 1 does not meet this criterion because it would not meet the RAOs. In contrast, RAOs would be achieved for Alternatives 2, 3, and 4 immediately following construction activities and establishment of ICs (2 years). ECs would be used to prevent dust, vapors, and noise and potential risks to the environment are expected to be minimal during implementation assuming use of adequate erosion controls. Best management practices, ECs, and use of PPE are highly effective at reducing risks to workers during remedy construction. Of the active alternatives, Alternative 2 has the lowest potential risk to workers because it has the least intrusive work and associated exposure risk. Potential exposure risk to workers is lower for Alternative 3 than Alternative 4.

- **River Area DU5.** Under Alternative 2, routine sampling and analysis of surface water and sediment porewater would demonstrate progress toward achieving RAOs. Monitoring requires no construction, so impacts to workers, residents, and the environment are very low.

10.2.4 Implementability

For all DUs, Alternative 1 (no action) is the easiest alternative to implement and scores the highest. Implementability of the remaining alternatives is discussed below.

- **Landfills DU1/Groundwater DU6.** Alternative 1 (No Action) would be the easiest alternative to implement. Construction of the waste management unit caps, slurry walls, and downgradient groundwater extraction and treatment are expected to be technically and administratively implementable. These components would use established technologies that have been proven effective and reliable. All activities would be conducted on-site, so no off-site access or third-party approvals would be needed.

  For Alternatives 3A and 4A, construction of a slurry wall (upgradient or fully -encompassing) to the contemplated depths would require specialty contractor services that are available but require long lead times and extensive pre-design investigations along the proposed alignment. The proposed depths would require the use of specialized technologies and rock breaking tools, but these are standard equipment and proven methods for slurry wall construction and would be implementable.

Downgradient groundwater extraction and treatment—standalone (Alternative 5B or in conjunction with a slurry wall (Alternatives 3C and 4C) would also be expected to be implementable; although the treatment system would be large to accommodate a flow rate of 500 gallons per minute year-round, the only COC requiring treatment is cyanide which is technically feasible. Other constituents in the extracted groundwater would need to be managed to prevent fouling of the cyanide polishing steps but are also technically feasible. This added component increases the complexity of the remedial construction.

The feasibility of excavating impacted material from the waste management units (Alternative 6) is questionable as the volumes of waste and impacted underlying soils to be removed are approximately 1.34 million cubic yards). Large quantities of water generated during construction have to be collected for treatment of a mix of COCs (i.e., cyanide, fluoride, and arsenic). Other uncertainties include the potential need for enclosed work areas and/or limitations on exposed waste areas which would complicate and slow excavation and increase costs.

- **Landfills DU2.** Alternative 2 is technically and administratively feasible. All activities would be conducted on-site, and treatability/pilot studies would not be needed. Development of off-site sources of fill material for cover would be coordinated with the appropriate agencies.

- **Soils DU3.** Alternatives 2, 3, and 4 are technically and administratively feasible, as they use established technologies that have been proven effective and reliable. A treatability pilot study may be required for Alternative 3. All activities would be conducted on-site, so no off-site access or third-party approvals would be needed. The necessary engineering services would be readily available for all alternatives. Alternatives 2 and 3 require soils for cover materials which may need to be imported from off-site sources. Alternative 4 does not require cover and scored the highest of the three active alternatives. Because Alternative 3 may require a pilot prior to implementation, it scored the lowest.

- **North Percolation Ponds DU4.** Alternatives 2, 3, and 4 use established technologies that have been proven effective and reliable. Physical solidification of the viscous, carbonaceous material present in the North Percolation Pond DU, if needed, may require bench or field pilot studies. All activities would be conducted on-site, so no off-site access or third-party approvals would be needed. The necessary engineering services would be readily available for all alternatives**.** Alternatives 2 and 3 would require soils for cover materials. Alternative 4 does not. For this reason, Alternative 4 scored highest of the three active alternatives. Alternative 2 would require more material for cover than Alternative 3 and so scored the lowest.

- **River Area DU5.** Long-term monitoring of surface water and sediment porewater would be easily implementable. All activities would be conducted on-site, and treatability/pilot studies would not be required.

10.2.5 Cost

- **Landfills DU1/Groundwater DU6.** Alternatives 3A ($27,716,290), 4A ($45,642,497), and 5B ($48,724,897) are the least expensive, while Alternatives 3C ($62,258,574), 4C ($74,303,074), and 6 ($165,590,849) are significantly more expensive (Table 10-3). Costs for Alternative 6 dwarf costs for the other alternatives in joint DU1/DU6 and for all other DUs. The NCP requires that the selected remedial action be cost-effective and proportional to overall effectiveness. Alternative 6 (On-Site Excavation and Consolidation) does not meet this requirement as it costs more than twice the next most expensive alternative and exceeds the least expensive retained alternative by a factor of six. Alternative 6 is also less effective than Alternatives 3C, 4A, and 4C. Thus, Alternative 6 is the least cost-effective alternative. Alternative 4A uses capping and a fully encompassing slurry wall to prevent future percolation of water through the source areas (West Landfill and Wet Scrubber Sludge Pond) and to contain the existing contaminated groundwater. Alternative 4A has the highest overall score of the seven retained alternatives when evaluating overall effectiveness, implementability, and reduction of contaminant mobility.

- **Landfills DU2.** The estimated total cost for Alternative 2 is approximately $7 million.

- **Soils DU3.** The costs of each active alternative are comparable, although Alternatives 3 ($1,171,948) and 4 ($1,237,989) are expected to cost less than Alternative 2 ($1,606,306) (Table 10-3). Alternative 3 is also more costly than Alternative 4 because of the 10-year implementation period.

- **North Percolation Ponds DU4.** Estimated costs are highest for Alternative 2 ($3,129,010). Alternatives 3 ($2,346,093) and 4 ($2,286,195) are similar and less expensive.

- **River Area DU5.** The estimated total cost for long-term monitoring of surface water and sediment porewater is approximately $1.4 million.

10.3 Modifying Criteria

Based on the comparative analysis of alternatives, EPA selected a Preferred Alternative for each DU which was presented in the Proposed Plan in June 2023. Because water quality in the seeps in DU5 is directly related to remediation of groundwater in joint DU1/DU6, DU5 was added to form joint DU1/DU5/DU6 in the Preferred Alternative.

The final criteria for evaluation of alternatives are state acceptance and public acceptance. These criteria were applied after the conclusion of the public comment period. The following summarizes how the modifying criteria affected the selection of the remedy.

10.3.1 State Acceptance

DEQ representatives participated in the development of the RI, FS, Proposed Plan, and ROD and their comments were incorporated before the documents were released to the public. DEQ supports the Preferred Alternative, as presented.

10.3.2 Community Acceptance

A total of 134 individual comment submissions were received near the end of the 90-day public comment period. Many were identical and organized by a local advocacy group. Most commenters preferred that the wastes be excavated, treated, and transported to a hazardous waste landfill for off-site disposal. However, that option was eliminated early in the FS evaluation process due to well-founded concerns about safety, short-term impacts, and cost effectiveness. Regarding the preferred alternative, concerns were centered around issues that can be addressed in the remedial design, such as frequency and scope of monitoring, stormwater control, and land use. Commenters also wanted to know that there was a process for addressing performance issues, if needed. A significant number of comments were received that did not address the preferred alternative as presented in the proposed plan but were focused on the site characterization process in the RI or the evaluation process in the FS. Public comments are addressed in Section 2 and 3 of the Responsiveness Summary (Part III of this ROD).

Section 11
Principal Threat Wastes

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP §300.430(a)(1)(iii)(A)). The principal threat concept is applied to the characterization of source materials at a Superfund site. A source material is one that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, or air or that acts as a source for direct exposure. Contaminated groundwater generally is not considered to be a source material. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur.

While the source materials in DU1/DU6 are toxic, they are not highly mobile, and they can be contained by the Selected Remedy. The DU1 source materials are in the vadose zone (in the West Landfill and the Wet Scrubber Sludge Pond). They are below grade and those in the West Landfill are capped.

Contamination in underlying groundwater is thought to be the result of downward percolation of contaminants to the water table and seasonal high-water contact with the contaminant sources. Placement of a new caps on the Wet Scrubber Sludge Pond and Center Landfill as part of the remedy will limit if not eliminate the downward influx of water through contaminated materials to the hydraulic system and will serve as an additional barrier to prevent contact with the source material. Installation of a fully encapsulating slurry wall will eliminate the seasonal high-water contact between groundwater and the source materials.

There is currently no realistic exposure pathway to source materials and there would be none under reasonably anticipated future land use.

Section 12
Selected Remedy

Based on consideration of CERCLA requirements, the detailed analysis of alternatives, and public comments, EPA, in consultation with DEQ, determined that the Preferred Alternative, as presented in the Proposed Plan, is the appropriate remedy for the site. While certain other alternatives may better satisfy certain individual selection criteria, the Preferred Alternative (now the Selected Remedy) best meets the entire range of selection criteria and achieves the appropriate balance considering site-specific conditions and criteria identified in CERCLA and the NCP, as provided in Section 13 of this document.

This section expands upon the details of the Selected Remedy from that which was provided in the Description of Alternatives section of the ROD. It includes:

- Summary of the Rationale for the Selected Remedy
- Description of the Selected Remedy
- Summary of Estimated Remedy Costs
- Expected Outcomes of Selected Remedy

12.1 Summary of the Rationale for the Selected Remedy

The Selected Remedy provides the best balance of tradeoffs among the alternatives evaluated and attains an equal or higher level of achievement of the threshold and balancing criteria than other sitewide alternatives that were evaluated. It achieves substantial risk reduction and is feasible, implementable, and has long-term cost-effectiveness. Residual risks are effectively eliminated, mitigated, or managed. The successful performance of the remedy is demonstrated similar to remedies implemented at other Superfund sites that included installation of slurry walls (Section 10.2.1). The individual alternatives that make up the Selected Remedy are shown in Figure 12-1 for each DU. These alternatives are essentially as presented in the Proposed Plan, except for the lining of the overflow ditch in DU4.

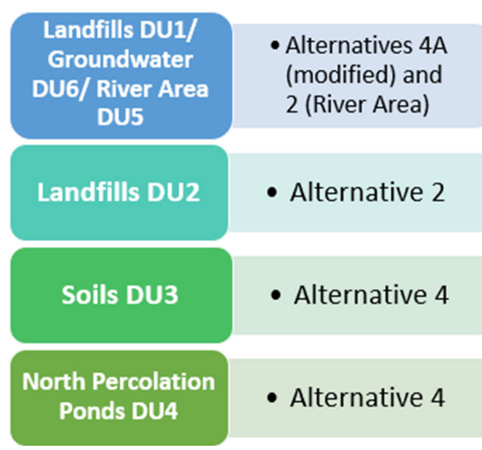

Figure 12-1. DU Components of the Selected Remedy

12.2 Description of the Selected Remedy

The Selected Remedy uses a remedial strategy that emphasizes sitewide consolidation and encapsulation of contaminant sources to eliminate exposure pathways, reduce the transfer of COCs to groundwater underlying the site, and bring concentrations of COCs in seeps near the Flathead River into compliance with standards for ecological receptors. It ensures that low-intensity recreational site users and commercial workers have no more than a 1E-5 chance of contracting cancer from ingestion and inhalation of on-site soils and that those users are also protected against non-cancer effects from inhalation and ingestion of surface soils.

Controls will be used to ensure that engineered elements of the remedy are not damaged. They will prevent the use of groundwater that poses human or ecological risks, limit access to private property, and allow low-intensity open space/recreational use or industrial/commercial use as permitted by the landowner. Specific ICs and ECs will be identified in remedial design. EPA anticipates that ICs will include community awareness programs (e.g., ads, handouts, and other educational materials) and land-use restrictions (e.g., deed restrictions). ECs will likely include posted warnings and fencing. EPA will work closely with DEQ and representatives of Flathead County in the remedial design process to ensure that the controls selected will be implementable and will achieve the desired results.

The following description expands on information provided in the Description of Alternatives (Section 9). It is possible that the remedy may change somewhat as a result of the remedial design and construction processes. Changes to the remedy described in the ROD will be documented using a technical memorandum in the Administrative Record, an ESD, or ROD amendment.

12.2.1 Landfills DU1/Groundwater DU6/River Area DU5 – DU1/DU6 Modified Alternative 4A and DU5 Alternative 2: Containment via Capping, Fully Encompassing Slurry Wall, Interior Extraction, and Monitoring

12.2.1.1 Overview

In DU1 soils, arsenic and PAHs pose elevated human health risks and ecological risks are PAHs, copper, and nickel. For DU6, human health risks are elevated for arsenic, cyanide, and fluoride in groundwater, but only for a theoretical future use scenario where use of groundwater for drinking water was permitted. Ecological risks in DU5 are elevated for barium in soils; aluminum, barium, copper, cyanide, and iron in surface water; barium, copper, and cyanide in sediments; and barium, copper, and cyanide in porewater. However, these risks were addressed during the 2020-2021 removal action. Modified Alternative 4A is EPA's Selected Remedy for DU1/DU6 and ranks highest of the seven alternatives evaluated (Table 10-1). It differs slightly from the alternative presented in the FS report in that interior extraction wells will be installed during construction for long-term groundwater extraction and treatment, if necessary.

This joint DU alternative incorporates River Area DU5 Alternative 2 because the primary objective of the DU5 monitoring is to evaluate whether decreases in groundwater contamination from DU1/DU6 remedial actions are effective in achieving surface water standards at the DU5 seeps.

The number and locations of additional interior monitoring/extraction wells and exterior monitoring wells will be determined during remedial design. These wells will be used initially for monitoring and, if the slurry wall is not effective in limiting groundwater flow beneath the West Landfill and the Wet Scrubber Sludge Ponds, they will be used to extract groundwater for treatment. If treatment is determined to be necessary, it will likely be seasonal and require much lower volumes of groundwater to be treated compared to the downgradient extraction alternatives.

The remedy will:

- Construct low-permeability caps on the Wet Scrubber Sludge Pond and Center Landfill and maintain the West Landfill cap. Upgrade existing stormwater engineered run on and runoff controls to minimize infiltration and percolation of snowmelt and stormwater into the containment cell. Monitoring well CFMW-017 that was installed through the Center Landfill will be abandoned in accordance with State of Montana rules and regulations for well abandonment.
- Construct a fully encompassing slurry wall around the West Landfill and Wet Scrubber Sludge Pond to depths that key into the underlying low-permeability, glacial till layer (typically between 100 and 125 feet). If dewatering is needed, treat captured groundwater in a treatment plant and return effluent to groundwater via infiltration basins.
- Install paired extraction/monitoring wells (one within and one outside of the slurry wall) as needed to monitor groundwater quality and to extract groundwater for treatment, if necessary. Locations of these monitoring and extraction wells will be determined during the remedial design.
- Conduct short-term groundwater monitoring after slurry wall construction has been completed. A shakedown plan will be prepared during remedial design that will include a groundwater elevation level(s) or other hydrogeologic conditions that will trigger groundwater extraction and treatment from within the containment cell in selected monitoring wells. If groundwater triggers are activated, then a groundwater treatment facility will be constructed to treat cyanide, fluoride, and arsenic, with infiltration basins for discharge of treated clean effluent back to groundwater outside of the slurry wall containment cell. The treatment facility may be constructed prior to the construction of the slurry wall if the remedial design determines it to be necessary for dewatering during construction, and then may be retained for use after remedial action construction is completed.
- Implement groundwater, surface water, and sediment porewater performance monitoring of the groundwater plume using existing and newly installed monitoring wells and at seeps and other floodplain areas within DU5.
- Line the Cedar Creek Reservoir Overflow Ditch in the vicinity of DU1 to minimize surface water infiltration into the groundwater. This is a new requirement based on review of public comment.

The Selected Remedy is consistent with EPA's presumptive strategy for landfill sites as containment remedies are preferred over treatment remedies, while extraction and treatment of groundwater is retained if necessary (EPA 1993).

12.2.1.2 Operations, Inspection and Maintenance

ECs installed at the waste management units at Landfills DU1 and Landfills DU2 will require long-term inspection and maintenance. Inspection and maintenance plans will include the following:

- Inspection and maintenance of stormwater ECs, including conveyance channels, sediment ponds, and infiltration basins
- Inspection and maintenance of engineered caps and covers, including vegetation established on the covers to reduce erosion
- Inspection and maintenance of fencing and signage

If groundwater extraction and treatment is determined to be necessary, an operation and maintenance plan will be completed to document all operations associated with groundwater treatment, including, but not limited to, pumping of extraction wells, water treatment facility operations, sampling of effluent water to ensure water quality standards are being achieved, effluent disposal infiltration basin inspection and maintenance, and winterization of the groundwater treatment facility as it would be expected to be used only on a seasonal basis.

12.2.1.3 Long-Term Monitoring

Under the Selected Remedy for the joint DU1/DU5/DU6 long-term monitoring of DU5 will continue to document the reduction of total cyanide concentrations in surface water and free cyanide concentrations in porewater. Surface water and sediment porewater will be routinely sampled and analyzed for total and free cyanide to demonstrate decreases in concentrations of cyanide over time. A long-term surface water, porewater and groundwater monitoring plan will be developed during remedial design.

Initial monitoring rounds will include sampling of surface water metal COCs that exceed remedial goals (i.e., aluminum, barium, copper, and iron) to demonstrate that removal of the influent pipe from which stormwater enters the South Percolation Pond system performed under the 2020-2021 Superfund removal action has eliminated the source of aluminum and other metals to surface water in DU5. Other metals (i.e., arsenic, lead, mercury, and thallium), fluoride, and PAHs (i.e., benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-c,d)pyrene), which have exceeded the DEQ-7 surface water standards for human health in at least one sample, will also initially be monitored in surface water in their respective features of the DU5 until the agencies provide concurrence to reduce the number of constituents monitored (i.e., multiple sampling rounds demonstrate compliance with ARARs).

Some members of the community commented that there may be unknown wastes buried in the Landfills DU1 and DU2. While the RI identified a specific list of contaminants in groundwater that were detected through six rounds of groundwater sampling during the RI, EPA understands the community's concern that unknown contaminants might be released in the future, given the lack of knowledge of whether the landfills in Landfills DU2 are lined or not. To address this concern, EPA is requiring that a full suite of contaminant parameters be analyzed from a select suite of monitoring wells located downgradient of the landfill DUs every 5 years, prior to EPA's five-year review. Any process to reduce or eliminate this monitoring requirement will be addressed in the long-term surface water, porewater and groundwater monitoring plan that will be developed during remedial design.

For the first 5 years, long-term monitoring will be in June and October to document conditions during the high- and low-water season, respectively. Based on sampling results from the first 5 years, the frequency of monitoring may be reduced to annually. Surface water and sediment porewater monitoring will continue until RAOs are achieved. The details on the monitoring network and frequency of sampling and parameters analyzed will be provided in a long-term surface water, porewater and groundwater monitoring plan developed during remedial design.

12.2.1.4 ICs

ICs will be detailed in an ICs implementation and assurance plan and will be used sitewide to prevent or minimize exposure to human and ecological receptors and prevent activities that could compromise function or integrity of the caps/containment systems.

- Property restrictions on access to the landfill waste management units
- Prohibitions or restrictions to groundwater use, including potential designation of a state-administered Controlled Ground Water Area to prevent potable use
- Locally adopted land use restrictions in the former plant area of commercial/industrial use only
- EPA five-year reviews to ensure continued protectiveness of the remedy, consistent with Superfund requirements

12.2.2 Landfills DU2 – Alternative 2: Containment via Capping

12.2.2.1 Overview

The RI determined that the DU2 landfills are not sources of groundwater contamination. However, concentrations of arsenic and PAHs in soils pose elevated human health risks. For ecological risk, the concerns are PAHs, copper, nickel, and vanadium. The components of the Selected Remedy for DU2 are effective and permanent and easily implementable and will have few impacts on the community.

The Selected Remedy will:

- Continue to maintain the existing low-permeability cap on the East Landfill and the existing cap on the Sanitary Landfill
- Install a low-permeability cap on the Industrial Landfill
- Improve existing soil covers at the Asbestos Landfills
- Establish ICs and ECs

These actions will adequately mitigate exposure pathways to human health and ecological receptors by preventing direct contact.

The existing cap on the East Landfill consists of a multi-layer, low-permeability cap with a 6-inch-thick clay layer, a geomembrane layer, and an 18-inch vegetated soil cover. It should not require improvement based on review of engineering as-built drawings and field observations. The existing cap on the Sanitary Landfill consists of a cover layer comprised of clean fill which also is in good condition and vegetated. Although the thickness of the cap is unknown, the Sanitary Landfill ceased operation in 1982, which exempts the landfill from RCRA Subtitle D, Part 258 requirements (40 CFR 258.1e). Both landfills have engineered covers sloped to promote drainage and vegetated to minimize the potential for erosion or abrasion of the existing covers. Both landfills have demonstrated the capability to function with minimum maintenance.

The Industrial Landfill is uncovered and has many surface depressions that may promote stormwater infiltration through the landfill's surface. During the South Percolation Ponds removal action, the existing surface depressions were filled, to an extent, with excavated material from the South Percolation Ponds and a temporary soil cover of on-site borrow material. The Industrial Landfill will require an estimated 56,000 cubic yards of additional grading material to achieve a minimum slope requirement of 3% for a crowned cap design. Remediation waste from other DUs, on-site borrow material, imported soil, or a combination thereof will be used to continue filling surface depressions and for grading prior to constructing a low-permeability cap. The cap will comply with substantive DEQ Class II landfill requirements and will consist of a grading layer, a low-permeability membrane, a drainage layer, an 18-inch layer of clean soil, and a 6-inch layer of topsoil with vegetation. Along with capping and stormwater conveyance swales/ditches, a perimeter berm will be constructed, as necessary.

The Asbestos Landfills are overlain by a soil cover, but the grade is uneven and with some small depressions. Under the Selected Remedy, the thickness of the existing cover will be verified, and supplemental topsoil cover material will be placed, as needed, to establish a minimum 12-inch soil layer, eliminate surface depressions, and establish a uniform vegetated cover to prevent exposure and minimize erosion. This will comply with DEQ asbestos-containing materials disposal requirements. The surface will be graded following placement of cover material to prevent disturbing asbestos-containing material. Stormwater conveyance swales/ditches will be constructed as necessary, as determined through remedial design.

12.2.2.2 Long-Term Inspection and Maintenance

Regular inspections and long-term maintenance of the caps and stormwater management controls will be conducted to protect the integrity of the remedy. Inspection and maintenance requirements for DU2 waste management units will be included in the plan developed for the DU1 waste management units.

12.2.2.3 ICs and ECs

ICs will include deed restrictions for the waste management units to prevent activities that could compromise function or integrity of the caps or result in potential exposure to receptors. On-property development activities, such as agricultural or residential use, will be prohibited within the footprint of the DU2 waste management units. The property owner will retain all rights to preclude these activities at the site. ECs include use of fencing and signage around the perimeter of the waste management units to identify and physically restrict access to human receptors and some ecological receptors. Reviews will be conducted once every 5 years to ensure continued performance of the remedy, consistent with CERCLA requirements.

12.2.3 Soils DU3 – Alternative 4: Excavation with On-Site Consolidation

12.2.3.1 Overview

DU-3 soils are not a significant source of the cyanide and fluoride concentrations observed in groundwater. However, concentrations of arsenic and PAHs in soils pose elevated human health risks. For ecological risk, the concerns are PAHs and copper, nickel, selenium, and zinc in soils. The extent of containment, treatment, or excavation will be further delineated during remedial design via pre-design investigation (PDI) sampling. The components of the Selected Remedy for DU3 are effective and permanent and easily implementable and will have few impacts on the community. Alternative 4 ranks highest of the four alternatives evaluated (Table 10-1) for DU3. It has the top score for overall effectiveness and scores highly for implementability and cost.

Under Alternative 4, the remedy will:

- Excavate approximately 32,500 cubic yards of impacted soil.
- Consolidate excavated materials with disposal on-site at an agency-approved existing waste management facility or a new, agency-approved, on-site engineered repository selected during remedial design.

All impacted material exceeding small range receptor remedial goals and/or resulting in exceedances of remedial goals will be removed by excavating the AOCs and consolidating the excavated material for disposal on-site. The extent of excavation will be determined during remedial design via PDI sampling. The volume of excavated material is anticipated to be approximately 25,000 cubic yards.

12.2.3.2 ICs and ECs

Because all impacted material that exceeds remedial goals will be removed, ICs and ECs to prevent intrusive activities and potential damage to the soil cover are not necessary. These measures will be required for the eventual on-site disposal location as decided in the remedial design process.

12.2.4 North Percolation Ponds DU4 – Alternative 4: Excavation with On-Site Consolidation

12.2.4.1 Overview

DU4 is not a significant source of the cyanide and fluoride concentrations observed in groundwater. However, concentrations of arsenic and PAHs in soils and sediment pose elevated human health risks. For ecological risk, the concerns are PAHs, barium, nickel, selenium, thallium, and vanadium in soils; PAHs, aluminum, barium, cadmium, copper, fluoride, and zinc in surface water; and PAHs, barium, cadmium, lead, nickel, selenium, vanadium, and zinc in sediments. The actual depth of excavation will be determined by sampling during design or remediation. The components of the Selected Remedy for DU 4 are effective and permanent and easily implementable and will have few impacts on the community. Alternative 4 ranks highest of the four alternatives evaluated for DU4. It receives the top score for long-term effectiveness and permanence while still scoring highly for short-term effectiveness and implementability.

Under Alternative 4, the remedy will:

- Excavate approximately 35,000 cubic yards of impacted material from the Northeast Percolation Pond, Northwest Percolation Pond, influent ditch, and effluent ditch.
- Consolidate excavated materials with disposal on-site at an agency-approved existing waste management facility or a new, agency-approved, on-site engineered repository selected during remedial design.

This alternative will remove all impacted material resulting in exceedances of remedial goals in DU4 by excavating impacted material from the three areas noted in the bullets above. The influent pipes that allow stormwater to enter the North Percolation Pond system will be decommissioned. Once the impacted materials have been removed, these ponds may be re-used as part of the sitewide stormwater management plan.

12.2.4.2 ICs and ECs

Because all impacted material that exceeds remedial goals will be removed, ICs and ECs to prevent intrusive activities and potential damage to the soil cover are not necessary. These measures will be required for the eventual on-site disposal location as decided in the remedial design process.

12.3 Summary of the Estimated Remedy Costs

For the summary of estimated remedy costs, costs generated in the FS for the alternatives included in Selected Alternative were revisited (Appendix B) and minor modifications were made to account for ditch lining in DU4, which does not change the overall ranking of the alternatives. The present value cost for the Selected Remedy is $57,634,528, with the joint DU1/DU5/DU6 accounting for approximately 82% ($47,143,022) of that estimate (Figure 12-2). This cost is less than half of that estimated for the most expensive alternative (Alternative 6, excavation of the roughly 1.2 million cubic yards of waste and disposal on-site) and roughly 5% of the cost to excavate the DU1 wastes and dispose of them at an off-site hazardous waste repository.

	Present Value Costs		
DU and Alternative	Capital	Operation and Maintenance	Total
Landfills DU1/River Area DU5/Groundwater DU6			
4A modified	$39,098,737	$8,044,285	$47,143,022
Landfills DU2			
2	$6,169,608	$797,715	$6,967,323
Soils DU3			
4	$1,237,989	$0	$1,237,989
North Percolation Ponds DU4			
4	$2,286,195	$0	$2,286,195
Total			
	$48,792,529	$8,842,000	$57,634,528

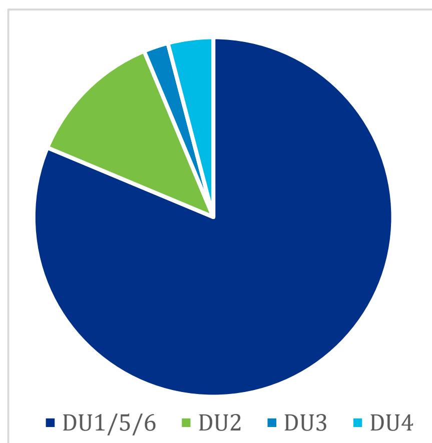

Figure 12-2. Distribution of Selected Remedy Costs by DU

The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30% of the actual project cost.

- Present value costs ($47,143,022) for DU1/DU6 (Alternative 4) and DU5 (Alternative 2) are relatively low compared to the other alternatives evaluated, including the potential for extraction and treatment of groundwater. This joint DU (with an estimated 1.2 million cubic yards waste) accounts for approximately 82% of estimated present value cleanup costs for the site.
- Present value costs ($6,967,323) for DU2 Alternative 2 are moderate and represent only about 12% of the total estimated site costs.
- Present value costs ($1,237,989) for DU3 Alternative 4 are the second lowest of the three active alternatives for DU3. They represent only about 2% of the total estimated site costs.
- Present value costs ($2,286,195) for DU4 Alternative 4 are the lowest of the three active alternatives for DU4 and represent approximately 4% of the total estimated site costs.

12.4 Expected Outcomes of the Selected Remedy

The resulting uses for land and groundwater and the risk reduction achieved as a result of the response action are presented below.

12.4.1 Soils and Sediments

- Excavation, consolidation, and capping remedial actions in DUs 1, 2, 3, and 4 will prevent ingestion, direct contact, and inhalation of contaminated soils and sediments that would result in unacceptable human health risk from PAHs under reasonably anticipated future land uses.
- Unacceptable risks for terrestrial and transitional ecological receptors (Table 8-3) will be eliminated by reducing ingestion of and direct contact with elevated concentrations of metals and PAHs from contaminated surficial and shallow soils in the areas to be capped or excavated.
- Ingestion and direct contact that would result in unacceptable risk for aquatic and semiaquatic ecological receptors will be eliminated by reducing contact with metals, cyanide, and PAHs from contaminated surficial and shallow soils and sediments in the areas to be capped or excavated.
- Exceedances of DEQ-7 aquatic life criteria in surface water and porewater (Table 8-1) will be eliminated by reducing migration of metals, cyanide, fluoride, and PAHs from contaminated soils, sediments, and wastes.

- Discharge of COCs from DU1 source areas to groundwater (DU6) will be reduced or eliminated.
- Remedial actions for soils and sediments (especially DUs 1 and 4) will protect DU5 wetlands and their inhabitants by reducing the concentrations of metals, cyanide, fluoride, and PAHs in surface water and sediment porewater to the aquatic life criteria identified in DEQ-7 (Table 8-1) as applied to State of Montana B-1 class waters.
- Cleanup levels (Tables 8-2 and 8-3) for soils and sediments are expected to be achieved in 4 years for DU1 and in 2 years for DUs 2, 3, and 4.

12.4.2 Groundwater

- Control of the DU1 source areas will reduce the cyanide, fluoride, and arsenic concentrations in groundwater in the upper hydrogeologic unit (DU6) that exceed DEQ-7 standards (Table 8-1). This will prevent further degradation of groundwater and expansion of the groundwater plume into groundwater that meets DEQ-7 standards.
- ICs will prevent ingestion of, or direct contact with, groundwater contaminated with arsenic, cyanide, and fluoride in excess of DEQ-7 standards. ICs will be determined in the design phase but may include prohibitions or restrictions to groundwater use, including potential designation of a state-administered Controlled Ground Water Area.
- Estimates of time to achieve RAOs for cyanide for drinking water standards range from 15 to 26 years after the remedy has been implemented. As there are no domestic well uses of groundwater at the site, this is acceptable as there is no risk to human health from drinking water consumption.

12.4.3 Surface Water

- Metals, cyanide, fluoride, and PAH concentrations in DU 5 surface water and sediment porewater will be reduced to the aquatic life criteria identified in DEQ-7 (Table 8-1) as applied to State of Montana B-1 class waters.

12.4.4 Land Use

- The area beyond the site is sparsely populated and the Selected Remedy may have a positive impact on property values at adjacent properties. Much of the property will be available for unlimited commercial use, which has the potential to benefit the local tax base and may potentially create jobs.
- Development will be possible much earlier with the Selected Remedy than with an alternative that requires removal and on-site disposal of contamination in DU1.
- If the site owner desires, DU5 and undeveloped areas in the northern part of the site could be designated as open space and a potential wildlife corridor to provide enhanced human uses of the ecological resource found on the riverbank.

- Property restrictions (such as fencing and signage) will limit access to the landfill waste management units to protect the remedy. Residential development and use of groundwater will be prohibited.

12.5 Performance Standards

This ROD defines performance standards for contaminant sources that will be used to measure the overall effectiveness of the remedy over the long term. Performance standards are directly linked to the long-term protection of human health and the environment from site COCs and include the final site ARARs. Performance will be monitored through comprehensive and interrelated monitoring programs for each media. These monitoring programs will be planned, reviewed, and approved by EPA and DEQ.

12.6 Environmental Justice

Executive Order 12898, "Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations," became effective in 1994. The purpose of the executive order is to ensure that environmental actions or decisions do not result in disproportionately high and adverse human health or environmental effects by ensuring that the analysis of these effects includes the examination of secondary effects, cultural concerns, and cumulative impacts/effects. Achieving environmental protection for all communities is a fundamental part of EPA's mission. A review of the area within a 1-mile radius of the site identified no areas with specific environmental justice concerns.

Section 13
Statutory Determinations

Under CERCLA §121 and the NCP, EPA must select remedies that protect human health and the environment and comply with ARARs (unless a statutory waiver is justified), are cost-effective, and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

13.1 Protection of Human Health and the Environment

13.1.1 Human Health

The BHHRA (Roux 2020a) identified potential receptors on-site and associated with the Flathead River based on potential exposure to affected soil, groundwater, surface water, and sediment (current and future use). Potential receptors vary by specific exposure area. Under current use, potential receptors are trespassers and recreationists. In a reasonably anticipated future use scenario, potential receptors include industrial or commercial workers, construction workers, residents, trespassers, and recreationists (such as hunters and fishers).

Most exposure areas do not pose an excess lifetime cancer risk above de minimis levels or potential for non-cancer health effects. Exceptions are the North Percolation Pond Area, Main Plant Area, Central Landfills Area, and Industrial Landfill Area. Groundwater in the plume core poses risk to hypothetical future residential drinking water users. PAHs, cyanide, and fluoride are the primary risk drivers. Risks are summarized below. Where more than one risk value exists, the most conservative number is presented. Elevated non-cancer risks are primarily due to exposure to groundwater in the plume core. These risks are within EPA's generally acceptable carcinogenic risk range of 1E-4 to 1E-6 with some exceedances of an HI of 1. Most are less than DEQ's target cancer risk level of 1E-5.

- Main Plant Area (in DU3)
  - Trespasser – 2E-6
  - Industrial worker – 2E-5
  - Construction worker – 2E-6

- North Percolation Ponds Area (in DU4)
  - Stormwater worker – 1E-4
  - Trespasser – 5E-5
- Central Landfills Area (in DU3)
  - Trespasser – 2E-6
  - Landfill worker – 1E-6
- Industrial Landfills Area (in DU2)
  - Trespasser – 2E-6

- Landfill worker – 1E-5

- Groundwater Plume Core Area (in DU6)
  - Future resident – 2E-4

By excavating contaminated soils in DUs 3 and 4 and consolidating them into existing waste management units or into a new on-site repository and by improving the caps/covers in DU 2, the Selected Remedy will prevent ingestion, direct contact, and inhalation of contaminated soils and sediments that would result in unacceptable risk from PAHs and arsenic in all DUs under reasonably anticipated future land uses (commercial/industrial/recreational). Risk will be reduced to less than 1E-5.

The threat to groundwater is from waste that was landfilled in DU1. Capping will limit or eliminate downward migration of precipitation and the slurry wall is intended to prevent the seasonal contact between DU1 waste and groundwater. This will reduce cyanide, fluoride, and arsenic concentrations in groundwater in the upper hydrogeologic unit that currently exceed DEQ-7 standards, prevent further degradation of groundwater, and prevent expansion of the groundwater plume into groundwater that meets DEQ-7 standards. ICs/ECs will protect the integrity of the caps.

Groundwater in the plume core (DU6) poses a risk to hypothetical future residential drinking water users (1E-4 future resident). PAHs, cyanide, and fluoride are the primary risk drivers. Groundwater is not currently used for drinking. Through the use of ICs that prohibit groundwater use, the Selected Remedy will prevent future ingestion of, or direct contact with, groundwater contaminated with arsenic, cyanide, and fluoride in excess of DEQ-7 standards.

The Selected Remedy will be monitored and maintained through comprehensive programs using ICs, monitoring, and maintenance. There are no short-term threats associated with the Selected Remedy that cannot be readily controlled through applicable health and safety requirements, monitoring, and standard construction practices. In addition, no adverse cross-media impacts are expected from the Selected Remedy.

13.1.2 Ecological Risk

Potential adverse ecological effects exist in parts of all three exposure areas:

- **Terrestrial Exposure Area**. Main Plant Area, Central Landfills Area, and soil sampling grid area (in DU3).

- **Transitional Exposure Area**. North Percolation Pond (in DU4) and South Percolation Ponds (formerly in DU5, now removed).

- **Aquatic Exposure Area**. Flathead River Riparian Area Channel and Backwater Seep Sampling Area (in DU5)

The Selected Remedy will eliminate unacceptable risk for terrestrial and transitional ecological receptors by reducing ingestion of and direct contact with elevated concentrations of metals and PAHs from contaminated surficial and shallow soils. Capping and/or excavation and consolidation will address remedial goals for specific contaminants (metals, PAHs, and PCBs) in soils in impacted DUs. Notable ecological receptors as described in the BERA (Roux 2020a) include terrestrial plants, soil invertebrates, the American Woodcock, and the short-tailed shrew.

The Selected Remedy will eliminate ingestion and direct contact that would result in unacceptable risk for aquatic and semiaquatic ecological receptors by reducing contact with metals, cyanide, and PAHs from contaminated surficial and shallow soils and sediments.

The Selected Remedy for DU1/DU5/DU6 will limit the percolation of water through source areas to groundwater and will minimize or eliminate groundwater contact with the source area during times of seasonal high-water levels. This will eventually eliminate exceedences of DEQ-7 aquatic life criteria in surface water and porewater by reducing migration of metals, cyanide, fluoride, and PAHs from contaminated soils, sediments, and wastes.

Long-term monitoring will confirm the success of the remedy in preventing the contaminant plume from migrating and in meeting remedial goals at the DU5 seeps. If the slurry wall is not effective in controlling plume migration, groundwater extraction will be performed during periods of seasonal high water and the extracted groundwater will be treated if concentrations do not allow for direct discharge.

There are no short-term threats associated with the Selected Remedy that cannot be readily controlled. Implementation of the Selected Remedy will not pose unacceptable short-term risks or cross-media impacts.

13.2 Compliance with ARARs

ARARs are determined based on analysis of which requirements are applicable or relevant and appropriate to the distinctive set of circumstances and actions contemplated at a specific site. The NCP requires that ARARs be attained during the implementation and at completion of the remedial action.

The Selected Remedy will comply with the chemical-specific ARARs for groundwater and surface water (including porewater). There are no chemical-specific ARARs for soil or sediments, however the Selected Remedy would meet the site remedial goals and would be designed to comply with action- and location-specific ARARs, as applicable.

The specific ARARs that the Selected Remedy will attain are listed in Appendix A. They include:

- **Chemical-specific ARARs**. Health- or risk-based numerical values or methodologies used to determine acceptable concentrations of chemicals that may be found in or discharged to the environment.
    - Public water supply criteria for inorganic contaminants for surface water and groundwater
    - Surface water quality criteria and criteria for discharging to surface waters
    - Criteria for maintaining Class 1 groundwaters
    - Presence of COCs in on-site groundwater/surface water
    - Presence of COCs in on-site surface water

- Standards for explosive gases control

- **Location-specific ARARs**. Restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they occur in a specific location.
  - Protection of site wildlife and endangered species
  - Site features within the designated floodway or floodplain or within natural streambeds and drainages
- **Action-specific ARARs**. Technology- or action-based requirements or limitations or actions taken with respect to hazardous substances.
  - Degradation or pollution of state waters
  - Point source discharges to state surface waters
  - Degradation of high-quality ground waters and wasting and contaminating groundwater
  - Constructing or abandoning a monitoring well
  - On-site construction and settlement of particulate matter or particulate emissions during response actions
  - Class II or IV landfills (building or expanding, monitoring groundwater, abandoning a monitoring well, or closing)
  - Landfill placement, operation, design, construction, or maintenance
  - Controlling asbestos
  - Transporting solid waste or disposing of used oil
  - Generating, handling, managing, transporting, and disposing hazardous waste
  - Excavating cover and/or waste material, reclaiming and revegetating, or propagation and control of noxious weeds

13.3 Cost Effectiveness

All Superfund remedies must be cost-effective, meaning that the “costs are proportional to overall effectiveness.” The overall effectiveness of a remedial alternative is determined by evaluating three of the five balancing criteria used in the detailed analysis of alternatives: long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness. Overall effectiveness is then compared to cost to determine whether a remedy is cost-effective.

More than one cleanup alternative can be cost-effective, and the Superfund program does not mandate the selection of the most cost-effective cleanup alternative. The most cost-effective remedy is not necessarily the remedy that provides the best balance of tradeoffs with respect to the remedy selection criteria nor is it necessarily the least-costly alternative. Rather, cost-effectiveness is concerned with the reasonableness of the relationship between the effectiveness afforded by each alternative and its costs compared to other available options.

- The Selected Remedy is cost effective and represents a reasonable value for the money to be spent. The relative costs for the individual alternatives chosen for each DU or DU combination have the highest scores for balancing criteria in the ranking of alternatives conducted for the FS (Table 10-1). They are neither the least expensive nor the most expensive alternatives evaluated.
- **DU1/DU5/DU6**. Alternative 4A is second only to Alternative 4C in overall effectiveness (48 versus 54) and has the highest score (77) for any alternative for the five balancing criteria. Alternative 4A is easier to implement than 4C and the cost for 4A is 61% of 4C and only 28% of the costliest alternative (Alternative 6) which relies on excavation and on-site consolidation. The cost of $45,902,410 for DU1/DU5/DU6 is 82% of the Selected Remedy cost.
- **DU2**. Alternative 2 was the only active alternative and, as such, it was not ranked in the FS. The cost of $6,743,575 for DU2 is 12% of the Selected Remedy cost.
- **DU3**. Alternative 4 has the highest score for overall effectiveness (50) and has the highest score (77) for any alternative for the five balancing criteria. The cost of $1,177,783 for DU3 is 2% of the Selected Remedy cost.
- **DU4**. Alternative 4 has the highest score for overall effectiveness (55) and has the highest score (83) for any alternative for the five balancing criteria. The cost of $2,204,884 for DU4 is 4% of the Selected Remedy cost.

13.4 Use of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a particular manner at the site. Of those alternatives that are protective of human health and the environment and comply with ARARs, the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal and considering State and community acceptance.

For DU1/DU5/DU6, the Selected Remedy would reduce the magnitude of residual risk in groundwater over time and, subsequently, in surface water and porewater in DU5 through natural attenuation. Low-permeability caps would prevent infiltration of precipitation and runoff through the surface of the landfill and the underlying impacted materials, preventing/reducing leaching of COCs to groundwater. The fully encompassing slurry wall around the West Landfill and the Wet Scrubber Sludge Pond would contain contaminated groundwater within the footprint of the waste management units and prevent contaminant mass flux from beyond the containment cell. This would cut off the source of contamination to groundwater. The slurry wall will be augmented by groundwater extraction and treatment during seasonal high water, if necessary. Long-term monitoring and ICs/ECs ensure the remedy is functioning as planned.

At DU2, DU3, and DU4, the Selected Remedy satisfies the criteria for long-term effectiveness by using proven containment technologies (capping and excavation with on-site consolidation) to reduce the potential for direct contact or mobilization of contaminants to groundwater. For DU3 and DU4, the Selected Remedy reduces the magnitude of residual risk by removing impacted material resulting in exceedances of remedial goals from the DU, and as such ECs are not needed for those two DU areas. For all three DUs, treatability/pilot studies would not be required. Development of off-site borrow sources for cover materials would be coordinated with the appropriate agencies.

The alternatives incorporated into the Selected Remedy scored the highest against all other alternatives against the Primary Balancing Criteria. The Selected Remedy does not present short-term risks different from other treatment technologies and there are no special implementability issues that set it apart from other alternatives evaluated. Long-term effectiveness is achieved through monitoring and ICs/ECs.

13.5 Preference for Treatment as a Principal Element

Treatment does not constitute a major component of the Selected Remedy. However, the use of containment is consistent with EPA's presumptive strategy for landfill sites, where containment remedies are preferred over other remedies such as removal and treatment (EPA 1993). Site wastes also do not meet the definition of principal threat wastes.

Treatment is incorporated into the Selected Remedy for groundwater in DU1/DU6/DU5. Interior wells will be installed for monitoring and dewatering of the area during installation of the slurry wall. If the slurry wall is not effective in reducing the influx of groundwater and migration of the groundwater plume due to seasonal high-water, the wells will be used to extract groundwater during high-water periods to limit contact between the source areas and groundwater.

A temporary groundwater treatment facility may be built prior to slurry wall installation, if determined necessary in remedial design. If shakedown monitoring conducted after the slurry wall has been constructed determines that groundwater treatment is necessary, a long-term treatment facility and its ancillary components will be constructed. Extracted groundwater will be treated if concentrations of contaminants during remedy construction or long-term monitoring are elevated above levels that would allow for direct discharge. The facility would be anticipated to be in use only possibly during seasonal high-water conditions. This satisfies the statutory preference for treatment, even though contaminated groundwater is not considered a principal threat waste.

13.6 Five-Year Review Requirements

Because the Selected Remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after the initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

Section 14
Documentation of Significant Changes

The Proposed Plan was released for public comment on June 1, 2023, and presented the Preferred Alternative which is described herein as the Selected Remedy. The public comment period was extended from 60 to 90 days, and EPA reviewed all written and verbal comments submitted during that time. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary. One minor change to the remedy, requiring lining of the Cedar Creek Overflow Ditch in the vicinity of DU1, was added based on public comment.

Section 15
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Tables

Table 5-1. Occurrence of COCs at Site DUs for Ecological and Human Health Receptors

COC	Media of Interest by DU									
	Ecological Risk					Human Health Risk				
	DU1	DU2	DU3	DU4	DU5	DU1	DU2	DU3	DU4	DU5
Aluminum				Surface Water	Surface Water	Soil	Soil	Soil	Soil Sediment	Groundwater
Barium				Soil Sediment Surface Water	Soil Sediment Surface Water Porewater					
Cadmium				Sediment Surface Water						
Cyanide (total)					Sediment Surface Water Porewater					Groundwater
Cyanide (free)										Groundwater
Copper	Soil	Soil	Soil	Surface Water	Sediment Surface Water Porewater					
Fluoride				Surface Water						
Iron					Surface Water					
Lead				Sediment						
Nickel	Soil	Soil	Soil	Soil Sediment						
Selenium			Soil	Soil Sediment						
Thallium				Soil						
Vanadium		Soil		Soil Sediment						
Zinc			Soil	Sediment Surface Water						
PAHs	Soil	Soil	Soil	Soil Sediment Surface Water		Soil	Soil	Soil	Soil Sediment	

Table 8-1. Human Health Remedial Goals for Soils and Sediments

Human Health Contaminants	Remedial Goals				
	Soils				Sediments
	Main Plant Area	North Percolation Pond Area	Central Landfills Area	Industrial Landfills Area	North Percolation Pond Area
Metals					
Arsenic		200	40	40	200
PAHs					
Benzo(a)anthracene	280	1400	280	NA	NA
Benzo(a)pyrene	28	140	28	28	140
Benzo(b)fluoranthene	280	1400	280	NA	1400
Dibenzo(a,h)anthracene	28	140	28	28	140
Indeno(1,2,3-c,d)pyrene	280	1400	280	NA	1400

PAH = polyaromatic hydrocarbon (low and high molecular weight)
Based on an additional lifetime cancer risk of 10E-5 (1 in 100,000)
Main Plant Area receptors: construction worker, industrial worker, and trespasser
North Percolation Pond receptors: stormwater management worker and trespasser
Central Landfills Area receptors: landfill management worker and trespasser
Industrial Landfill Area receptors: landfill management worker and trespasser
All concentrations are in milligrams per kilogram.

Table 8-2. Human Health Remedial Goals for Groundwater, Surface Water, and Sediment Porewater

Contaminant of Concern	DEQ-7 Standard (µg/L)		
	Aquatic Life – Surface Water		Human Health – Groundwater
	Chronic	Acute	
Aluminum	87 (D)	750 (D)	NA
Arsenic	NA	NA	10 (D)
Barium	200	2,000	NA
Cadmium	0.25 (T,H)	0.49 (T,H)	NA
Copper	2.85 (T,H)	3.79 (T,H)	NA
Cyanide, total	5.2	22	200
Fluoride	None	None	4,000
Iron	1,000 (T)	None	NA
Zinc	37 (T,H)	37 (T,H)	NA

D = dissolved
T = total recoverable
H = hardness dependent; calculated herein at a hardness of 25 mg/L; NA = not applicable (not a COC)
Source: Circular DEQ-7 Montana Numeric Water Quality Standards, June 2019, except for barium for which there are no DEQ-7 standards. Acute and chronic barium standards are derived by the Ohio EPA, as discussed in Appendix B of the FS work plan.

Table 8-3. Ecological Remedial Goals for Soils and Sediments

Ecological Contaminants	Soils			Sediments		
	Remedial Goal	Basis	Applicable Exposure Areas	Remedial Goal	Basis	Applicable Exposure Areas
Metals						
Barium	1,000	Terrestrial plants	North and South Percolation Ponds	300	BTV	North and South Percolation Ponds and Flathead River
Cadmium	NA	NA	NA	4.9	Benthic invertebrates	North Percolation Pond
Copper	490	Terrestrial plants	Central Landfill and Grid Area			
Lead	NA	NA	NA	120	Benthic invertebrates	North Percolation Pond
Nickel	140	Short-tailed shrew	North Percolation Pond, Central Landfills, and Industrial Landfill	48	Benthic invertebrates	North Percolation Pond
Selenium	3.4	Terrestrial plants	North Percolation Pond and Grid Area	1.38	BTV	North Percolation Pond
Thallium	0.5	Terrestrial plants	North Percolation Pond	NA	NA	NA
Vanadium	80	Terrestrial plants	North Percolation Pond and Industrial Landfill	38	American Dipper	North Percolation Pond
Zinc	810	Terrestrial plants	Grid Area	450	Benthic invertebrates	North Percolation Pond
PAHs						
LMW PAHs	175	Soil inverte-brates	Main Plant, North Percolation Pond, Central Landfills, and Grid Area	196	American Dipper	
HMW PAHs	69	American Woodcock	Main Plant, North Percolation Pond, Central Landfills, Industrial Landfills, and Grid Area	28.2	American Dipper	
PCBs						
Aroclor 1254	1.2	Short-tailed shrew	Central Landfills	NA	NA	NA

BTV = background threshold value
LMW= low molecular weight
HMW = high molecular weight
PAH = polyaromatic hydrocarbon (low and high molecular weight)
PCB = polychlorinated biphenyl
All concentrations are in milligrams per kilogram.

Table 10-1. FS Evaluation Criteria Results

Alternative		Protection of Human Health and the Environment	Compliance with ARARs	Long-term Effectiveness and Permanence	Treatment	Short-term Effectiveness	Implementability	Cost	Total Score
		Threshold Criteria		Balancing Criteria: Overall Effectiveness			Balancing Criteria: Implementability		
Landfills DU1/Groundwater DU6									
1	No action	No	No	0	0	0	20	20	NA
3A	Containment (capping and upgradient slurry wall)	Yes	Yes	15	9	10	16	16	66
3C	Containment (capping, upgradient slurry wall, and extraction)	Yes	Yes	15	12	16	10	12	65
4A	Containment (capping and fully encompassing slurry wall)	Yes	Yes	18	14	16	15	14	77
4C	Containment (capping, fully encompassing slurry wall, and extraction)	Yes	Yes	18	16	20	10	10	74
5B	Containment (capping and hydraulic control)	Yes	Yes	10	10	12	14	14	60
6	Excavation w/on-site consolidation	Yes	Yes	20	12	5	5	0	42
Landfills DU2									
1	No action	No	No	Not ranked in the feasibility study					NA
2	Containment (capping)	Yes	Yes	Not ranked in the feasibility study					NA
Soils DU3									
1	No action	No	Yes	0	0	0	20	20	NA
2	Covers with hot spot excavation	Yes	Yes	10	12	20	12	10	64
3	In-Place phytoremediation with hot spot excavation	Yes	Yes	20	20	5	8	13	66
4	Excavation w/on-site consolidation	Yes	Yes	20	15	15	15	12	77
North Percolation Ponds DU4									
1	No action	No	No	0	0	0	20	20	NA
2	Limited excavation w/covers	Yes	Yes	10	10	20	10	10	60
3	Excavation with cover	Yes	Yes	15	15	18	12	13	73
4	Excavation w/on-site consolidation	Yes	Yes	20	20	15	15	13	83
River Area DU5									
1	No action	No	No	Not ranked in the feasibility study					NA
2	Performance monitoring of surface water and sediment porewater	Yes	Yes	Not ranked in the feasibility study					NA

No Action alternatives fail the threshold criteria and are not ranked; Landfills DU2 and River Area DUs are not ranked as there is only one alternative beyond No Action for each.
Grayed cells are the alternatives included in the Preferred Alternative and Selected Remedy.
Source: Proposed Plan (EPA 2023)

Table 10-2. Volume, Time, and Cost Information for Remedial Alternatives

Decision Unit and Alternative		Volume (cubic yards)	Time (years)		Cost	
			Construc-tion	Achieve RAOs	Operation and Maintenance (30 years)	Present Value Estimated
Landfills DU1/Groundwater DU6						
1	No action	0	0	0	$1,859,250	$769,050
3A	Containment (capping and upgradient slurry wall)	2,301	1	4	$6,537,000	$27,716,290
3C	Containment (capping, upgradient slurry wall, and extraction)	2,301	1	4	$61,110,600	$62,258,574
4A	Containment (capping and fully encompassing slurry wall)	3,859	2	4	$16,059,000	$45,642,497
4C	Containment (capping, fully encompassing slurry wall, and extraction)	3,859	2	4	$61,110,600	$74,303,074
5B	Containment (capping and hydraulic control)	0	1	4	$61,110,600	$48,724,897
6	Excavation w/on-site consolidation	1,400,000	5	4-5	$18,918,000	$165,590,849
Landfills DU2						
1	No action	0	0	0	$1,928,550	$797,715
2	Containment (capping)		1	2	$1,928,550	$6,967,323
Soils DU3						
1	No action	0	0	0	$0	$0
2	Covers with hot spot excavation		1	2	$819,240	$1,606,306
3	In-Place phytoremediation with hot spot excavation		1	10	$563,953	$1,171,948
4	Excavation w/on-site consolidation		1	2	$0	$1,237,989
North Percolation Ponds DU4						
1	No action	NA	0	NA	NA	NA
2	Limited excavation w/covers		1	2	$1,536,000	$3,129,010
3	Excavation with cover		1	2	$902,400	$2,346,093
4	Excavation w/on-site consolidation		1	2	$0	$2,286,195
River Area DU5						
1	No action	NA	NA	NA	NA	NA
2	Performance monitoring of surface water and sediment porewater	0	0	0	$3,388,800	$1,401,725

Source: Proposed Plan (EPA 2023)

Design will occur prior to construction and will include pre-design investigations and take up to 2 years to complete.

Table 10-3. Comparative Costs for Retained Alternatives

Alternative by DU	Costs		
	Capital	Operations and Maintenance	Total (present value)
Landfills DU1/Groundwater DU6			
1	$0	$769,050	$769,050
3A	$25,012,360	$2,703,930	$27,716,290
4A	$38,999,937	$6,642,560	$45,642,497
5B	$23,447,432	$25,277,465	$48,724,897
3C	$36,981,109	$25,277,465	$62,258,574
4C	$49,025,609	$25,277,465	$74,303,074
6	$157,765,708	$7,825,141	$165,590,849
Landfills DU2			
1	$0	$797,715	$797,715
2	$6,169,608	$797,715	$6,967,323
Soils DU3			
1	$0	$0	$0
3	$775,851	$396,097	$1,171,948
4	$1,237,989	$0	$1,237,989
2	$1,267,440	$388,866	$1,606,306
North Percolation Ponds DU4			
1	$0	$0	$0
4	$2,286,195	$0	$2,286,195
3	$1,972,829	$373,264	$2,346,093
2	$2,493,668	$635,343	$3,129,010
River Area DU5			
1	$0	$0	$0
2	$0	$1,401,725	$1,401,725

Source: Proposed Plan (EPA 2023)

Appendix A
Applicable or Relevant and Appropriate Requirements

Preliminary Notes

State and federal requirements must be substantive in nature to qualify as ARARs. On-site portions of response actions need only comply with "substantive" aspects of ARARs rather than any corresponding "administrative" requirements. Substantive requirements typically are those requirements that pertain directly to actions or conditions in the environment. Administrative requirements typically are those mechanisms that facilitate the implementation of the substantive requirements of a statute or regulation and include the approval of, or consultation with, administrative bodies, issuance of permits, documentation, reporting, recordkeeping and enforcement.[1]

The summary statements in the "Requirement" column for each identified ARAR should not be relied upon exclusively in ascertaining the full requirement. Please refer to full version of the applicable state or federal law, as codified.

Chemical-Specific ARARs

Chemical-specific ARARs are usually health- or risk-based numerical values or methodologies used to determine acceptable concentrations of chemicals that may be found in or discharged to the environment.

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Media	**Requirement**	**Prerequisite**	**Citation(s)**
Statute | Public Water Supply			
Criteria for inorganic contaminants for surface and groundwater	Shall not exceed the SDWA National Revised Primary Drinking Water Regulations maximum contaminant levels (MCLs) for inorganic contaminants, as specified in Circular DEQ-7. Standards applicable to current site conditions are listed separately in the next entry. *Available at*: https://www.epa.gov/sites/production/files/2015-09/documents/cfr-2014-title40-vol23-sec141-62_0.pdf **§ 141.62 Maximum contaminant levels for inorganic contaminants.** (b) The maximum contaminant levels for inorganic contaminants specified in paragraphs (b) (2)–(6), (b)(10), and (b)(11)–(16) of this section apply to community water systems and non-transient, non-community water systems. The maximum contaminant level specified in paragraph (b)(1) of this section only applies to community water systems. The maximum contaminant levels specified in (b)(7), (bw)(8), and (b)(9) of this section apply to community water systems; non-transient, noncommunity water systems; and transient non-community water systems.	☑Applicable **LDU2** **SO** **NPP** **LDU1/GW** **RADU** Applies to the presence of inorganic contaminants outside the LDU1/GW slurry wall.	40 C.F.R. § 141.62(b) Circular DEQ-7

[1] *See* Memorandum from Larry Douchand to Superfund National Program Managers re: "Documenting Applicable, or Relevant and Appropriate Requirements in Comprehensive Environmental Response, Compensation, and Liability Act Response Action Decisions" at p. 10-11 (Mar. 1, 2023), available at https://semspub.epa.gov/work/HQ/100003166.pdf

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Media	**Requirement**	**Prerequisite**	**Citation(s)**
		Note: RADU—The 2021 TCRA complied with this ARAR with respect to barium, but that work only involved a portion of the RADU.	
Regulation | Surface Waters			

Criteria for surface water quality	Shall meet applicable standards set forth in Department Circular DEQ-7 for surface water classified B-1, including but not limited to concentrations of harmful parameters as follows:
	• Aluminum:
	  o Aquatic Life Standards: 87 µg/L (chronic, dissolved); 750 µg/L (acute, dissolved)
	• Barium:
	  o Human Health Standard: 1,000 (surface water)
	• Cadmium:
	  o Aquatic Life Standards: 0.25 µg/L (chronic, total recoverable, hardness dependent); 0.49 µg/L (acute, total recoverable, hardness dependent)
	  o Human Health Standard: 5 µg/L (surface water)
	• Copper:
	  o Aquatic Life Standards: 2.85 µg/L (chronic, total recoverable, hardness dependent); 3.79 µg/L (acute, total recoverable, hardness dependent)
	  o Human Health Standard: 1,300 µg/L (surface water)
	• Total Cyanide:
	  o Aquatic Life Standards: 5.2 µg/L (chronic); 22 µg/L (acute)
	  o Human Health Standard: 4 µg/L (surface water)
	• Fluoride:
	  o Human Health Standard: 4,000 (surface water)
	• Iron:
	  o Aquatic Life Standard: 1,000 µg/L (chronic, total recoverable)
	• Zinc:
	  o Aquatic Life Standard: 37 µg/L (chronic and acute, total recoverable, hardness dependent)
	  o Human Health Standard: 7,400 µg/L (surface water)
	
	Available at: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E30%2E623
	
	Rule Title: B-1 CLASSIFICATION STANDARDS
	Department: ENVIRONMENTAL QUALITY
		☑Applicable
		LDU2
		SO
		NPP
		LDU1/GW
		
		Applies to the presence of contaminants of concern in B-1 classified waters, outside the LDU1/GW slurry wall. Applies to water quality standards, e.g. concentrations of toxic or harmful parameters.
		
		Note: RADU—The 2021 TCRA complied with this ARAR with respect to barium, but that work only involved a portion of the RADU.
			ARM 17.30.623
			
			Cross-references: ARM 17.30.608; ARMs 17.30.641 & 17.30.646 (sampling methodology requirements)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
Anaconda/CFAC ROD

Media	Requirement	Prerequisite	Citation(s)
	Chapter: WATER QUALITY Subchapter: Surface Water Quality Standards and Procedures **17.30.623** B-1 CLASSIFICATION STANDARDS (1) Waters classified B-1 are to be maintained suitable for drinking, culinary, and food processing purposes, after conventional treatment; bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply. (2) No person may violate the following specific water quality standards for waters classified B-1: (a) Water quality criteria for Escherichia coli are expressed in colony forming units per 100 milliliters of water or as most probable number, which is a statistical representation of the number of organisms in a sample, as incorporated by reference in 40 CFR 136.3(b). The water quality standard for Escherichia coli bacteria (E-coli) varies according to season, as follows: (i) from April 1 through October 31, the geometric mean number of E-coli may not exceed 126 colony forming units per 100 milliliters and 10 percent of the total samples may not exceed 252 colony forming units per 100 milliliters during any 30-day period; and (ii) from November 1 through March 31, the geometric mean number of E-coli may not exceed 630 colony forming units per 100 milliliters and 10 percent of the samples may not exceed 1,260 colony forming units per 100 milliliters during any 30-day period. (b) Dissolved oxygen concentration must not be reduced below the applicable standards given in department Circular DEQ-7. (c) Induced variation of hydrogen ion concentration (pH) within the range of 6.5 to 8.5 must be less than 0.5 pH unit. Natural pH outside this range must be maintained without change. Natural pH above 7.0 must be maintained above 7.0. (d) The maximum allowable increase above naturally occurring turbidity is five nephelometric turbidity units except as permitted in 75-5-318, MCA. (e) A 1ºF maximum increase above naturally occurring water temperature is allowed within the range of 32ºF to 66ºF; within the naturally occurring range of 66ºF to 66.5ºF, no discharge is allowed which will cause the water temperature to exceed 67ºF; and where the naturally occurring water temperature is 66.5ºF or greater, the maximum allowable increase in water temperature is 0.5ºF. A 2ºF per-hour maximum decrease below naturally occurring water temperature is allowed when the water temperature is above 55ºF. A 2ºF maximum decrease below naturally occurring water temperature is allowed within the range of 55ºF to 32ºF. This applies to all waters in the state classified B-1 except for Prickly Pear Creek from McClellan Creek to the Montana Highway No. 433 crossing where a 2ºF maximum increase above naturally occurring water temperature is allowed within the range of 32ºF to 65ºF; within the naturally occurring range of 65ºF to 66.5ºF, no discharge is allowed which will cause the water temperature to exceed 67ºF; and where the naturally occurring water temperature is 66.5ºF or greater, the maximum allowable increase in water temperature is 0.5ºF. (f) No increases are allowed above naturally occurring concentrations of sediment or suspended sediment (except as permitted in 75-5-318, MCA), settleable solids, oils, or floating solids, which will or are likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife. (g) True color must not be increased more than five color units above naturally occurring color. (h) Concentrations of carcinogenic, bioconcentrating, toxic, radioactive, nutrient, or harmful parameters may not exceed the applicable standards set forth in Department Circular DEQ-7 and, unless a nutrient standards variance has been granted, Department Circular DEQ-12A. (i) Dischargers issued permits under ARM Title 17, chapter 30, subchapter 13, shall conform with ARM Title 17, chapter 30, subchapter 7, the nondegradation rules, and may not cause receiving water concentrations to exceed the applicable standards specified in Department Circular DEQ-7 and, unless a nutrient standards variance has been granted, Department Circular DEQ-12A when stream flows equal or exceed the design flows specified in ARM 17.30.635(2).		

<table>
<tr><th colspan="4">APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
Anaconda/CFAC ROD</th></tr>
<tr><th>Media</th><th>Requirement</th><th>Prerequisite</th><th>Citation(s)</th></tr>
<tr><td></td><td>(j) If site-specific criteria for aquatic life are adopted using the procedures given in 75-5-310, MCA, the criteria shall be used as water quality standards for the affected waters and as the basis for permit limits instead of the applicable standards in Department Circular DEQ-7.
(k) In accordance with 75-5-306(1), MCA, it is not necessary that wastes be treated to a purer condition than the natural condition of the receiving water as long as the minimum treatment requirements, adopted pursuant to 75-5-305, MCA, are met.</td><td></td><td></td></tr>
<tr><td>Criteria for discharges to surface waters</td><td>Shall not engage in certain prohibited discharges

Available at:
http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E30%2E637

Rule Title: GENERAL PROHIBITIONS
Department: Environmental Quality
Chapter: Water Quality
Subchapter: Surface Water Quality Standards and Procedures

ARM 17.30.637 GENERAL PROHIBITIONS
(1) State surface waters must be free from substances attributable to municipal, industrial, agricultural practices or other discharges that will:
(a) settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines;
(b) create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter), or globules of grease or other floating materials;
(c) produce odors, colors, or other conditions as to which create a nuisance or render undesirable tastes to fish flesh or make fish inedible;
(d) create concentrations or combinations of materials which are toxic or harmful to human, animal, plant, or aquatic life; and
(e) create conditions which produce undesirable aquatic life.
(2) No wastes may be discharged and no activities conducted such that the wastes or activities, either alone or in combination with other wastes or activities, will violate, or can reasonably be expected to violate, any of the standards.
(3) Until such time as minimum stream flows are established for dewatered streams, the minimum treatment requirements for discharges to dewatered receiving streams must be no less than the minimum treatment requirements set forth in ARM 17.30.1203.
(4) Treatment requirements for discharges to ephemeral streams must be no less than the minimum treatment requirements set forth in ARM 17.30.1203. Ephemeral streams are subject to ARM 17.30.635 through 17.30.637, 17.30.640, 17.30.641, 17.30.645, and 17.30.646 but not to the specific water quality standards of ARM 17.30.620 through 17.30.629.
(5) Pollution resulting from storm drainage, storm sewer discharges, and non-point sources, including irrigation practices, road building, construction, logging practices, over-grazing, and other practices must be eliminated or minimized as ordered by the department.
(6) Application of pesticides in or adjacent to state surface waters must be in compliance with the labeled direction, and in accordance with provisions of the Montana Pesticides Act (Title 80, chapter 8, MCA) and the Federal Environmental Pesticides Control Act (7 USC 136, et seq., (Supp. 1973) as amended). Excess pesticides and pesticide containers must not be disposed of in a manner or in a location where they are likely to pollute surface waters.
(7) No pollutants may be discharged and no activities may be conducted which, either alone or in combination with other wastes or activities, result in the total dissolved gas pressure relative to the water surface exceeding 110% of saturation.</td><td>☑Applicable
LDU2
SO
NPP
LDU1/GW

Applies to discharges to state surface waters outside the LDU1/GW slurry wall.

Note: RADU—The 2021 TCRA complied with this ARAR with respect to barium, but that work only involved a portion of the RADU.</td><td>ARM 17.30.637</td></tr>
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APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Media	**Requirement**	**Prerequisite**	**Citation(s)**
Regulation | Ground Waters			
Criteria for maintaining Class I ground waters	Shall meet human health standards listed in Circular DEQ-7 for Class I ground waters, as follows: • Arsenic: 10 µg/L (dissolved) • Total Cyanide: 200 µg/L • Fluoride: 4,000 µg/L *Available at*: http://www.mtrules.org/gateway/ruleno.asp?RN=17.30.1006 Rule Title: CLASSIFICATIONS, BENEFICIAL USES, AND SPECIFIC STANDARDS FOR GROUND WATERS Department: Environmental Quality Chapter: Water Quality Subchapter: Montana Ground Water Control System 17.30.1006 CLASSIFICATIONS, BENEFICIAL USES, AND SPECIFIC STANDARDS FOR GROUND WATERS (1) Class I ground waters are those ground waters with a natural specific conductance less than or equal to 1,000 microSiemens/cm at 25ºC. (a) The quality of Class I ground water must be maintained so that these waters are suitable for the following beneficial uses with little or no treatment: (i) public and private water supplies; (ii) culinary and food processing purposes; (iii) irrigation; (iv) drinking water for livestock and wildlife; and (v) commercial and industrial purposes. (b) Except as provided in ARM 17.30.1005(2) , a person may not cause a violation of the following specific water quality standards in Class I ground water: (i) the human health standards for ground water listed in DEQ-7; (ii) for concentrations of parameters for which human health standards are not listed in DEQ-7, no increase of a parameter to a level that renders the waters harmful, detrimental, or injurious to the beneficial uses listed for Class I water. The department may use any pertinent credible information to determine these levels; and (iii) no increase of a parameter that causes a violation of the nondegradation provisions of 75-5-303 , MCA.	☑Applicable **LDU1/GW** Total Cyanide Fluoride **LDU2** **SO** **NPP** Arsenic Applies to the presence of contaminants of concern in Class I ground waters (including at seeps), except RADU.	ARM 17.30.1006(1)
Presence of COC **arsenic** in on-site ground waters	Arsenic Standards (µg/L): 10 – Ground Water	☑Applicable **LDU1/GW** **LDU2** **SO** **NPP**	DEQ-7, page 11
Presence of COC **cyanide** in on-site waters	Cyanide Aquatic Life Standards (surface water) (µg/L): 22 – Acute 5.2 – Chronic	☑Applicable **RADU** **LDU1/GW**	DEQ-7, page 23

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Media	**Requirement**	**Prerequisite**	**Citation(s)**
	Cyanide Human Health Standards (µg/L): 4 – Surface Water 200 – Ground Water		
Presence of COC **fluoride** in on-site waters	Fluoride Human Health Standards (µg/L): 4,000 – Surface Water 4,000 – Ground Water	☑Applicable **RADU** **LDU1/GW** **NPP**	DEQ-7, page 41
Presence of COC **aluminum** in on-site surface waters	Aluminum Aquatic Life Standards (µg/L): 750 – Acute 87 – Chronic	☑Applicable **RADU** **NPP**	DEQ-7, page 10
Presence of COC **barium** in on-site surface waters	Barium Aquatic Life Standards (µg/L): n/a – Acute n/a – Chronic Barium Human Health Standard (µg/L): 1,000– Surface Water	☑Applicable **NPP** ***Note***: RADU—The 2021 TCRA complied with this ARAR with respect to barium, but that work only involved a portion of the RADU.	DEQ-7, page 12 (PRG Exceedance)
Presence of COC **cadmium** in on-site surface waters	Cadmium Aquatic Life Standards (µg/L): 0.25 – Chronic, total recoverable, hardness dependent 0.49 – Acute, total recoverable, hardness dependent Cadmium Human Health Standard (µg/L): 5 – Surface Water	☑Applicable **NPP**	DEQ-7, page 18
Presence of COC **copper** in on-site surface waters	Copper Aquatic Life Standards (µg/L): 3.79@ 25mg/L – Acute 2.85@ 25 mg/L – Chronic Copper Human Health Standard (µg/L): 1,300 – Surface Water	☑Applicable **RADU** **LDU1/GW** **LDU2** **SO** **NPP**	DEQ-7, page 23
Presence of COC **iron** in on-site surface waters	Iron Aquatic Life Standards (µg/L): n/a – Acute 1,000 – Chronic	☑Applicable **RADU** **LDU1/GW**	DEQ-7, page 46

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Media	**Requirement**	**Prerequisite**	**Citation(s)**
		LDU2 **SO** **NPP**	
Presence of COC **zinc** in on-site surface waters	Zinc Aquatic Life Standard (µg/L): 37 – Chronic and acute, total recoverable, hardness dependent Zinc Human Health Standard (µg/L): 7,400 – Surface Water	☑Applicable **NPP**	DEQ-7, page 73
Standards for explosive gases control	Shall manage concentration of methane gas in air to ensure explosive gases control *Available at*: http://www.mtrules.org/gateway/ruleno.asp?RN=17.50.1106 Rule Title: EXPLOSIVE GASES CONTROL 17.50.1106 EXPLOSIVE GASES CONTROL (1) The owner or operator of a Class II landfill unit shall ensure that: (a) the concentration of methane gas generated by the facility does not exceed 25 percent of the lower explosive limit for methane in facility structures, excluding gas control or recovery system components; and (b) the concentration of methane gas does not exceed the lower explosive limit for methane at the facility property boundary. (2) The owner or operator of a Class II landfill unit shall implement a routine methane monitoring program to ensure that the standards of (1) are met. (3) The minimum frequency of monitoring required in (2) is quarterly, except as provided in (7). The type and frequency of monitoring required in (2) must be determined based on the following factors: (a) soil conditions; (b) the hydrogeologic conditions surrounding the facility; (c) the hydraulic conditions surrounding the facility; (d) the location of facility structures and property boundaries. (4) If methane gas levels exceeding the limits specified in (1) are detected, the owner or operator shall: (a) immediately take all necessary steps to ensure protection of human health and notify the department; (b) within seven days after detection, place in the operating record specification of the methane gas levels detected and a description of the steps taken to protect human health; and	☑Applicable **LDU1/GW** **LDU2** **SO** **NPP** Applies to the release of methane to air from spent potliner material, except RADU. Long-term monitoring will be important to monitor landfill vents for potential explosive gases & gas build-up.	ARM 17.50.1106(1), (2), (3), (4)(a)-(b)

Location-Specific ARARs

Location-specific requirements are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they occur in special locations.

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
Anaconda/CFAC ROD

Location	Requirement	Prerequisite	Citation(s)
Statute | Fish & Wildlife			
Site	Shall not take, possess, transport, export, sell, or offer for sale any listed endangered species, as specified in ARM 12.5.201 *Available at*: https://leg.mt.gov/bills/mca/title_0870/chapter_0050/part_0010/section_0070/0870-0050-0010-0070.html TITLE 87. FISH AND WILDLIFE CHAPTER 5. WILDLIFE PROTECTION Part 1. Nongame and Endangered Species List Of Endangered Species **87-5-107. List of endangered species.** (3) Except as otherwise provided in this part, it is unlawful for any person to take, possess, transport, export, sell, or offer for sale and for any common or contract carrier knowingly to transport or receive for shipment any species or subspecies of wildlife appearing on any of the following lists: (a) the list of wildlife indigenous to the state determined to be endangered within the state pursuant to subsection (1); (b) any species or subspecies of fish and wildlife included by the department and appearing on the United States' list of endangered native fish and wildlife (part 17 of Title 50, Code of Federal Regulations, appendix D) as it appears on July 1, 1973; and the United States' list of endangered foreign fish and wildlife (part 17 of Title 50, Code of Federal Regulations, appendix A), as that list may be modified. *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=12%2E5%2E201 Rule Title: ENDANGERED SPECIES LIST Department: FISH, WILDLIFE, AND PARKS Chapter: RESOURCE PROTECTION Subchapter: Endangered Species **12.5.201** ENDANGERED SPECIES LIST (1) The following endangered species list is established in accordance with Title 87, chapter 5, MCA. Except as otherwise provided, it is unlawful for any person to take, possess, transport, export, sell or offer for sale, and for any common or contract carrier knowingly to transport or receive for shipment any species or subspecies of wildlife appearing on the following list: (a) whooping crane (*grus americana*); (b) Northern Rocky Mountain wolf (*canis lupus irremotus*); and (i) Subsection (1)(b) will be applied until the date the gray wolf in Montana is no longer subject to federal jurisdiction under the Endangered Species Act, 16 U.S.C. 1531, et seq., and the department and commission have sole jurisdiction over the management of the gray wolf in Montana. (c) black-footed ferret (*mustela nigripes*).	☑Applicable Applies where a federal action may result in a taking of a listed endangered species. This is of particular concern with respect to RADU and the potential presence of Bull Trout.	Section 87-5-107(3), MCA
Statute | Floodplain and Floodway Management Act			

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Location	**Requirement**	**Prerequisite**	**Citation(s)**
Site features within the designated floodway	Shall not construct a structure or excavation that will cause water to be diverted from the established floodway, cause erosion, obstruct the natural flow of water, or reduce the carrying capacity of the floodway within a designated floodway *Available at*: https://leg.mt.gov/bills/mca/title_0760/chapter_0050/part_0040/section_0030/0760-0050-0040-0030.html TITLE 76. LAND RESOURCES AND USE CHAPTER 5. FLOOD PLAIN AND FLOODWAY MANAGEMENT Part 4. Use of Flood Plains and Floodways 76-5-403. Prohibited uses within floodway. The following nonconforming uses shall be prohibited within the designated floodway: (2) a structure or excavation that will cause water to be diverted from the established floodway, cause erosion, obstruct the natural flow of water, or reduce the carrying capacity of the floodway;	☑Applicable Applies to federal actions that involve certain potential impacts within a designated floodway. ***Note***: RADU—The 2021 TCRA complied with this ARAR with respect to barium, but that work only involved a portion of the RADU.	Section 76-5-403(2), MCA Cross-reference: ARM 36.15.605(1)(b), 2(c) and (d)
Regulation | Floodplain Management			
Site features within the floodplain	Shall consider certain factors for the proposed new construction, substantial improvement, or alteration of an artificial obstruction within a floodplain. *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=36%2E15%2E216 Rule Title: PERMITS - CRITERIA - TIME LIMITS Department: NATURAL RESOURCES AND CONSERVATION, DEPARTMENT OF Chapter: FLOODPLAIN MANAGEMENT Subchapter: Regulation and Enforcement **36.15.216** PERMITS - CRITERIA - TIME LIMITS (2) Additional factors that shall be considered for every permit application are: (a) the danger to life and property from backwater or diverted flow caused by the obstruction; (b) the danger that the obstruction will be swept downstream to the injury of others; (c) the availability of alternative locations; (d) the construction or alteration of the obstruction in such manner as to lessen the danger; (e) the permanence of the obstruction; (f) The anticipated development in the foreseeable future of the area which may be affected by the obstruction; and, (g) such other factors as are in harmony with the purposes of the Act and these rules. ***Note***: Under CERCLA, a permit is not required, per paragraph (2).	☑Applicable Applies to federal actions that involve certain potential impacts within a floodplain. ***Note***: RADU—The 2021 TCRA complied with this ARAR with respect to barium, but that work only involved a portion of the RADU.	ARM 36.15.216(2)
Site features within the	Shall comply with certain standards for uses within a designated floodway.	☑Applicable	ARM 36.15.602(1), (5)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Location	**Requirement**	**Prerequisite**	**Citation(s)**
designated floodway	*Available at*: http://www.mtrules.org/gateway/ruleno.asp?RN=36.15.602 Rule Title: USES REQUIRING PERMITS Department: NATURAL RESOURCES AND CONSERVATION, DEPARTMENT OF Chapter: FLOODPLAIN MANAGEMENT Subchapter: Designated Floodway Minimum Standards **36.15.602** USES REQUIRING PERMITS In addition to the uses allowed under ARM 36.15.601, the following artificial obstructions may be permitted within the designated floodway subject to the issuance of a permit by the permit issuing authority under the conditions set forth in this rule and ARM 36.15.603 and 36.15.604: (1) excavation of material from pits or pools provided that: (a) a buffer strip of undisturbed land of sufficient width to prevent flood flows from channeling into the excavation is left between the edge of the channel and the edge of the excavation; (b) the excavation meets all applicable laws and regulations of other local and state agencies; and (c) excavated material is stockpiled outside the designated floodway; (5) storage of materials and equipment provided that: (a) the material or equipment is not subject to major damage by flooding and is properly anchored to prevent flotation or downstream movement; or, (b) the material or equipment is readily removable within the limited time available after flood warning. Storage of flammable, toxic, or explosive materials shall not be permitted; ***Note*: Under CERCLA, a permit is not required.**	Applies to federal actions that involve certain potential impacts within a designated floodway. ***Note***: RADU—The 2021 TCRA complied with this ARAR with respect to barium, but that work only involved a portion of the RADU.	
Site features within the designated floodway	Shall not construct a structure or excavation that will cause water to be diverted from the established floodway, cause erosion, obstruct the natural flow of water, reduce the carrying capacity of the floodway, construct certain artificial obstructions, dispose of solid and hazardous waste, or store toxic, flammable, hazardous, or explosive materials *Available at*: http://www.mtrules.org/gateway/ruleno.asp?RN=36%2E15%2E605 Rule Title: PROHIBITED USES Department: NATURAL RESOURCES AND CONSERVATION, DEPARTMENT OF Chapter: FLOODPLAIN MANAGEMENT Subchapter: Designated Floodway Minimum Standards **36.15.605** PROHIBITED USES (1) The following artificial obstructions are prohibited within the designated floodway except as allowed by permit under ARM 36.15.602 through 36.15.604 and ARM 36.15.606: (b) a structure or excavation that will cause water to be diverted from the established floodway, cause erosion, obstruct the natural flow of water, or reduce the carrying capacity of the floodway; (2) The following artificial obstructions are also prohibited within the designated floodway: (c) solid and hazardous waste disposal and individual or multiple family sewage disposal systems; (d) storage of toxic, flammable, hazardous, or explosive materials.	☑Applicable Applies to federal actions that involve certain potential impacts within a designated floodway. ***Note***: RADU—The 2021 TCRA complied with this ARAR with respect to barium, but that work only involved a portion of the RADU.	ARM 36.15.605(1)(b), (2)(c) and (d) Cross-reference: Section 76-5-403(2), MCA

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Location	**Requirement**	**Prerequisite**	**Citation(s)**
	***Note*: Under CERCLA, a permit is not required, per paragraph (1).**		
Site features within the flood fringe	Shall not dispose of solid and hazardous waste, or store toxic, flammable, hazardous, or explosive materials within the designated flood fringe *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=36.15.703 Rule Title: PROHIBITED USES Department: NATURAL RESOURCES AND CONSERVATION, DEPARTMENT OF Chapter: FLOODPLAIN MANAGEMENT Subchapter: Flood Fringe Minimum Standards **36.15.703** PROHIBITED USES The following artificial obstructions and nonconforming uses are prohibited within the flood fringe: (1) solid and hazardous waste disposal; and (2) storage of toxic, flammable, hazardous, or explosive materials. Storage of petroleum products may be allowed by permit if stored on compacted fill at least 2 feet above the elevation of the base flood and anchored to a permanent foundation that is properly anchored to the ground. ***Note*: Under CERLCA, a permit is not required, per paragraph (2).**	☑Applicable Applies to federal actions that result in artificial obstructions and nonconforming uses within the flood fringe, namely the disposal of solid and hazardous waste, or the storage of toxic, flammable, hazardous, or explosive materials within the flood fringe. ***Note***: RADU—The 2021 TCRA complied with this ARAR with respect to barium, but that work only involved a portion of the RADU.	ARM 36.15.703
Regulation | Natural Streambed and Land Preservation Act			
Site features co-located with natural streambeds and drainages	Shall meet certain minimum standards and shall not engage in certain prohibited projects *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=36%2E2%2E410 Rule Title: STANDARDS AND GUIDELINES Department: NATURAL RESOURCES AND CONSERVATION, DEPARTMENT OF Chapter: PROCEDURAL RULES Subchapter: Minimum Standards and Guidelines for Natural Streambed and Land Preservation Act of 1975 **36.2.410** STANDARDS AND GUIDELINES (2) Projects must be designed and constructed using methods that minimize: (a) adverse impacts to the stream, both upstream and downstream; (b) future disturbance to the stream. (3) All disturbed areas must be managed during construction and reclaimed after construction to minimize erosion.	☑Applicable Applies to federal actions that adversely impacts a stream. ***Note***: RADU—The 2021 TCRA complied with this ARAR with respect to barium, but that work only involved a portion of the RADU.	ARM 36.2.410(2)-(7), (9)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Location	**Requirement**	**Prerequisite**	**Citation(s)**
	(4) Temporary structures used during construction must be designed to handle high flows reasonably anticipated during the construction period. Temporary structures must be completely removed from the stream channel at the conclusion of construction and the area must be restored to a natural or stable condition. (5) Channel alterations must be designed to retain original stream length or otherwise provide hydrologic stability. (6) Streambank vegetation must be protected except where removal of such vegetation is necessary for the completion of the project. When removal of vegetation is necessary, it must be kept to a minimum. (7) Riprap, rock, or other material used in a project must be of adequate size, shape, and density and must be properly placed to protect the streambank from erosion. (9) Unless specifically authorized by the district, the following projects are prohibited: (a) the placement of road fill material in a stream; (b) the placement of debris or other materials in a stream where it can erode or float into the stream; (c) projects that permanently prevent fish migration; (d) operation of construction equipment in a stream; and (e) excavation of streambed gravels.		

Action-Specific ARARs

Action-specific requirements are technology- or activity-based requirements or limitations or actions taken with respect to hazardous substances.

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
Statute | Montana Water Quality Act			
Activities causing degradation of State Waters	Shall maintain the level of water quality necessary for existing uses of state waters, unless exempted *Available at*: https://leg.mt.gov/bills/mca/title_0750/chapter_0050/part_0030/section_0030/0750-0050-0030-0030.html TITLE 75. ENVIRONMENTAL PROTECTION CHAPTER 5. WATER QUALITY Part 3. Classification and Standards **Nondegradation policy.** (1) Existing uses of state waters and the level of water quality necessary to protect those uses must be maintained and protected. (2) Unless authorized by the department under subsection (3) or exempted from review under **75-5-317**, the quality of high-quality waters must be maintained.	☑Applicable* **LDU1/GW** **LDU2** **SO** **NPP** *Applies to the construction, implementation, and maintenance of remedial action components resulting in a discharge to surface and/or ground water (e.g., excavation, consolidation, containment/capping, slurry wall, groundwater pumping).	Section 75-5-303(1) and (2), MCA Cross-references: Section 75-5-317, MCA; ARM 17.30.1011

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
		Note: RADU—The 2021 TCRA complied with this ARAR, but that work only involved a portion of the RADU.	
Activities causing "pollution" of state waters	Shall not cause, or place any wastes that cause, pollution of any state waters *Available at*: https://leg.mt.gov/bills/mca/title_0750/chapter_0050/part_0060/section_0050/0750-0050-0060-0050.html TITLE 75. ENVIRONMENTAL PROTECTION CHAPTER 5. WATER QUALITY Part 6. Enforcement, Appeal, and Penalties (1) It is unlawful to: (a) cause pollution, as defined in **75-5-103**, of any state waters or to place or cause to be placed any wastes where they will cause pollution of any state waters. Any placement of materials that is authorized by a permit issued by any state or federal agency is not a placement of wastes within the prohibition of this subsection (1)(a) if the agency's permitting authority includes provisions for review of the placement of materials to ensure that it will not cause pollution of state waters. (c) cause degradation of state waters without authorization pursuant to 75-5-303; ***Note*****:** Under CERCLA, a permit is not required, per paragraph (1)(a).	☑Applicable* **LDU1/GW** **LDU2** **SO** **NPP** *Applies to the construction, implementation, and maintenance of remedial action components resulting in a discharge to surface and/or ground water (e.g., excavation, consolidation, containment/capping, slurry wall, groundwater pumping). ***Note***: RADU—The 2021 TCRA complied with this ARAR, but that work only involved a portion of the RADU.	Section 75-5-605(1)(a) and (c), MCA Cross-references: Section 75-5-103(28), MCA; Section 75-5-308, MCA (criteria for short-term exceedances)
Statute | Clean Water Act			
Activities resulting in point source discharges to surface waters	Shall comply with technology-based treatment requirements at point source discharges *Available at:* https://www.govinfo.gov/content/pkg/USCODE-2021-title33/pdf/USCODE-2021-title33-chap26.pdf Title 33. Navigation and Navigable Waters Chapter 26. Water Pollution Prevention and Control Subchapter III. Standards and Enforcement (b) Timetable for achievement of objectives In order to carry out the objective of this chapter there shall be achieved—	☑Applicable* **LDU1/GW** **LDU2** **SO** **NPP** *These provisions would apply to direct discharges to surface water from a point source from RA activities.	33 U.S.C. § 1311(b) Cross-reference: ARM 17.30.1203 (variance procedure for meeting Clean Water Act requirements)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
Anaconda/CFAC ROD

Action	Requirement	Prerequisite	Citation
	(1)(A) not later than July 1, 1977, effluent limitations for point sources, other than publicly owned treatment works, (i) which shall require the application of the best practicable control technology currently available as defined by the Administrator pursuant to section 1314(b) of this title, or (ii) in the case of a discharge into a publicly owned treatment works which meets the requirements of subparagraph (B) of this paragraph, which shall require compliance with any applicable pretreatment requirements and any requirements under section 1317 of this title; and (B) for publicly owned treatment works in existence on July 1, 1977, or approved pursuant to section 1283 of this title prior to June 30, 1974 (for which construction must be completed within four years of approval), effluent limitations based upon secondary treatment as defined by the Administrator pursuant to section 1314(d)(1) of this title; or, (C) not later than July 1, 1977, any more stringent limitation, including those necessary to meet water quality standards, treatment standards, or schedules of compliance, established pursuant to any State law or regulations (under authority preserved by section 1370 of this title) or any other Federal law or regulation, or required to implement any applicable water quality standard established pursuant to this chapter. (2)(A) for pollutants identified in subparagraphs (C), (D), and (F) of this paragraph, effluent limitations for categories and classes of point sources, other than publicly owned treatment works, which (i) shall require application of the best available technology economically achievable for such category or class, which will result in reasonable further progress toward the national goal of eliminating the discharge of all pollutants, as determined in accordance with regulations issued by the Administrator pursuant to section 1314(b)(2) of this title, which such effluent limitations shall require the elimination of discharges of all pollutants if the Administrator finds, on the basis of information available to him (including information developed pursuant to section 1325 of this title), that such elimination is technologically and economically achievable for a category or class of point sources as determined in accordance with regulations issued by the Administrator pursuant to section 1314(b)(2) of this title, or (ii) in the case of the introduction of a pollutant into a publicly owned treatment works which meets the requirements of subparagraph (B) of this paragraph, shall require compliance with any applicable pretreatment requirements and any other requirement under section 1317 of this title; (C) with respect to all toxic pollutants referred to in table 1 of Committee Print Numbered 95–30 of the Committee on Public Works and Transportation of the House of Representatives compliance with effluent limitations in accordance with subparagraph (A) of this paragraph as expeditiously as practicable but in no case later than three years after the date such limitations are promulgated under section 1314(b) of this title, and in no case later than March 31, 1989; (D) for all toxic pollutants listed under paragraph (1) of subsection (a) of section 1317 of this title which are not referred to in subparagraph (C) of this paragraph compliance with effluent limitations in accordance with subparagraph (A) of this paragraph as expeditiously as practicable, but in no case later than three years after the date such limitations are promulgated under section 1314(b) of this title, and in no case later than March 31, 1989; (E) as expeditiously as practicable but in no case later than three years after the date such limitations are promulgated under section 1314(b) of this title, and in no case later than March 31, 1989, compliance with effluent limitations for categories and classes of point sources, other than publicly owned treatment works, which in the case of pollutants identified pursuant to section 1314(a)(4) of this title shall require application of the best conventional pollutant control technology as determined in accordance with regulations issued by the Administrator pursuant to section 1314(b)(4) of this title; and (F) for all pollutants (other than those subject to subparagraphs (C), (D), or (E) of this paragraph) compliance with effluent limitations in accordance with subparagraph (A) of this paragraph as expeditiously as practicable but in no case later than 3 years after the date such limitations are established, and in no case later than March 31, 1989.	***Note***: RADU—The 2021 TCRA complied with this ARAR, but that work only involved a portion of the RADU.	

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	(3)(A) for effluent limitations under paragraph (1)(A)(i) of this subsection promulgated after January 1, 1982, and requiring a level of control substantially greater or based on fundamentally different control technology than under permits for an industrial category issued before such date, compliance as expeditiously as practicable but in no case later than three years after the date such limitations are promulgated under section 1314(b) of this title, and in no case later than March 31, 1989; and (B) for any effluent limitation in accordance with paragraph (1)(A)(i), (2)(A)(i), or (2)(E) of this subsection established only on the basis of section 1342(a)(1) of this title in a permit issued after February 4, 1987, compliance as expeditiously as practicable but in no case later than three years after the date such limitations are established, and in no case later than March 31, 1989.		
Regulation | Water Quality			
Activities causing degradation of state waters	Shall not degrade state waters, except as specifically allowed *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E30%2E705 Rule Title: BIOASSAYS Department: Environmental Quality Chapter: Water Quality Subchapter: Nondegradation of Water Quality **17.30.705** NONDEGRADATION POLICY--APPLICABILITY AND LEVEL OF PROTECTION (1) The provisions of this subchapter apply to any activity of man resulting in a new or increased source which may cause degradation. (2) Department review of proposals for new or increased sources will determine the level of protection required for the impacted water as follows: (a) For all state waters, existing and anticipated uses and the water quality necessary to protect those uses must be maintained and protected. (b) For high quality waters, degradation may be allowed only according to the procedures in ARM 17.30.708. These rules apply to any activity that may cause degradation of high quality waters, for any parameter, unless the changes in existing water quality resulting from the activity are determined to be nonsignificant under ARM 17.30.670, 17.30.715, or 17.30.716. If degradation of high quality waters is allowed, the department will assure that within the United States Geological Survey hydrologic unit upstream of the proposed activity, there shall be achieved the highest statutory and regulatory requirements for all point and nonpoint sources. This assurance will be achieved through ongoing administration by the department of mandatory programs for control of point and nonpoint discharges. (c) For outstanding resource waters, no degradation is allowed and no permanent change in the quality of outstanding resource waters resulting from a new or increased point source discharge is allowed. (3) The department will comply with the provisions of the Montana Environmental Policy Act in the implementation of this subchapter.	☑Applicable* **LDU1/GW** **LDU2** **SO** **NPP** *Applies to the construction, implementation, and maintenance of remedial action components resulting in a discharge to state waters (e.g., excavation, consolidation, containment/capping, slurry wall, groundwater pumping). This ARAR functions to maintain the level of protection for state waters, even where existing water concentrations fall below Circular DEQ-7 standards. ***Note***: RADU—The 2021 TCRA complied with this ARAR, but that work only involved a portion of the RADU.	ARM 17.30.705 Cross-reference: Section 75-5-303(1) and (2), MCA ARM 17.30.1011 ARM 17.30.708
Activities causing	Shall maintain existing high quality ground water at that high quality	☑Applicable*	ARM 17.30.1011

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
Anaconda/CFAC ROD

Action	Requirement	Prerequisite	Citation
degradation of high quality ground waters	*Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E30%2E1011 Rule Title: NONDEGRADATION Department: Environmental Quality Chapter: Water Quality Subchapter: Montana Ground Water Control System **17.30.1011** NONDEGRADATION (1) Any ground water whose existing quality is higher than the established groundwater quality standards for its classification must be maintained at that high quality in accordance with 75-5-303 , MCA, and ARM Title 17, chapter 30, subchapter 7.	**LDU1/GW** **LDU2** **SO** **NPP** *Applies to the construction, implementation, and maintenance of remedial action components resulting in a discharge to ground water (e.g., excavation, consolidation, containment/capping, slurry wall, groundwater pumping). This ARAR functions to maintain the level of protection for ground waters, even where existing water concentrations fall below Circular DEQ-7 standards.	Cross-references: Section 75-5-303, MCA; ARM 17.30.705 ARM 17.30.708 ARM 17.30.641 (approved sampling methodology)
Activities resulting in point source discharges to State surface waters	Point source discharges shall meet certain effluent limitations or standards of performance *Available at*: http://www.mtrules.org/gateway/ruleno.asp?RN=17.30.1207 Rule Title: EFFLUENT LIMITATIONS AND STANDARDS OF PERFORMANCE Department: ENVIRONMENTAL QUALITY Chapter: WATER QUALITY Subchapter: Montana Pollutant Discharge Elimination System (MPDES) Standards **17.30.1207** EFFLUENT LIMITATIONS AND STANDARDS OF PERFORMANCE (1) Permits issued to point source dischargers, other than POTWs, must include effluent limitations or standards of performance applicable to the point source that are set forth in 40 CFR Chapter I, Subchapter N, as provided below: (a) for existing sources, effluent limitations representing the degree of effluent reduction attainable by the application of: (i) the best practicable control technology currently achievable (BPT) for all pollutants; (ii) the best available technology economically achievable (BAT) for toxic and nonconventional pollutants; and (iii) the best conventional pollutant control technology (BCT) for conventional pollutants; (b) for new sources, new source performance standards (NSPS) reflecting the best available demonstrated control technology, processes, operating methods, or other alternatives, including, where practicable, a standard permitting no discharge.	☑Applicable* **LDU1/GW** **LDU2** **SO** **NPP** *Applies to discharges to surface water (including groundwater discharging to surface water at seeps) from construction, implementation or operation and maintenance of the selected remedy. ***Note*: RADU**—The 2021 TCRA complied with this ARAR, but that work only involved a portion of the RADU.	ARM 17.30.1207(1) Cross-references: 40 CFR Chapter I, Subchapter N

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	***Note*: Under CERCLA, a permit is not required, per paragraph (1).**		
Regulation | Stormwater Runoff Control Requirements			
Activities resulting in point source discharges to State surface waters	Shall comply with effluent limitations, standards, and other certain conditions in order to implement best management practices (BMPs) and to take all reasonable steps to minimize or prevent any discharge which has a reasonable likelihood of adversely affecting human health or the environment *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E30%2E1344 Rule Title: ESTABLISHING LIMITATIONS, STANDARDS, AND OTHER PERMIT CONDITIONS Department: ENVIRONMENTAL QUALITY Chapter: WATER QUALITY Subchapter: Montana Pollutant Discharge Elimination System (MPDES) Permits 17.30.1344 ESTABLISHING LIMITATIONS, STANDARDS, AND OTHER PERMIT CONDITIONS (2) The board hereby adopts and incorporates herein by reference: (b) 40 CFR 122.44 (July 1, 1991), which is a federal agency rule setting forth additional permit conditions which may be applicable to a point source. Such conditions include technology-based and water-quality-based standards, toxic and pretreatment standards, reopener clause, reporting and monitoring requirements, permit duration and reissuance, test methods, best management practices, conditions concerning sewage sludge, privately owned treatment works, and conditions imposed in EPA grants to POTW's; (e) 40 CFR chapter 1, subchapter N, (July 1, 1991), which sets forth federal effluent limitations and standards and new source performance standards; (f) 40 CFR Part 125 (July 1, 1991), which states standards and criteria for the national point discharge elimination system; ***Note*: Under CERCLA, a permit is not required, per paragraph (2)(b).**	☑Applicable* The substantive requirements of the general permits listed below would be applicable to activities at the Site that are governed by the general permits: --General Stormwater Permit for Construction Activities, Permit No MTR100000 (January 7, 2021) --General Stormwater Permit for Industrial Activity, Permit No. MTR000000, January 31, 2018 --General Permit for Construction Dewatering, MTG070000 (March 1, 2020 **LDU1/GW** **LDU2** **SO** **NPP** *Discharges to surface water (including groundwater discharging to surface water, e.g., at seeps) from construction, implementation or operation and maintenance of the selected remedy. Need to address through remedial design for temporary treatment facilities.	ARM 17.30.1344, (2)(b), (e), (f) Cross-references: 40 C.F.R. 122.44; 40 C.F.R. chapter 1, subchapter N; 40 C.F.R. Part 125

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
Anaconda/CFAC ROD

Action	Requirement	Prerequisite	Citation
		Note: **RADU**— The 2021 TCRA complied with this ARAR, but that work only involved a portion of the RADU.	
Statute | Water Use			
Wasting & contaminating ground water	Shall not waste groundwater, and shall take certain actions to prevent waste, contamination, or pollution of ground water *Available at*: https://leg.mt.gov/bills/mca/title_0850/chapter_0020/part_0050/section_0050/0850-0020-0050-0050.html TITLE 85. WATER USE CHAPTER 2. SURFACE WATER AND GROUND WATER Part 5. Ground Water **85-2-505. Waste and contamination of ground water prohibited.** (1) No ground water may be wasted. The department shall require all wells producing waters that contaminate other waters to be plugged or capped. It shall also require all flowing wells to be so capped or equipped with valves that the flow of water can be stopped when the water is not being put to beneficial use. Likewise, both flowing and nonflowing wells must be so constructed and maintained as to prevent the waste, contamination, or pollution of ground water through leaky casings, pipes, fittings, valves, or pumps either above or below the land surface. However, in the following cases the withdrawal or use of ground water may not be construed as waste under this part: (a) the withdrawal of reasonable quantities of ground water in connection with the construction, development, testing, or repair of a well or other means of withdrawal of ground water; (b) the inadvertent loss of ground water owing to breakage of a pump, valve, pipe, or fitting, if reasonable diligence is shown by the person in effecting the necessary repair; (c) the disposal of ground water without further beneficial use that must be withdrawn for the sole purpose of improving or preserving the utility of land by draining the same or that must be removed from a mine to permit mining operations or to preserve the mine in good condition; (d) the disposal of ground water used in connection with producing, reducing, smelting, and milling metallic ores and industrial minerals or that displaced from an aquifer by the storage of other mineral resources; and (e) the management, discharge, or reinjection of ground water produced in association with a coal bed methane well in accordance with **82-11-175**(2)(b) through (2)(d).	☑Applicable* **LDU1/GW** **LDU2** **SO** **NPP** *This provision applies to RA activities that involve maintenance or upgrades to existing water-producing or flowing wells or construction of new wells and withdrawal of groundwater.	Section 85-2-505, MCA
Regulation | Monitoring Well Construction			
Constructing a monitoring well	Shall construct a monitoring well according to specific requirements for construction materials, subject to certain exclusions *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=36%2E21%2E804	☑Applicable* **LDU1/GW** **LDU2** **SO**	ARM 36.21.804 Cross-reference: ARM 36.21.802 (exclusions)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	Rule Title: MONITOR WELL CONSTRUCTION MATERIALS Department: NATURAL RESOURCES AND CONSERVATION, DEPARTMENT OF Chapter: BOARD OF WATER WELL CONTRACTORS Subchapter: Monitoring Well Construction Standards **36.21.804** MONITOR WELL CONSTRUCTION MATERIALS (1) The well screen configuration, construction, and type of material used should be based on the in-field environmental and physical conditions. (2) Drilling fluids which will contaminate the aquifer shall not be used. (3) In areas of known contamination, materials which will not corrode in the environment in which they are placed shall be used. (4) The well screen and well casing shall be new and be of sufficient structural strength to protect the integrity of the well.	**NPP** *Applies to construction of new monitoring wells or maintenance or upgrades to existing wells but does not otherwise apply to and is not relevant or appropriate for existing monitoring wells at the Site.	
Constructing a monitoring well	Shall construct a monitoring well according to specific requirements for seal materials *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=36%2E21%2E805 Rule Title: SEAL/MATERIALS Department: NATURAL RESOURCES AND CONSERVATION, DEPARTMENT OF Chapter: BOARD OF WATER WELL CONTRACTORS Subchapter: Monitoring Well Construction Standards **36.21.805** SEAL/MATERIALS (1) The intent of this rule is to provide protection to the ground water at least equal to the soil or rock profile penetrated by the borehole or excavation. More stringent standards set by other local, state, or federal agencies shall be followed when applicable. (2) Acceptable seals for rotary or dug holes [air, fluid, auger (solid and hollowstem) , backhoe] include: (a) above the water table: (i) neat cement grout or Portland cement concrete, (ii) bentonite clay grout, (iii) cuttings slurry grout, (iv) compacted clay cuttings, (v) pre-wetted granular or powdered bentonite, (vi) compacted asphaltic concrete, (vii) other materials or methods with board approval; (b) below the water table: (i) neat cement grout, tremied or pumped, (ii) bentonite clay grout, tremied or pumped, (iii) cuttings slurry grout, tremied or pumped, (iv) bentonite pellets or chips, (v) other materials or methods with board approval. (3) For driven wells acceptable seals are granular or powdered bentonite.	☑Applicable* **LDU1/GW** **LDU2** **SO** **NPP** *Applies to construction of new monitoring wells or maintenance or upgrades to existing wells but does not otherwise apply to and is not relevant and appropriate for existing monitoring wells at the Site.	ARM 36.21.805

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	(4) Jetted methods are not allowed for monitoring well use without board approval. *Note*: Under CERCLA, board approval is not required, per paragraphs (2) and (4).		
Constructing a monitoring well	Shall construct a monitoring well according to specific requirements for seal installation *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=36%2E21%2E806 Rule Title: INSTALLATION OF SEALS Department: NATURAL RESOURCES AND CONSERVATION, DEPARTMENT OF Chapter: BOARD OF WATER WELL CONTRACTORS Subchapter: Monitoring Well Construction Standards **36.21.806** INSTALLATION OF SEALS (1) In installing and developing a monitoring well, care shall be taken to preserve the natural barriers to groundwater movement between aquifers. All sealing shall be performed by adding the mixture from the bottom of the space to be sealed toward the surface in one continuous operation, except for driven wells. (2) The minimum sealing material thickness shall be 1 1/2 inches around the outside of the casing on all sides, except for driven wells. (3) For driven wells, granular or powdered bentonite shall be fed alongside the casing. (4) Seal material shall extend down to within five feet of the zone being monitored. In sand and gravel formations, a minimum of 10 feet of surface seal shall be used, except when the zone of monitoring is higher. (5) If the borehole will be advanced through a confining bed immediately below a contaminated aquifer, a casing shall be sealed into the top of the confining bed prior to advancing the borehole through the confining bed. All contaminated tools, drilling fluids, and down-hole equipment shall be cleaned or treated prior to advancing the borehole through the confining bed. (6) A monitoring well encountering an artesian condition shall be sealed and controlled in the same manner as an artesian water well (ARM 36.21.658).	☑Applicable* **LDU1/GW** **LDU2** **SO** **NPP** *Applies to construction of new monitoring wells or maintenance or upgrades to existing wells but does not otherwise apply to and is not relevant and appropriate for existing monitoring wells at the Site.	ARM 36.21.806
Constructing a monitoring well	Shall comply with certain requirements to prevent against contamination from equipment used to install or sample monitoring wells *Available at*: http://www.mtrules.org/gateway/ruleno.asp?RN=36%2E21%2E807 Rule Title: PREVENTION OF CONTAMINATION BY EQUIPMENT Department: NATURAL RESOURCES AND CONSERVATION, DEPARTMENT OF Chapter: BOARD OF WATER WELL CONTRACTORS Subchapter: Monitoring Well Construction Standards **36.21.807** PREVENTION OF CONTAMINATION BY EQUIPMENT (1) Preventive measures shall be performed to ensure against contamination from equipment used to install or sample monitoring wells. Particular care must be exercised when equipment used to install or sample monitoring wells in contaminated environments is subsequently used to install production wells for domestic use. (2) When practicable or feasible, monitoring well installation should proceed from areas with no or low levels of contamination to areas with higher levels of contamination.	☑Applicable* **LDU1/GW** **LDU2** **SO** **NPP** *Applies to construction of new monitoring wells or maintenance or upgrades to existing wells but does not otherwise apply to and is not relevant and appropriate for existing monitoring wells at the Site.	ARM 36.21.807

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
Anaconda/CFAC ROD

Action	Requirement	Prerequisite	Citation
	(3) If contamination is detected during installation of a monitoring well, down-hole equipment should be decontaminated before use on another well or at another site. Appropriate methods of cleaning or decontamination will depend upon the level and type of contaminants, but may include steam cleaning, rinsing with uncontaminated water, or thorough cleaning with surfactants and deionized water. (4) Contamination of down-hole equipment on the drill rig itself by hazardous materials requires thorough cleaning to prevent transport of hazardous contaminants to other locations. On-site decontamination may be necessary under particularly hazardous conditions.		
Constructing a monitoring well	Shall comply with certain requirements to ensure well site protection and security *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=36%2E21%2E808 Rule Title: SITE PROTECTION AND SECURITY Department: NATURAL RESOURCES AND CONSERVATION, DEPARTMENT OF Chapter: BOARD OF WATER WELL CONTRACTORS Subchapter: Monitoring Well Construction Standards **36.21.808** SITE PROTECTION AND SECURITY (1) The top of the well shall be fitted with a tight fitting slip cap, threaded plug or cap, or locking cap. Monitoring wells within the radius of influence of a well used as a domestic supply well and hydraulically connected to the aquifer from which the well is drawing water shall have a locking cap or be surrounded by a fenced controlled enclosure. (2) The following are suggested methods for site protection: (a) If the well is cased with metal and completed above the ground surface, a lockable watertight cap may be welded to the top of the casing. (b) If the well is not cased with metal and completed above the ground surface, a metal protective casing may be installed around the well. The protective casing may extend at least six inches above the top of the well casing and at least two feet into the ground. A lockable cap may be welded to the top of the protective casing. (c) If the well is completed below ground surface, a lockable "water-meter cover," or equivalent, may be installed around the well. The cover must be designed to withstand the maximum expected loadings. A watertight seal on the casing itself shall be installed to prevent the inflow of surface water. Drains may be provided, when feasible, to keep water out of the well and below the well cap. (3) The well(s) completed above ground may be protected from damage by one of the following suggested methods: (a) Three metal posts at least three inches in diameter may be installed in a triangular array around the casing. Each post may extend at least three feet above and below the ground surface. (b) A reinforced concrete pad may be installed to prevent freeze/thaw cracking of the surface seal. When a concrete pad is used, the annular seal shall be contiguous to the concrete pad. (c) Other methods agreed upon by the well owner and the monitoring well constructor may be used. (4) The final surface should be sloped away from the monitoring well. If slabs or pavements prevent this, the surface should be sealed with at least four inches of Portland cement or asphaltic concrete. A surface condition which allows surface runoff to run down the side of the casing or borehole is unacceptable and shall be repaired. Note: The term "suggested methods" in paragraph (2) and (3) connotes "acceptable methods."	☑Applicable* **LDU1/GW** **LDU2** **SO** **NPP** *Applies to construction of new monitoring wells or maintenance or upgrades to existing wells but does not otherwise apply to and is not relevant and appropriate for existing monitoring wells at the Site.	ARM 36.21.808(1), (4)
Abandoning a monitoring well	Shall comply with certain requirements for abandoning monitoring wells *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=36%2E21%2E810	☑Applicable* **LDU1/GW**	ARM 36.21.810(1), (2)(a), (c), (d), (3), (4)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
Anaconda/CFAC ROD

Action	Requirement	Prerequisite	Citation
	Rule Title: ABANDONMENT Department: NATURAL RESOURCES AND CONSERVATION Chapter: BOARD OF WATER WELL CONTRACTORS Subchapter: Monitoring Well Construction Standards 36.21.810 ABANDONMENT (1) Wells which have not been monitored for more than three years shall be deemed abandoned unless written permission is obtained from the board to maintain the well. (2) Monitoring wells that have outlived their useful purpose shall be abandoned by one of the following methods: (a) if the casing and screen are left in place, the casing and screen shall be sealed from the bottom up by the following methods: (i) using a pump and hose or tremie pipe to conduct the sealing material to the bottom of the well; or (ii) by filling the casing and screen with bentonite pellets or chips placed in a manner that will prevent bridging. Metal casings shall be cut off three feet below the ground surface and the last three feet backfilled with naturally occurring soils; (b) the department recommends that the casing be removed in all possible instances. If the casing and/or screen are removed, the hole shall be filled with sealing material, concrete, or bentonite pellets or chips from the bottom up, as the casing and/or screen is removed. From six to three feet from the surface, bentonite shall be added to the well. The last three feet shall be filled with naturally occurring soils; (c) the sealing material shall be bentonite pellets or chips, bentonite clay grout, neat cement grout, or concrete. The material may contain nonbiodegradeable fluidizing admixtures, provided they will not contaminate the groundwater. Sealing materials which settle shall be topped to provide a continuous column of grout to within three feet of the surface; or (d) other methods for abandonment with prior board approval. (3) For flowing wells, the abandonment procedures outlined in ARM 36.21.671 shall apply. (4) A properly abandoned well shall not produce water nor serve as a channel for movement of water. ***Note*: Under CERCLA, board permission and approval is not required, per paragraph (1) and (2)(d).**	**LDU2** **SO** **NPP** *This provision applies to RA activities that involve abandonment of existing or future wells.	
Regulation | Air			
On-site construction activity which causes settlement of particulate matter	Shall not cause or contribute to concentrations of particulate matter in the ambient air such that the mass of settled particulate matter exceeds a 30-day average of 10 grams per square meter (gm/m2) *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E8%2E220 Rule Title: AMBIENT AIR QUALITY STANDARD FOR SETTLED PARTICULATE MATTER Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: AIR QUALITY Subchapter: Ambient Air Quality	☑Applicable* **RADU** **LDU1/GW** **LDU2** **SO** **NPP** *This ARAR applies to any RA activities that generate fugitive dust.	ARM 17.8.220

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	17.8.220 AMBIENT AIR QUALITY STANDARD FOR SETTLED PARTICULATE MATTER (1) No person shall cause or contribute to concentrations of particulate matter in the ambient air such that the mass of settled particulate matter exceeds the following standard: (a) thirty-day average: 10 gm/m^2, 30-day average, not to be exceeded. (2) Measurement method: For determining compliance with this rule, settled particulate matter shall be measured by the dust fall method, as more fully described in "Methods of Air Sampling and Analysis, Second Edition" (1977), Method No. 21101-0170T, or by an approved equivalent method.		
On-site construction activity which causes settlement of particulate matter affecting visibility	Shall not cause or contribute to concentrations of particulate matter in ambient air such that the annual average scattering coefficient exceeds 3 x 10^{-5} per meter in certain designated Class I areas *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E8%2E221 Rule Title: AMBIENT AIR QUALITY STANDARD FOR SETTLED PARTICULATE MATTER Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: AIR QUALITY Subchapter: Ambient Air Quality 17.8.221 AMBIENT AIR QUALITY STANDARD FOR VISIBILITY (1) No person shall cause or contribute to concentrations of particulate matter such that the scattering coefficient of particulate matter in the ambient air exceeds the following standard: (a) annual average: 3 x 10^{-5} per meter, annual average, not to be exceeded. (2) The provisions of (1) are applicable only in Class I areas as are designated under the Montana Clean Air Act rules, Prevention of Significant Deterioration of Air Quality, (ARM Title 17, chapter 8, subchapter 8) on the effective date of this rule. Areas redesignated Class I subsequent to the effective date of this rule shall be subject to the provisions of (1) only upon a finding by the board that visibility is an important attribute of such area. (3) Measurement method: For determining compliance with this rule, visibility shall be measured by the integrating nephelometer method, as more fully described in "Methods of Air Sampling and Analysis, Second Edition" (1977) Method No. 11203-03-76 T, as modified by the addition of a heated sample inlet line and green spectral sensitivity; or by an approved equivalent method.	☑Applicable* **RADU** **LDU1/GW** **LDU2** **SO** **NPP** *This ARAR applies to any RA activities that generate fugitive dust.	ARM 17.8.221
On-site construction activity which causes settlement of PM-10 particulate matter affecting visibility	Shall not cause or contribute to concentrations of PM-10 concentrations in the ambient air which exceed a 24-hour average of 150 ug/m3 of air and an annual average of 50 ug/m3 of air *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E8%2E223 Rule Title: AMBIENT AIR QUALITY STANDARD FOR SETTLED PARTICULATE MATTER Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: AIR QUALITY Subchapter: Ambient Air Quality 17.8.223 AMBIENT AIR QUALITY STANDARD FOR PM-10	☑Applicable* **RADU** **LDU1/GW** **LDU2** **SO** **NPP** *This ARAR applies to any RA activities that generate fugitive dust.	ARM 17.8.223

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	(1) No person may cause or contribute to concentrations of PM-10 in the ambient air which exceed the following standards: (a) Twenty-four hour average: 150 µg/m^3 of air, 24-hour average, with no more than one expected exceedance per calendar year. (b) Annual average: 50 µg/m^3 of air, expected annual average, not to be exceeded. (2) For the purposes of this rule, expected exceedance and expected annual average shall be determined in accordance with 40 CFR Part 50, Appendix K, incorporated by reference in ARM 17.8.202. (3) For determining compliance with this rule, PM-10 shall be measured by an applicable reference method based on 40 CFR Part 50, Appendix J, and designated in accordance with 40 CFR Part 53 or by an equivalent method designated in accordance with 40 CFR Part 53, all incorporated by reference in ARM 17.8.202.		
Activities resulting in emissions of airborne particulate matter	Shall take reasonable precautions to control emissions of airborne particulate matter; airborne particulate matter emissions shall not exhibit an opacity of 20% or greater averaged over six consecutive minutes *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E8%2E308 Rule Title: PARTICULATE MATTER, AIRBORNE Department: ENVIRONMENTAL QUALITY Chapter: AIR QUALITY Subchapter: Emission Standards **17.8.308** PARTICULATE MATTER, AIRBORNE (1) No person shall cause or authorize the production, handling, transportation, or storage of any material unless reasonable precautions to control emissions of airborne particulate matter are taken. Such emissions of airborne particulate matter from any stationary source shall not exhibit an opacity of 20% or greater averaged over six consecutive minutes, except for emission of airborne particulate matter originating from any transfer ladle or operation engaged in the transfer of molten metal which was installed or operating prior to November 23, 1968. (2) No person shall cause or authorize the use of any street, road, or parking lot without taking reasonable precautions to control emissions of airborne particulate matter. (3) No person shall operate a construction site or demolition project unless reasonable precautions are taken to control emissions of airborne particulate matter. Such emissions of airborne particulate matter from any stationary source shall not exhibit an opacity of 20% or greater averaged over six consecutive minutes. (4) Within any area designated nonattainment in 40 CFR 81.327 for PM, any person who owns or operates: (a) any existing source of airborne particulate matter shall apply reasonably available control technology (RACT); (b) any new source of airborne particulate matter that has a potential to emit less than 100 tons per year of particulate matter shall apply best available control technology (BACT); (c) any new source of airborne particulate matter that has a potential to emit more than 100 tons per year of particulate matter shall apply lowest achievable emission rate (LAER). (5) The provisions of this rule shall not apply to emissions of airborne particulate matter originating from: (a) any agricultural activity or equipment that is associated with the use of agricultural land or the planting, production, processing, harvesting, or storage of agricultural crops by an agricultural producer and that is not subject to the requirements of 42 USC 7475, 7503, or 7661, as set forth in 75-2-111(1)(a), MCA; or (b) a business relating to the activities or equipment referred to in (5)(a) that remains in a single location for less than 12 months and is not subject to the requirements of 42 USC 7475, 7503, or 7661, as set forth in 75-2-111(1)(b), MCA.	☑Applicable* **RADU** **LDU1/GW** **LDU2** **SO** **NPP** *This ARAR applies to any RA activities that generate fugitive dust.	ARM 17.8.308

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
Generation of emissions during response action activities	Shall not exceed pollutant concentrations permitted under the applicable secondary or primary national ambient air quality standard, whichever concentration is lowest for the pollutant for a period of exposure *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E8%2E805 Rule Title: AMBIENT AIR CEILINGS Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: AIR QUALITY Subchapter: Prevention of Significant Deterioration of Air Quality **17.8.805** AMBIENT AIR CEILINGS (1) No concentration of a pollutant shall exceed the concentration permitted under either the applicable secondary or primary national ambient air quality standard, whichever concentration is lowest for the pollutant for a period of exposure.	☑Applicable* **RADU** **LDU1/GW** **LDU2** **SO** **NPP** *This ARAR applies to any RA activities that generate fugitive dust.	ARM 17.8.805
Regulation | Mining - Air			
Generating dust emissions during response action activities	Shall employ certain fugitive dust control measures *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E761 Rule Title: AIR RESOURCES PROTECTION Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Topsoiling, Revegetation, and Protection of Wildlife and Air Resources **17.24.761** AIR RESOURCES PROTECTION (1) Each operator shall employ fugitive dust control measures as an integral part of site preparation, coal mining and reclamation operations in accordance with 82-4-231(10) (m), MCA, the operator's air quality permit, and applicable federal and state air quality standards. (2) Air monitoring equipment must be installed and monitoring must be conducted in accordance with the air monitoring plan required under ARM 17.24.311 and approved by the department. ***Note***: Under CERCLA, permits and DEQ approval are not required, per paragraphs (1) and (2).	☑Relevant and Appropriate* **RADU** **LDU1/GW** **LDU2** **SO** **NPP** *Some fugitive dust control measures could be considered relevant and appropriate to control fugitive dust emissions in connection with excavation, earth moving and transportation conducted as part of the response action(s) at the facility. Such measures include, for example, paving, watering, chemically stabilizing, or frequently compacting and scraping roads, promptly removing rock, soil or other dust-forming debris from	ARM 17.24.761

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
		roads, restricting vehicle speeds, revegetating, mulching, or otherwise stabilizing the surface of areas adjoining roads, restricting unauthorized vehicle travel, minimizing the area of disturbed land, and promptly revegetating regraded lands.	
Regulation | Montana Solid Waste Management Act			
Building or laterally expanding a new Class II or IV landfill unit	Shall design and construct a Class II or IV landfill to certain specifications *Available at*: https://www.google.com/search?q=ARM+17.50.1204(1)(b)&sourceid=ie7&rls=com.microsoft:en-US:IE-Address&ie=&oe=&gws_rd=ssl#spf=1614190843717 Rule Title: DESIGN CRITERIA - CLASS II AND CLASS IV LANDFILL UNITS Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Landfill Design Criteria **17.50.1204** DESIGN CRITERIA - CLASS II AND CLASS IV LANDFILL UNITS (1) An owner or operator of a new Class II or Class IV landfill unit, or a lateral expansion of an existing Class II or Class IV landfill unit, may construct it only if the owner or operator has obtained department approval of a design that either: (a) ensures that the concentration values listed in Table 1 of this rule will not be exceeded at the relevant point of compliance, as specified by the department: (i) for a Class II landfill unit, in the uppermost aquifer; or (ii) for a Class IV landfill unit, in an underground drinking water source; or (b) utilizes a composite liner and a leachate collection and removal system that is designed and constructed to maintain less than a 30-cm depth of leachate over the liner. ***Note:*** Under CERCLA, DEQ approval is not required, per paragraph (1).	☑Applicable* **LDU1**(Wet Scrubber Landfill cap improvement; Center Landfill) *Applies to constructing or laterally expanding a new Class II landfill.	ARM 17.50.1204(1)
Building or laterally expanding a new Class II or IV landfill unit	Shall design and construct the leachate system as specified to provide for accurate monitoring of the leachate level and provide the specified minimum slope *Available at*: http://www.mtrules.org/gateway/ruleno.asp?RN=17.50.1205 Rule Title: ADDITIONAL DESIGN CRITERIA - CLASS II AND CLASS IV LANDFILL UNITS Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Landfill Design Criteria	☑Applicable* **LDU1** (Wet Scrubber Landfill cap improvement; Center Landfill)	ARM 17.50.1205(3)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
Anaconda/CFAC ROD

Action	Requirement	Prerequisite	Citation
	17.50.1205 ADDITIONAL DESIGN CRITERIA - CLASS II AND CLASS IV LANDFILL UNITS (3) The owner or operator of a new Class II or Class IV landfill unit, or lateral expansion of an existing Class II or Class IV landfill unit, shall design and construct a landfill unit leachate collection and leachate removal system required under this subchapter to: (a) provide for accurate monitoring of the leachate level, measured to within one centimeter, on the liner or base of the unit, and the leachate volume removed from the unit; and (b) provide a minimum slope at the base of the overlying leachate collection layer equal to at least two percent.	*Applies to constructing or laterally expanding a new Class II landfill	
Monitoring ground water at Class II and Class IV landfill units	Shall comply with certain ground water monitoring requirements at Class II and Class IV landfill units *Available at*: http://www.mtrules.org/gateway/ruleno.asp?RN=17.50.1303 Rule Title: APPLICABILITY OF LANDFILL GROUND WATER MONITORING AND CORRECTIVE ACTION Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Ground Water Monitoring and Corrective Action 17.50.1303 APPLICABILITY OF LANDFILL GROUND WATER MONITORING AND CORRECTIVE ACTION (1) The requirements in this subchapter apply to Class II and Class IV landfill units, except as provided in (2). (2) Ground water monitoring requirements under ARM 17.50.1304 through 17.50.1307 for a Class II or Class IV landfill unit may be suspended by the department if the owner or operator submits, and obtains department approval for, a demonstration that there is no potential for migration of a constituent in Appendix I or II to 40 CFR Part 258 (July 1, 2008) from that Class II or Class IV landfill unit to the uppermost aquifer or underground drinking water source, as required in ARM 17.50.1204, during the active life of the unit and the post-closure care period. This demonstration must be certified by a qualified ground water scientist, and must be based upon: (a) site-specific field collected measurements, sampling, and analysis of physical, chemical, and biological processes affecting contaminant fate and transport; and (b) contaminant fate and transport predictions that maximize contaminant migration and consider impacts on human health and environment. (3) The owner or operator of an existing Class II or Class IV landfill unit, or a lateral expansion of an existing Class II or Class IV landfill unit, except one meeting the conditions of ARM 17.50.1203, shall comply with the ground water monitoring requirements of ARM Title 17, chapter 50, subchapters 5 through 14. (4) A new Class II or Class IV landfill unit must be in compliance with the ground water monitoring requirements specified in ARM 17.50.1304 through 17.50.1307 before waste may be placed in the unit. (5) Once ground water monitoring has begun at a Class II or Class IV landfill unit, the owner or operator shall continue to conduct ground water monitoring throughout the active life and post-closure care period of that unit, as specified in ARM 17.50.1404. Note: Under CERCLA, department approval is not required, per paragraph (2).	☑Applicable* **LDU1** (Wet Scrubber Landfill cap improvement; Center Landfill) *Applies to ground water monitoring at a newly constructed Class II landfill.	ARM 17.50.1303(1) – (5) Cross-reference: ARM 17.24.645 (ground water monitoring outside landfill units)
Abandoning a monitoring well at a solid waste	Shall comply with certain requirements for monitoring well abandonment at a solid waste management facility *Available at*:	☑Applicable* **LDU1**	ARM 17.50.1312

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
management facility	http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E50%2E1312 Rule Title: MONITORING WELL ABANDONMENT Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Ground Water Monitoring and Corrective Action 17.50.1312 MONITORING WELL ABANDONMENT (1) The owner or operator of a solid waste management facility shall: (a) completely seal all abandoned borings, water supply wells, and monitoring wells with grout or bentonite to prevent future contamination of ground water. The sealing materials must be continuous, physically and chemically stable, and have a hydraulic conductivity of less than 1 x 10^{-5}cm/sec; (b) immediately abandon, after drilling and completion of soil testing, all boreholes not completed as a monitoring well, piezometer, or water supply well; (c) for any borehole deeper than the well to be placed in it, seal with bentonite pellets or a bentonite slurry the portions of the borehole below the well screen; and (d) conduct all abandonment activities in accordance with ARM 36.21.670 through 36.21.678 and 36.21.810.	(Wet Scrubber Landfill cap improvement; Center Landfill) *Applies to ground water monitoring at a Class II landfill.	
Closing landfill unit	Shall comply with certain closure requirements at Class II landfills *Available at*: http://mtrules.org/gateway/ruleno.asp?RN=17.50.1403 Rule Title: CLOSURE CRITERIA Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Closure and Post-Closure Care 17.50.1403 CLOSURE CRITERIA (1) The owner or operator of a Class II or Class IV landfill unit shall install a final cover system that is designed to minimize infiltration and erosion. The final cover system must be designed and constructed to: (a) have a permeability no greater than to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than 1×10^{-5} cm/sec, whichever is less; (b) minimize infiltration through the closed Class II or Class IV landfill unit by the use of an infiltration layer that contains at least 18 inches of earthen material; and (c) minimize erosion of the final cover by the use of an erosion layer that contains at least six inches of earthen material that is capable of sustaining native plant growth. (2) The department may approve an alternative final cover design for a Class II or Class IV landfill unit that includes: (a) an infiltration layer that achieves a reduction in infiltration equivalent to the infiltration layer specified in (1)(a) and (b); and (b) an erosion layer that provides protection from wind and water erosion equivalent to the erosion layer specified in (1)(c). (3) An owner or operator of a Class II or Class IV landfill unit that disposes of 20 tons or less of solid waste per day, based on an annual average, shall comply with alternative requirements for the infiltration barrier that may be established by the department after public review and comment. An alternative requirement established under this subsection must: (a) consider the unique characteristics of small communities; (b) take into account climatic and hydrogeologic conditions; and	☑Applicable* **LDU1** (Wet Scrubber Landfill cap improvement; Center Landfill) *Applies to closure of a newly constructed Class II landfill. ☑Relevant and Appropriate* *Although the on-site landfills are exempt from classification under Mont. Code Ann. 75-10-214(b) because they were originally installed during the operation of an electrolytic reduction facility, the substantive requirements of this provision would be relevant and appropriate to the closure of LDU2 units including the Industrial Landfill, Center Landfill, East Landfill, and	ARM 17.50.1403(1)-(3)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	(c) protect human health and the environment.	Asbestos Landfills, and LDU1-GW units including the West Landfill and the Wet Scrubber Sludge Pond.	
Closing landfill unit	Shall conduct the specified post-closure care for Class II landfills *Available at*: http://www.mtrules.org/gateway/ruleno.asp?RN=17.50.1404 Rule Title: POST-CLOSURE CARE REQUIREMENTS Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Closure and Post-Closure Care **17.50.1404** POST-CLOSURE CARE REQUIREMENTS (1) Following closure of a Class II or Class IV landfill unit, the owner or operator shall conduct post-closure care. Post-closure care must be conducted for 30 years, except as provided under (2), and consist of at least the following: (a) maintaining the integrity and effectiveness of any final cover, including making repairs to the cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the final cover; (b) maintaining and operating the leachate collection and removal system in accordance with the requirements in ARM 17.50.1204, if applicable. The department may allow the owner or operator to stop managing leachate if the owner or operator submits to the department for approval a demonstration that leachate no longer poses a threat to human health and the environment; (c) monitoring the ground water in accordance with the requirements of ARM Title 17, chapter 50, subchapter 13, and maintaining the ground water monitoring system, if applicable; and (d) maintaining and operating the gas monitoring system in accordance with the requirements of ARM 17.50.1106. (2) The length of the post-closure care period may be: (a) decreased by the department if the owner or operator demonstrates that the reduced period is sufficient to protect human health and the environment and this demonstration is approved by the department; or (b) increased by the department if the department determines that the lengthened period is necessary to protect human health and the environment. (8) During the post-closure care period the owner or operator of a facility containing a Class II or Class IV landfill unit shall: (a) maintain adequate vegetative cover, as specified in the closure plan; (b) maintain and operate all corrective action systems pursuant to ARM Title 17, chapter 50, subchapter 13; (c) annually inspect and submit to the department a report on the condition of all landfill systems; and (d) comply with any other post-closure care requirements determined by the department to be necessary to protect human health or the environment. ***Note:*** Under CERCLA, no closure plan is required, per paragraph (8)(a).	☑Applicable* **LDU1** (Wet Scrubber Landfill cap improvement; Center Landfill) *Applies to closure of a newly constructed Class II landfill. ☑Relevant and Appropriate* *Although the on-site landfills are exempt from classification under Mont. Code Ann. 75-10-214(b) because they were originally installed during the operation of an electrolytic reduction facility, the substantive requirements of this provision would be relevant and appropriate to the closure of LDU2-2 units including the Industrial Landfill, Center Landfill, East Landfill, and the Asbestos Landfills, and LDU1-GW4A units including the West Landfill and the Wet Scrubber Sludge Pond.	ARM 17.50.1404(1), (2) and (8) Cross-reference: ARM Title 17, chapter 50, subchapter 13
Regulation | Asbestos			

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
Controlling asbestos	Shall comply with the National Emission Standards for Asbestos as adopted and incorporated, and shall comply with certain specified analytical methods *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E74%2E351 Rule Title: INCORPORATION BY REFERENCE Department: ENVIRONMENTAL QUALITY Chapter: NOISE, ASBESTOS CONTROL, METHAMPHETAMINE CLEANUP Subchapter: Asbestos Control 17.74.351 INCORPORATION BY REFERENCE (1) For the purposes of this subchapter, the department adopts and incorporates by reference: (a) 40 CFR 61, subparts A and M, pertaining to national emission standards for hazardous air pollutants (NESHAPs) for asbestos, with the following exception: (i) 40 CFR 61.145(a)(2) is not incorporated by reference. (b) National Institute of Occupational Safety and Health (NIOSH) Manual of Analytical Methods, fourth edition, August 1994, which contains a description of the 7400 Analytical Method for detecting asbestos and other fibers by phase contrast microscopy (PCM) and a description of the 7402 Analytical Method for detecting asbestos by transmission electron microscopy (TEM); and (c) Method for the Determination of Asbestos in Bulk Building Materials, EPA/600/R-93/116 (1993).	☑Applicable* **LDU2** *This ARAR applies where RA activities involve the disturbance in the Asbestos Landfills (or if it is determined that asbestos is present in any other areas/site features being addressed by remedial action under CERCLA), but is not applicable to or relevant or appropriate for the existing conditions of the Asbestos Landfills.	ARM 17.74.351(1) Cross-reference: 40 CFR 61, subparts A and M
Controlling asbestos	Shall conduct asbestos projects in accordance with certain requirements *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E74%2E353 Rule Title: APPLICABILITY--ASBESTOS PROJECT REQUIREMENTS Department: ENVIRONMENTAL QUALITY Chapter: NOISE, ASBESTOS CONTROL, METHAMPHETAMINE CLEANUP Subchapter: Asbestos Control 17.74.353 APPLICABILITY--ASBESTOS PROJECT REQUIREMENTS (1) All asbestos projects must be conducted in accordance with the requirements of this subchapter and 40 CFR 61, subpart M, with the following exceptions: (a) the minimum quantities of regulated asbestos-containing material (RACM) specified in 40 CFR 61.145(a)(1)(i) and (ii) and (4)(i) and (ii) do not apply; (b) for purposes of 40 CFR 61.145(a)(1) and (4), the minimum quantities of asbestos provided in 75-2-502(3), MCA, apply;	☑Applicable* **LDU2** *This ARAR applies where RA activities involve the disturbance in the Asbestos Landfills (or if it is determined that asbestos is present in any other areas/site features being addressed by remedial action under CERCLA) but is not applicable to or relevant and appropriate for the existing conditions of the Asbestos Landfills.	ARM 17.74.353(1)(a)-(b)
Controlling asbestos	Shall comply with certain requirements regarding the asbestos project contractor/supervisor *Available at*: http://www.mtrules.org/gateway/ruleno.asp?RN=17%2E74%2E356	☑Applicable* **LDU2**	ARM 17.74.356

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	Rule Title: ASBESTOS PROJECT CONTROL MEASURES Department: ENVIRONMENTAL QUALITY Chapter: NOISE, ASBESTOS CONTROL, METHAMPHETAMINE CLEANUP Subchapter: Asbestos Control 17.74.356 ASBESTOS PROJECT CONTROL MEASURES (1) An asbestos project contractor/supervisor shall be: (a) physically present at all times at the work site when regulated work is being conducted on an asbestos project; (b) accessible to all asbestos project workers; and (c) responsible for ensuring that the asbestos project complies with the asbestos project permit and the project design. (2) Alternate control measures that are equivalent to those required under this subchapter may be used if written approval is obtained from the department in advance. ***Note***: Under CERCLA, a permit and DEQ approval are not required, per paragraphs (1)(c) and (2).	*This ARAR applies to the disturbance of asbestos containing material in the Asbestos Landfills (or if it is determined that asbestos is present in any other areas/Site features being addressed by remedial action under CERCLA) but is not applicable to or relevant and appropriate for the existing conditions of the Asbestos Landfills.	
Controlling asbestos	Shall comply with standards and methods for clearing asbestos projects and requirements for persons clearing asbestos projects *Available at*: http://www.mtrules.org/gateway/ruleno.asp?RN=17%2E74%2E357 Rule Title: STANDARDS AND METHODS FOR CLEARING ASBESTOS PROJECTS AND REQUIREMENTS FOR PERSONS CLEARING ASBESTOS PROJECTS Department: ENVIRONMENTAL QUALITY Chapter: NOISE, ASBESTOS CONTROL, METHAMPHETAMINE CLEANUP Subchapter: Asbestos Control 17.74.357 STANDARDS AND METHODS FOR CLEARING ASBESTOS PROJECTS AND REQUIREMENTS FOR PERSONS CLEARING ASBESTOS PROJECTS (1) At the conclusion of any asbestos project conducted in a facility, the owner of the facility or the owner's designee shall ensure that final visual inspection and air clearance sampling are conducted in all asbestos project work areas. (2) The concentration of asbestos fibers in air clearance samples collected pursuant to (1) must be: (a) less than or equal to 0.01 fibers per cubic centimeter of air for each of five samples collected within the work area, if analyzed by PCM. The PCM analysis must be conducted using the NIOSH 7400 or NIOSH 7402 method; or (b) less than or equal to the average concentration of 70 structures per square millimeter for five samples collected within the work area, if analyzed by transmission electron microscopy (TEM). The TEM analysis must be conducted using EPA's interim TEM analytical methods provided in 40 CFR 763, subpart E, appendix A. (3) Final visual inspection and clearance sampling and analysis must be conducted as follows: (a) a person performing a final visual inspection and final air clearance sampling shall: (i) observe the entire asbestos project area to verify that the asbestos project contractor has removed all visible asbestos-containing waste, dust, and debris from the work area;	☑Applicable* **LDU2** *This ARAR applies to the disturbance of asbestos containing material in the Asbestos Landfills (or if it is determined that asbestos is present in any other areas/Site features being addressed by remedial action under CERCLA) but is not applicable to relevant and appropriate for the existing conditions of the Asbestos Landfills.	ARM 17.74.357(1)-(4), (6)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
Anaconda/CFAC ROD

Action	Requirement	Prerequisite	Citation
	(ii) require any necessary recleaning by the asbestos project contractor and conduct subsequent visual inspections that verify that the asbestos project contractor has removed all ACM identified in the asbestos project permit and related asbestos-containing waste, dust, and debris from the work area; and (iii) complete a signed, written affidavit verifying that the asbestos project contractor has removed all ACM identified in the asbestos project permit and related asbestos-containing waste, dust, and debris; (b) a person collecting final air clearance samples shall: (i) ensure final clearance air sampling and testing are not performed until after the final visual inspection has been completed in accordance with this rule; (ii) once the work area has passed the final visual inspection, sweep an air stream from a high-speed blower or equivalent air-blowing device across all surfaces in the work area for a time adequate to disturb air in all areas of the work area prior to beginning final air clearance sampling; (iii) ensure the air is continually agitated, creating maximum air disturbance in all potentially occupied areas, i.e., continually running fans, during the collection of final air clearance samples. Agitating the air in the work area prior to final air clearance sampling is not required for unoccupied areas such as crawl spaces; and (iv) immediately after agitating the air in the work area, begin collecting at least five final clearance air samples in the work area; (c) for an asbestos project with more than a single isolated work area within a large space contained by four walls and a ceiling, the owner or operator of a renovation or demolition activity shall ensure the isolated work areas are sampled by taking at least one air sample within each isolated work area. If more than five isolated work areas are used in a space contained by four walls and a ceiling, at least five aggressive air samples must be collected. The first four air samples must be gathered from those isolated work areas where the greatest potential for asbestos exposure exists; the fifth sample must be taken in the last isolated work area in which the asbestos project occurred; (d) for asbestos projects employing glovebags, the owner or operator of the renovation or demolition activity shall have at least one aggressive air sample collected in the immediate area of each glovebag, with at least five air samples collected for each space contained by four walls and a ceiling. If more than five glovebags are used in a space contained by four walls and a ceiling, at least five air samples are required for that space. The five samples must be gathered from areas where the greatest potential for asbestos exposure exists; (e) the asbestos project may not be cleared until after the final visual inspection and after the results of all required air clearance samples demonstrate that asbestos concentrations do not exceed the applicable concentration specified in (2); (f) persons conducting a final visual inspection and final air clearance sampling and testing shall record: (i) the names of the asbestos project contractor/supervisor and the person or persons conducting final visual inspection and final air clearance sampling; (ii) the name and address of the facility site and location of the asbestos project; (iii) the number of the asbestos project permit issued by the department; (iv) the date of final visual inspection and final air clearance sampling; (v) whether the work area was aggressed; (vi) the number of samples collected; (vii) the type of samples (i.e., PCM or TEM); (viii) a statement of whether final visual inspection and final air clearance sampling has documented the completion of the asbestos project; (g) the final visual inspection and air clearance sampling report must include the signatures of the project contractor/supervisor and final air clearance sampling person attesting to the completion of the asbestos project; and (h) the results of the final visual inspection and final air clearance sampling and testing must be maintained by the asbestos project contractor and by the person who performed the sampling and must be made available to the department within five working days of a request for the results. (4) For asbestos projects with final air clearance sampling, the person conducting final air clearance sampling shall: (a) collect five samples of air, with each sampling at least 1,199 liters of air, by using an air sampling pump capable of drawing a volume that is equal to or greater than 1,199 liters of air through each of the five millimeter		

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
Anaconda/CFAC ROD

Action	Requirement	Prerequisite	Citation
	filters, at a rate equal to or greater than one liter and less than ten liters per minute for TEM samples and equal to or greater than one liter and less than 16 liters per minute for PCM samples; (b) ensure that the flow rate for each air sampling pump is calibrated at the beginning and end of the sampling period; and (c) ensure air sampling cassettes are placed four to six feet above the floor at a 45 degree angle down. The cassettes must be uniformly distributed throughout the work area. At least one cassette must be located in each room. If the asbestos project was conducted in more than five rooms, a representative sample of rooms must be selected. Each cassette must be subject to normal air circulation, avoiding room corners, walls, ceilings, obstructed locations, and sites near windows, doors, or vents. (6) An asbestos project is considered complete when the final visual inspection documents no residual visible ACM, dust, or debris is present, and the results of clearance air sampling meet the requirements of (2). ***Note:*** Under CERCLA, a permit is not required, per paragraph (3).		
Controlling asbestos	Shall comply with certain requirements for the enclosure of asbestos-containing material *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E74%2E370 Rule Title: ENCLOSURE OF ASBESTOS-CONTAINING MATERIAL Department: ENVIRONMENTAL QUALITY Chapter: NOISE, ASBESTOS CONTROL, METHAMPHETAMINE CLEANUP Subchapter: Asbestos Control **17.74.370** ENCLOSURE OF ASBESTOS-CONTAINING MATERIAL (2) When conducting asbestos enclosure procedures for an asbestos project, a person shall: (a) apply amended water to the ACM to reduce airborne asbestos concentrations; (b) remove or repair loose or hanging ACM; (c) ensure that the enclosure material is impact resistant and installed in a manner that provides an airtight barrier; (d) ensure that the enclosed ACM is conspicuously marked or labeled to warn persons of its presence; and (e) meet the requirements of ARM 17.74.357.	☑Applicable* **LDU2** *This ARAR applies to the disturbance of asbestos containing material in the Asbestos Landfills (or if it is determined that asbestos is present in any other areas/Site features being addressed by remedial action under CERCLA) but is not applicable to or relevant or appropriate for the existing conditions of the Asbestos Landfills.	ARM 17.74.370(2)
Controlling asbestos	Shall comply with certain requirements for asbestos encapsulation procedures *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E74%2E371 Rule Title: ENCAPSULATION OF ASBESTOS-CONTAINING MATERIAL Department: ENVIRONMENTAL QUALITY Chapter: NOISE, ASBESTOS CONTROL, METHAMPHETAMINE CLEANUP Subchapter: Asbestos Control **17.74.371** ENCAPSULATION OF ASBESTOS-CONTAINING MATERIAL (2) A person conducting asbestos encapsulation procedures for an asbestos project shall: (a) apply amended water to the ACM to reduce airborne asbestos concentrations; (b) remove or repair loose or hanging ACM;	☑Applicable* **LDU2** *This ARAR applies to the disturbance of asbestos containing material in the Asbestos Landfills (or if it is determined that asbestos is present in any other areas/Site features being addressed by remedial action under CERCLA) but is not applicable to or	ARM 17.74.371(2)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	(c) field-test encapsulants prior to their use by applying each encapsulant to a small area to determine how well the encapsulant works with the ACM to be encapsulated; and (d) meet the requirements of ARM 17.74.357. (3) Bridging and penetrating encapsulants must be applied to ACM according to the encapsulant manufacturer's specifications.(4) Encapsulants must be applied in a manner that does not dislodge or disturb the ACM.	relevant and appropriate for the existing conditions of the Asbestos Landfills.	
Regulation | Montana Solid Waste Management Act			
Transporting solid waste	Shall transport solid waste in such a manner as to prevent its discharge, dumping, spilling, or leaking from the transport vehicle *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E50%2E523 Rule Title: TRANSPORTATION Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Refuse Disposal **17.50.523** TRANSPORTATION (1) Solid waste must be transported in such a manner so as to prevent its discharge, dumping, spilling, or leaking from the transport vehicle. (2) Waste haulers transporting oilfield exploration and production waste must cover and secure loads and keep loads covered and secure while in transit in a manner that prevents discharge, dumping, spilling, or leaking from the transport vehicle.	☑Applicable* *This ARAR applies to the site transport of solid waste.	ARM 17.50.523
Placing a landfill unit in floodplains	Shall comply with certain requirements governing the placement of a new or existing Class II or Class IV landfill in a 100-year floodplain *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E50%2E1004 Rule Title: FLOODPLAINS Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Landfill Location **17.50.1004** FLOODPLAINS (1) The owner or operator of a new or existing Class II or Class IV landfill unit, or a lateral expansion of an existing Class II or Class IV landfill unit, located in a 100-year floodplain shall submit for department approval a demonstration that the unit will not restrict the flow of the 100-year flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste so as to pose a hazard to human health and the environment. The	☑Applicable* *The substantive requirements of this ARAR apply to construction of a new Class II landfill.	ARM 17.50.1004(1)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	owner or operator shall place the approved demonstration in the operating record and notify the department that it has been placed in the operating record. ***Note:*** Under CERCLA, DEQ approval is not required, per paragraph (1).		
Placing a landfill unit in wetlands	Shall not place a Class II or Class IV landfill in a wetland unless certain conditions are met *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E50%2E1005 Rule Title: WETLANDS Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Landfill Location **17.50.1005** WETLANDS (1) A new Class II or Class IV landfill unit, or a lateral expansion of an existing Class II or Class IV landfill unit, may not be located in wetlands, unless the owner or operator submits to the department for approval the following demonstrations: (a) when applicable under 33 USC 1344 (Section 404 of the Federal Clean Water Act, as amended) or applicable Montana wetlands laws, clear rebuttal of the presumption that a practicable alternative to the proposed landfill is available that does not involve wetlands; (b) the construction and operation of a Class II or Class IV landfill unit will not: (i) cause or contribute to violations of any applicable Montana water quality standard; (ii) violate any applicable toxic effluent standard or prohibition under 33 USC 1317 (Section 307 of the Federal Clean Water Act, as amended); (iii) jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of a critical habitat, protected under 16 USC 1531 through 1544 (the Endangered Species Act of 1973, as amended); or (iv) violate any requirement under 33 USC 1401 through 1447(f) (the Marine Protection, Research, and Sanctuaries Act of 1972, as amended) for the protection of a marine sanctuary; (c) the Class II or Class IV landfill unit will not cause or contribute to significant degradation of wetlands. The owner or operator shall demonstrate the integrity of the Class II or Class IV landfill unit and its ability to protect ecological resources, by addressing the following factors: (i) erosion, stability, and migration potential of native wetland soils, muds, and deposits used to support the Class II or Class IV landfill unit; (ii) erosion, stability, and migration potential of dredged and fill materials used to support the Class II or Class IV landfill unit; (iii) the volume and chemical nature of the waste managed in the Class II or Class IV landfill unit; (iv) impacts on fish, wildlife, and other aquatic resources and their habitat from release of the solid waste; (v) the potential effects of catastrophic release of waste to the wetland and the resulting impacts on the environment; and (vi) any additional factors, as necessary, to demonstrate that ecological resources in the wetland are sufficiently protected; (d) to the extent required under 33 USC 1344 (Section 404 of the Federal Clean Water Act, as amended) or applicable Montana wetlands laws, steps have been taken to attempt to achieve no net loss of wetlands, as defined by acreage and function, by first avoiding impacts to wetlands to the maximum extent practicable as required by (1)(a), then minimizing unavoidable impacts to the maximum extent practicable, and finally offsetting remaining unavoidable wetland impacts through all appropriate and practicable compensatory mitigation actions, e.g., restoration of existing degraded wetlands or creation of artificial wetlands; and	☑Applicable* *The substantive requirements of this ARAR apply to construction of a new Class II landfill.	ARM 17.50.1005

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Action	**Requirement**	**Prerequisite**	**Citation**
	(e) sufficient information is available to make a reasonable determination with respect to these demonstrations. ***Note:*** Under CERCLA, DEQ demonstration approval is not required, per paragraph (1).		
Placing a landfill unit in fault area	Shall not place a Class II landfill within 200 feet of a fault that has had displacement in Holocene time unless certain conditions are met *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E50%2E1006 Rule Title: FAULT AREAS Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Landfill Location **17.50.1006** FAULT AREAS (1) A new Class II landfill unit, or a lateral expansion of an existing Class II landfill unit, may not be located within 200 feet (60 meters) of a fault that has had displacement in Holocene time unless the owner or operator submits to the department for approval a demonstration that an alternative setback distance of less than 200 feet (60 meters) will prevent damage to the structural integrity of the Class II landfill unit and will be protective of human health and the environment. ***Note:*** Under CERCLA, DEQ demonstration approval is not required, per paragraph (1).	☑Applicable* *The substantive requirements of this ARAR apply to construction of a new Class II landfill.	ARM 17.50.1006
Placing a landfill unit in seismic area	Shall not place a Class II landfill in a seismic impact zone unless certain conditions are met *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E50%2E1007 Rule Title: SEISMIC AREAS Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Landfill Location **17.50.1007** SEISMIC AREAS (1) A new Class II landfill unit, or a lateral expansion of an existing Class II landfill unit, may not be located in a seismic impact zone, unless the owner or operator submits to the department for approval a report prepared by a Montana licensed professional engineer demonstrating that all landfill containment structures including, but not limited to, the landfill liner, leachate collection and removal system, and surface water control system are designed to resist the maximum horizontal acceleration in lithified earth material for the site. The owner or operator shall place the approved report in the operating record and notify the department that it has been placed in the operating record. ***Note:*** Under CERCLA, DEQ approval is not required, per paragraph (1).	☑Applicable* *The substantive requirements of this ARAR apply to construction of a new Class II landfill.	ARM 17.50.1007 Cross-reference: ARM 17.50.1002(35) (definitions)
Placing a landfill unit in unstable area	Shall not place a Class II landfill in an unstable area unless certain conditions are met *Available at*: http://www.mtrules.org/gateway/ruleno.asp?RN=17.50.1008	☑Applicable*	ARM 17.50.1008 Cross-reference:

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Action	**Requirement**	**Prerequisite**	**Citation**
	Rule Title: UNSTABLE AREAS Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Landfill Location **17.50.1008** UNSTABLE AREAS (1) An applicant for a license for a new Class II landfill unit, or a lateral expansion of an existing Class II landfill unit, located in an unstable area shall submit to the department for approval, with the application, a report prepared by a Montana licensed professional engineer demonstrating that the unit is designed to ensure that the integrity of the structural components of the unit will not be disrupted. The owner or operator shall place the approved report in the operating record and notify the department that it has been placed in the operating record. When determining whether an area is unstable, the owner or operator shall consider the following factors, and any other factor determined by the department to be necessary to protect human health or the environment: (a) on-site or local soil conditions that may result in significant differential settling; (b) on-site or local geologic or geomorphologic features; and (c) on-site or local artificial features or events, both surface and subsurface. ***Note:*** Under CERCLA, DEQ approval is not required, per paragraph (1).	*The substantive requirements of this ARAR apply to construction of a new Class II landfill.	ARM 17.50.1002(40) (definitions)
Placing a landfill	Shall comply with certain landfill location restrictions *Available at*: http://mtrules.org/gateway/RuleNo.asp?RN=17%2E50%2E1009 Rule Title: LOCATION RESTRICTIONS Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Landfill Location **17.50.1009** LOCATION RESTRICTIONS (1) The owner or operator of a landfill facility shall comply with the following general locational requirements: (a) a sufficient amount of land must be available to satisfy the approved design, operation, and capacity of any solid waste management system, including adequate separation of wastes from underlying ground water or adjacent surface water; (b) local roads must be capable of providing access in all weather conditions and local bridges must be capable of supporting vehicles with maximum rated loads; (c) the facility must be located in a manner that does not allow the discharge of pollutants in excess of state standards for the protection of state waters, public water supply systems, or private water supply systems. The department may, if necessary to protect human health or the environment, impose additional conditions on a facility in or near sensitive hydrogeological environments including, but not limited to, sole-source aquifers, wellhead protection areas, or gravel pits; (d) drainage structures must be installed to control surface water run-off from waste management areas and prevent surface water run-on into waste management areas; (e) the facility must be located to allow for closure, post-closure care, and planned uses of the land after the post-closure period; (f) the facility must manage solid waste, gas, and leachate pursuant to subchapters 4 and 5 and subchapters 10 through 14;	☑Applicable* *The substantive requirements of this ARAR apply to construction of a new Class II landfill.	ARM 17.50.1009(1)(a)-(g)

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	(g) the facility or practices may not cause or contribute to the taking of any endangered or threatened species of plants, fish, or wildlife;		
Operating a Class II landfill	Shall comply with procedures for detecting and preventing the disposal of regulated hazardous waste at a Class II landfill *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E50%2E1103 Rule Title: PROCEDURES FOR EXCLUDING THE RECEIPT OF HAZARDOUS WASTE Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Landfill Operating Criteria **17.50.1103** PROCEDURES FOR EXCLUDING THE RECEIPT OF HAZARDOUS WASTE (1) The owner or operator of a Class II landfill unit shall implement a program at the facility for detecting and preventing the disposal of regulated hazardous waste, as defined in 40 CFR Part 261 and polychlorinated biphenyls (PCB) waste, as defined in 40 CFR Part 761. This program must include, at a minimum: (a) random inspections of incoming loads, unless the owner or operator takes other precautions to ensure that incoming loads do not contain regulated hazardous waste or PCB waste; (b) maintaining records of any inspections; (c) training of facility personnel to recognize regulated hazardous waste and PCB waste; and (d) notification of the department if a regulated hazardous waste or PCB waste is discovered at the facility.	☑Applicable* *The substantive requirements of this ARAR apply to new on-site Class II landfills that receive solid waste during RA activities.	ARM 17.50.1103 Cross-reference: 40 C.F.R. Part 261 (Identification and Listing of Hazardous Waste)
Operating a Class II landfill	Shall ensure that a Class II landfill unit does not violate any applicable air quality requirements *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E50%2E1107 Rule Title: AIR CRITERIA Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Landfill Operating Criteria **17.50.1107** AIR CRITERIA (1) The owner or operator of a Class II landfill unit shall ensure that the unit does not violate any applicable requirements developed under a State Implementation Plan (SIP) approved or promulgated by the EPA Regional Administrator pursuant to section 110 of the Clean Air Act, as amended, or any other applicable air quality requirements. (2) Open burning of solid waste is prohibited at all Class II landfill units, except that infrequent burning of agricultural wastes, silvicultural wastes, land-clearing debris, diseased trees, or debris from emergency cleanup operations, may occur only in compliance with the solid waste facility's operation and maintenance plan and a permit obtained under ARM Title 17, chapter 8, part 6. ***Note***: Under CERCLA, a plan and permit are not required, per paragraph (2).	☑Applicable* *The substantive requirements of this ARAR apply to new on-site Class II repositories that receive solid waste during RA activities.	ARM 17.50.1107

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Action	Requirement	Prerequisite	Citation
Operating a Class II landfill	Shall comply with certain access requirements at a Class II landfill *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E50%2E1108 Rule Title: ACCESS REQUIREMENTS Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Landfill Operating Criteria **17.50.1108** ACCESS REQUIREMENTS (1) The owner or operator of a Class II landfill unit shall control public access and prevent unauthorized vehicular traffic and illegal dumping of wastes, by using artificial barriers, natural barriers, or both, as appropriate to protect human health and the environment.	☑Applicable* *The substantive requirements of this ARAR apply to new on-site Class II repositories that receive solid waste during RA activities.	ARM 17.50.1108
Designing, constructing, and maintaining Class II landfill unit	Shall design, construct, and maintain a Class II landfill with a run-on and run-off control system as specified to address 25-year storm events *Available at*: http://www.mtrules.org/gateway/ruleno.asp?RN=17.50.1109 Rule Title: RUN-ON AND RUN-OFF CONTROL SYSTEMS Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Landfill Operating Criteria **17.50.1109** RUN-ON AND RUN-OFF CONTROL SYSTEMS (1) The owner or operator of a Class II landfill unit shall design, construct, and maintain: (a) a run-on control system to prevent flow onto the active portion of the landfill during the peak discharge from a 25-year storm; and (b) a run-off control system from the active portion of the landfill to collect and control at least the water volume resulting from a 24-hour, 25-year storm. (2) Run-off from the active portion of the landfill unit must be handled in accordance with 17.50.1110(1).	☑Applicable* *The substantive requirements of this ARAR apply to new on-site Class II repositories that receive solid waste during RA activities.	ARM 17.50.1109
Operating a Class II landfill	Shall not cause a discharge of a pollutant from a Class II landfill unit or from a nonpoint source into state waters, including wetlands *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E50%2E1110 Rule Title: SURFACE WATER REQUIREMENTS Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Landfill Operating Criteria **17.50.1110** SURFACE WATER REQUIREMENTS (1) A Class II landfill unit may not:	☑Applicable* *The substantive requirements of this ARAR apply to new on-site Class II repositories that receive solid waste during RA activities.	ARM 17.50.1110

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Action	**Requirement**	**Prerequisite**	**Citation**
	(a) cause a discharge of a pollutant into state waters, including wetlands, that violates any requirement of the Montana Water Quality Act including, but not limited to, the Montana pollutant discharge elimination system (MPDES) or the requirements found in ARM Title 17, chapter 30, subchapter 13; or (b) cause the discharge from a nonpoint source of pollution to waters of the United States, including wetlands, that violates any requirement of an area-wide or statewide water quality management plan that has been approved under 33 USC 1288 or 1329 (section 208 or 319 of the Federal Clean Water Act, as amended).		
Operating a Class II landfill	Shall comply with certain liquid waste restrictions at a Class II landfill *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E50%2E1111 Rule Title: LIQUIDS RESTRICTIONS Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Landfill Operating Criteria **17.50.1111** LIQUIDS RESTRICTIONS (1) Bulk or noncontainerized liquid waste may not be placed in a Class II landfill unit unless: (a) the waste is household waste other than septic waste; or (b) the waste is leachate or gas condensate derived from the Class II landfill unit and the Class II landfill unit, whether it is a new or existing Class II landfill unit, or lateral expansion of an existing Class II landfill unit, is designed with a composite liner and leachate collection and removal system as described in ARM 17.50.1204(1)(b). The owner or operator shall submit a demonstration to the department that the waste would meet the requirements of this rule, place the demonstration in the facility operating record, and notify the department that it has been placed in the operating record. (2) Containers holding liquid waste may not be placed in a Class II landfill unit unless: (a) the container is a small container similar in size to that normally containing household waste; (b) the container is designed to hold liquids for use other than storage; or (c) the waste is household waste.	☑Applicable* *The substantive requirements of this ARAR apply to new on-site Class II repositories that receive solid waste during RA activities.	ARM 17.50.1111
Operating landfills	Shall satisfy certain operating criteria at a solid waste management facility *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E50%2E1116 Rule Title: OPERATING CRITERIA Department: ENVIRONMENTAL QUALITY Chapter: SOLID WASTE MANAGEMENT Subchapter: Landfill Operating Criteria **17.50.1116** OPERATING CRITERIA (2) In addition to the requirements of ARM 17.50.509, the owner or operator of a solid waste management facility shall satisfy the following general operating requirements: (a) all solid waste management must be confined to areas within the facility that can be effectively maintained and operated in compliance with this subchapter. The areas to which waste is confined must be created and maintained by supervision, fencing, signs, or similar means approved by the department;	☑Applicable* *The substantive requirements of this ARAR apply to new on-site Class II repositories that receive solid waste during RA activities. ☑Relevant and Appropriate* *Although the on-site landfills are exempt from classification under Mont. Code Ann. 75-10-214(b) because they were originally installed during the	ARM 17.50.1116(2)(a), (f) Cross-reference: ARM 17.50.509 Section 75-10-206, MCA

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Action	Requirement	Prerequisite	Citation
	(f) a solid waste management facility must be designed, constructed, and operated in a manner to prevent harm to human health and the environment. ***Note:*** Under CERCLA, DEQ approval is not required, per paragraph (2)(a).	operation of an electrolytic reduction facility, the substantive requirements of this provision would be relevant and appropriate for the Industrial Landfill.	
Statute | Montana Hazardous Waste Act			
Disposing used oil or hazardous waste	Shall not unlawfully dispose of used oil or hazardous waste *Available at*: https://leg.mt.gov/bills/mca/title_0750/chapter_0100/part_0040/section_0220/0750-0100-0040-0220.html TITLE 75. ENVIRONMENTAL PROTECTION CHAPTER 10. WASTE AND LITTER CONTROL Part 4. Hazardous Waste Management **75-10-422. Unlawful disposal.** It is unlawful to dispose of used oil or hazardous waste, as defined in this part or by rule, without a permit or, if a permit is not required under this part or rules adopted under this part, by any other means not authorized by law. ***Note***: Under CERCLA, a permit is not required.	☑Applicable* *This provision would apply to used oil or hazardous waste (e.g., maintenance shop and diesel storage activities) generated during remedial action activities, if any.	Section 75-10-422, MCA
Regulation | Montana Hazardous Waste Act			
Handling and disposing of hazardous waste	Shall comply with applicable provisions of 40 C.F.R. Part 261 as adopted and incorporated by reference, except as otherwise provided in ARM 17.52.502 *Available at*: http://www.mtrules.org/gateway/ruleno.asp?RN=17.53.501 https://www.ecfr.gov/current/title-40/chapter-I/subchapter-I/part-261 https://www.ecfr.gov/current/title-40/chapter-I/subchapter-I/part-261/subpart-D/section-261.32 Rule Title: ADOPTION OF FEDERAL PROCEDURES FOR IDENTIFICATION AND LISTING OF HAZARDOUS WASTE (40 CFR 261) Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: HAZARDOUS WASTE Subchapter: Identification and Listing of Hazardous Waste **17.53.501** ADOPTION OF FEDERAL PROCEDURES FOR IDENTIFICATION AND LISTING OF HAZARDOUS WASTE (40 CFR 261)	☑Applicable with respect to 40 C.F.R. 261.32 (Spent Potliner Material, K088)) and 40 C.F.R. 261.33 (Various Other Waste Material)* *The substantive requirements of this provision would apply to hazardous waste generated during remedial action activities, if any, but does not apply to and is not relevant or appropriate for the material that is not actively managed.	ARM 17.53.501 Cross-reference: 40 C.F.R. 261.32 40 C.F.R. 261.33 ARM 17.53.502 (exceptions and additions)

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Action	**Requirement**	**Prerequisite**	**Citation**
	(1) Except as provided otherwise in ARM 17.53.502, the department hereby adopts and incorporates by reference 40 CFR 261, pertaining to identification, characteristics, listing, and criteria for identification and listing of wastes regulated as hazardous waste.		
Generating hazardous waste	Shall comply with applicable provisions of 40 C.F.R. Part 262 as adopted and incorporated by reference, except as otherwise provided in ARM 17.53.602 *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E53%2E601 Rule Title: ADOPTION OF FEDERAL STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE (40 CFR 262) Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: HAZARDOUS WASTE Subchapter: Standards Applicable to Generators of Hazardous Waste **17.53.601** ADOPTION OF FEDERAL STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE (40 CFR 262) (1) Except as provided otherwise in ARM 17.53.602, the department hereby adopts and incorporates by reference 40 CFR 262, pertaining to hazardous waste generator standards.	☑Applicable,* with respect to subpart A (large quantity generator) and subpart M (preparedness, prevention, and emergency procedure) *The substantive requirements of this provision would apply to generators of hazardous waste during remedial action activities, if any, but does not apply to and is not relevant or appropriate for the material that is not actively managed.	ARM 17.53.601 Cross-reference: 40 C.F.R. Part 262, Subpart A and M; ARM 17.53.602 (exceptions and additions)
Transporting hazardous waste	Shall comply with applicable provisions of 40 C.F.R. Part 263 as adopted and incorporated by reference, except as otherwise provided in ARM 17.53.702 *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E53%2E701 Rule Title: ADOPTION OF FEDERAL STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE (40 CFR 263) Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: HAZARDOUS WASTE Subchapter: Standards Applicable to Transporters of Hazardous Waste **17.53.701** ADOPTION OF FEDERAL STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE (40 CFR 263) (1) Except as provided otherwise in ARM 17.53.702, the department hereby adopts and incorporates by reference 40 CFR 263, pertaining to requirements for transporters of hazardous waste.	☑Applicable, with respect to 40 C.F.R. 263.30 and 263.31* *The substantive requirements of this provision would apply to transporters of hazardous waste generated during remedial action activities, if any.	ARM 17.53.701 Cross-reference: 40 C.F.R. 263.30 40 C.F.R. 263.31 ARM 17.53.702 (exceptions and additions)
Managing and disposing hazardous waste	Shall comply with applicable provisions of 40 C.F.R. Part 264 as adopted and incorporated by reference, except as otherwise provided in ARM 17.53.802 *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E53%2E801	☑Applicable* *The substantive requirements of ARM 17.53.801 would apply to owners and operators of hazardous waste treatment,	ARM 17.53.801 Cross-reference: 40 C.F.R. Part 264 Subpart B: General Facility Standards

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Action	**Requirement**	**Prerequisite**	**Citation**
	Rule Title: ADOPTION OF FEDERAL STANDARDS APPLICABLE TO OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES (40 CFR 264) Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: HAZARDOUS WASTE Subchapter: Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities 17.53.801 ADOPTION OF FEDERAL STANDARDS APPLICABLE TO OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES (40 CFR 264) (1) Except as provided otherwise in ARM 17.53.802, the department hereby adopts and incorporates by reference 40 CFR 264, pertaining to standards for owners and operators of hazardous waste treatment, storage and disposal facilities.	storage, and disposal facilities utilized during remedial action activities, if any, but do not apply to and are not relevant and appropriate for the material that is not actively managed.	(40 C.F.R. 264.10-264.19) Subpart C: Preparedness and Prevention (40 C.F.R. 264.30-264.37 Subpart D Contingency Plan and Emergency Procedures (40 C.F.R. 264.50-264.56) Subpart F: Ground-water Protection & Monitoring (40 C.F.R. 264.90-264.101) Governs design and implementation of ground water protection measures Subpart G: Closure & Post-closure (40 C.F.R. 264.110-264.120) Governs closure and post closure activities Subpart I: Use and Management of Containers (40 C.F.R. 264.170-264.178) Governs use and management of containers

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Action	**Requirement**	**Prerequisite**	**Citation**
			Subpart J: Tank Systems (40 C.F.R. 264.190-264.200) Governs use of tanks Subpart K: Surface Impoundments (40 C.F.R. 264.220-264.232) Governs design and operating requirements for surface impoundments Subpart L: Waste Piles (40 C.F.R. 264.250-264.259) Governs storage and treatment in waste piles, including monitoring and closure and post-closure care Subpart N: Landfills (40 C.F.R. 264.300-264.317 Governs landfill disposal, including design and operating requirements, monitoring, and closure and post-closure 40 C.F.R. 264.18 (Appendix 6)

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Action	**Requirement**	**Prerequisite**	**Citation**
			ARM 17.53.802 (exceptions and additions)
STATUTE | Mine and Smelter Waste Remediation			
Reclaiming and revegetating	Shall comply with certain minimum reclamation standards, except as otherwise provided *Available at*: https://leg.mt.gov/bills/mca/title_0750/chapter_0100/part_0140/section_0040/0750-0100-0140-0040.html TITLE 75. ENVIRONMENTAL PROTECTION CHAPTER 10. WASTE AND LITTER CONTROL Part 14. Mine and Smelter Waste Remediation 75-10-1404. Minimum reclamation standards. (1) Except as provided in 75-10-1411, mine and smelter waste repositories constructed by persons undertaking a remedial action on property owned by another must be capped with a minimum of 24 inches of cover material, including a minimum of 6 inches of topsoil, and revegetated as provided in subsection (3). (2) Except as agreed to by the person undertaking the remedial action and the property owner or as provided in 75-10-1411, locations where mine or smelter waste has been removed by a person undertaking a remedial action on property owned by someone other than the waste owner must be capped by a minimum of 6 inches of topsoil and revegetated as provided in subsection (3). (3) Except as provided in 75-10-1411: (a) mine and smelter waste repositories or lands where mine or smelter waste has been removed must be revegetated using plant species native to the area; and (b) revegetated areas must achieve a vegetative cover equal to 85% of the vegetation cover of adjacent lands that were not previously disturbed within 3 years of the initial seeding.	☑Relevant and Appropriate* *This provision would be relevant and appropriate for on-site repositories that receive waste during response action activities and to excavations for removal of contaminated soil or waste.	Section 75-10-1404, MCA Cross-references: Section 75-10-1411 (exceptions)
Statute | Montana Strip and Underground Mine Reclamation Act			
Excavating cover material and/or waste material	Shall comply with certain substantive elements in reclaiming disturbed areas *Available at*: https://leg.mt.gov/bills/mca/title_0820/chapter_0040/part_0020/section_0310/0820-0040-0020-0310.html TITLE 82. MINERALS, OIL, AND GAS CHAPTER 4. RECLAMATION Part 2. Coal and Uranium Mine Reclamation 82-4-231. Submission of and action on reclamation plan. (1) As rapidly, completely, and effectively as the most modern technology and the most advanced state of the art will allow, each operator granted a permit under this part shall reclaim and revegetate the land affected by the operation, except that underground tunnels, shafts, or other subsurface excavations need not be revegetated. Under the provisions of this part and rules adopted by the board, an operator shall prepare and carry out a method of operation, a	☑Relevant and Appropriate* *This provision would be relevant and appropriate for on-site repositories that receive waste during response action activities and to excavations for removal of contaminated soil or waste.	Section 82-4-231(1), (2), (10), (11), MCA Cross-reference: Section 82-4-233, MCA (Revegetation) ARM 17.24.751

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Action	**Requirement**	**Prerequisite**	**Citation**
	plan of grading, backfilling, highwall reduction, subsidence stabilization, water control, and topsoiling and a reclamation plan for the area of land affected by the operation. In developing a method of operation and plans of grading, backfilling, highwall reduction, subsidence stabilization, water control, topsoiling, and reclamation, all measures must be taken to eliminate damages to landowners and members of the public, their real and personal property, public roads, streams, and all other public property from soil erosion, subsidence, landslides, water pollution, and hazards dangerous to life and property. (2) The reclamation plan must set forth in detail the manner in which the applicant intends to comply with 82-4-232 through 82-4-234 and this section and the steps to be taken to comply with applicable air and water quality laws and rules and any applicable health and safety standards. (10) In addition to the method of operation, grading, backfilling, highwall reduction, subsidence stabilization, water control, topsoiling, and reclamation requirements of this part and rules adopted under this part, the operator, consistent with the directives of subsection (1), shall: (a) bury under adequate fill all toxic materials, shale, mineral, or any other material determined by the department to be acid-producing, toxic, undesirable, or creating a hazard; (b) as directed by rules, seal off tunnels, shafts, or other openings or any breakthrough of water creating a hazard; (c) impound, drain, or treat all runoff or underground mine waters so as to reduce soil erosion, damage to grazing and agricultural lands, and pollution of surface and subsurface waters; (d) remove or bury all metal, lumber, and other refuse resulting from the operation; (e) use explosives in connection with the operation only in accordance with department regulations designed to minimize noise, damage to adjacent lands, and water pollution and ensure public safety and for other purposes; (f) adopt measures to prevent land subsidence unless the department approves a plan for inducing subsidence into an abandoned operation in a predictable and controlled manner, with measures for grading, topsoiling, and revegetating the subsided land surface. In order for a controlled subsidence plan to be approved, the applicant is required to show that subsidence will not cause a direct or indirect hazard to any public or private buildings, roads, facilities, or use areas, constitute a hazard to human life or health or to domestic livestock or a viable agricultural operation, or violate any other restrictions the department may consider necessary. (g) stockpile and protect from erosion all mining and processing wastes until these wastes can be disposed of according to the provisions of this part; (h) deposit as much stockpiled waste material as possible back into the mine voids upon abandonment in a manner that will prevent or minimize land subsidence. The remaining waste material must be disposed of as provided by this part and the rules of the board. (i) seal all portals, entryways, drifts, shafts, or other openings between the surface and underground mine workings when no longer needed; (j) to the extent possible using the best technology currently available, minimize disturbances and adverse impacts of the operation on fish, wildlife, and related environmental values and achieve enhancement of those resources when practicable; (k) minimize the disturbances to the prevailing hydrologic balance at the mine site and in adjacent areas and to the quality and quantity of water in surface water and ground water systems both during and after strip- or underground-coal-mining operations and during reclamation by: (i) avoiding acid or other toxic mine drainage by measures including but not limited to: (A) preventing or removing water from contact with toxic-producing deposits; (B) treating drainage to reduce toxic content that adversely affects downstream water upon being released to watercourses; (C) casing, sealing, or otherwise managing boreholes, shafts, and wells and keeping acid or other toxic drainage from entering ground and surface waters; (ii) (A) conducting strip- or underground-mining operations so as to prevent, to the extent possible using the best technology currently available, additional contributions of suspended solids to streamflow or runoff outside the permit area, but the contributions may not be in excess of requirements set by applicable state or federal law;		

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Action	Requirement	Prerequisite	Citation
	(B) constructing any siltation structures pursuant to subsection (10)(k)(ii)(A) prior to commencement of strip- or underground-mining operations, with the structures to be certified by a qualified registered engineer and to be constructed as designed and as approved in the reclamation plan; (iii) cleaning out and removing temporary or large settling ponds or other siltation structures from drainways after disturbed areas are revegetated and stabilized and depositing the silt and debris at a site and in a manner approved by the department; (iv) restoring recharge capacity of the mined area to approximate premining conditions; (v) avoiding channel deepening or enlargement in operations that requires the discharge of water from mines; (vi) preserving throughout the mining and reclamation process the essential hydrologic functions of alluvial valley floors in the arid and semiarid areas of the country; (vii) designing and constructing reclaimed channels of intermittent streams and perennial streams to ensure long-term stability; and (viii) any other actions that the department may prescribe; (l) conduct strip- or underground-mine operations in accordance with the approved coal conservation plan; (m) stabilize and protect all surface areas, including spoil piles, to effectively control air pollution; (n) seal all auger holes with an impervious and noncombustible material in order to prevent drainage except when the department determines that the resulting impoundment of water in the auger holes may create a hazard to the environment or the public health and safety; (o) develop contingency plans to prevent sustained combustion; (p) refrain from construction of roads or other access ways up a streambed or drainage channel or in proximity to the channel so as to seriously alter the normal flow of water; (q) meet other criteria that are necessary to achieve reclamation in accordance with the purposes of this part, taking into consideration the physical, climatological, and other characteristics of the site; (r) with regard to underground mines, eliminate fire hazards and otherwise eliminate conditions that constitute a hazard to health and safety of the public; (s) locate openings for all new drift mines working acid-producing or iron-producing coal seams in a manner that prevents a gravity discharge of water from the mine. (11) An operator may not throw, dump, pile, or permit the throwing, dumping, or piling or otherwise placing of any overburden, stones, rocks, mineral, earth, soil, dirt, debris, trees, wood, logs, or any other materials or substances of any kind or nature beyond or outside of the area of land that is under permit and for which a bond has been posted under 82-4-223 or place the materials described in this section in a way that normal erosion or slides brought about by natural physical causes will permit the materials to go beyond or outside of that area of land. An operator shall conduct the strip- or underground-mining operation in a manner that protects areas outside the permit area. ***Note:*** Under CERCLA, a permit and DEQ plan approval is not required, per paragraphs (1), (2), (10), and (11).		
Regulation | Strip and Under-Ground Mine Reclamation Act			
Excavating cover material and/or waste material	Shall comply with certain requirements for the backfilling and grading of disturbed areas *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E501 Rule Title: GENERAL BACKFILLING AND GRADING REQUIREMENTS Department: ENVIRONMENTAL QUALITY Chapter: RECLAMATION	☑Relevant and Appropriate* *This provision would be relevant and appropriate for on-site repositories that receive waste during response action activities and to excavations for	ARM 17.24.501

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	Subchapter: Strip and Underground Mine Reclamation Act: Backfilling and Grading Requirements **17.24.501** GENERAL BACKFILLING AND GRADING REQUIREMENTS (1) Backfilling and grading of the disturbed area must be completed prior to removal of necessary reclamation equipment from the area of operation. (2) Overburden and parting materials which are not conducive to revegetation techniques, establishment, and growth must not be left on the top nor within eight feet of the top of regraded spoils nor at the surface of any other affected areas, unless the applicant demonstrates to the department's satisfaction that a lesser depth will provide for reclamation consistent with the Act. The department may require that problem materials be placed at a greater depth. (3)(a) Backfilled material must be placed to minimize erosion and sedimentation of undisturbed and reclaimed areas both on and offsite, water pollution, adverse effects on ground water, other offsite effects, and to support the approved postmining land use. (b) Backfilled materials must be selectively placed and compacted wherever necessary to prevent leaching of acid, acid-forming toxic, or toxic-forming materials into surface or subsurface waters and wherever necessary to ensure the stability of the backfilled materials. The method and design specifications for placing and compacting such materials must be approved by the department. (4) All final grading on the area of land affected must be to the approximate original contour of the land in accordance with 82-4-232(1), MCA. (a) The operator shall transport, backfill, and compact to ensure compliance with (3)(b) and ARM 17.24.505, and grade all spoil material as necessary to achieve the approximate original contour. Highwalls must be reduced or backfilled in compliance with ARM 17.24.515(1), or reclaimed using approved highwall reduction alternatives in compliance with ARM 17.24.515(2). (b) Cut-and-fill terraces may be used only in those situations expressly identified in and in compliance with ARM 17.24.502. (c) The postmining graded slopes must approximate the premining natural slopes in the area. (d) Depressions must be eliminated, except as provided in ARM 17.24.503(1). (5) The disturbed area must be blended with surrounding and undisturbed ground to provide a smooth transition in topography. (6) Backfilling and grading must be kept current with mining operations. To be considered current, backfilling and grading must meet the following requirements, unless otherwise approved by the department upon adequate written justification and documentation provided by the operator: (a) On lands affected by area strip mining, there must not be more than four consecutive spoil ridges present in any location. (b) Backfilling and grading must be completed within two years after coal removal from each pit has been concluded. For the purpose of this provision, "each pit" means any continuous dragline pass within a particular permit area. (c) Backfilling and grading of other excavations must be kept current as departmental directives dictate for each set of field circumstances. (d) All backfilling and grading must achieve the approved postmining topography. (7) The operator shall notify the department, in writing, upon detection of grading problems that would result in topography not consistent with the approved postmine topography. ***Note***: Under CERCLA, a permit, DEQ approval, and notification are not required, per paragraphs (3), (6) and (7).	removal of contaminated soil or waste.	
Excavating cover material and/or waste material	Shall comply with certain requirements for the burial and treatment of waste materials *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E505	☑Relevant and Appropriate*	ARM 17.24.505(2), (3), (5)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
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Action	Requirement	Prerequisite	Citation
	Rule Title: BURIAL AND TREATMENT OF EXPOSED MINERAL SEAMS AND WASTE MATERIALS Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Backfilling and Grading Requirements 17.24.505 BURIAL AND TREATMENT OF EXPOSED MINERAL SEAMS AND WASTE MATERIALS (2) Acid, acid-forming, toxic, toxic-forming, combustible, or other undesirable waste materials or fly ash identified by the department that are exposed, used, or produced during mining or mineral preparation must be covered in accordance with ARM 17.24.501(2) with the best available nontoxic and noncombustible material. The method and site of final disposal must be approved by the department. If necessary, these materials must be tested to determine necessary mitigations to neutralize acidity, to nullify toxicity, to prevent water pollution and sustained combustion, or to minimize adverse effects on plant growth and land uses. If necessary to protect against upward migration of salts or exposure by erosion, to provide an adequate depth for plant growth or to otherwise meet local conditions, the department may specify thicker amounts of cover using non-combustible and non-toxic material or the use of special compaction and isolation techniques to prevent contact of these materials with ground water. Acid, acid-forming, toxic, toxic-forming or other deleterious materials must not be buried or stored in proximity to a drainage course so as to cause or pose a threat of water pollution. (3) Wastes must not be used in the construction of embankments for impoundments. (5) Whenever waste is temporarily impounded: (a) the impoundment must be designed and certified, constructed, and maintained: (i) in accordance with ARM 17.24.603, 17.24.639, and 17.24.642, using current prudent-design standards; and (ii) for structures meeting the criteria of 30 CFR 77.216(a) , to safely discharge the 6-hour, probable maximum precipitation (PMP) or greater event; (b) the impoundment must be designed, and when operational must be managed, so that at least 90% of the water stored during the design precipitation event can be and is removed within the 10-day period following the event; (c) spillways and outlet works for coal impounding structures must be designed to provide adequate protection against erosion and corrosion; (d) inlets must be protected against blockage; and (e) the impoundment may not include acid, acid-forming, toxic, or toxic-forming waste. ***Note:*** Under CERCLA, DEQ approval is not required, per paragraph (2).	*This provision would be relevant and appropriate for on-site repositories that receive waste during response action activities and to excavations for removal of contaminated soil or waste.	
Excavating cover material and/or waste material	Shall comply with certain requirements to minimize disturbance to the prevailing hydrologic balance *Available at*: http://www.mtrules.org/gateway/ruleno.asp?RN=17%2E24%2E631 Rule Title: GENERAL HYDROLOGY REQUIREMENTS Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Transportation Facilities, Use of Explosives, and Hydrology	☑Relevant and Appropriate* * This provision would be relevant and appropriate for on-site repositories that receive waste during response action activities and to excavations for removal of contaminated soil or waste.	ARM 17.24.631

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	17.24.631 GENERAL HYDROLOGY REQUIREMENTS (1) The permittee shall plan and conduct mining and reclamation operations to minimize disturbance to the prevailing hydrologic balance and to prevent material damage to the prevailing hydrologic balance outside the permit area. (2) Changes in water quality and quantity, in the depth to ground water, and in the location of surface water drainage channels must be minimized so that the postmining land use of the disturbed land is not adversely affected and applicable federal and state statutes and regulations are not violated. (3) (a) The permittee shall conduct operations so as to minimize water pollution and shall, where necessary, use treatment methods to control water pollution. The permittee shall emphasize mining and reclamation practices that will prevent or minimize water pollution. Diversions of drainages must be used in preference to the use of water treatment facilities. (b) Practices to control and minimize pollution include, but are not limited to, stabilizing disturbed areas through land shaping, diverting runoff, achieving quickly germinating and growing stands of temporary vegetation, regulating channel velocity of water, lining drainage channels with rock or vegetation, mulching, selectively placing and sealing acid-forming and toxic-forming materials, and selectively placing waste materials in backfill areas. (4) If pollution can be controlled only by treatment, the permittee shall operate and maintain the necessary water treatment facilities for as long as treatment is required. The department may specify which practices, used to minimize water pollution, may be used on a permanent basis.		
Excavating cover material and/or waste material	Shall treat all surface drainage from a disturbed area by the best technology currently available (BTCA), and shall comply with other certain requirements *Available at*: http://www.mtrules.org/gateway/ruleno.asp?RN=17.24.633 Rule Title: WATER QUALITY PERFORMANCE STANDARDS Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Transportation Facilities, Use of Explosives, and Hydrology 17.24.633 WATER QUALITY PERFORMANCE STANDARDS (1) All surface drainage from the disturbed area, including disturbed areas that have been graded, seeded, or planted, must be treated by the BTCA before leaving the permit area. Additional BTCA practices may be required after commencement of the operation if conditions arise that were not anticipated at the time of the permit application. (2) Sediment control through BTCA practices must be maintained until the disturbed area has been restored, the revegetation requirements of ARM 17.24.711, 17.24.713, 17.24.714, 17.24.716 through 17.24.718, 17.24.721, 17.24.723 through 17.24.726, and 17.24.731 have been met, the area meets state and federal requirements for the receiving stream, and evidence is provided that demonstrates that the drainage basin has been stabilized consistent with the approved postmining land use. (3) All sediment control must be constructed in accordance with ARM 17.24.638 and 17.24.639 in approved locations before any strip or underground mining operations in the drainage area to be affected may begin. (4) All discharges which include water from areas disturbed by strip or underground mining operations must be in compliance with all federal and state laws and regulations and applicable effluent limitations. (5) In accordance with 40 CFR 434, for certain constituents as defined in the operator's MPDES permit, discharge from the disturbed areas is not subject to the effluent limitations or BTCA standards of ARM 17.24.638 if: (a) the discharge is demonstrated by the permittee to have resulted from a precipitation event equal to or larger than a 10-year, 24-hour precipitation event, or snowmelt runoff of equivalent volume; and	☑Relevant and Appropriate* *This provision would be relevant and appropriate for construction water/stormwater management in excavation areas.	ARM 17.24.633

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Action	Requirement	Prerequisite	Citation
	(b) the discharge is from BTCA practices designed, constructed, and maintained in accordance with (1) through (4) and ARM 17.24.639. ***Note***: Under CERCLA, a permit is not required, per paragraphs (1) and (5).		
Excavating cover material and/or waste material	Shall comply with certain requirements regarding the reclamation of drainage basins *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E634 Rule Title: RECLAMATION OF DRAINAGE BASINS Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Transportation Facilities, Use of Explosives, and Hydrology **17.24.634** RECLAMATION OF DRAINAGE BASINS (1) Reclaimed drainage basins, including valleys, channels, and floodplains must be constructed to: (a) comply with the postmining topography map required by ARM 17.24.313(1) (d) (iv) and approved by the department; (b) approximate original contour; (c) an appropriate geomorphic habit or characteristic pattern consistent with 82-4-231 (10) (k) , MCA; (d) allow the drainage channel to remain in dynamic equilibrium with the drainage basin system without the use of artificial structural controls unless approved by the department; (e) provide separation of flow between adjacent drainages and safely pass the runoff from a six-hour precipitation event with a 100-year recurrence interval, or larger event as specified by the department; (f) provide for the long-term relative stability of the landscape. The term "relative" refers to a condition comparable to an unmined landscape with similar climate, topography, vegetation and land use; (g) provide an average channel gradient that exhibits a concave longitudinal profile; (h) establish or restore a diversity of habitats that are consistent with the approved postmining land use, and restore, enhance where practicable, or maintain natural riparian vegetation as necessary to comply with ARM subchapter 7; and (i) exhibit dimensions and characteristics that will blend with the undisturbed drainage system above and below the area to be reclaimed and that will accommodate the approved revegetation and postmining land use requirements. ***Note:*** Under CERCLA, DEQ approval is not required, per paragraph (1) and (2).	☑Relevant and Appropriate* *This provision would be relevant and appropriate for excavation of cover/waste material and construction of on-site repositories that receive waste during response action activities (e.g., Cedar Creek).	ARM 17.24.634(1)
Excavating cover material and/or waste material	Shall comply with certain requirements for temporary and permanent diversions *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E635 Rule Title: GENERAL REQUIREMENTS FOR TEMPORARY AND PERMANENT DIVERSION OF OVERLAND FLOW, THROUGH FLOW, SHALLOW GROUND WATER FLOW, EPHEMERAL DRAINAGEWAYS, AND INTERMITTENT AND PERENNIAL STREAMS Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: RECLAMATION	☑Relevant and Appropriate* *This provision would be relevant and appropriate for diversions of surface water or groundwater flow required to construct, operate, and maintain a remedial action. Examples include modification of surface drainage and installation of	ARM 17.24.635(1)-(4)(b)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
Anaconda/CFAC ROD

Action	Requirement	Prerequisite	Citation
	Subchapter: Strip and Underground Mine Reclamation Act: Transportation Facilities, Use of Explosives, and Hydrology 17.24.635 GENERAL REQUIREMENTS FOR TEMPORARY AND PERMANENT DIVERSION OF OVERLAND FLOW, THROUGH FLOW, SHALLOW GROUND WATER FLOW, EPHEMERAL DRAINAGEWAYS, AND INTERMITTENT AND PERENNIAL STREAMS (1) The department may require or approve a diversion of flow whenever: (a) the purpose is to divert water away from disturbed areas, to minimize erosion, to reduce the volume of water requiring treatment or to prevent or remove water from contact with acid- or toxic-forming materials; and (b) the department finds that the diversion will not adversely affect the water quantity and quality and related environmental resources of the stream. (See also ARM 17.24.633, 17.24.634, 17.24.651, and 17.24.751.) (2) A diversion that increases the potential for landslides or allows entry of diverted water into underground mines must not be created. (3) Diversions must not be constructed to pass large flow events into an adjacent drainage channel that would result in excessive erosion in the natural channel. Water in excess of the design event must be conveyed in a stable manner to an appropriate treatment facility to meet effluent limitations before passing off the permit area. (4) (a) Diversions must be designed, constructed, stabilized, and maintained to prevent additional contributions of suspended solids to streamflow, to runoff outside the permit area, to prevent material damage to surface and ground water outside the permit area, and to assure the safety of the public to the extent possible, using the BTCA. (b) Materials used to construct diversions must be approved as acceptable by the department prior to their use. ***Note:*** Under CERCLA, a permit and DEQ approval are not required, per paragraphs (1), (3) and (4).	slurry walls to divert flow around repositories.	
Excavating cover material and/or waste material	Shall comply with certain requirements for temporary diversions *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E636 Rule Title: SPECIAL REQUIREMENTS FOR TEMPORARY DIVERSIONS Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Transportation Facilities, Use of Explosives, and Hydrology 17.24.636 SPECIAL REQUIREMENTS FOR TEMPORARY DIVERSIONS (1) A temporary diversion must be constructed to pass safely the peak runoff from a precipitation event with a 10-year, 24-hour recurrence interval, or a larger event as specified by the department. (2) If channel lining is required to prevent erosion, the channel lining must be designed using standard engineering practices to safely pass design velocities. (3) Freeboard must be as specified by the department, but no less than 1.0 foot. (4) Energy dissipators must be installed in streams where exit velocity of the diversion is greater than that of the receiving stream. (5) Whenever streamflow is allowed to be diverted, the stream channel diversion must be designed, constructed, and removed in accordance with the following requirements: (a) The longitudinal profile of the stream, the channel, and the floodplain must be designed and constructed to remain stable and to prevent, to the extent possible using the BTCA, additional contributions of suspended solids to streamflow or to runoff outside the permit area. These contributions must not be in excess of requirements of state or	☑Relevant and Appropriate* *This provision would be relevant and appropriate for diversions of surface water or groundwater flow required to construct, operate, and maintain a remedial action. Examples include modification of surface drainage and installation of slurry walls to divert flow around repositories.	ARM 17.24.636

Action	Requirement	Prerequisite	Citation
	federal law. Erosion control structures, such as channel lining structures, basins, and artificial channel roughness structures, may be used in diversions only when approved by the department as being necessary to control erosion. (b) The combination of channel, bank, and flood-plain configurations must be adequate to pass safely the peak runoff of a 10-year, 24-hour precipitation event for temporary diversions or larger events specified by the department. However, the capacity of the channel itself must be at least equal to the capacity of the unmodified stream channel immediately upstream and downstream from the diversion. (6) When no longer needed to achieve the purpose for which it was authorized, a temporary diversion must be removed and the affected land regraded, resoiled, and revegetated, in accordance with subchapters 5 and 7. At the time a diversion is removed, downstream water treatment facilities previously protected by the diversion must be modified or removed to prevent over-topping or failure of the facilities. This requirement does not relieve the operator from responsibility for maintenance of a water treatment facility otherwise required under this subchapter or the permit. ***Note***: Under CERCLA, a permit and DEQ approval are not required, per paragraph (5)(a) and (6).		
Excavating cover material and/or waste material	Shall comply with certain requirements for sediment control measures *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E638 Rule Title: SEDIMENT CONTROL MEASURES Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Transportation Facilities, Use of Explosives, and Hydrology **17.24.638** SEDIMENT CONTROL MEASURES (1) Appropriate sediment control measures must be designed, constructed, and maintained using the BTCA to: (a) prevent, to the extent possible, additional contributions of sediment to streamflow or to runoff outside the permit area; (b) meet the more stringent of applicable state or federal effluent limitations; and (c) minimize erosion to the extent possible. (2) Sediment control measures include practices carried out within or adjacent to the disturbed area. The sedimentation storage capacity of practices in and downstream from the disturbed area must reflect the degree to which successful mining and reclamation techniques are applied to reduce erosion and control sediment. Sediment control measures consist of the utilization of proper mining and reclamation methods and sediment control practices, singly or in combination. Sediment control methods include but are not limited to: (a) disturbing the smallest practicable area at any one time during the mining operation through progressive backfilling, grading, and prompt revegetation in accordance with ARM 17.24.711, 17.24.713, 17.24.714, 17.24.716 through 17.24.721, and 17.24.723 through 17.24.726; (b) stabilizing the backfill material to promote a reduction in the rate and volume of runoff, in accordance with the requirements of subchapter 5; (c) retaining sediment within disturbed areas; (d) diverting runoff away from disturbed areas; (e) diverting runoff by using protected channels or pipes through disturbed areas to eliminate additional erosion; (f) using straw dikes, riprap, check dams, mulches, vegetative sediment filters, dugout ponds, and other measures that reduce overland flow velocity, reduce runoff volume, or trap sediment; and (g) treating with chemicals.	☑Relevant and Appropriate* *This provision would be relevant and appropriate for excavation of cover/waste material and construction of on-site repositories that receive waste during response action activities.	ARM 17.24.638

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	Note: Under CERCLA, a permit is not required, per paragraph (1).		
Excavating cover material and/or waste material	Shall comply with certain requirements to control discharge from sedimentation ponds, impoundments, and diversions *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E640 Rule Title: DISCHARGE STRUCTURES Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Transportation Facilities, Use of Explosives, and Hydrology **17.24.640** DISCHARGE STRUCTURES (1) Discharge from sedimentation ponds, impoundments, and diversions must be controlled by vegetation, energy dissipators, riprap channels, and other measures, where necessary, to reduce erosion, to prevent deepening or enlargement of stream channels, and to minimize disturbance of the hydrologic balance. Discharge structures must be designed according to standard engineering-design procedures and be certified by a qualified, registered, professional engineer as meeting the performance standards of this subchapter and any design criteria specified by the department.	☑Relevant and Appropriate* *This provision would be relevant and appropriate to structures associated with on-site repositories that receive waste during response action activities and to excavations for removal of contaminated soil or waste that discharge directly to surface water.	ARM 17.24.640
Excavating cover material and/or waste material	Shall comply with certain requirements for the protection of ground water recharge *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E644 Rule Title: PROTECTION OF GROUND WATER RECHARGE Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Transportation Facilities, Use of Explosives, and Hydrology **17.24.644** PROTECTION OF GROUND WATER RECHARGE (1) The disturbed area must be reclaimed to restore the approximate premining recharge capacity through restoration of the capability of the reclaimed areas as a whole to transmit water to the ground water system. The recharge capacity must be restored to support the approved postmining land use, minimize disturbances to the prevailing hydrologic balance in the mine plan and adjacent areas, and provide a rate of recharge that approximates the premining recharge rate. The permittee shall monitor according to ARM 17.24.645 to ensure operations conform to this requirement. (2) The permittee shall collect data and conduct studies as requested by the department to determine whether the recharge capacity of the mined lands can be restored to the approximate premining recharge capacity.	☑Relevant and Appropriate *This provision would be relevant and appropriate to on-site repositories that receive waste during response action activities and to excavations for removal of contaminated soil or waste.	ARM 17.24.644
Excavating cover material and/or waste material	Shall comply with certain requirements for ground water monitoring *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E645	☑Relevant and Appropriate*	ARM 17.24.645(1)-(5), (7)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	Rule Title: GROUND WATER MONITORING Department: ENVIRONMENTAL QUALITY Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Transportation Facilities, Use of Explosives, and Hydrology **17.24.645** GROUND WATER MONITORING (1) Ground water levels, subsurface flow and storage characteristics, and the quality of ground water must be monitored based on information gathered pursuant to ARM 17.24.304 and the monitoring program submitted pursuant to ARM 17.24.314 and in a manner approved by the department to determine the effects of strip or underground mining operations on the recharge capacity of reclaimed lands and on the quantity and quality of water in ground water systems in the permit and adjacent areas. When operations may affect the ground water system, ground water levels and ground water quality must be periodically monitored using wells that can adequately reflect changes in ground water quantity and quality resulting from such operations. The information must be submitted to the department in a format approved by the department. (2) Monitoring must: (a) include the measurement of the quantity and quality of water in all disturbed or potentially affected geologic strata within and adjacent to the permit area. Affected strata are all those adjacent to or physically disturbed by mining disturbance and any aquifers below the base of the spoils that could receive water from or discharge water to the spoils. Monitoring must be of sufficient frequency and extent to adequately identify changes in ground water quantity and quality resulting from mining operations; and (b) be adequate to plan for modification of strip or underground mining operations, if necessary, to minimize disturbance of the prevailing hydrologic balance. (3) The department may require the permittee to expand the ground water monitoring system whenever a significant impact to the hydrologic balance of the permit and adjacent area is likely and the expanded monitoring is needed to adequately monitor the ground water system. As specified and approved by the department, additional observations and analyses, such as infiltration tests and aquifer tests, must be undertaken by the permittee to demonstrate compliance with this rule. (4) Whenever an applicant demonstrates by the use of the probable hydrologic consequences determination (see ARM 17.24.314) and other available information that a particular water bearing stratum in the proposed permit or adjacent areas does not have a significant role in maintaining the hydrologic balance within the cumulative impact area, the department may waive monitoring of that stratum. (5) Ground water monitoring must proceed through mining and continue until phase IV bond release. The department may allow modification of the monitoring requirements, except those required by the Montana pollutant discharge elimination system permit, including the parameters covered and sampling frequency, if the operator or the department demonstrates, using the monitoring data obtained under this rule, that: (a)(i) the operation has minimized disturbance to the hydrologic balance in the permit and adjacent areas and prevented material damage to the hydrologic balance outside the permit area; (ii) water quantity and quality are suitable to support approved postmining land uses; and (iii) the water rights of other users have been protected or replaced; (b) monitoring is no longer necessary to achieve the purposes set forth in the monitoring plan approved under this rule; or (c) with regard to monitoring related to an alluvial valley floor, monitoring of the essential hydrologic function of the alluvial valley floor is ensured under the modified program. (7) Whenever monitoring reveals noncompliance with the permit, the Act, or the rules adopted thereunder, the permittee shall immediately take steps to minimize adverse effects. Those steps include, but are not limited to, accelerated or additional monitoring, abatement, and warning of all persons whose health or safety is in imminent	*This provision would be relevant and appropriate to on-site repositories that receive waste during response action activities and to excavations.	*See also* 40 C.F.R. part 264.97, General groundwater monitoring requirements

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
Anaconda/CFAC ROD

Action	Requirement	Prerequisite	Citation
	danger. The permittee shall, within five days of discovery of noncompliance, notify the department of noncompliance and remedial measures taken. ***Note:*** Under CERCLA, administrative provisions of paragraph (1) - (5) and (7) are not required.		
Excavating cover material and/or waste material	Shall comply with certain requirements for surface water monitoring *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E646 Rule Title: SURFACE WATER MONITORING Department: ENVIRONMENTAL QUALITY Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Transportation Facilities, Use of Explosives, and Hydrology **17.24.646** SURFACE WATER MONITORING (1) Surface water monitoring must be based on information submitted pursuant to ARM 17.24.304 and must be conducted in accordance with the monitoring program submitted under ARM 17.24.314 and approved by the department. Monitoring must: (a) be adequate to measure accurately and record water quantity and quality of all discharges from the permit area; (b) in all cases in which analytical results of the sample collections indicate noncompliance with a permit condition or an applicable standard, result in the operator immediately taking appropriate remedial measures. Within five days of the discovery of the noncompliance, the operator shall notify the department of the noncompliance and of the remedial measures taken and shall comply with (6). These remedial measures include, but are not limited to, accelerated or additional monitoring, abatement, and warning of all persons whose health and safety is in imminent danger. Whenever a violation of a Montana pollutant discharge elimination system (MPDES) permit occurs, the operator shall forward the analytic results concurrently with the written notice of noncompliance; (3) Monitoring must be conducted at appropriate frequencies to measure normal and abnormal variations in concentrations. (4) After disturbed areas have been regraded and stabilized according to ARM 17.24.501, the operator shall monitor surface water flow and quality. Data from this monitoring must be used to determine whether the quality and quantity of runoff without treatment is consistent with the requirements of this rule to minimize disturbance to the prevailing hydrologic balance, to demonstrate that the drainage basin has stabilized to its previous, undisturbed state, and to attain the approved postmining land use. These data must also be used by the department to review requests for removal of water quality or flow control systems and for bond release. With department approval, other information or methods, such as models, may be used, in conjunction with monitoring data, for these purposes. (5) Equipment, structures, and other devices necessary to measure and sample accurately the quality and quantity of surface water discharges from the disturbed area must be properly installed, maintained, and operated and must be removed when no longer required. ***Note:*** Under CERCLA, a permit, DEQ approval, and notification are not required, per paragraphs (1) and (4).	☑Relevant and Appropriate* *This provision would be relevant and appropriate to on-site repositories that receive waste during response action activities and to excavations for removal of contaminated soil or waste that discharge to surface water.	ARM 17.24.646(1), (3)-(5)
Excavating cover material and/or waste material	Shall comply with certain requirements for the removal and handling of soil suitable for reclamation *Available at*:	☑Relevant and Appropriate*	ARM 17.24.701

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
Anaconda/CFAC ROD

Action	Requirement	Prerequisite	Citation
	http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E701 Rule Title: REMOVAL OF SOIL Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Topsoiling, Revegetation, and Protection of Wildlife and Air Resources 17.24.701 REMOVAL OF SOIL (1) Prior to any surface disturbance by the mining operation, and after the removal of vegetation that would interfere with soil removal and use, all soil suitable for reclamation use must be removed. Exceptions may be granted if the operator demonstrates to the satisfaction of the department that a site-specific disturbance would be insignificant and that soil loss, degradation, and contamination would be minimized. (2) The operator shall use a multiple-lift soil handling method consisting of the separate handling of surface soil (A, E, and possibly upper B or C horizons) and subsurface soil (underlying B and C horizons) during salvage, stockpiling, and redistribution, unless, for any particular soil component, the operator affirmatively demonstrates, and the department finds, that multiple lifts are not necessary to achieve reclamation consistent with the Act, rules and reclamation plan. (3) Undisturbed soils must be protected to the extent possible from contamination and degradation and soil salvage operations must be conducted in a manner and at a time that minimizes erosion, contamination, degradation, compaction, and deterioration of the biological properties of the soil. (4) Soil removal is not required for minor disturbances which occur at the site of small structures such as power poles, signs or fences or where operations will not destroy vegetation and cause erosion. ***Note:*** Under CERCLA, DEQ approval is not required, per paragraphs (1) and (2).	*This provision would be relevant and appropriate to removal of uncontaminated soil that may be reused on-site but is not applicable to or relevant or appropriate for contaminated soil that is being removed for subsequent disposal.	
Excavating cover material and/or waste material	Shall comply with certain requirements for the redistribution and stockpiling of soil *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E702 Rule Title: REDISTRIBUTION AND STOCKPILING OF SOIL Department: ENVIRONMENTAL QUALITY Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Topsoiling, Revegetation, and Protection of Wildlife and Air Resources 17.24.702 REDISTRIBUTION AND STOCKPILING OF SOIL (1) After salvage, soil must be immediately redistributed according to the requirements of (5) and (6) on areas graded to the approved postmining topography. (2) Salvaged soil must be stockpiled if graded areas are not immediately available for redistribution. Soil stockpiles must be located where they will not be disturbed by mining operations and will not be lost to wind or water erosion. Compaction, contamination, and degradation of stockpiles must be minimized. Stockpiled soil must not be rehandled until replaced on regraded areas, unless authorized by the department. (3)(a) Inactive soil stockpiles must be seeded or planted with an effective cover of non-noxious, quick-growing, annual and/or perennial plants during the first normal period favorable for planting.	☑Relevant and Appropriate* *This provision would be relevant and appropriate to excavation of cover/waste material and construction of on-site repositories that receive waste during response action activities.	ARM 17.24.702

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	(b) Active stockpiles or stockpiles that will be used within one year do not require seeding. However, other measures must be taken as necessary to minimize erosion. (4) Prior to redistribution of soil or soil substitutes, regraded areas must be: (a) sampled and analyzed to determine the physicochemical nature of the surficial spoil material in accordance with ARM 17.24.313(1)(h)(xi); (b) scarified on the contour to a minimum 12-inch depth, unless otherwise approved by the department upon a determination that the purpose of this subsection will be met, to eliminate any possible slippage potential at the soil/spoil interface, to relieve compaction, and to promote root penetration and permeability of spoils. If no adverse effects to the redistributed material or postmining land use will occur, such treatments may be conducted after the soil or soil substitute is replaced. (5) The operator shall, during and after redistribution, prevent, to the extent possible, spoil and soil compaction, protect against soil erosion, contamination, and degradation, and minimize the deterioration of the biological properties of the soil. (6) Soil must be redistributed in a manner that achieves thicknesses consistent with soil resource availability and appropriate for the postmining vegetation, land uses, contours, and surface water drainage systems. (7) Redistributed soil must be reconditioned by subsoiling or other appropriate methods approved by the department. Soil reconditioning must be done on the contour, whenever possible. ***Note:*** Under CERCLA, DEQ approval is not required, per paragraphs (4) and (7).		
Excavating cover material and/or waste material	Shall comply with certain requirements when using materials other than soil for final surfacing in reclamation *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E703 Rule Title: SUBSTITUTION OF OTHER MATERIALS FOR SOIL Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Topsoiling, Revegetation, and Protection of Wildlife and Air Resources 17.24.703 SUBSTITUTION OF OTHER MATERIALS FOR SOIL (1) Any application for permit or accompanying reclamation plan that for any reason proposes to use materials other than, or along with, soil and final surfacing of spoil or other disturbances must document problems of soil quantity or quality. The following requirements must be met before use of material other than soil will be allowed: (a) The operator shall demonstrate and the department shall find that the resulting medium is at least as capable as the soil of supporting the approved vegetation and postmining land use (see ARM 17.24.304(1) (g) and (1) (k)) . (b) The medium must be the best available in the permit area to support revegetation. (2) Soil substitutes must be handled consistent with ARM 17.24.701 and 17.24.702. ***Note:*** Under CERCLA, a permit is not required, per paragraph (1).	☑Relevant and Appropriate* *This provision would be relevant and appropriate for on-site repositories that receive waste during response action activities and to excavations for removal of contaminated soil or waste.	ARM 17.24.703 Cross-reference: ARM 17.24.701 ARM 17.24.702
Excavating cover material and/or waste material	Shall comply with certain requirements for the establishment of vegetation in reclamation *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E711 Rule Title: ESTABLISHMENT OF VEGETATION	☑Relevant and Appropriate* *The provision would be relevant and appropriate for on-site repositories that receive	ARM 17.24.711(1) Cross-reference: Section 82-4-233, MCA

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	Department: ENVIRONMENTAL QUALITY Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Topsoiling, Revegetation, and Protection of Wildlife and Air Resources 17.24.711 ESTABLISHMENT OF VEGETATION (1) Vegetation must be reestablished in accordance with 82-4-233, MCA. For purposes of that statute, "other constructed features" means discrete man-made features less than two acres in size that are incorporated into reclaimed areas, that have been constructed to an approved design, and that do not require revegetation to achieve the approved postmining land use or postmining slope stability.	waste during response action activities and to excavations for removal of contaminated soil or waste. This provision would not be relevant and appropriate in certain instances, for example, where there is dedicated development.	
Excavating cover material and/or waste material	Shall comply with certain requirements for the timing of seeding and planting of disturbed areas *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E713 Rule Title: TIMING OF SEEDING AND PLANTING Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Topsoiling, Revegetation, and Protection of Wildlife and Air Resources 17.24.713 TIMING OF SEEDING AND PLANTING (1) Seeding and planting of disturbed areas must be conducted during the first appropriate period favorable for planting after final seedbed preparation unless a variance is approved by the department. The appropriate period favorable for planting is that planting time generally accepted locally for the type of plant materials selected to meet specific site and climatic conditions. ***Note***: Under CERCLA, DEQ approval is not required, per paragraph (1).	☑Relevant and Appropriate* *This provision would be relevant and appropriate for on-site repositories that receive waste during response action activities and to excavations for removal of contaminated soil or waste.	ARM 17.24.713
Excavating cover material and/or waste material	Shall comply with certain requirements for soil stabilizing practices *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E714 Rule Title: SOIL STABILIZING PRACTICES Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Topsoiling, Revegetation, and Protection of Wildlife and Air Resources 17.24.714 SOIL STABILIZING PRACTICES (1) Such practices as seedbed preparation, mulching, or cover cropping must be used on all regraded and resoiled areas to control erosion, to promote germination of seeds, and to increase the moisture retention of the soil until an adequate,	☑Relevant and Appropriate* *This provision would be relevant and appropriate for on-site repositories that receive waste during response action activities and to excavations for removal of contaminated soil or waste.	ARM 17.24.714

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	permanent cover is established. This requirement may be suspended if the operator demonstrates to the department's satisfaction that it is not needed to control air or water pollution and erosion. ***Note:*** Under CERCLA, DEQ approval is not required, per paragraph (1).		
Excavating cover material and/or waste material	Shall comply with certain requirements for the method of revegetation *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E716 Rule Title: METHOD OF REVEGETATION Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Topsoiling, Revegetation, and Protection of Wildlife and Air Resources 17.24.716 METHOD OF REVEGETATION (1) All revegetation must be in compliance with the approved reclamation plan and carried out in a manner that encourages prompt vegetation establishment. (2) Revegetation must be accomplished by drill or broadcast seeding, by seedling transplants, by establishing sod plugs, or by other methods. All methods must have prior approval of the department. All seeding must be done on the contour, whenever possible. Mixed seedings must be conducted in a manner and at a time that will avoid deleterious competition of different vegetal types or to avoid seed distribution problems due to different seed sizes. (3) Seeding rates must be calculated on a pure live seed basis, and purity and germination percentages must be documented. (4) To the extent possible, the operator shall utilize seed mixes free of weedy or other undesirable species and shall utilize the best reclamation and land management techniques available to prevent establishment of noxious weeds on all disturbed and reclaimed areas. The operator shall control noxious weeds in accordance with the Noxious Weed Management Act (7-22-2101 through 7-22-2153 , MCA, as amended) . ***Note:*** Under CERCLA, DEQ approval is not required, per paragraphs (1) and (2).	☑Relevant and Appropriate* *This provision would be relevant and appropriate for on-site repositories that receive waste during response action activities and to excavations for removal of contaminated soil or waste.	ARM 17.24.716 Cross-reference: Sections 7-22-2101 — 7-22-2153, MCA
Excavating cover material and/or waste material	Shall comply with certain requirements for the planting of trees and shrubs, as necessary *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E717 Rule Title: PLANTING OF TREES AND SHRUBS Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Topsoiling, Revegetation, and Protection of Wildlife and Air Resources 17.24.717 PLANTING OF TREES AND SHRUBS (1) Tree or shrub species necessary to meet the approved postmining land use must be adapted for local site conditions and climate. Trees and shrubs must be planted in combination with herbaceous species as necessary to achieve the postmining land use and as approved by the department. If necessary to increase tree and shrub survival, seeding of the herbaceous species may be delayed providing that measures are taken to control air and water pollution and erosion.	☑Relevant and Appropriate* *This provision would be relevant and appropriate for new excavations for removal of contaminated soil or waste.	ARM 17.24.717

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	Note: Under CERCLA, DEQ approval is not required, per paragraph (1).		
Excavating cover material and/or waste material	Shall comply with certain requirements for soil amendments, management techniques, and land use practices, as necessary *Available at*: http://mtrules.org/gateway/ruleno.asp?RN=17.24.718 Rule Title: SOIL AMENDMENTS, MANAGEMENT TECHNIQUES, AND LAND USE PRACTICES Department: ENVIRONMENTAL QUALITY Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Topsoiling, Revegetation, and Protection of Wildlife and Air Resources 17.24.718 SOIL AMENDMENTS, MANAGEMENT TECHNIQUES, AND LAND USE PRACTICES (1) Soil amendments must be used as necessary to supplement the soil and to aid in the establishment of a permanent vegetative cover as specified in the approved reclamation plan or as later deemed necessary by the department. (2) An operator may use husbandry practices, approved by the department, for management of vegetation consistent with the approved reclamation plan without affecting the minimum responsibility period. If husbandry practices other than those specified for the approved land use are employed, the minimum responsibility period will start after the last such unapproved practice is used. (3) Reclamation land use practices including, but not limited to, grazing, haying, or chemical applications, may not be conducted in a manner or at a time that interferes with establishment and/or persistence of seeded and planted grasses, forbs, shrubs, and trees or with other reclamation requirements. ***Note:*** Under CERCLA, DEQ approval is not required, per paragraphs (1) and (2).	☑Relevant and Appropriate *This provision would be relevant and appropriate for on-site repositories that receive waste during response action activities and to excavations for removal of contaminated soil or waste.	ARM 17.24.718
Excavating cover material and/or waste material	Shall comply with requirements for the eradication of rills and gullies in certain instances *Available at*: http://www.mtrules.org/gateway/ruleno.asp?RN=17.24.721 Rule Title: ERADICATION OF RILLS AND GULLIES Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Topsoiling, Revegetation, and Protection of Wildlife and Air Resources 17.24.721 ERADICATION OF RILLS AND GULLIES (1) When rills or gullies form in areas that have been regraded and resoiled, the rills or gullies must be filled, graded, or otherwise stabilized and the area reseeded or replanted if rills or gullies are: (a) disrupting the approved postmining land use or reestablishment of the vegetative cover; or (b) causing or contributing to a violation of water quality standards for a receiving stream.	☑Relevant and Appropriate *This provision would be relevant and appropriate for remedial activities and to excavations for removal of contaminated soil or waste.	ARM 17.24.721

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	(2) The department shall specify time frames for completion of rill and gully repair work. Repair work will result in restarting the period of responsibility for reestablishing vegetation, unless it can be demonstrated that such work is a normal conservation practice and is limited to: (a) minor erosional features on land for which proper erosion-control practices are in use; and (b) rills and gullies that affect only small areas and do not recur. (3) If reclaimed areas have experienced extensive rill or gully erosion, the department may require submittal of a plan of mitigation for such features and department approval prior to implementation of repair work. Note: Under CERCLA, DEQ approval is not required, per paragraph (3).		
Excavating cover material and/or waste material	Shall comply with certain requirements for periodic vegetation, soils, and wildlife monitoring *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E723 Rule Title: MONITORING Department: ENVIRONMENTAL QUALITY Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Topsoiling, Revegetation, and Protection of Wildlife and Air Resources **17.24.723** MONITORING (1) The operator shall conduct periodic vegetation, soils, and wildlife monitoring under plans submitted pursuant to ARM 17.24.312(1)(d) and 17.24.313(1)(g) and (h) and the approved postmining land use as approved by the department. (3) If the data indicate that corrective measures are necessary, the operator shall implement corrective measures to comply with permit requirements. (4) The operator may request and the department may approve revision or discontinuation of a monitoring program, if it can be documented that adverse impacts have not occurred and are unlikely to occur or that mitigating measures have been effective. ***Note:*** Under CERCLA, a permit and DEQ approval are not required, per paragraphs (1), (3), and (4).	☑Relevant and Appropriate *This provision would be relevant and appropriate for on-site repositories that receive waste during response action activities and to excavations for removal of contaminated soil or waste.	ARM 17.24.723(1), (3)-(4)
Excavating cover material and/or waste material	Shall meet certain criteria for revegetation success *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E724 Rule Title: REVEGETATION SUCCESS CRITERIA Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Topsoiling, Revegetation, and Protection of Wildlife and Air Resources **17.24.724** REVEGETATION SUCCESS CRITERIA (1) Success of revegetation must be determined by comparison with unmined reference areas or by comparison with technical standards. Reference areas and standards must be representative of vegetation and related site	☑Relevant and Appropriate* *This provision would be relevant and appropriate for on-site repositories that receive waste during response action activities and to excavations for removal of contaminated soil or waste.	ARM 17.24.724

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	characteristics occurring on lands exhibiting good ecological integrity. The department must approve the reference areas, technical standards, and methods of comparison. (2) Reference areas are parcels of land chosen for comparison to revegetated areas. A reference area is not required for vegetation parameters with approved technical standards. Reference areas must be in a condition that does not invalidate or preclude comparison to revegetated areas and the operator must: (a) have legal right to control the management of all approved reference areas; and (b) manage reference areas in a manner that is comparable to the management of the revegetated areas and in accordance with the approved postmining land use. (3) Technical standards may be derived from: (a) historical data generated for a sufficient time period to encompass the range in climatic variations typical of the premine or other appropriate area; or (b) data generated from revegetated areas that are compared to historical data representing the range of climatic conditions comparable to those conditions existing at the time revegetated areas are sampled; or (c) U.S. department of agriculture, U.S. department of the interior, or other publications or sources relevant to the area and land use of interest and approved by the department. ***Note:*** Under CERCLA, DEQ approval is not required, per paragraphs (1) and (2).		
Excavating cover material and/or waste material	Shall comply with certain required methods for measuring vegetative success *Available at*: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E24%2E726 Rule Title: VEGETATION MEASUREMENTS Department: ENVIRONMENTAL QUALITY Chapter: RECLAMATION Subchapter: Strip and Underground Mine Reclamation Act: Topsoiling, Revegetation, and Protection of Wildlife and Air Resources **17.24.726** VEGETATION MEASUREMENTS (1) Standard, consistent, and statistically valid field and laboratory methods must be used to obtain and evaluate vegetation data consistent with 82-4-233 and 82-4-235, MCA, and to compare revegetated area data with reference area data and/or with technical standards. Specific field and laboratory methods used and schedules of assessments must be approved by the department for inclusion in the permit. In addition to these and other requirements described in this rule, the department shall supply guidelines regarding representative field and laboratory methods. (2) Production, cover, and density shall be considered equal to the approved success standard when they are equal to or greater than 90 percent of the standard with 90 percent statistical confidence, using an appropriate (parametric or non-parametric) one-tail test with a 10 percent alpha error. (3) Areas to be developed for grazing land, pastureland, or cropland must meet or exceed the applicable performance standards in (1) and (2) in any two years after year six of the phase III bond period of responsibility. Pursuant to ARM 17.24.1113, the department shall evaluate the vegetation at the time of the bond release inspection for phase III to confirm the findings of the quantitative data. (4) Areas to be developed for fish and wildlife habitat, forestry, or recreation must meet or exceed the performance standards in (1) and (2), excluding production, and a minimum tree and shrub density following the requirements of (1). Tree and shrub density must be sampled during the last growing season of the phase III bond period of responsibility. Sampling must demonstrate the following conditions: (a) all trees and shrubs must be healthy and have been in place for not less than two growing seasons; (b) at least 80 percent of the trees and shrubs used to determine success shall have been in place for at least the last six years of the phase III bond period of responsibility; and	☑Relevant and Appropriate* *This provision would be relevant and appropriate for on-site repositories that receive waste during response action activities and to excavations for removal of contaminated soil or waste.	ARM 17.24.726 Cross-reference: ARM 17.24.731 (methods to evaluate tree and shrub health where toxicity to plants or animals is suspected to due disturbance effects)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) Anaconda/CFAC ROD			
Action	**Requirement**	**Prerequisite**	**Citation**
	(c) volunteer and sucker trees and shrubs of the approved species may be included in the accounting for success. (5) For areas to be developed for residential or industrial/commercial post-mine land use, the vegetative ground cover shall not be less than that required to control erosion within two years after regrading is completed. (6) The reestablished vegetation must meet the requirements of the Noxious Weed Management Act (7-22-2101 through 7-22-2153, MCA, as amended). ***Note:*** Under CERCLA, DEQ approval is not required, per paragraph (1).		
Statute | Weed Control			
Propagation of noxious weeds	Shall not permit any noxious weed to propagate *Available at*: https://leg.mt.gov/bills/mca/title_0070/chapter_0220/part_0210/section_0160/0070-0220-0210-0160.html TITLE 7. LOCAL GOVERNMENT CHAPTER 22. WEED AND PEST CONTROL Part 21. County Weed Control | Unlawful To Permit Noxious Weeds To Propagate -- Notice Required In Sale **7-22-2116. Unlawful to permit noxious weeds to propagate -- notice required in sale.** (1) It is unlawful for any person to permit any noxious weed to propagate or go to seed on the person's land, except that any person who adheres to the noxious weed management program of the person's weed management district or who has entered into and is in compliance with a noxious weed management agreement is considered to be in compliance with this section. (2) When property is offered for sale, the person who owns the property shall notify the owner's agent and the purchaser of: (a) the existence of noxious weed infestations on the property offered for sale; and (b) the existence of a noxious weed management program or a noxious weed management agreement as provided in subsection (1).	☑Applicable* *These requirements would apply to the reclamation of an area disturbed by grading, excavation, or similar actions, and require the revegetation of the area.	Section 7-22-2116(1), MCA
Regulation | Weed Control			
Controlling specified noxious weeds	Shall eradicate weeds where specified noxious weeds exist *Available at:* http://www.mtrules.org/gateway/ruleno.asp?RN=4.5.206 Department: AGRICULTURE Chapter: NOXIOUS WEED MANAGEMENT Subchapter: Designation of Noxious Weeds	☑Applicable* *Where listed noxious weeds may be present on-site	ARM 4.5.206 – 4.5.210

Note for Inclusion in Record of Decision:

ARM 17.53.1101 (incorporating by reference 40 C.F.R. Part 268, except as noted in ARM 17.53.1102). Absent CERCLA Area of Contamination (AOC) use, this state regulation might qualify as an ARAR. The use of the AOC precludes the need to evaluate the remedy against LDR regulations. As such, the ARARs table omits ARM 17.53.1101.

Available at: http://www.mtrules.org/gateway/RuleNo.asp?RN=17%2E53%2E1101

Rule Title: ADOPTION OF FEDERAL LAND DISPOSAL RESTRICTIONS (40 CFR 268)

Department: ENVIRONMENTAL QUALITY, DEPARTMENT OF

Chapter: HAZARDOUS WASTE

Subchapter: Land Disposal Restrictions

17.53.1101 ADOPTION OF FEDERAL LAND DISPOSAL RESTRICTIONS (40 CFR 268)

(1) Except as provided otherwise in ARM 17.53.1102, the department hereby adopts and incorporates by reference 40 CFR 268, pertaining to land disposal restrictions.

Appendix B

Estimated Costs for the Selected Alternative

Selected Remedies Cost Summary

Selected Remedy	Total Capital Costs	Annual OM&M Costs	Estimated Total 30-year OM&M Costs	Estimated PV Total 30-year OM&M Costs	Total Present Value Costs
Landfills DU1/Groundwater DU6/River Area DU5 - DU1/DU6 Modified Alternative 4A and DU5 Alternative 2: Containment via Capping, Fully Encompassing Slurry Wall, Interior Extraction, and Monitoring	$39,098,737	$648,260	$19,447,800	$8,044,285	$47,143,022
Landfills DU2 - Alternative 2: Containment via Capping	$6,169,608	$64,285	$1,928,550	$797,715	$6,967,323
Soils DU3 - Alternative 4: Excavation and On-Site Consolidation	$1,237,989	$0	$0	$0	$1,237,989
North Percolation Ponds DU4 - Alternative 4: Excavation and On-Site Consolidation	$2,286,195	$0	$0	$0	$2,286,195
Total Present Value Costs for Selected Remedies					**$57,634,528**

Notes:

Total PV costs equals total capital costs plus estimated PV total 30-year OM&M costs.

Acronyms:

OM&M = operation maintenance and monitoring

PV = present value

DU = decision unit

Landfills DU1/Groundwater DU6/River Area DU5 - DU1/DU6 Modified Alternative 4A and DU5 Alternative 2: Containment via Capping, Fully Encompassing Slurry Wall, Interior Extraction, and Monitoring

Description	Estimated Quantities	Unit	Unit Cost	Total Cost
CAPITAL COSTS				
Direct Capital Costs				
Capping of Landfills				
Mobilization/Demobilization/General Conditions	1	LS	$ 250,000	$ 250,000
Erosion and Sediment Control	1	LS	$ 30,000	$ 30,000
Construction Surveying	1	LS	$ 50,000	$ 50,000
Wet Scrubber Sludge Pond				
Settlement Study	1	LS	$ 100,000	$ 100,000
Pre-Load Backfill and Compaction of Onsite Soil	39450	CY	$ 16	$ 631,200
Pre-Load Relocation of Onsite Soil	39450	CY	$ 16	$ 631,200
Physical Solidification of Low-Strength Material	87000	CY	$ 35	$ 3,045,000
Placement of Sand Layer (6" Layer)	8900	CY	$ 35	$ 311,500
Surface Grading	54000	SY	$ 2	$ 108,000
Installation of Geomembrane Layer (40 mil)	55000	SY	$ 4.1	$ 225,500
Installation of Geocomposite Drainage Layer	55000	SY	$ 6.35	$ 349,250
Backfill and Compaction of Imported Soil (18" layer)	27000	CY	$ 27	$ 729,000
Backfill with Top Soil (6" layer)	8900	CY	$ 35	$ 311,500
Installation of Stormwater Conveyance Swales/Ditches	1	LS	$ 300,000	$ 300,000
Perimeter Soil Berm	1500	CY	$ 32	$ 48,000
Seeding/Vegetation	10.8	ACRES	$ 1,000	$ 10,800
Center Landfill				
Excavation of Existing Soil Cap to Stockpile (12" min)	2900	CY	$ 9	$ 26,100
Surface Grading	8700	SY	$ 2	$ 17,400
Installation of Geomembrane Layer	9500	SY	$ 4.1	$ 38,950
Backfill and Compaction with Onsite Soil (12" layer)	3100	CY	$ 8	$ 24,800
Backfill and Compaction with Imported Soil (6" layer)	1550	CY	$ 27	$ 41,850
Backfill and Compaction with Top Soil (6" layer)	1550	CY	$ 35	$ 54,250
Installation of Stormwater Conveyance Swales/Ditches	1	LS	$ 150,000	$ 150,000
Perimeter Soil Berm	600	CY	$ 32	$ 19,200
Seeding/Vegetation	1.8	ACRES	$ 1,000	$ 1,800
			Subtotal Capping of Landfill Costs	**$ 7,484,300**
Lining of Overflow Ditch				
Excavation of Ditch (12")	1481	CY	$ 9	$ 13,333
Backfill and Compaction of Sand (6" Grading Layer)	741	CY	$ 27	$ 20,000
Installation of Geomembrane Layer	4,444	SY	$ 4.1	$ 18,222
Backfill and Compaction with Onsite Soil (6" Layer)	741	CY	$ 8	$ 5,926

Landfills DU1/Groundwater DU6/River Area DU5 - DU1/DU6 Modified Alternative 4A and DU5 Alternative 2: Containment via Capping, Fully Encompassing Slurry Wall, Interior Extraction, and Monitoring

Description	Estimated Quantities	Unit	Unit Cost	Total Cost
Disposal of Excess Soil	741	CY	$ 25	$ 18,519
Subtotal Capping of Landfill Costs				**$ 76,000**
ICs and ECs				
Establish Groundwater Use Restrictions	1	LS	$ 20,000	$ 20,000
Establish ICs for Landfills and Deed Notices	1	LS	$ 20,000	$ 20,000
Fencing Around Perimeter of Landfills	5500	LF	$ 7.5	$ 41,250
Subtotal ICs and ECs Costs				**$ 81,250**
Installation of Fully-Encompassing Slurry Wall (3,700 ft. x 100-125 ft. x 2-3 ft.)				
Pre-Design Investigation	1	LS	$ 570,000	$ 570,000
Mobilization/Demobilization/General Conditions	1	LS	$ 750,000	$ 750,000
Clearing and Grubbing	2	ACRE	$ 4,600	$ 9,200
Installation of Slurry Wall	1	LS	$ 15,000,000	$ 15,000,000
Disposal of Excess Soil at Onsite Repository	3,859	CY	$ 25	$ 96,484
Surveying	1	LS	$ 20,000	$ 20,000
Monitoring Well Installation	11	EA	$ 25,000	$ 275,000
Installation of Pumps and Electrical (If needed)	8	EA	$ 12,000	$ 96,000
Subtotal Installation of Fully-Encompassing Slurry Wall				**$ 16,816,684**
Installation of Ex Situ Groundwater Treatment System				
Bench-Scale Treatability Study	1	LS	$ 100,000	$ 100,000
Mobilization/Demobilization/General Conditions	1	LS	$ 100,000	$ 100,000
Site Preparation	1	LS	$ 20,000	$ 20,000
Piping from Extraction Wells to Central Trench	500	LF	$ 25	$ 12,500
Piping from Central Trench to GWTS	250	LF	$ 30	$ 7,500
Treatment Plant Building	1	LS	$ 100,000	$ 100,000
Treatment System Equipment	1	LS	$ 900,000	$ 900,000
Subtotal Installation of Ex Situ Groundwater Treatment System Costs				**$ 1,240,000**
Installation of Effluent Discharge Piping				
Mobilization/Demobilization/General Conditions	1	LS	20000	$ 20,000
Piping from GWTS to Discharge	500	LF	35	$ 17,500
Subtotal Installation of Effluent Discharge Piping				**$ 37,500**
Subtotal of Direct Capital Costs				**$ 25,735,734**
Indirect Capital Costs				
Scope/Bid Contingency (Capping)	30%	% of Capital Costs		$ 2,245,290
Scope/Bid Contingency (Lining)	30%	% of Capital Costs		$ 22,800
Scope/Bid Contingency (Fully-Encompassing Slurry Wall)	30%	% of Capital Costs		$ 5,045,005
Scope/Bid Contingency (Treatment System)	30%	% of Capital Costs		$ 372,000
Scope/Bid Contingency (Effluent Discharge Piping)	30%	% of Capital Costs		$ 11,250
Project Management	5%	% of Capital Costs		$ 1,666,664
Remedial Design	6%	% of Capital Costs		$ 1,999,997
Construction Management	6%	% of Capital Costs		$ 1,999,997

Landfills DU1/Groundwater DU6/River Area DU5 - DU1/DU6 Modified Alternative 4A and DU5 Alternative 2: Containment via Capping, Fully Encompassing Slurry Wall, Interior Extraction, and Monitoring

Description	Estimated Quantities	Unit	Unit Cost	Total Cost
			Subtotal of Indirect Capital Costs	**$ 13,363,003**
			Total Capital Costs	**$ 39,098,737**
Operation Maintenance and Monitoring				
Direct OM&M Costs				
Annual Costs				
Cap Maintenance	20	ACRE	$ 1,000	$ 20,000
Groundwater Monitoring	1	LS	$ 100,000	$ 100,000
Site Maintenance	1	LS	$ 15,000	$ 15,000
Reporting	1	LS	$ 60,000	$ 60,000
GWTS Operational Costs	11	MG	$ 3,500	$ 37,000
GWTS Maintenance and Repair Costs	1	LS	$ 35,000	$ 35,000
GWTS Power and Utilities	1	LS	$ 13,000	$ 13,000
GWTS Operator and Labor	104	MD	$ 1,200	$ 125,000
Technical Support	10%	% of Annual Costs		$ 40,500
Contingency	10%	% of Annual Costs		$ 40,500
			Subtotal of Direct OM&M Costs	**$ 486,000**
Long-Term Monitoring of Surface and Sediment Porewater				
Boat Rental	1	Event	$ 19,000	$ 19,000
Labor and Equipment	1	Event	$ 19,000	$ 19,000
Analysis of Surface Water Samples	20	Sample	$ 800	$ 16,000
Analysis of Sediment Porewater Samples	20	Sample	$ 200	$ 4,000
Reporting	1	LS	$ 20,000	$ 20,000
Contingency	20%	% of Annual Costs		$ 15,600
			Subtotal of Direct OM&M Costs	**$ 93,600**
Indirect OM&M Costs				
Administrative Costs	1	LS	$ 35,000	$ 35,000
Contingency (LDU1/GW6)	5%	% of Direct OM&M Costs		$ 24,300
Contingency (RADU5)	10%	% of Direct OM&M Costs		$ 9,360
			Subtotal of Indirect OM&M Costs	**$ 68,660**
			Total OM&M Costs	**$ 648,260**
		Estimated Total 30-year OM&M Costs	**30**	**$ 19,447,800**
		Estimated PV Total 30-year OM&M Costs	**7%**	**$ 8,044,285**
			Total Present Value Costs	**$ 47,143,022**

Notes:

These costs are referenced from Appendix J of the Final Feasibility Study (Roux 2021).

The areal extent of the Cedar Creek Overflow Ditch lining is assumed to be 4,000 LF in length and 10 feet wide.

Bulking or compaction factors were not considered for ditch lining costs but should be considered during the remedial design.

Acronyms:

LS = lump sum
CY = cubic yard
SY = square yard
OM&M = operation maintenance and monitoring
MG = million gallons
DU = decision unit
PV = present value
LF = linear feet
EA = each
MD = man-days

Landfills DU2 - Alternative 2:
Containment via Capping

Description	Estimated Quantities	Unit	Unit Cost	Total Cost
CAPITAL COSTS				
Direct Capital Costs				
Capping of Landfills				
Mobilization/Demobilization/General Conditions	1	LS	$ 250,000	$ 250,000
Erosion and Sediment Control	1	LS	$ 20,000	$ 20,000
Construction Surveying	1	LS	$ 30,000	$ 30,000
Industrial Landfill				
Backfill with Onsite Material for Grading	58,000	CY	$ 8	$ 464,000
Surface Grading	60,000	SY	$ 2	$ 120,000
Backfill and Compaction of Sand (6" Grading Layer)	10,000	CY	$ 27	$ 270,000
Installation of Geomembrane Layer	61,000	SY	$ 4.1	$ 250,100
Installation of Geocomposite Drainage Layer	61,000	SY	$ 6.35	$ 387,350
Backfill and Compaction of Imported Soil (18" Layer)	30,000	CY	$ 27	$ 810,000
Backfill and Compaction of Topsoil (6" Layer)	10,000	CY	$ 35	$ 350,000
Installation of Stormwater Conveyance Swales/Ditches	1	LS	$ 450,000	$ 450,000
Perimeter Soil Berm	1,900	CY	$ 32	$ 60,800
Seeding/Vegetation	12.4	ACRE	$ 1,000	$ 12,400
Asbestos Landfills				
Backfill and Compaction of Topsoil (8" Layer)	11,000	CY	$ 27	$ 297,000
Surface Grading	16,000	SY	$ 2	$ 32,000
Limited Stormwater Conveyance Swales/Ditches	1	LS	$ 118,000	$ 118,000
Seeding/Vegetation	3.4	ACRE	$ 1,000	$ 3,400
Subtotal Capping of Landfill Costs				**$ 3,925,050**
ICs and ECs				
Establish ICs for Landfills and Deed Notices	1	LS	$ 20,000	$ 20,000
Fencing Around Perimeter of Landfills	8264	LF	$ 8.0	$ 61,979
Subtotal ICs and ECs Costs				**$ 81,979**
Subtotal of Direct Capital Costs				**$ 4,007,029**
Indirect Capital Costs				
Scope/Bid Contingency (Capping)	30%	% of Capital Costs		$ 1,177,515
Project Management	5%	% of Capital Costs		$ 259,227
Remedial Design	8%	% of Capital Costs		$ 414,764
Construction Management	6%	% of Capital Costs		$ 311,073
Subtotal of Indirect Capital Costs				**$ 2,162,578**
Total Capital Costs				**$ 6,169,608**
Operation Maintenance and Monitoring				
Direct OM&M Costs				
Annual Costs (Capping)				
Cap Maintenance	22	ACRE	$ 1,000	$ 22,000
Site Maintenance	1	LS	$ 15,000	$ 15,000
Reporting	1	LS	$ 10,000	$ 10,000
Contingency	10%	% of Annual Costs		$ 4,700
Subtotal of Direct OM&M Costs				**$ 51,700**
Indirect OM&M Costs				
Administrative Costs	1	LS	10000	$ 10,000

Landfills DU2 - Alternative 2:
Containment via Capping

Description	Estimated Quantities	Unit	Unit Cost	Total Cost
Contingency	5%	% of Direct OM&M Costs		$ 2,585
Subtotal of Indirect OM&M Costs				**$ 12,585**
Total OM&M Costs				**$ 64,285**
Estimated Total 30-year OM&M Costs			**30**	**$ 1,928,550**
Estimated PV Total 30-year OM&M Costs			**7%**	**$ 797,715**
Total Present Value Costs				**$ 6,967,323**

Notes:

These costs are referenced from Appendix J of the Final Feasibility Study (Roux 2021).

Acronyms:

LS = lump sum
CY = cubic yard
SY = square yard
LF = linear feet
PV = present value
OM&M = operation maintenance and monitoring
DU = decision unit

Soils DU3 - Alternative 4:
Excavation and On-Site Consolidation

Description	Estimated Quantities	Unit	Unit Cost	Total Cost
CAPITAL COSTS				
Direct Capital Costs				
Site Preparation				
Mobilization/Demobilization/General Conditions	1	LS	$ 100,000	$ 100,000
In situ pre-characterization sampling				
Pre-characterization Sampling Labor	10	DAYS	$ 1,200	$ 12,000
Analysis of Copper for AOC A	8	SAMPLES	$ 79.0	$ 630
Analysis of PAHs for AOCs C through G	84	SAMPLES	$ 189	$ 15,876
Excavation and Onsite Consolidation				
Excavation and Staging	25,670	CY	$ 9	$ 231,030
Relocation to Onsite Repository	32,100	CY	$ 5	$ 160,500
Confirmatory Endpoint Sampling				
Analysis of Copper for AOC A	2	SAMPLES	$ 79	$ 158
Analysis of PAHs for AOCs C through G	15	SAMPLES	$ 189	$ 2,835
Post Removal Response Action				
Backfill and Compaction of Topsoil (6" Layer)	6400	CY	$ 35	$ 224,000
Seeding/Vegetation	7.96	ACRES	$ 1,000	$ 7,960
			Subtotal of Direct Capital Costs	**$ 754,989**
Indirect Capital Costs				
Scope/Bid Contingency (Capping)	30%	% of Direct Capital Costs		$ 227,000
Project Management	6%	% of Direct Capital Costs		$ 59,000
Remedial Design / Construction Completion Reporting	12%	% of Direct Capital Costs		$ 118,000
Construction Management	8%	% of Direct Capital Costs		$ 79,000
			Subtotal of Indirect Capital Costs	**$ 483,000**
			Total Capital Costs	**$ 1,237,989**
			Total Present Value Costs	**$ 1,237,989**

Notes:

These costs are referenced from Appendix J of the Final Feasibility Study (Roux 2021).

Acronyms:

LS = lump sum
CY = cubic yard
PV = present value
OM&M = operation maintenance and monitoring
DU = decision unit

North Percolation Ponds DU4 - Alternative 4:
Excavation and On-Site Consolidation

Description	Estimated Quantities	Unit	Unit Cost	Total Cost
CAPITAL COSTS				
Direct Capital Costs				
Site Preparation				
Mobilization/Demobilization/General Conditions	1	LS	$ 200,000	$ 200,000
Decommission influent stormwater pipes	1	LS	$ 10,000	$ 10,000
Excavation and Onsite Consolidation				
Excavation and Staging	35,180	CY	$ 9	$ 316,620
Relocation to Onsite Repository	43,975	CY	$ 5	$ 219,875
Physical Solidification of Viscous, Carbonaceous Materia	12,740	CY	$ 35	$ 445,900
Post Removal Response Action				
Backfill and Compaction of Topsoil (6" Layer)	8,551	CY	$ 35	$ 299,275
Seeding/Vegetation	11	ACRES	$ 1,000	$ 10,600
Confirmatory Endpoint Sampling				
Sampling & Analysis of NPP DU Soil / Sediment COCs 30	30	SAMPLES	$ 268	$ 7,925
			Subtotal of Direct Capital Costs	**$ 1,510,195**
Indirect Capital Costs				
Scope/Bid Contingency (Capping)	20%	% of Direct Capital Costs		$ 303,000
Project Management	6%	% of Direct Capital Costs		$ 109,000
Remedial Design / Construction Completion Reporting	12%	% of Direct Capital Costs		$ 218,000
Construction Management	8%	% of Direct Capital Costs		$ 146,000
			Subtotal of Indirect Capital Costs	**$ 776,000**
			Total Capital Costs	**$ 2,286,195**
			Total Present Value Costs	**$ 2,286,195**

Notes:

These costs are referenced from Appendix J of the Final Feasibility Study (Roux 2021).

Acronyms:

LS = lump sum

CY = cubic yard

OM&M = operation maintenance and monitoring

DU = decision unit

Part III – Responsiveness Summary

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Acronyms and Initializations

ARAR	applicable or relevant and appropriate requirements
Atlantic Richfield	The Atlantic Richfield Company
BaP_{eq}	benzo(a)pyrene equivalent
BERA	baseline ecological risk assessment
BHHRA	baseline human health risk assessment
CBF	Citizens for a Better Flathead
CERCLA	Comprehensive Environmental Response, Compensation & Liability Act of 1980
CFAC	Columbia Falls Aluminum Company
CFR	Code of Federal Regulations
cPAH	carcinogenic polycyclic aromatic hydrocarbons
COC	contaminant of concern
COPC	contaminant of potential concern
DEQ	Montana Department of Environmental Quality
DPHHS	Montana Department of Public Health and Human Services
DU	decision unit
EPA	U.S. Environmental Protection Agency
ESBTU	equilibrium partitioning sediment benchmark toxic unit
FS	feasibility study
HMW	high molecular weight
LMW	low molecular weight
mg/kg	milligrams per kilogram
NCP	National Contingency Plan
NRDP	Montana Department of Justice, Natural Resource Damage Program
PAH	polycyclic aromatic hydrocarbon
PCBs	polychlorinated biphenyls
PEC	probable effect concentration
PFAS	polyfluoroalkyl substances
PRB	permeable reactive barrier
PRG	preliminary remedial goal
PRPs	potentially responsible parties
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
ROD	record of decision
SPL	spent potliner
TASC	Technical Assistance Services for Communities
<	less than
%	percent
µg/L	micrograms per liter

Section 1
Introduction

1.1 Overview and Background

The U.S. Environmental Protection Agency (EPA)—in consultation with the Montana Department of Environmental Quality (DEQ)—is issuing this record of decision (ROD) for remediation of the Anaconda Aluminum Company, Columbia Falls Reduction Plant (also known as the Columbia Falls Aluminum Company (CFAC) plant) Superfund Site in Flathead County, Montana.

Following Superfund guidance, *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (EPA 1999), the ROD contains three parts:

- Part I – Declaration
- Part II – Decision Summary
- Part III – Responsiveness Summary

Part III provides a summary of the public comments submitted to EPA regarding the *Proposed Plan for Cleanup, Columbia Falls Aluminum Company Superfund Site, Columbia Falls, Montana* (EPA 2023a), along with EPA's responses to those comments and is organized as follows:

- Section 1 – Introduction
- Section 2 – Public Comments and EPA Responses Related to the Proposed Plan
- Section 3 – Public Comments and EPA Responses Related to the Remedial Investigation or the Feasibility Study
- Section 4 – References

1.2 Community Involvement Activities

EPA's goal is to educate the community about the work at the site and to collaborate with stakeholders on how to successfully engage the public. We have worked in conjunction with DEQ, the Community Liaison Panel, and interested members of the public throughout the project. Outreach is addressed in Section 2 of Part II of this ROD.

In the months leading up to the Proposed Plan, EPA used public information sessions, fact sheets, websites, one-on-one discussions, and participation in community events to share information about the site with the broader community. In May 2023, EPA provided independent assistance to the community through the Technical Assistance Services for Communities (TASC) program to help the community better understand the technical issues associated with the Proposed Plan, ROD, and beyond. All key supporting documents, including a fact sheet prepared by EPA to explain the Proposed Plan process, were posted on EPA's CFAC site webpage. Hard copies of the Proposed Plan and fact sheets were made available at the ImaginIF library.

The National Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) §300.430(f)(3)(i), requires a 30-day comment period. EPA started with a 60-day public comment period and extended it to 90 days at the request of the public (June 1 to August 31, 2023). The public comment period was announced in advertisements run in June 2023 in the *Daily Interlake, Hungry Horse News,* and *Flathead Beacon* and on EPA's webpage. Additionally, EPA began notifying specific groups (local government, congressional representatives, the Community Liaison Panel) before the Proposed Plan was issued.

EPA held a public meeting on June 28, 2023, that was advertised throughout June in the *Daily Interlake, Hungry Horse News,* and *Flathead Beacon*. The meeting was held in the Columbia Falls Town Hall which is an accessible space near the site. EPA made a formal presentation of the Proposed Plan with opportunity for clarifying questions immediately afterward. Time was then provided for oral comments on the plan. Those comments were recorded by a court reporter and the transcripts are in the administrative record. The input EPA received from the public and other stakeholders throughout the Superfund process was important in developing the ROD. EPA's commitment to engaging the community and other stakeholders will remain an important part of the cleanup as it moves forward.

Upon closure of the formal comment period, EPA participated in several community outreach activities through 2024. An open house was held in Columbia Falls the afternoon of April 25, followed by a presentation on the RI/FS and an open question and answer session that evening. EPA gave a presentation on the CFAC site to the Confederated Salish & Kootenai Tribes tribal council on June 11, followed by participating in site tours of the site hosted by CFAC on June 12. Two other open houses were held in Columbia Falls on July 17 and September 18. Additionally, EPA manned a table at the Columbia Falls farmer's market periodically throughout the summer. Numerous fact sheets were prepared and distributed by EPA to answer the public's questions about the proposed remedy. These fact sheets were also posted on EPA's website.

1.3 Overview of Comments Received

A total of 135 individual comment submissions were received by mail, email, and orally, as recorded by the stenographer, and each submission was assigned a sequential comment identification number. Some commenters submitted more than once in the comment period. For each submission, basic identification information (date received and commenter name) was recorded. The submission was then separated into subcomments which were grouped and addressed by topic. Some submissions were difficult to separate and fit, and the comment or subcomment was placed in the category that offered the best fit. This method of grouping allowed all major topics to be addressed without repetition, so that the reader can easily identify topics of interest.

Comments related to the Preferred Alternative as presented in the Proposed Plan (the focus of the public comment period) (Section 2) are segregated from those relating to the RI or FS (Section 3). For brevity, introductory or background material that was not relevant to the specifics of the Proposed Plan was extracted from the comment summary. The comments are presented as received. However, because of the potential for errors when copying text from a pdf document into a Word document, spelling and typographical errors were treated as artifacts of the transfer process and were corrected. If references were provided in a comment submission, they were added to the list of references cited in Section 4.

The names of individuals who submitted comments were recorded and tracked but are not available to the public due to EPA's Privacy Policy and commitment to protect personally identifiable information. However, names of businesses, organizations, and government entities submitting comments are shareable and include:

- Atlantic Richfield Company (Atlantic Richfield)
- Citizens for a Better Flathead (CBF)
- Columbia Falls Aluminum Company (CFAC)
- Montana Department of Public Health and Human Services (DPHHS)
- Montana Department of Justice, Natural Resource Damage Program (NRDP)
- Ruis Holdings
- SKEO Solutions (the TASC contractor)
- Wood Haus Supply

Roughly 31 percent (%) of the commenters were from Columbia Falls or Aluminum City. Comment submissions ranged in length from 1 to over 180 comments in a single letter. Approximately 40% of the comments were identical or differed only by a few words. EPA prepared a total of 61 responses addressing the comments received. Comments were received from the Coalition for a Clean CFAC beginning in January 2024 (see Part II, page 3-2).

The comments are available in full, with privacy information redacted, in the ROD administrative record.

Section 2
Public Comments and Responses Related to the Proposed Plan

Public comments related to the Proposed Plan (EPA 2023a) are organized alphabetically by topic. The text of each subcomment follows, along with EPA's response.

1. Bioremediation, Permeable Reactive Barrier (PRB), Recycling
2. Cedar Creek Surface Water/Groundwater Connection
3. Climate Change
4. Contaminants of Concern (COCs), Preliminary Remedial Goals (PRGs), Remedial Action Objectives (RAOs)
5. Consider Comments Carefully
6. Evaluating Cost and Protectiveness
7. Explain Decisions
8. Financial Bonding
9. Frequency of Groundwater Pumping
10. Groundwater Treatment
11. Landfill Design
12. Land Use and Reuse
13. Miscellaneous Design Details
14. Modeling
15. Monitoring – Drinking Water
16. Monitoring – Decision Unit (DU) 5
17. Monitoring – Gas Production
18. Monitoring – Groundwater
19. Monitoring – Wildlife
20. Monitoring – Other

21. Off-Site Disposal in Arlington, Oregon
22. Off-Site Disposal as at Milltown Dam
23. Other
24. Oversight Body
25. Plans and Reviews
26. Proposed Plan Clarification and Terminology
27. Remedy – DU1
28. Remedy – DU2, 3, 4, and 6
29. Remedy – DU5
30. Restitution
31. Restoration
32. Risk – Cancer
33. Risk – Polycyclic Aromatic Hydrocarbon (PAH) Bioaccumulation
34. Risk – PAH Calculation
35. Risk – Process
36. Schedule
37. Slurry Wall – Capability
38. Slurry Wall – Design
39. Slurry Wall – Impacts on Monitoring Well Network
40. Slurry Wall – Include Center Landfill
41. Stormwater
42. Supports Preferred Alternative
43. Supports Wildlife Corridor
44. Wants Best Possible Cleanup
45. What if It Fails?
46. What Worked Elsewhere?

2.1 Bioremediation, PRB, Recycling

2.1.1 Public Comments

Nine comments were received from six individuals and CBF (#134), that addressed the question of using wetlands for biotreatment of extracted groundwater, the use of a PRB in addition to the Preferred Alternative, and the possibility of recycling spent potliner (SPL).

- **Comment 53S.** "9) Put in place effective and efficient treatment facilities and disposal sites (such as constructed wetlands) for the treated groundwater."
- **Comment 53T.** "10) Put in place PRB's down gradient of the slurry wall for arsenic should the water treatment facilities not met remediation goals."
- **Comment 76B.** "My students are wondering if additional remediation options could be used at CFAC such as a permeable reactive barrier to clean the water before it reaches the river? Others have asked if additional testing can be done to determine additional dump sites that could be located in the area that were not recorded. How can essentially one remediation option address the scope of the problem? Can additional strategies be used to strengthen the plan? Thank you for your consideration."
- **Comments 106D, 123J, 130F, and 134AS.** "10. Has EPA considered discharged water being diverted to constructed wetlands for bioremediation? This would allow for the natural cleansing process of wetlands to be used. In addition, the plants can later be analyzed as part of the ongoing monitoring and assessment."
- **Comment 116K.** "The feasibility study and proposed plan both highlight the risks of reactive spent potliner waste and justify their proposed in place remedy based on these presumed risks. However, the feasibility study also recognizes that these risks can be mitigated by use of long armed excavators, personal protective equipment for workers, and methods to limit infiltration of water into the excavation. I would ask the agencies to examine the methods used to clean up the Tacoma site to reduce these risks. Use of partial excavation cells could limit the amount of area open to precipitation. Geomembranes or other impermeable covers could be used to limit infiltration and provide drainage off the excavation. The feasibility study acknowledges that long term deed restrictions or a controlled groundwater area will likely be required to prevent beneficial use of groundwater at the site. This imposes unacceptable restrictions on use of the land in perpetuity, impacting all of us but especially the local community. The feasibility study fails to examine any alternatives that include treatment or recycling of spent potliner. Many such technologies are under development, and I don't know enough about them to recommend one for further examination. But it is disappointing that the FS fails to examine this potential at all."
- **Comment 134H.** "7) Based on this research paper found at https://www.lightmetalage.com/ news/ industrynews/smelting/the-spl-waste-management-challenge-in-primary-aluminum/continuous improvements in technology the costs to a smelter of recycling SPL are now less than the liabilities associated with landfilling. How was this option of recycling considered for the SPL and other toxins buried or remaining at the CFAC facility/property?"

2.1.2 EPA Response

The interior wells in EPA's Preferred Alternative for DU1/DU6 will initially be used for monitoring and for dewatering during construction. However, if the slurry wall is not effective in stopping migration of the groundwater plume, these wells will be used to extract groundwater for treatment. Treatment of extracted groundwater using constructed wetlands was discussed in the 2021 *Feasibility Study Report, CFAC Facility* (Roux 2021a) and will be further considered during remedial design.

PRBs were evaluated in the FS and were determined to be less effective than the chosen slurry wall. A PRB at the site would likely require sequential or multiple PRB treatment trains with multiple types of reactive media. Additionally, backfilling permeable material for a PRB is considerably more restrictive than backfilling less permeable material for a slurry wall; and therefore, PRBs cannot achieve the same depths of installation.

Adding a PRB downgradient of the slurry wall would considerably increase costs with limited gains in effectiveness and is therefore not cost-effective. Superfund law (40 CFR § 300.430*(f)(1)(ii)(D)*) requires that cost be considered, as follows:

> *"Each remedial action selected shall be cost-effective, provided that it first satisfies the threshold criteria set forth in § 300.430(f)(1)(ii)(A) and (B). Cost-effectiveness is determined by evaluating the following three of the five balancing criteria noted in § 300.430(f)(1)(i)(B) to determine overall effectiveness: long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, and short-term effectiveness. Overall effectiveness is then compared to cost to ensure that the remedy is cost-effective. A remedy shall be cost-effective if its costs are proportional to its overall effectiveness that the Selected Remedy be cost-effective and proportional to the overall effectiveness."*

EPA's overall Preferred Alternative consists of five individual alternatives over six DUs. Each alternative can include several remedial technologies. For example, Modified Alternative 4A (EPA's Preferred Alternative for DU1/DU6) includes containment (low-permeability caps and a fully encompassing slurry wall to reduce infiltration vertically and horizontally, groundwater extraction for hydraulic control), groundwater performance monitoring (monitors the effectiveness of the remedy and attenuation over time), institutional controls (e.g., property or groundwater restrictions), and engineering controls (e.g., fencing and signing). The performance and protectiveness of the final remedy will be continually monitored.

The potential for adverse impacts to human health and the environment that would be posed from excavation and on-site consolidation of the West Landfill and the Wet Scrubber sludge pond is one of many factors for selecting Modified Alternative 4A over Alternative 6 (excavation with on-site consolidation) in DU1/DU6. The same hazards posed by Alternative 6 for the excavation of spent potliner exist for excavating and then recycling these liners. Excavation of spent potliner does not meet the requirement of being proportionately cost-effective, which is a statuary requirement for Superfund cleanups (NCP §300.430(f)(5)(ii)(D)). This is discussed further on page 2-50.

Land use or groundwater restrictions would be specified in the design phase and would be imposed on the site. They would not extend to the community.

2.2 Cedar Creek Surface Water/Groundwater Connection

2.2.1 Public Comments

Six comments were received from four individuals, the TASC (#1), and Atlantic Richfield (#49) that addressed the potential connection between surface water in the Cedar Creek Reservoir Overflow Ditch and site groundwater.

- **Comment 1J.** "6. The Cedar Creek Reservoir Overflow channel occurs above the West Landfill, Wet Scrubber Sludge Pond and Center Landfill (see DELIBERATIVE Exhibit 13 above). This is a well-established surface water channel. It is not clear if surface water from this channel seeps into site groundwater and acts as a source of water to the groundwater resource. It seems important to ensure that the surface water within the Cedar Creek Reservoir Overflow channel be actively managed to eliminate any hydrologic connectivity to site groundwater, and to ensure that there is no breach of surface water to the landfills (which could cause considerable issues if water were to come into contact with underlying, reactive waste within the West Landfill). The community may want to ask EPA if there are any plans to manage the surface water within the Cedar Creek Reservoir Overflow channel in order to eliminate the connection of the surface water to site groundwater and possible infiltration into the West Landfill, Wet Scrubber Sludge Pond and Center Landfill."
- **Comment 8G.** "4) Is there any plans to manage the surface water within Cedar Creek Reservoir Overflow channel in order to eliminate the connection of the surface water to site groundwater and possible infiltration into west Landfill, Wet Scrubber Sludge Pond and Center Landfill?"
- **Comment 16F.** "6. Are there plans to manage the surface water within the Cedar Creek reservoir overflow channel in order to eliminate the connection of surface water to site ground water and possible infiltration into the west landfill, wet scrubber sludge pond and center landfill."
- **Comment 47B.** "Additionally, a plan to manage the surface water from the Cedar Creek Reservoir overflow channel should be developed in order that it does not intermingle with the groundwater from the West Landfill, Wet Scrubber Pond and Center Landfill. That management plan becomes central to the prevention of cross contamination of the surface water and groundwater."
- **Comment 49C.** "The Technical Assistance Services for Communities (TASC) for the Site submitted Proposed Plan comments to EPA on June 29, 2023. TASC Comment #6 states: "The Cedar Creek Reservoir Overflow channel occurs above the West Landfill, Wet Scrubber Sludge Pond and Center Landfill (see Exhibit 13 above). This is a well-established surface water channel. It is not clear if surface water from this channel seeps into site groundwater and acts as a source of water to the groundwater resource. It seems important to ensure that the surface water within the Cedar Creek Reservoir Overflow channel be actively managed to eliminate any hydrologic connectivity to site groundwater, and to ensure that there is no breach of surface water to the landfills (which could cause considerable issues if water were to come into contact with underlying, reactive waste within the West Landfill)." Atlantic Richfield agrees with TASC's suggestion that water conveyed by the Cedar Creek Reservoir

Overflow Ditch should be managed to reduce or eliminate infiltration and any resulting hydrologic influence on groundwater flow patterns toward and through the area of contamination beneath the Landfills DUI primary source area. Given the proximate location of the Overflow Ditch and the highly transmissive geology at the Site, it is fair to assume that leakage into the subsurface, especially during periods of peak flow, could be affecting groundwater elevations and flow velocities near the West Landfill and Wet Scrubber Sludge Pond and contributing to the mobilization and downgradient migration of contaminants of concern. Additional evaluation of the hydrologic system and possibly infiltration controls is needed to ensure that EPA's remedy selection decision adequately considers what may be a more effective and less expensive remedial technology.

Site conditions described in the RI highlight the importance of considering the Overflow Ditch in the selection of remedial alternatives. First, the Upper Hydrogeologic Unit at the Site consists of coarse-grained glacial outwash and alluvium deposits, making it hydraulically conductive. Second, the RI concludes the Overflow Ditch is a losing system, stating in Section 3.3 that: "data indicate that the ditch was acting as a losing stream throughout the entire year (when wet) and thus losing water infiltration into the groundwater system. These data are also supported by visual field observations throughout the program where the northern end of Cedar Creek Reservoir Overflow Ditch was observed to be wet, while the southern end of the ditch was dry at the same time.

Despite these conditions, neither the impacts of the Overflow Ditch on the groundwater system nor the potential for minimizing this additional input to groundwater hydraulics was evaluated or considered in the FS or the Proposed Plan. Further evaluation, including groundwater modeling, is needed to determine what hydrologic and fate-and-transport consequences could be expected from reducing upgradient hydraulic inputs from the Overflow Ditch and whether measures aimed at reducing infiltration, including impervious lining of additional portions of the Overflow Ditch bottom and managing flows, should be included in the remedial design. These measures could reduce or eliminate the need for less cost-effective remedial alternative components."

- **Comment 52B.** "The Cedar Creek overflow runs right through a very contaminated area. The contaminates exist both above and below ground. I wonder about the cleanup process creating a bigger problem to the overflow channel, therefore the Flathead River. How will it be managed in the future to keep the integrity of the channel?"

2.2.2 EPA Response

The Cedar Creek Reservoir Overflow Ditch was characterized in the RI report (Roux 2020a) as flowing intermittently with an elevation greater than the groundwater elevation (RI Sections 1.3.3.4 and 3.3). It is presumed to be an unlined ditch and would lose water to groundwater when the ditch is flowing intermittently during spring (RI Sections 1.3.3.4 and 3.2.4). The water quality in this ditch is comparable to background conditions (RI Section 4.4.2). Flow in the ditch is limited and is low in contaminants. The commentors assume that the ditch may be a significant source to the seasonal rise in groundwater elevation (average increase of 25 feet) in the vicinity of the West Landfill and West Scrubber Sludge Pond. One commentor suggests that reduction of infiltration from the ditch may reduce or eliminate the need for construction of the fully encapsulating slurry wall and an impervious cap over the West Scrubber Sludge Pond.

The RI report (Section 2.1.5.3) indicates that the Cedar Creek Reservoir Overflow Ditch was dry throughout most of the field program and only has a catchment area of approximately 2 square miles. While the RI report acknowledges that seepage from the ditch may contribute to groundwater recharge, infiltration from snowmelt and precipitation events in the upgradient Teakettle Mountain is believed to be a far greater contributor to the increase in groundwater elevations observed in late May/early June monitoring events. The slurry wall, completely surrounding the West Landfill and West Scrubber Sludge Pond, extending to low-permeability glacial till (Roux 2021a, Section 4.3.6), will encapsulate these source areas and prevent upgradient groundwater, including any seepage from the Cedar Creek Reservoir Overflow Ditch, from contact with the waste. The proposal to line the Cedar Creek Reservoir Overflow Ditch and wait and see if contaminant concentrations in groundwater decrease is inconsistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) mandate to find a permanent solution to meet remedial action objectives. However, the Selected Remedy includes a remedial requirement to line the Cedar Creek Reservoir Overflow Ditch in the vicinity of DU1 to minimize surface water infiltration into the groundwater.

One commentor also included the Center Landfill with the West Landfill and West Scrubber Sludge Pond in their comment on reducing seepage to groundwater from the Cedar Creek Reservoir Overflow Ditch. The Center Landfill will receive a low-permeability cap to prevent infiltration, but groundwater in wells adjacent to the Center Landfill already meets remedial goals and no groundwater controls are needed.

2.3 Climate Change

2.3.1 Public Comments

Seven comments were received from four individuals, the TASC (#1), and CBF (#134) regarding EPA's plans to address the impacts of climate change, such as flooding, on the Preferred Alternative. Seismic considerations were also mentioned by one commenter.

- **Comment 1K.** "7. EPA has a goal of designing site remedies to be "climate resilient" (refer to EPA 2019 "Climate Resilience Technical Fact Sheet: Contaminated Waste Containment Systems"). Changing climate conditions can render certain remedy efforts to be vulnerable to changing weather conditions. Proactive planning to address potential climate effects is a prudent and appropriate requirement for long-term remedy actions. EPA has recommended climate resilience planning for waste containment systems to include:

  1. Assessing vulnerability of the system's elements and associated site infrastructure.
  2. Evaluating measures potentially increasing the system's resilience to a changing climate.
  3. Assuring the system's capacity to adapt to a changing climate, which helps the cleanup remedy continue to be protective of human health and the environment. It is not clear if the alternative analysis presented in the Proposed Plan is protective of changing climate conditions. Furthermore, there are site surface water features (such as Cedar Creek Reservoir Overflow Ditch) that may be affected by climate changes and in turn impact the

water balance on the site. The community may want to ask EPA if the preferred alternatives will be designed to accommodate potential effects from climate change."

- **Comment 1L.** "8. Similar to issues raised in Comment #7 above, the River Area Decision Unit may be affected by climate change conditions. The River Area DU had a removal action at the South Percolation Ponds completed in 2021 where impacted sediment in the ponds was excavated and disposed of at an existing on-site repository. It is unclear if there are any residual contaminated materials in this area that could be of concern if high flows in the future were to scour the riparian area and expose underlying materials. The community may want to ask EPA if there are any concerns about possible future climate change impacts such as high flows that could scour and expose contamination from the historic South Percolation Ponds area."
- **Comment 16G.** "8. There may be possible concerns about future climate change impacts such as high flows that could scour and expose contamination from South Percolation Ponds area. How would that affect fish especially downstream."
- **Comments 106G, 123M, and 134AV.** "13. Will the preferred alternatives be designed to accommodate potential effects from climate change? EPA's goal of designing site remedies is to be "climate resilient." How will the cleanup and mitigation and future treatment and testing be climate resilient? How will possible future climate change impacts such as high flows that could scour and expose contamination from the historic South Percolation Ponds area be planned for?"
- **Comment 116J.** "There is no mention in the feasibility study of potential flood or seismic risks to the proposed landfills and slurry wall containment structures. If the slurry walls and landfills must remain in place in perpetuity, long term seismic and flood risks should be accounted for. The site is surrounded by surface water on all sides, with the Flathead River to the south, Cedar Creek to the west, Cedar Creek Reservoir to the north, and the Cedar Creek overflow ditch to the east, and adjacent to the landfills. A tributary to Cedar Creek flows directly adjacent to east side and industrial landfills. While the feasibility study describes the watershed area upstream of the site, it does not provide any information on potential flooding caused by extreme weather events or dam failure at Cedar Creek. If the slurry wall and dumps must be maintained in perpetuity, the impacts of a probable maximum flood (PMF) should be thoroughly assessed. The feasibility study does not examine the risks of even a much smaller 100-year flood event. Extreme weather events have occurred very recently in places like Yellowstone Park, California and Vermont. When will such an event occur near Columbia Falls? Maybe not this year, or next, or even 50 years from now. But if we assume a timeframe of perpetuity, then we should certainly assume that such an event will occur here, and we should plan for it."

2.3.2 EPA Response

As is typical at Superfund sites, specific details for remedy implementation will be addressed in the remedial design phase, which will follow the release of the ROD. This allows for flexibility in incorporating the latest data and other technical considerations into the remedy. Potential issues related to climate change are important given weather volatility and will be addressed, as needed.

The potential for increased precipitation events and flooding on-site and on nearby water features will be considered when designing stormwater conveyances and other infrastructure. Design will also account for potential seismic related issues. EPA recognizes the potential for flooding impacts along Cedar Creek, the reservoir, and the overflow ditch and plans to require seismic and flooding evaluations in the design process to develop any necessary modifications.

The elevation of all DUs, other than DU5, is over 100 feet higher than the riverbed and more than 1,000 acres of open land lie between the river and U.S. Route 2. As such, future flooding on the Flathead River will not reach the DU1 landfills. Water rising above the riverbank during a severe flood event would spill into the floodplain, continue moving south, and not overtop the embankment between the river and the railroad tracks.

DU5 is adjacent to the river, but the DU5 removal action addressed contamination in the South Percolation Pond by excavating and disposing of 22,000 cubic yards of contaminated sediment. Results of confirmation sampling conducted after the excavation showed the remaining soils and sediments have concentrations of contaminants that are well below the preliminary remedial goals. Thus, there are no impacted soils or sediments to pose a potential threat to human health or the environment.

2.4 COCs, PRGs, RAOs

2.4.1 Public Comments

Ten comments were received from one individual, Montana NRDP (#82), and CBF (#134) regarding COCs, PRGs, and RAOs.

- **Comment 54BC.** “41. Page 8 of your proposed ROD is the start of a lot on human health risk. Not my area of comfort; but I have one general comment. In the verbiage you talk of Remedial action objectives. Why not get rid of the wishy washy word preliminary, if this is the permanent final ROD, then make them final goals for each area with a best guess time frame based off of your almost 40 years of running the same 9 step procedure on countless properties. This would give the general public confidence there is a plan and the EPA a measuring stick to keep your employees and contractors accountable. If the DEQ-7 standards are the correct number, make it the goal today. None of this preliminary nonsense.”

- **Comment 82H.** “8. Page 6, Exhibits 4 and 5: What is the source of the contaminants of concern (COCs) presented in these tables? Please include a reference to the relevant section(s) of the Remedial Investigation. These tables do not align with the COCs identified in Section 4.3 of the Remedial Investigation. For example, PCB-1254 is not included in these tables and cyanide is not listed as an ecological COC for soil in DU4.”

- **Comment 82I.** “9. Page 8, Exhibit 6: This table should list the cyanide Circular DEQ-7 surface water standard for human health of 4 ug/L.”

- **Comment 82K.** “11. Page 9, Ecological PRGs-Sediments: The PRGs for low molecular weight (LMW) PAHs (196 mg/kg) and high molecular weight (HMW) PAHs (28.2 mg/kg) are both greater than the probable effect concentration (PEC) for total PAHs (22.8 mg/kg)1. How are LMW PAH and HMW PAH concentrations measured/determined? Based on the Feasibility

Study and review of MacDonald et al, it appears that more PAHs are included in the LMW and HMW PAH groups than were used to determine the PEC. If this is the case, please demonstrate that the PRGs proposed and the method of measuring or calculating LMW and HMW PAHs are at least as protective as the PEC for the relevant PAHs."

- **Comment 82L.** "12. Page 9: The proposed plan does not include a leaching to groundwater PRG for soil. NRDP recommends the proposed plan include a PRG for leaching to groundwater, so that the remedy can demonstrate that the final cleanup has removed all sources of contamination to groundwater. Comparison to the leaching to groundwater PRG also would allow the public to feel confident in statements (see comments above) that various areas of the site are not a source of contamination to the groundwater."
- **Comment 82M.** "13. Page 9: A PRG that addresses the groundwater surface water pathway is needed. I.e., the DEQ-7 standards for groundwater allow significantly more contamination in the groundwater (human health based) than the DEQ-7 standards based on chronic aquatic. How will the remedy ensure that the contamination in the groundwater does not result in exceedances of the DEQ-7 chronic aquatic standards in the seeps (and the Flathead River)?"
- **82N.** "14. Page 11, Blue Callout Box, Page 21 River Area DU5: Is it accurate to state that the only COC in the River Area Decision Unit is cyanide? Exhibit 6 lists other DEQ-7 standards for surface water that must be attained, which would seem to indicate that there may be other COCs to be addressed in the River Area DU."
- **Comment 82P.** "16. Page 13: the discussion of Alternative 3B discusses an alternative to address cyanide in groundwater before it discharges to River Area seeps and porewater. However, the reference is to the PRG for cyanide of 200 μg /L. This is the DEQ-7 standard for groundwater, but the surface water DEQ-7 standard is 4 μg /L for cyanide. As noted above in Comment 13, there needs to be a PRG that captures the fact that groundwater that meets the groundwater PRG of 200 μg /L could still discharge to the River Area DU and cause exceedances of the DEQ-7 surface water standard of 4 μg /L."
- **Comment 82T.** "20. Page 18, Soils DU3: Please see comment about a leaching to groundwater PRG for soil. NRDP recommends the alternatives address the leaching to groundwater pathway."
- **Comment 134AH. "**33) Given efforts in the last two Montana Legislative sessions to change Montana's water quality standards and definitions of how the State of Montana defines as water quality, and the fact that the EPA has not yet approved these proposed changes, what water quality standards will govern the clean-up required at the CFAC site and the standards that will be required to be met under any final record of decision? What standards, for example, will be used to measure if contaminated water treated during the clean-up process is clean enough under what standards for discharge into Montana water bodies or groundwater?"

2.4.2 EPA Response

- **Response to Comment 54BC.** The term preliminary was not used for the RAOs in the Proposed Plan, but for the PRGs. EPA guidance (EPA 1999) states, "In the Proposed Plan, this discussion should contain preliminary remediation goals (PRGs) for site soils and other media that address Pb risk. In the ROD, this discussion should contain the final cleanup levels and the rationale for any modifications from the PRGs." This allows for public comment and input before the goals are final.

Note. The remaining comments are technical, and each comment has been repeated in italics to accompany the EPA response.

- **Comment 82H.** "8. Page 6, Exhibits 4 and 5: What is the source of the contaminants of concern (COCs) presented in these tables? Please include a reference to the relevant section(s) of the Remedial Investigation. These tables do not align with the COCs identified in Section 4.3 of the Remedial Investigation. For example, PCB-1254 is not included in these tables and cyanide is not listed as an ecological COC for soil in DU4."

  Section 4.3 of the RI presents the COCs contributing to risk based on the findings for the baseline human health risk assessment (BHHRA) and the BERA. The COCs contributing to risk are summarized at the high level and not distinguished by DU in Section 4.3. PCB-1254 is identified as a risk contributor but does not result in cancer risk greater than 1E-06 for human health (RI Table 9a). For ecological risk, PCB-1254 was concluded to present minimal risk with ecological exposure pathways limited under current, disturbed conditions (RI Table 28). Cyanide is not listed as a COC in soil in DU4 (North Percolation Pond). This is consistent with Table 3-11 of the FS.

- **Comment 82I.** "9. Page 8, Exhibit 6: This table should list the cyanide Circular DEQ-7 surface water standard for human health of 4 µg/L."

  Table 3-12 in Section 3.3.5 of the FS identifies the applicable PRG for surface water chronic exposure as 4 µg/L and as 5.2 µg/L for sediment porewater. The Preferred Alternative was designed to achieve these PRGs.

- **Comment 82K**. "11. Page 9, Ecological PRGs-Sediments: The PRGs for low molecular weight (LMW) PAHs (196 mg/kg) and high molecular weight (HMW) PAHs (28.2 mg/kg) are both greater than the probable effect concentration (PEC) for total PAHs (22.8 mg/kg)1. How are LMW PAH and HMW PAH concentrations measured/determined? Based on the Feasibility Study and review of MacDonald et al, it appears that more PAHs are included in the LMW and HMW PAH groups than were used to determine the PEC. If this is the case, please demonstrate that the PRGs proposed and the method of measuring or calculating LMW and HMW PAHs are at least as protective as the PEC for the relevant PAHs."

  The Proposed Plan omitted the ecological PRG for sediments for the protection of benthic invertebrate (small animals, such as clams, worms, and crustaceans that live on or in the bottom substrate of a water body) communities from Exhibit 7 on page 9. The omitted PRG is ESBTU34 greater than (>) 10 for benthic invertebrate receptors. This PRG was presented in Appendix B of the field sampling work plan titled: *Development of Preliminary Remediation Goals (PRGs) for Ecological Risk Drivers Memorandum*.

  The probable effect concentration (PEC) and PRGs noted in this comment are for different receptors and therefore should not be compared. The PEC derived by MacDonald et al. (2000)

is a dry weight sediment threshold for benthic invertebrates. The LMW and HMW PAH PRGs of 196 and 28.2 milligrams per kilogram (mg/kg) are derived for wildlife ingestion from sediment based on estimated exposure to American Dipper (*Cinclus mexicanus*), the most sensitive wildlife receptor modeled in the BERA.

The BERA does not use the dry weight sediment PEC for benthic invertebrate risk assessment. Instead, consistent with EPA guidance, PAH exposure is derived from application of the equilibrium partitioning sediment benchmark toxic unit (ESBTU) method. The ESBTU method estimates the potential additive narcotic effects of dissolved PAH mixtures in sediment porewater based on theoretical partitioning of PAH compounds between sediment organic carbon and pore water (EPA 2003).

ESBTU34 is based on 34 PAHs, which include both HMW (4 or more rings) and LMW PAHs (two or three rings). Sediment samples collected in the Phase I and II Site Characterization were analyzed for 17 or 34 PAHs. In cases where results for 34 PAHs are not available, (EPA 2003) includes a model for ESBTU13 based on 13 PAHs (a subset of the 17 PAHs). Results for ESBTU13 are then multiplied by an uncertainty factor of 2.75 to obtain an estimate of ESBTU34. This adjustment accounts for the potential toxicity of unmeasured PAHs in the 13 PAH model (EPA 2003).

- **Comment 82L**. "12. Page 9: The proposed plan does not include a leaching to groundwater PRG for soil. NRDP recommends the proposed plan include a PRG for leaching to groundwater, so that the remedy can demonstrate that the final cleanup has removed all sources of contamination to groundwater. Comparison to the leaching to groundwater PRG also would allow the public to feel confident in statements (see comments above) that various areas of the site are not a source of contamination to the groundwater."

  The leaching to groundwater screening levels (more specifically, the EPA Protection of Groundwater Risk-Based Soil Screening Levels [RBSSLs]) are not "cleanup" levels. These levels do not qualify as either Applicable or Relevant and Appropriate Requirements (ARARs) or PRGs under the NCP (see 40 CFR 300.5 for the definition of ARARs and 300.430(e)(2)(i) for a discussion of the role of ARARs and PRGs in the evaluation of alternatives in a FS). These levels and any other leaching to groundwater screening levels do not measure a risk pathway in and of themselves but are indicators of a possible risk associated with groundwater contamination. The presence or absence of groundwater contamination above groundwater PRGs immediately downgradient of a potential source is a stronger line of evidence than generic screening levels for determining whether the potential source is in fact a source of contamination to the groundwater. At sites where potential sources have existed for many years, the presence or absence of actual groundwater contamination above the PRGs is a more reliable approach in identifying sources requiring remedies than an indicator of possible groundwater contamination.

  The leaching to groundwater screening levels were used at the site in a manner consistent with the NCP in the RI as an indicator of possible baseline human health risk due to the potential presence of contaminants in groundwater. Screening levels are an assessment tool to be used as part of the development of the site-specific baseline risk assessments required under the NCP (40 CFR 300.430(d)(4)). Exceedances of the generic screening levels indicate the need for further evaluation.

There were concentrations of cyanide and fluoride in soil that exceeded the protection of groundwater risk-based soil screening levels (RI Tables 11 and 12). This led to the additional investigation of groundwater to identify what areas are contributing to groundwater contamination above ARARs and PRGs. The results of the extensive onsite RI groundwater sampling (77 wells sampled over the course of multiple years with approximately 400 total groundwater samples) was a much more accurate assessment of actual risk due to groundwater ingestion and indicate that the DU1 landfills are the only contaminant sources contributing to the observed exceedances of the groundwater PRGs.

The remedial actions for combined DU1/DU5/DU6 in the Preferred Alternative are designed to achieve groundwater, porewater, and surface water PRGs by eliminating the sources of contaminants to groundwater. This approach was not only consistent with the NCP but is the highest ranked and therefore likely to be the most effective approach when considering the evaluation criteria in 40 CFR 300.430(e)(7) and 300.430(e)(9)(iii).

In addition, the Preferred Alternative includes remedial actions to achieve the soil PRGs for materials that are not impacting groundwater. When taken together, these remedies should effectively address all of the human health and ecological risk associated with the site. The introduction of a "leaching to groundwater PRG for soil" is inconsistent with this approach and would also be inconsistent with the NCP because it would create a PRG that is not an effective indicator of site risk.

To the extent that such a PRG were used to justify a remedial measure other than the Preferred Alternative for any of the site DUs, including combined DU1/DU5/DU6, that alternative would be inconsistent with the NCP because it would not eliminate, reduce or control risks to human health and the environment.

- **Comment 82M.** "13. Page 9: A PRG that addresses the groundwater surface water pathway is needed. I.e., the DEQ-7 standards for groundwater allow significantly more contamination in the groundwater (human health based) than the DEQ-7 standards based on chronic aquatic. How will the remedy ensure that the contamination in the groundwater does not result in exceedances of the DEQ-7 chronic aquatic standards in the seeps (and the Flathead River)?"

  The Preferred Alternative for combined DU1/DU5/DU6 will substantially reduce if not eliminate the flow of contaminants from these areas to groundwater through the installation of a low-permeability slurry wall around the sources of contaminants to groundwater. Once the flow of contaminants to groundwater is significantly reduced or eliminated, contaminant levels in groundwater will reduce over time as groundwater is replenished with new, clean surface water. Concentrations of contaminants in porewater and surface water which are fed by groundwater will also decrease. Modeling in Appendix A of the FS shows that these remedies will ultimately achieve both groundwater and surface water PRGs.

- **Comment 82N.** "14. Page 11, Blue Callout Box, Page 21 River Area DU5: Is it accurate to state that the only COC in the River Area Decision Unit is cyanide? Exhibit 6 lists other DEQ-7 standards for surface water that must be attained, which would seem to indicate that there may be other COCs to be addressed in the River Area DU."

Cyanide is not the only COC in DU5, but it is the only COC in groundwater that is contributing to exceedances of surface water PRGs or ARARs in DU5. The other COCs in DU5 have been addressed by the South Percolation Ponds removal action, which included the removal of impacted sediment and elimination of the former discharge line into the South Percolation Ponds. As described on page 21 of the Proposed Plan, monitoring for the other constituents will be performed to demonstrate that the South Ponds removal action eliminated the source of these COCs to surface water in DU5.

- **Comment 82P**. "16. Page 13: the discussion of Alternative 3B discusses an alternative to address cyanide in groundwater before it discharges to River Area seeps and porewater. However, the reference is to the PRG for cyanide of 200 μg/L. This is the DEQ-7 standard for groundwater, but the surface water DEQ-7 standard is 4 μg/L for cyanide. As noted above in Comment 13, there needs to be a PRG that captures the fact that groundwater that meets the groundwater PRG of 200 μg/L could still discharge to the River Area DU and cause exceedances of the DEQ-7 surface water standard of 4 μg/L."

  In order to achieve the surface water PRG for cyanide of 4 μg/L, the groundwater concentrations of cyanide near the river will need to drop to well below the groundwater PRG of 200 μg/L. Groundwater modeling results predict that this will occur with the source control in the Preferred Alternative as supported by current data. Cyanide concentrations in groundwater near DU5 are already around 200 μg/L. Source control will prevent that number from increasing and will lead to the number beginning to decrease to meet the surface water PRG.

- **Comment 82T.** "20. Page 18, Soils DU3: Please see comment about a leaching to groundwater PRG for soil. NRDP recommends the alternatives address the leaching to groundwater pathway."

  See above response to Comment 12 for a discussion of the consistency of a leaching to groundwater PRG with the NCP. Furthermore, the RI concluded that the soils were not sources of groundwater contamination that resulted in exceedances of groundwater ARARs and PRGs. Therefore, alternatives to address groundwater impact from the Soils DU3 are unnecessary because it is not a source of groundwater contamination requiring remediation.

- **Comment 134AH. "**33) Given efforts in the last two Montana Legislative sessions to change Montana's water quality standards and definitions of how the State of Montana defines as water quality, and the fact that the EPA has not yet approved these proposed changes, what water quality standards will govern the clean-up required at the CFAC site and the standards that will be required to be met under any final record of decision? What standards, for example, will be used to measure if contaminated water treated during the clean-up process is clean enough under what standards for discharge in to Montana water bodies or groundwater?"

Promulgated water quality standards will be required to be met as they exist at the time of the ROD's signature. Any changes to water quality standards will be reviewed during the five-year review process to determine whether the remedy is still protective of human health and the environment.

2.5 Consider Comments Carefully

2.5.1 Public Comments

Fifty-five comments were received from individuals that stated that EPA's cleanup plan for the site was unacceptable and asked that EPA carefully consider the questions raised in the comment period. Fifty-three of these comments were either identical or had very slight modifications.

- **Comments 19A, 20A, 21A, 22B, 23A, 25A, 27A, 28A, 30A, 33A, 34A, 35A, 36A, 37A, 38A, 39A, 41A, 42A, 44A, 57A, 58A, 59A, 60A, 61A, 62A, 63A, 64A, 65A, 68A, 70A, 71A, 72A, 73A, 77A, 78A, 81A, 83A, 84A, 88C, 90A, 93B, 94B, 95A, 96B, 97A, 100A, 101A, 105A, 127A, and 131A**. "I feel the Columbia Falls Aluminum Company Superfund site proposed cleanup plan, which includes leaving a massive volume of toxic waste in place without a plan for removal, or a plan for long-term full remediation of the Columbia Falls Aluminum Plant site, is an unacceptable clean-up plan. I urge you to give careful consideration to the numerous questions that are being raised during this comment period by former CFAC employees, organizations, scientists, and agency and local government officials. Consider these to be my questions as well."

- **Comment 87G.** "Your clean up plan does not provide for long term full remediation of the Columbia Falls Aluminum Plant Site and is not acceptable to the community of Columbia Falls. Please give careful consideration to the numerous concerns that have been raised by former CFAC employees and citizens (former workers). Thank you for your attention to this letter of questions and concerns."

- **Comment 106A.** After attending Environmental Protection Agency presentations and the public hearing in Columbia Falls, listening to comments at the hearing, reviewing documents, and speaking with knowledgeable professionals, it is my belief that the investigation and resulting proposed plan for cleanup of the CFAC Superfund Site is not adequate. I urge you to give careful consideration to the numerous questions that are being raised during this comment period by former CFAC employees, organizations, scientists, and agency and local government officials."

2.5.2 EPA Response

Superfund requires that EPA provide a reasonable opportunity for submission of written and oral comments and an opportunity for a public meeting at or near the facility. Public comment is an important tool for gauging public acceptance of EPA's Preferred Alternative for cleanup, and public acceptance is one of the nine Superfund criteria for evaluating clean-up alternatives. EPA carefully considers all comments received with an eye toward finding new information or perspectives that might warrant a modification of the selected alternative that was presented in the Proposed Plan (EPA 2023a) for cleanup. Public input can also be very useful in the design phase of cleanup where additional sampling and studies are done to provide data needed to construct the cleanup. Finally, public comment, received during the Proposed Plan comment period, can shape details like long-term monitoring, by letting EPA know that sampling of a particular area or media (like residential drinking water supplies) is important to the community. EPA appreciates receiving comments from the community and takes them seriously. We intend to keep the community informed of the progress in the design and construction of the Selected Remedy through public meetings, fact sheets, and other means of communication.

2.6 Evaluating Cost and Protectiveness

2.6.1 Public Comments

Sixty-nine comments were received in the category of evaluating costs and protectiveness. Most (59) were identical (see first bullet).

- **Comments 19B, 20B, 21B, 22C, 23B, 25B, 26B, 27B, 28B, 30B, 33B, 34B, 35B, 36B, 37B, 38B, 39B, 41B, 42B, 44B, 57B, 58B, 59B, 60B, 61B, 62B, 63B, 64B, 66B, 68B, 69B, 70B, 72B, 73B, 77B, 78B, 83B, 84B, 88A, 90B, 91B, 93C, 94C, 95B, 96C, 97B, 100B, 101B, 105B, 106A, 107B, 109C, 118A, 119B, 122A, 124B, 125B, 127B, and 131B).** "Please explain in more detail how leaving this toxic waste in place, despite all the questions being raised during this comment period and previously, will better protect the health, safety, and welfare of current and future generations of residents of the Flathead as well as the health of the Flathead River and Flathead Lake ecosystems? Leaving cost to the companies and government out of the evaluation criteria, how could that change the outcome of your recommendations for this cleanup proposal? Explain why costs factors have been given greater weight than the health, safety, and welfare of current and future generations of residents of the Flathead as well as the health of the Flathead River and Flathead Lake ecosystems?"

- **Comment 26C.** "4. How will the proposed containment plan protect me and future Columbia Falls residents that live downriver from CFAC from toxic/residual contamination? For decades or even hundreds of years? This should not be a short term 'fix'."

- **Comment 53J.** "According to the comparative analysis ranking of alternatives on page 23 of the Proposed Plan for Cleanup, soil excavation for DU3 and DU4 score a 15 in short term effectiveness. Why then does soil excavation for DU1 only score a 5? It seems like immediately getting rid of the source of contamination would boost the short term effectiveness score (and thus the overall score), and would also satisfy a major sticky point with the general public Additionally, the treatment scores on page 23 of the cleanup plan for both DU3 and DU4 are scored "15", but soil excavation in DU1 is only scored "12". What reason does the EPA have for why the scores for the same type of treatment differ from DU3 and DU4 to DU1? Additional arguments the EPA leverages against DU1 soil excavation can be found on page 25 of the Proposed Plan for Cleanup which states, "Alternative 6 would be the least technically feasible and is expected to be much less implementable than the other alternatives." Curiously, the feasibility and implementation to excavate soils for the DU3 and DU4 preferred plans score "15", while for DU1 excavation only scores "5". Why are the scores much lower for implementation regarding DU1 compared to DU3 and DU4? If this is because it would take an additional year longer to dig up more material, it is worth it to us. Our children's health means more to us than your money. Will the EPA reconsider soil excavation for DU1 and include it in its final remediation plan for the CFAC Superfund site?

Curiously, according to page 22 of the Proposed Plan for Cleanup, the criteria for "implementation" is described as "Is the alternative technically and administratively feasible (i.e., are materials and services readily available)?" Based on the low implementability score for DU1, one would assume soil excavation is less implementable because the material and services are not readily available. However, this remediation action appears to be readily available for the preferred remediation options for DU3 and DU4 – is this really about cost? Indeed it is. On page 25 of the Proposed Plan for Cleanup, the EPA continues to downgrade soil excavation as a remediation action for DU1 because "costs for Alternative 6 dwarf costs for the other alternatives in joint DU1/DU6 and all other DUs. The NCP requires that the selected remedial action be cost-effective and proportional to overall effectiveness. Alternative 6 (on-site excavation and consolidation) does not meet this requirement as it costs more than twice the next most expensive alternative and exceeds the least expensive retained alternative by a factor of six." My question here is, how is soil excavation not effective? Again, the "effectiveness scores for soil excavation are very high for both DU3 and DU4 (average scores = 20 for long term effectiveness, 17.5 for treatment effectiveness, and 15 for short term effectiveness), but for DU1 the scores are 20, 12, and 5). Why is the short term effectiveness score so low if the treatment were to be able to get rid of the source of contamination? Will the EPA consider soil excavation with onsite treatment as a viable addition to the overall plan? If not, why not?

And yet another vague argument against soil excavation for DU1 includes "Alternative 6 is also less effective than Alternatives 3C, 4A, and 4C. Thus, Alternative 6 is the least cost-effective alternative." What makes soil excavation so "less effective" than the others, and why is it ok to be included in the cleanup plan for DU3 and DU4 but not DU1?

It seems like getting rid of the source of contaminant would 1) increase the short term effectiveness (gets rid of the source material), 2) increase the long term effectiveness (source material is remediated), 3) increase the overall treatment (less source contamination), 4) increase the overall effectiveness (residents are happy and contamination is remediated), and 5) decrease current and future risk to residents (risk has been mitigated). Does the EPA agree with these statements? If not, can you tell us why not?

Unfortunately, what it really comes down to is cost. Our future insurance, mitigation, and quality of life costs will ultimately exceed the price it takes to excavate and treat the contamination, and seeing as both BP and Glencore have made $1 Billion each (at minimum) at this communities expense, placating to our humble requests will improve your image immensely.re a 5? It seems like immediately getting rid of the source of contamination would boost the short term effectiveness score (and thus the overall score), and would also satisfy a major sticky point with the general public. "

- **Comment 54BD**. "42. Since you went out of your way to write about the elimination of off-site disposal (The communities choice), I have the following comments: Screened out because of effectiveness, implementability, and cost.

Effectiveness - Does moving it to Arlington protect the Flathead Valley community better than leaving the waste "Out of site - Out of mind" at the CFAC superfund site? What is effective about leaving a problem in the ground to cause future long term problems?

Implementability _ What are you implementing by leaving the waste in place with a two foot thick clay/gravel ring surrounding it? The slurry wall ring was claimed to be effective technology only down to 100 feet deep during a Liaison Panel meeting by the EPA. These landfills have up to 160 feet of glacial alluvium on their East side. Are you going to dig down 60 feet before starting the slurry wall? Water table will be flowing into the structure while you are trying to cap the top of it. How will you honestly implement this technology at this location? Do you actually know what is in the landfills, how much water do they contain already, and where is it going and how fast. What is the strata in the 715,000 square feet of ground under the landfills? You have done nothing yet to investigate this large area inside the slurry wall. How can you decide to implement a decision that you have no idea whether it well work? Digging it out for transport bypasses the slurry wall technology issues and gets the waste out of the ground to a known safe location. How is digging it out less implementable than risking millions of dollars on a technically questionable solution?

Pre- treatment is the first hurdle. How to segregate the west landfill? First you drill it so you know what your dealing with and is it somewhat segregated already when it was put into this dump. You then develop a plan to segregate the carbon products from the chemical drums and the general construction/maintenance wastes. The carbon in the dump should be soft enough to crush and size reduce now. If it needs dewatering heat and air dry before putting carbon products into existing fleet of unused rail car containers already in service. The drummed liquids that remain should be combined and incinerated with a portable military incinerator. The remaining construction/maintenance material should be moved to an on-site CAMU that meets current industrial waste specifications. The soil under the dumps should be either mined and put into this hazardous waste CAMU or just allowed to slowly decontaminate themselves with time. This is implementable technology. The wet scrubber sludge pond should be drilled and volumes, specific chemistry, of the contents identified. Is there just a F problem or is there any CN/PAH concerns anywhere in this dump? Your plan is to mix it with cement and put it into a hazardous waste CAMU on the CFAC site. The problem becomes you have increased the size of the hazardous waste pile and turned it into a permanent hazard on site. Removing it and then chemically processing it to strip the F might allow the remaining metal oxides to be recycled, if that is possible, or these wastes could be put into an on-site industrial waste CAMU.

Cost - By size reducing each hazardous waste component the amount shipped to Arlington would be greatly minimized so costs should fall. You already need an industrial waste landfill/CAMU that meets modern standards. Just build it bigger to handle the non-hazardous waste pile after segregation. It may be possible to leave the underground soils in place, bury them, and let the site naturally clean itself because no new COPCs will be coming from above."

- **Comment 54BE.** "43. EPA states, in your RI-FS document, that as an organization they believe that "it is best to leave toxic wastes in the dumps; rather than attempt to remove them." This statement explains why so few hazardous waste sites have been cleaned up in the

40 years EPA has been in existence. EPA follows a 9 Step Procedure religiously, at every site, that leads to the "leave it in the ground" solution inevitably. They are using Mother Nature's slow and deliberate ability to clean itself up. The soil can gradually reduce concentrations of chemicals by chemical and dilution processes for contaminants. The rivers, once the contaminated material reaches them have the ability to make them magically disappear through the processes of dilution and re-distribution down stream into bigger and bigger bodies of water. These are the EPA solutions we generally see. Look at what is proposed at CFAC. There is no proactive attempt to remove anything from our natural environment on a timely basis. Just hide it and dilute it away over decades. To accomplish this they have to convince people that it is too risky or dangerous to touch the contaminants and scare you with statistics like car accidents, deaths, carbon footprints, toxicity if you breathe, eat, or touch it, and much more so that you buy into their preferred alternative. There is little they do that is proactive to quickly address any issue they face."

- **Comment 86A.** "Thank you for the opportunity to ask questions on the proposed cleanup plan for the Columbia Falls Aluminum company site. What are the advantages of keeping the waste on site versus shipping to Oregon waste site? Can the Waste be contained in perpetuity to protect the community and the Flathead River System? Has the Waste been analyzed as to its toxicity and the Possibility of reusing/recycling the waste into concrete or some other usable resource. Possibly if contained on site, can the waste be used as fill for structural support for gardens or buildings with containment preventing toxic materials from entering the ecosystem?"
- **Comment 89A.** "How will this plan protect the water quality of the Flathead River as well as all the downstream components of the system including Flathead Lake?"
- **Comment 130I.** "Again IF removal is reconsidered, I would like the information about the long-term benefit to be more quantified vs. cap and seal options. (In the ranking system used it was easy to compare either / or, but not to give a numeric value to how much benefit one option was over another). Since removal would be a much greater health concern for our community of Columbia Falls and a somewhat elevated negative impact to communities along the route in the short term (a con), it would be helpful to understand how much more valuable that option would be in the long-term (the pro)."
- **Comment 132J.** "What is the cost comparison between installation and subsequent failure remediation of the proposed solution and 1-off hauling via established rail link and proper sequestration off-site?"
- **Comment 134C.** "2) the Government Accountability Office has criticized EPA's lack of data on Superfund cleanup costs, noting the information is inconsistent and unreliable. Based on this criticism, what steps have been taken in the proposed clean-up plan for the CFAC superfund site to provide a well-documented basis for proposed costs particularly as costs appear to be one of the main factors being used to justify leaving toxic waste in place rather than a goal of complete remediation?"
- **Comment 134D.** "3) For two-plus decades, federal policy helped corporations and businesses ignore the growing cost of contamination by shifting the financial burden for

cleaning up Superfund sites from industry and onto taxpayers, according to a report by Environment America and the U.S. Public Interest Research Group published in December 2021. The 184-page report noted the Superfund initiative was originally funded by a set of "polluter pays" taxes on the chemical and petroleum industries. Funds from these taxes went into a trust fund designated to support the Superfund program. When Congress let those taxes expire in 1995, the EPA increasingly relied on money from general taxpayer revenue to make up the growing funding shortfall. Shortly after the polluter pays taxes were allowed to expire, the Superfund Trust, at the start of fiscal 1997, reached its peak balance of $4.7 billion and then began rapidly declining, according to the report. At the start of fiscal 2022, the trust had a balance of $67 million. Unsurprisingly, as the amount of money in the trust fund fell so too did the number of remedial cleanup actions, from 91 in 1999 to 14 in 2021. In late 2021, Congress passed and President Biden signed into law the bipartisan infrastructure bill reinstating the polluter pays taxes to fund the Superfund program. An initial investment of $1 billion from the Bipartisan Infrastructure Law will go toward clearing out the Superfund backlog in 23 states and Puerto Rico, according to the EPA. A total of $3.5 billion was set aside in the infrastructure package to remediate Superfund sites. How were these changes in potential funding for the cleanup of the CFAC superfund site both from the reinstatement of the polluter pays taxes to the $3.5 billion now set aside in the new infrastructure bill incorporated into cleanup options and alternative proposed at the CFAC superfund site?

What efforts have been made to date, or could be made to secure such funding to ensure that all toxic waste at the CFAC site are removed to a specially designed hazardous waste landfill and away from the banks of the Flathead River. While the cleanup plan fails to recommend removal of all toxic waste, how did it consider and evaluate the very real possibilities, as in the Milltown Dam situation, that if these toxic chemicals are not removed, climatic events of a historic scale might in the future wash these, toxins down the river doing even greater damage? How have each of these possibilities been evaluated and ranked in your decision-making criteria?"

2.6.2 EPA Response

EPA has ensured that the potentially responsible party (PRP) followed accepted national guidance in their preparation of the RI (Roux 2020a) and FS (Roux 2021a), and that both documents comply with the requirements of CERCLA. EPA worked closely with DEQ in oversight of the project and has been transparent and proactive in providing information on the process and results to anyone in the community who has been interested. The 2021 FS explains, in detail, the step-by-step process for developing cleanup alternatives that are protective of human health and the environment and that provide the most effective, implementable, and cost-effective remedy possible. EPA and DEQ held numerous public meetings, organized meet and greets at the local farmer's market, worked with the Community Liaison Panel, developed fact sheets and presentations, made the FS available online, and provided funding for a TASC contractor to be available.

Following *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA,* (EPA 1988a), the FS evaluated in detail every alternative for each DU at the site. EPA's team of scientists, engineers, and risk managers used the results to select a Preferred Alternative that was presented for public comment in the June 2023 Proposed Plan. Nine evaluation criteria were used to rank the alternatives for each DU. Superfund requires that all alternatives must meet the two threshold criteria (overall protection of human health and the environment and compliance with applicable or relevant and appropriate requirements) in order to move forward for further evaluation. After that, a potential remedy is ranked against five balancing criteria (long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost). If "cost" was removed from the criteria, the fully encapsulating cell with groundwater treatment alternative would still score the highest in terms of effectiveness and implementability, as was shown in Exhibit 25 of the Proposed Plan.

"Short-term effectiveness" is another of the five balancing criteria (40 CFR § 300.430(e)(iii)(E)). It considers protection of the community and workers during cleanup, environmental impacts during cleanup, and time until cleanup objectives are achieved. In simple terms, it assesses how hard it is to construct the remedy and how long it will take. The likelihood the remedy will be successful and the permanence it affords is evaluated under the "long-term effectiveness" criterion. With this in mind, it is expected that an alternative that excavates, treats, and relocates previously land-filled materials will receive a lower rating for short-term effectiveness than one that leaves the material in place and increases the thickness of the cover, adds a monitoring network, and uses institutional controls to protect the remedy. There is more disruption to the community, more risk to workers, and it takes longer to implement.

The results of the evaluation for short-term effectiveness at the site are presented in Section 7 of the 2021 FS (Roux 2021a). In response to the commenter who is comparing the scores for short-term effectiveness across various DUs, the FS states that "*Determination of scoring values for each alternative is based on comparisons between the alternatives for each DU; the assigned scores are not meaningful if compared between DUs. In general, the higher the relative score, the better that alternative satisfies the respective criterion when compared to the other alternatives for that DU.*" This is standard FS procedure on sites with multiple DUs.

As for costs, FS costs are detailed, reproducible, and allow for comparison between alternatives. The specifics used in those calculations (such as the price of fuel) are provided in the FS appendices. These estimated costs are used to compare the relative costs of one alternative with those of another (again, within the same DU). They are not intended to be precise estimates of the final cost. As per FS guidance (EPA 1988a), the cost estimates are calculated with the intention of achieving a cost-estimating goal for accuracy of -30 to +50 percent. Estimates for the Preferred Alternative are in 2020 dollars and are based on conceptual design from information available at the time of the FS. They have undoubtably escalated in the three years since. The actual cost of the project will depend on the final scope and design of the cleanup, schedule, competitive market conditions, and other variables. Most of these factors are not expected to affect the relative cost differences between alternatives, so it is still possible to see how the alternatives rank by cost.

Finally, the investigation and cleanup of the site has been paid for by the PRP, and EPA anticipates that the same will hold true of site cleanup. The decision to remove off-site disposal from the list of alternatives to be considered for cleanup was not because funding was not available. It was based on the factors enumerated on page 10 of the Proposed Plan, *Evaluation and Elimination of Off-Site Disposal*.

2.7 Explain Decisions

2.7.1 Public Comments

Twelve comments were received that requested that EPA better explain its decisions. CFAC (#135) expressed concern about the role that SKEO played in the comment process. Seven comments were identical and referenced a lack of transparency in the process to date. An extension of the 60-day public comment period was also requested.

- **Comment 5C.** "It took many years to get to this point, and then when I start to hear about, Well, we're gonna have these five-year reviews, and we may adjust. Those adjustments, will they take another 10 or 15 years to figure out how to make the corrections? This is a pretty serious, long-term situation, and my comments are, I just don't know that I have the technical expertise to properly comment on something I don't fully understand, and I don't believe that this is enough time, in 30 days, for the community to get the information from the EPA on this design and then how the community is going to feel about it, whether it supports it or not. So I definitely believe that there needs to be an extension of the comment period and more information provided to the community as to why they're not gonna haul it away. It baffles me. That's all I have to say. Thank you."

- **Comment 6A.** "Good evening. …I'm here tonight representing Citizens for a Better Flathead. We will be, based on this hearing, wanting to submit written comments, but I would -- based on the information that we've heard tonight, I would like to ask that you extend the deadline for public comment. Not only that you extend the deadline, but that you create a deadline when you will provide that information -- you'll extend the deadline, provide us the public information from these hearings, and then reopen this public comment, because the public needs the information that's going to come out of this hearing process to be able to be informed and to comment. So I'd like to see a second public hearing process. Again, I work for Citizens for a Better Flathead. We are a nonprofit that works countywide here in the Flathead; we are very concerned about water-quality issues, and we represent many residents throughout the whole Valley, and while I think this is definitely an issue for Columbia Falls, because it's all one community, we need to make sure that we get a communitywide response to this. And so I hope your outreach will be larger than just the community of Columbia Falls. Thank you."

- **Comments 106A, 107A, 109B, 119A, 122A, 124A, and 125A.** "I believe the Columbia Falls Aluminum Company Superfund site proposed cleanup plan, which includes leaving a massive volume of toxic waste in place without a plan for removal, and does not provide for long-term full remediation of the Columbia Falls Aluminum Plant site, is an unacceptable clean-up plan. Describe to me in detail the process in which EPA determined that this proposed plan which calls for retaining contaminants on site outweighs a plan for removing contaminants and shipping to an out of state repository. Why was EPA not transparent in providing detailed information to the public about the removal option so we could understand and comment on this as an option rather than presenting it in a way that brushes it off as "something we wouldn't want to see happen?" How in depth was this removal option studied? Include communication between EPA, MT DEQ, Glencore, Columbia Falls residents and former employees, and others in your explanation."

- **Comments 123R and 134BA. "**Describe to me in detail the process in which EPA determined that this proposed plan which calls for retaining contaminants on site outweighs a plan for removing contaminants and shipping to an out of state repository. Why was removal of contaminants not explained to the public in detail so the public could understand and comment on this, too, as an option. How in depth was this removal option studied? Why was EPA not transparent in providing detailed information to the public about the removal option rather than presenting it in a way that brushes it off as "something we wouldn't want to see happen?"

- **Comment 135Q. "**<u>Comment 5: The EPA Contractor Skeo's Report Entitled "Proposed Plan for Cleanup Columbia Falls Aluminum Company" ("Skeo Report") Was Inaccurate and Misleading and Inconsistent with the EPA's Obligation to Effectively Inform the Public</u>. For the reasons described in the June 29, 2023 e-mail and attached comments from John Stroiazzo, Columbia Falls Aluminum Company Project Manager to EPA Remedial Project Manager for the site Christopher Wardell and EPA site Outreach Coordinator Melissa Haniewicz, the Skeo Report mislead members of the public by, among other things, incorrectly implying that (i) significant technical uncertainties remain regarding the conditions at the site when site conditions were extensively studied and reported on in a Remedial Investigation Report that Skeo barely mentioned in their comments and (ii) that this technical information in the RI was not used as the basis for evaluating remedial alternatives in the Feasibility Study that Skeo also ignored.

  The National Contingency Plan requires that EPA provide the public an opportunity to comment on the Proposed Plan and the supporting analysis, including in the RI and FS. (40 CFR 300.430(f)(3)(i)(C). Courts have made clear that the public must be given an opportunity to provide meaningful and effective public comment on the Plan and RI and FS.7 The incorrect characterization of the technical record in the Skeo Report and its failure to provide the public with any material information about the RI/FS means that it was not consistent with EPA's obligation to provide the public opportunities to submit meaningful comments. The Skeo report left readers with the incorrect impression that major technical issues had not been explored when they had been and that there was a need for further site assessment to address these shortfalls when, in fact, those site conditions or possible impacts had been fully studied. In addition, a document that fails to discuss the RI/FS in any meaningful way cannot act as an effective basis for the public to comment on the RI/FS.

  Furthermore, the fact that the Report provided pre-drafted comments for members of the public to submit to the EPA as their own also raises the question of whether any such comments submitted in response to the report are a genuine reflection of the sentiments of the commenter or a response to a strong suggestion from a more knowledgeable and seemingly neutral third party. Ultimately, the drafting of comments for public submission by an EPA contractor puts EPA in the position of drafting the Proposed Plan, paying a third party to draft comments on the Plan, and responding to any of the contractor-drafted comments that are submitted by the public. This apparent conflict and the deficiencies of the Skeo Report cast doubt on whether comments received by EPA based on the Report are a legitimate basis for evaluating the Community Acceptance (40 CFR 300.430(f)(1)(i)(C)) criteria in the remedy selection process.

2.7.2 EPA Response

The Superfund law outlines requirements for public outreach once a Proposed Plan is issued (40 CFR § 300.430.(f)(3)(i)). Specifically, EPA must:

- Publish a notice and make the plan available to the public
- Provide a comment period of at least 30 days for written and oral comment
- Hold a public meeting at or near the site
- Keep a transcript of the public meeting which is available to the public
- Prepare a written summary of significant comments, criticisms, and new relevant information submitted during the public comment period and the lead agency response to each issue that shall be made available with the record of decision

EPA has complied with all requirements above and has taken steps to educate the public on the components of the Preferred Alternative as described in the Proposed Plan. These steps include:

- Arranged for public assistance with understanding technical aspects of the Proposed Plan by engaging a contractor to lead 4 local public meetings (two on June 21 and two on July 12, 2023) specifically tailored to the Proposed Plan. Attendance ranged from 2 to 20 people.
- Held public meetings to further explain the results of the RI (Roux 2020a) and FS (Roux 2021a), including why off-site disposal was eliminated after consideration (September 2022).
- Conducted outreach from a booth at the local farmer's market (August and September 2022 and June 2023).
- Extended the public comment period from an initial 60 days to 90 days.
- Prepared fact sheets recapping the results of the RI/FS (September 2022), the schedule and opportunities for public comment (August 2022), release of the Proposed Plan and the upcoming public comment period (May 2023).

The notices for the Proposed Plan and public comment period were published broadly (Flathead Beacon, Hungry Horse News, and Daily Interlake) to encourage comment from an area well beyond Columbia Falls. At the request of several members of the public, EPA extended the 60-day public comment period to 90 days shortly after the June 28, 2023 public meeting. To balance community engagement with moving forward with cleanup at the site, EPA will not hold an additional public hearing or further extend the public comment period.

By design, proposed plans are formatted to provide an overview of the site and the process for evaluating and selecting a Preferred Alternative for cleanup. At 10 to 20 pages in length, they cannot provide the same level of detail found in the RI or FS. The Proposed Plan (EPA 2023a) detailed why off-site disposal was eliminated in the evaluation process and devoted an entire page to the list of reasons (distance, pre-treatment, volume, logistics, carbon footprint, quality of life impacts, long-term intense disruption, health risks to workers, traffic accidents, and high costs). Off-site disposal was eliminated in the 2021 FS (which was available to the public on EPA's website), and this was discussed with the Community Liaison Panel and at the September 2022 public meeting.

Under EPA's National Technical Assistance Services for Communities (TASC) program, EPA provided an independent contractor (SKEO) to assist the community in understanding and formulating comments on the Proposed Plan. CFAC's comments about their concerns with SKEO's report are noted. SKEO's report and CFAC's comments on SKEO's report have been included in the administrative record.

2.8 Financial Bonding

2.8.1 Public Comments

Six comments were received from two individuals requesting that that CFAC be made to post a financial bond (possibly as an institutional control) for potential future costs such as poor performance, waste removal, a new water system, enhanced monitoring, residential development, and maintenance and operation.

- **Comment 54FV.** "1. Institutional and engineering controls should be expanded from just minimizing exposures or stopping access to caps. Include protection for the local community with financial guarantees and permanent zoning requirements."
- **Comment 54FW.** "2. CFAC should post a financial bond that would cover the cost of removing the waste if their ROD choice doesn't perform to written goals, time lines, and expectations for final outcomes."
- **Comment 54FX.** "3. Bond to protect Aluminum City residents from bearing the cost of a state administered controlled water use restriction declaration that forces residents to abandon domestic wells and forces them to other water sources. Cost of installing and running city water and sewer to Aluminum City residents or others affected by contaminants reaching their well water."
- **Comment 54FY.** "4. A better early monitoring system for COPC's should be installed on the west fence line of the CFAC property. Include wells that actually monitor the water zones that are being used by the families in the area and include semi-annual well monitoring for COPC's for as long as the site has any wells, seeps etc. not meeting DEQ-7 drinking water standards. The value of all these protections and monitoring should be a separate bond payable to the property owners of Aluminum City should CFAC pollution or annexation by the City of Columbia Falls occur."
- **Comment 54FZ.** "5. CFAC should be required to place another bond that protects the City of Columbia Falls tax payers from funding any residential development on the current CFAC 960 acre superfund site for 50 years. Bond payable to the City of Columbia Falls should CFAC/Glencore or any successor property owners seek to zone change any property to other than commercial or industrial. Undeveloped land being the only exception."
- **Comment 116I.** "The proposed slurry wall would attempt to isolate two of the seven landfills at the site. Others, which have no liners, would remain in place. The proposed slurry wall would need to be maintained in perpetuity. The pump and treat system for groundwater

within the slurry wall will also need to be done in perpetuity. This will impose a very substantial long term cost for the responsible parties. There is no mention in the documents of a financial guarantee for the responsible parties to ensure funds adequate to maintain and repair the slurry wall and the pump and treat system. And what is the expected life of the slurry wall? 30 years? 50 years? Will CFAC be around in 30-50 years to take care of this problem? Or will EPA and the State require action by future innocent landowners?"

2.8.2 EPA Response

Financial assurance provisions in CERCLA settlements and orders help ensure that PRPs, and not public funding sources, bear the financial burden of completing Superfund cleanups. EPA negotiates financial assurance requirements in its Superfund settlements and imposes financial requirements on PRPs through orders. In general, financial assurance provisions in settlements and orders require PRPs to demonstrate that adequate financial resources are available to complete required cleanup work.

Permissible Superfund financial assurance mechanisms in settlements and orders typically include:

- Trust Funds
- Letters of Credit
- Surety Bonds
- Insurance Policies
- Corporate Financial Tests
- Corporate Guarantees

In November 2015, CFAC signed an EPA Administrative Settlement Agreement and Order on Consent acknowledging financially responsibility for investigation of the site. After the ROD is signed, a consent decree will be negotiated to cover remedial design; remedial action (cleanup); and long-term inspection, operations, maintenance, and monitoring costs.

The plume beneath the site is not expected to change direction and migrate to Aluminum City, but any unanticipated movement of the plume toward the Aluminum City wells would be picked up by the network of monitoring wells between the site and Aluminum City. Actions (such as additional pumping in DU1/DU5/DU6) would be implemented to redirect flow and would be paid for by CFAC. If drinking water wells were impacted (again, not anticipated), EPA will investigate next steps and whether additional financial assurance would be required.

The institutional controls for the site will prevent residential development on portions of the site in perpetuity and will not be impacted by any local zoning ordinances that may be put in place in the future.

2.9 Frequency of Groundwater Pumping

2.9.1 Public Comments

Seven comments were received from three individuals and CBF (#134) that addressed the frequency of pumping from DU1.

- **Comments 106A, 123C, 130B, and 134AL.** "3. Has EPA considered that pumping should be done more frequently than "seasonal" as ground water accumulates and gathers contaminants from the compromised soils? Given the high hydraulic conductivity of the area, inevitably groundwater will accumulate increasing potential for slurry wall compromise.

- **Comments 106C, 123I, and 134R. "**9. How will the proposed plan accommodate the necessity of contaminated water being removed in the initial phase prior to, during, and after the construction of the slurry wall? As EPA states on page 15 of the Proposed Plan for Cleanup, "lessening the migration of contaminants from the source area would reduce the rate of contaminant loading to the hydrogeologic system." Does this mean just following the construction of the slurry wall or during the other phases, as mentioned above?"

2.9.2 EPA Response

Modified Alternative 4A (EPA's Preferred Alternative for DU1/DU6) includes interior wells that will initially be used for monitoring. If the slurry wall is not effective in stopping migration of the groundwater plume, these interior wells will then be used to extract groundwater for treatment. If treatment is determined to be necessary, it would be seasonal and would require much less groundwater to be treated compared to downgradient extraction alternatives. Should groundwater extraction be necessary, an appropriate treatment system will be designed and constructed. Groundwater extraction flowrates will be driven by well specific capacity and the flowrates required to meet the remedial action objectives.

Water generated from dewatering or stormwater management activities during the preliminary design investigation or remedial action will be handled in accordance with applicable state and federal regulations. This may include off-site disposal or onsite treatment so that arsenic, cyanide, and fluoride concentrations are below groundwater and surface water performance standards, and then discharged.

EPA anticipates that under the Preferred Alternative for DU1/DU6 any potential groundwater extraction from within the slurry wall would lessen the migration of contaminants from the source area and reduce the rate of contaminant loading to the hydrogeologic system.

2.10 Groundwater Treatment

2.10.1 Public Comments

Eight comments were received from six individuals, the TASC (#1), and CBF (#134) that addressed the treatment of extracted groundwater.

- **Comment 1I.** "5. The Proposed Plan's Preferred Alternative LDU1/GW-4A states that the proposed interior wells within the containment cell could be used to dewater the groundwater accumulating within the cell. The Proposed Plan states that these wells will pump water to maintain an inward gradient. The extracted groundwater would be treated and discharged and will be managed with the construction of a groundwater treatment facility and infiltration basins. It is not clear how these additional features (as part of the modified Alternative 4A) will be accommodated within the footprint of the proposed containment cell. In addition, it is important that the treatment facility and infiltration basins be designed to effectively contain the potentially contaminated groundwater, and not create a new source of concern. The community may want to ask EPA to expand the discussion of how the pumped water will be managed in order to eliminate any potential concern regarding the release of contaminated water."

- **Comment 16E.** "5. The EPA needs to expand the discussion on how the pump water will be managed to eliminate any potential concerns regarding the release of contaminated water."
- **Comment 47A.** "The plan's preferred alternative LDUI/GW-4A calls for interior wells that would pump accumulating groundwater to maintain an inward gradient. It calls for the water to be treated and discharged by way of a groundwater treatment facility and filtration basins. There needs to be a better and/or more thorough explanation of how this possibly contaminated groundwater will be managed so that it does not create an additional source of contamination concern."
- **Comment 53E.** "4) Construct a groundwater treatment facility to treat cyanide, fluoride, and arsenic, with infiltration basins for discharge of treated effluent back to groundwater. The facility will be used during construction of the slurry wall for dewatering and will be retained for use after construction is completed. If pumping is needed because groundwater elevations in the interior and downgradient monitoring wells indicate that the slurry wall is not performing as designed, the groundwater extracted from the interior of the slurry wall will be treated and then discharged into infiltration basins. Groundwater extraction is an excellent idea, but any pumped water needs to be managed in such a way as to eliminate any potential concern regarding the release of contaminated water back into the system. There is stated concern from the EPA "relating to the treatment of cyanide, fluoride, and arsenic in groundwater" (page 22 Proposed Plan of Cleanup). If the groundwater treatment facilities and infiltration basins cannot be designed to effectively contain and neutralize the contamination, then Permeable Reactive Barriers should also be installed down gradient of the fully encompassing slurry walls to help with the treatment of cyanide where the plume concentrations exceed the preliminary remedial goal of 200 µg/l. Why was this remediation option not considered along with the preferred alternative? Seeing the effectiveness and efficacy of the PRB treatment, will the EPA consider it? If not, why not?

  Additionally, groundwater monitoring efforts should be increased to a quarterly basis until such a time as the groundwater quality patterns are established and understood. This data should be given to the public in a timely manner to be reviewed as often as data is collected and analyzed by EPA officials. Will the EPA commit to monitoring these wells on a quarterly basis? Will the EPA provide this data to the public to peruse and provide comment on in a timely manner? Will you allow certain members of the public participating in this Proposed Plan for Cleanup commentary session to partake in the initial data review alongside the EPA team? If not, why not?

Lastly, discharged water should be diverted to wetlands for bioremediation. These plants can later be analyzed as part of the ongoing monitoring and assessment. Will the EPA commit to wetland and bioremediation to supplement the infiltration basin treatments?"

- **Comments 106A, 123E, 130D, and 134AN.** "5. Has EPA considered how to treat any contaminated groundwater that occurs from the above mentioned diversion of groundwater?"

2.10.2 EPA Response

Pumping and treatment of groundwater interior to the slurry wall is both a short-term measure for use during construction and a long-term component of the Selected Remedy. The location of additional monitoring/extraction wells was not provided in the Proposed Plan but will be determined during the remedial design.

Several technologies for treating arsenic, cyanide and fluoride concentrations in groundwater were identified in the FS (Roux 2021a) and summarized in the Proposed Plan (EPA 2023a) and in this ROD. The technologies to treat contaminated groundwater will be determined during remedial design. Multiple treatment technologies may be used, as each contaminant of concern has different chemical properties that may not overlap with respect to treatment technologies, as was discussed in detail in the FS. Regardless, treated groundwater must meet the applicable performance standards identified in this ROD before it can be discharged into the environment.

The groundwater treatment facility and infiltration basins will <u>not</u> be located within the footprint of West Landfill/Wet Scrubber Sludge Pond containment area. Interior groundwater will be pumped and piped to a nearby location, as determined during the remedial design. Presently, the preferred location for the groundwater treatment facilities and infiltration basins is southeast of the containment area, not towards the western undisturbed portion of the Site. The treatment facility will likely consist of holding tanks or lined ponds for the captured groundwater, the treatment facility itself (either a permanent building or a mobile unit), and then piping to a discharge location for the clean, treated groundwater. If lined holding ponds are used, measures will be taken to ensure that wildlife contact with the impacted waters will not occur. Discharge points may include infiltration basins and constructed wetlands. All these details, including treatment technologies, will be determined during remedial design. The remedial design may require treatability studies to determine the best way to treat this water and may include bench-scale studies and pilot tests prior to remedial action construction of the slurry wall.

If pumping and treating of captured interior groundwater with the slurry wall is necessary, it is expected that this will occur seasonally during the summer/early fall months sporadically. Onsite personnel will be managing the operations and will conduct necessary inspections and maintenance to ensure that there are no releases to the environment, under EPA/DEQ oversight.

EPA will continue to engage the public throughout the remedial design and subsequent remedial action, as discussed in Section 2.24.

2.11 Landfill Design

2.11.1 Public Comments

Seven comments were received from two individuals and CFAC (#135) asking for information about the existing landfills and potential changes to those landfills.

- **Comment 53B.** "According to the Proposed Plan for Cleanup, the remedy would:

  1) Construct low-permeability caps on the Wet Scrubber Sludge Pond and Center Landfill and maintain the West Landfill cap.

  However, the plan does not guarantee the current cap at the West Landfill will be inspected and mitigated for structural and functional integrity. As these caps are prone to wear over time and have a limited effective shelf life, a compromised cap can lead to water infiltrating the contaminated zone and leach contaminated groundwater into other areas down gradient. Will the EPA ensure the current cap is 100% effective in preventing surface water from entering the slurry containment structure surrounding the West Landfill and Wet Scrubber Sludge Pond for the lifetime of the cleanup process? Will the EPA ensure the cap is frequently monitored, repaired, and secured in such a way as to maintain its efficacy for the lifetime of the cleanup?

  How will the EPA ensure that the installation and maintenance of additional caps at the Wet Scrubber Pond and Center Landfill include features to control sources of water that may erode and compromise the caps? Will the EPA design the caps to include contingency plans to prolong the life and efficacy of the caps? Will often will these caps be monitored?"

- **Comment 53I.** "Further Modification Requests to the EPA's modified Alternative 4A:

  Along with the EPA's preferred remediation plan (modified 4A) for DU1, soil excavation at the West Landfill and at the Wet Scrubber Pond should also be strongly considered as it is with the preferred plans for DU3 and DU4. The EPA's main argument for not utilizing this option is stated on page 25 of Evaluation of Alternatives as "the potential for adverse impacts to human health and the environment during the remedial action implementation that limit its short term effectiveness". While this is thoughtful to consider the health of the professional workers who are highly trained in dealing with contamination, the cancer risk to residents if the soils were to remain in place are 2:10,000 (pg7 Proposed Plan for Cleanup), while the risk to workers is only 1:100,000 – an order of magnitude less. What about the residents currently (or sadly, formerly) exposed to these contaminants?? How is their risk of exposure not deemed important enough for this basic remediation strategy to be utilized? Why has the EPA not considered the long term health of the local residents as being vastly more important than profit? Why has the community's needs and fears so easily been cast aside?"

- **Comment 53K.** "In short, we, the community of Columbia Falls, MT. humbly ask the EPA to carry along with their Preferred Plan (Modified A4 for Decision Unit 1) with the following additions:

  1) Ensure all current low permeability caps are fully functional and all existing and future caps can stand the test of time"

- **Comment 53M.** "3) Excavate the contaminated soils under the West Landfill and Wet Scrubber Sludge Pond."

- **Comment 132E.** "How resilient are the walls and cap against degradation or penetration, either by natural or human-contrived means?"

- **Comment 132H.** "How impregnable is the surface cap to deterioration or degradation resulting in vertical leaching drawing the toxics into the free groundwater system?"

- **Comment 135AC.** "Comment 17: Page 10 – Evaluation and Elimination of Off-Site Disposal. In addition to EPA's numerous reasons for screening out Off-Site Disposal, as discussed in comment 3(d)(i), percolation of water through landfilled waste can lead to generation of landfill leachate and groundwater contamination. Thus, if the West Landfill cap were to be removed for excavation of the underlying waste, there would be an increase in infiltration of precipitation through the waste and an increased generation of leachate and contaminant migration to groundwater. As discussed in Section 7.1.2 of the FS, this "would likely result in an increase in concentrations of COCs downgradient of the Landfills DU1, both within and potentially beyond the current extent of the plume, in contravention of RAOs and non-degradation ARARs"."

2.11.2 EPA Response

Capping places a cover (a cap) over contaminated materials to isolate them and keep them in place. Caps also prevent people and wildlife from contacting contaminants. Caps stop rain and snowmelt from seeping through contaminated material and into the groundwater. Caps keep stormwater runoff from carrying contaminated material off-site or into lakes and streams or from infiltrating the landfill, and they prevent wind from blowing contaminated material off-site.

Capping technology is standardized and effective. When properly built and maintained, a cap will continue to isolate contamination as long as it does not erode or develop cracks or holes that allow water to reach the contaminated material. Regular inspections ensure that weather, plant roots, and human activity have not damaged the cap. Groundwater monitoring wells are placed around the capped area and sampled to help determine if leaks occur.

The effectiveness of the constructed landfill caps will be monitored for the duration of the remedy, and any potential containment deficiencies identified during routine monitoring will be addressed. Stormwater management and sustainability will be a component of the remedial designs. These are all details that will be addressed in the design phase.

As for excavating the contaminated soil in DU1/DU6, the potential for adverse impacts to human health and the environment associated with excavation of the West Landfill and the Wet Scrubber sludge pond are one of many factors that caused Alternative 6 (excavation and on-site consolidation) to score lower than other alternatives. Superfund also requires that the Selected Remedy be cost-effective and proportional to overall effectiveness (see response 2.1.2). Alternative 6 does not meet this requirement.

The risks summarized on page 7 of the Proposed Plan are the potential number of excess lifetime cancers for a given group that might result from prolonged exposure to contaminants at these locations under EXISTING conditions and exposure pathways. They do NOT apply to post-cleanup risks. Remedial action objectives and remedial goals were developed for the site to address human health and ecological risks identified in the risk assessments. Cleanup will effectively break the exposure pathways by using caps to isolate contaminated soils and institutional controls to prevent the use of contaminated groundwater as drinking water. The slurry wall will reduce the contribution of contaminants that results from contact between the source and groundwater during periods of high water, which will result in decreasing concentrations in the plume over time.

EPA agrees that there would be increased generation of leachate and increases in groundwater contamination if an alternative that included excavation of the landfilled waste materials were selected.

2.12 Land Use and Reuse

2.12.1 Public Comments

Eight comments were received from five individuals, the TASC (#1), and CBF (#134) that addressed land use at the site.

- **Comment 1U.** "17. The Proposed Plan indicates that "Local authorities have not adopted a future land use plan for the site. In the absence of a definitive local plan, the feasibility study identifies potential future uses such as commercial, industrial, and recreational" (Proposed Plan pdf page 4). A portion of the site area will remain light commercial/industrial use. The eventual uses of other areas (outside of remedied features) will be determined within the purview of local permitting and zoning authorities, as well as the private property owner. During these forthcoming land use decision processes, it should be acknowledged that management of the water balance within the site is important to maintain in order to ensure the effectiveness of the remedy components. Certain future land uses may interrupt groundwater flow pathways and affect the monitoring results. It seems important to ensure that the future occupants/ businesses are aware of site setting features and the need to avoid disrupting the water balance of the area. The community may want to ask EPA how future land use decisions will accommodate the existing monitoring network in order to be sure this network continues to capture and adequately characterize site conditions."
- **Comment 54GC.** "8. Make a goal for this ROD document that the county with CFAC support will immediately zone the 960 acres superfund site as either Recreational, Industrial/Commercial, or Undeveloped land."
- **Comments 106K, 123Q, and 134AZ.** "17. How will EPA ensure that future land use decisions accommodate the existing monitoring network in order to be sure this network continues to capture and adequately characterize site conditions?"
- **Comment 121C.** "*Keep people out – do not develop it."
- **Comment 128C.** "Furthermore, the main CFAC Plant property is being considered for business development. The remaining buildings may be used, as well as the former potline property. However, the demolition company was allowed to leave the concrete potline basements, thousands of feet of utility tunnels, underground water & sewer lines, the 80 foot

deep rail car ore unloading pit, the rectifier room basements, etc. Gravel was just dumped into the potlines. From April to July each year, these areas have leeched-in, polluted ground water. The water eventually subsides, leaving chemical residue. The water is always visible, through the holes, in the exposed, thick concrete rectifier room floors. Glencore/CFAC proposes to do almost nothing, to address the massive mountains of buried potliner. Located far to the North, of the main Plant. The West side, of these huge hills, is where I discovered what I considered to be the worst pollution. I sustained chemical burns, on my left hand, from the water samples. The chemical plume moved further outward, each year."

- **Comment 134Q.** "16) Environmental Protection Agency Administrator Andrew Wheeler and Sen. Steve Daines, attended a July 24, 2020, browns field tour of the Glacier Rail Park north of Kalispell, Mont., which was once a stone quarry. The city of Kalispell has received about $2 million or more since then in EPA funding to put former industrial sites back to work. The article in the Daily Inter Lake reporting this event said nothing about progress in cleaning up the former Anaconda Aluminum Co. smelter about 15 miles away in Columbia Falls, Mont. or putting that site back to work. How is this clean-up plan for the CFAC site including plans and funding to put this cleaned up site back into use?"

2.12.2 EPA Response

The site owner (CFAC) has indicated that they may wish to sell the former plant site (excluding the landfills) to developers for light commercial/industrial use. During remedial design, potential site institutional controls will be evaluated by EPA, DEQ, and CFAC, and those selected for implementation will be summarized in an institutional controls implementation and assurance plan, as identified in Section 12, Selected Remedy, of Part II of this ROD.

As noted in Section 12, potential institutional controls to control groundwater use at the site include deed restrictions to prohibit the use of groundwater for drinking water and establishment of a controlled groundwater area administered by the Montana Department of Natural Resources and Conservation to prevent use of contaminated groundwater. The plan will include a discussion on the process for site redevelopment, including the need for developing an alternative water supply.

Regardless of which institutional controls are selected for groundwater restrictions, measures will be implemented to preserve the existing and future monitoring network and restrict groundwater pumping that would cause groundwater flow patterns to change. These measures will be evaluated and selected during remedial design.

EPA is not a land use entity and does not have the authority under CERCLA to make decisions about land use, including for unimpacted portions of a site, like the undeveloped areas west and north of the former plant. EPA cannot change zoning; rather, EPA's role is to ensure any use of property is protective of human health and the environment. Regarding the former plant site, EPA prioritizes redevelopment of Superfund sites once cleanup is completed to get formerly contaminated lands back into productive use and will work with future developers to ensure that any development is compatible with and protects the remedy. Following remedial action construction completion and verification that the site is now protective, EPA may conduct a Ready for Reuse Determination to certify that a property is ready for redevelopment or other land use.

One of the comments suggests that demolition of the pot room building complex left potliner buried in the ground. This is incorrect. Calbag Resources LLC, the demolition company, removed all spent potliner from the building and disposed it at the Arlington, Oregon licensed hazardous waste landfill per their June 2016 Final Waste Management Plan and Schedule for Building 1 of the Columbia Falls Aluminum Company under the oversight of DEQ. Materials were tested under this plan and disposed of or recycled based on the analytical results. Calbag was paid to remove and dispose of the waste and would have no financial incentive to leave potliner behind.

2.13 Miscellaneous Design Details

2.13.1 Public Comments

Eight comments were received from one individual that asked for a variety of details about the Preferred Alternative as presented in the Proposed Plan.

- **Comments 54FL through 54FS.**

"1. Why don't you reconfigure your slurry wall to fit the dump at 60 feet deep and forget about pushing the envelope of doability at 100 to 150 feet below the dump surface.

2. How about surveying what is in the dumps so you can run pilot plant studies for a couple of years before you pick a ground water treatment technology(s)?

3. Build the new repository above the ground surface (CAMU) instead of burying it in a new inaccessible hole?

4. Tell us what the increases in water volume and toxicity of the new chemicals will be.

5. How many complete chemical trains will have to be housed on-site in multiple buildings to clean the water?

6. Will you include funds to decommission and clean up all the new buildings and chemical trains?

7. How many gallons/minute are flowing in the plume you have identified in both low and high ground water scenarios?

8. How many miles of fence and total acres of land will be cordoned off for sure to protect from site access? Acreage to be semi-permanent loss?"

2.13.2 EPA Response

The Selected Remedy for DU1/Groundwater is described in detail in Section 12.2.1 of Part II of the ROD. The fully encapsulating slurry wall needs to key into the low-permeability glacial till layer which soil boring data indicates is 100 to 125 feet below ground surface in order to cut off groundwater flow in the vicinity of the West Landfill and the Wet Scrubber Sludge Pond. A 60-foot-deep slurry wall would not accomplish this objective.

Bench-scale treatability studies will be performed during remedial design to determine the most effective groundwater treatment technology that will meet groundwater performance standards.

This technology will be determined using the contaminated groundwater downgradient from the West Landfill and the Wet Scrubber Sludge Pond. There is no need to determine the contents of these waste disposal units.

Alternative DU1/GW-6 Excavation with Onsite Consolidation was evaluated in the FS (Roux 2021a) and is discussed in Section 9.1.1 of Part II of the ROD.

It is unclear what the commentor is referring to by "new chemicals." Groundwater, sediment, and soil samples were analyzed for a full suite of hazardous substances required by CERCLA, as well as general chemistry. This includes: 51 volatile organic compounds, 69 semi-volatile organic compounds, 21 pesticides, 19 polychlorinated biphenyls (PCBs), 23 Target Analyte List metals, and 3 inorganic compounds (pH, fluoride, phosphorous).

Arsenic, cyanide, and fluoride were identified as contaminants of concern in groundwater. The fully encompassing slurry wall will be designed to minimize the volume of groundwater within the containment cell. Similarly, it is unclear what the commentor is referring to by "chemical trains." Water treatment requirements, including infrastructure, will be determined during remedial design.

PRPs are required to provide financial assurance under CERCLA, as discussed in Section 2.8.

Results from slug testing monitoring wells during the RI indicate the geometric mean estimated hydraulic conductivity of the upper hydrogeologic unit is 11 feet per day.

The FS estimated that it would take 14,264 feet of fencing around the perimeter of the landfills. The estimated total acreage of the landfills (DU1 and DU2) is 42.2 acres. The exact acreage to fence off will be determined during remedial design.

2.14 Modeling

2.14.1 Public Comments

Five comments were received from Atlantic Richfield (#49) and one individual regarding the modeling done as part of the FS (Roux 2021a) for the remedy.

- **Comment 49N.** "3. The batch flushing model in the draft CFAC FS was overly simplistic. The draft CFAC FS includes a simplistic two-dimensional (2-D) batch flushing model to estimate the time required to meet the RAO criteria. This model is comprised of a three-part calculation (Roux 2020c, Appendix A, at p. 15):

    1. Estimate pipe flow (i.e., "the number of pore volumes (PV) of groundwater that must flow through the aquifer in order to reduce the initial contaminant concentration to the RAO concentration")

    2. Estimate flushing time (i.e., "the time required for groundwater to traverse the length of contamination…")

    3. "Estimate the time duration for the required number of [PVs] to flow through the aquifer."

The 2-D model makes several critical flawed assumptions, which lead to unreliable estimates of 35 to 60 years for MNA to achieve 5.2 µg/L total cyanide surface water concentrations at the seep after installation of the slurry wall. Key assumptions applied to the model include the use of average concentrations, average coefficients, and a distance value based on a feature boundary. Further, the model and these assumptions should have been evaluated in a sensitivity analysis.

The 2-D model uses a straight-line flow path from the southern boundary of the WSSP to the seep/river. This assumption is incorrect for two reasons: 1) the actual flow path should have originated at the upgradient wells with the highest cyanide concentrations6, and 2) groundwater follows a tortuous and curvilinear path because of differential permeability in the upper hydrogeologic zone across the site. Wells with the highest cyanide concentrations are approximately 500 ft north of the southern boundary of the WSSP, and outside of the western border of the West Landfill. If the flow path starting point had been correctly located at those wells, the flow path length would be 4,000 ft instead of 3,500 ft. Using 4,000 ft in the 2-D model for Scenario 2 presented in FS Tables A-5 and A-7 (Roux 2020c, Appendix A, Table A-5, at p. 17,) increases the range of values for T (the years to reduce the contaminant level from Ci to Cs due to flushing alone) from 36–60 years to 41–68 years. Similar to the flow path employed in the 2-D model, the use of average chemical concentrations is not appropriate for this evaluation. The use of site average concentrations is uncommon in these types of groundwater models, and more conservative approaches are typically applied.

The wells with the highest cyanide concentrations were sampled six times between September 2016 and October 2018 (Roux 2019, Appendix AA4). The highest concentrations were 8,120 (CFMW-015, sampled June 27, 2017) and 11,500 µg/L (CFMW-012, sampled October 3, 2018) for total and dissolved fractions, respectively. Substituting these concentrations into the batch flushing model, and applying the 4,000 ft flow path, extends the maximum time for achievement of cleanup criteria to between 77 and 81 years, respectively. Thus, one of the key considerations in the FS for scoring the highest scoring Alternative LDU1-GW-4A—the estimated time to reach the DEQ-7 cyanide criterion at the seep discharge (i.e., RAOs)—is significantly underestimated.

Notwithstanding the absence of source area sampling results, the RI dataset includes the following data streams, which support the use of a more robust 3-D model:

- Good distribution of wells penetrating the upper aquifer and below the upper aquifer throughout the site, with the exception of wells in the West Landfill and WSSP.
- Seasonal groundwater data over six sampling events across two years for water quality parameters and groundwater elevation.
- Characterization data for subsurface soil and geology.

Given the amount and diversity of groundwater and subsurface data, and the technical nature of the draft CFAC FS conclusions, it would have been more appropriate to employ a 3-D model. Data related to the characterization of subsurface soil and geology would allow for sitewide evaluations of coefficients like porosity, permeability, and organic content.

Specificity in the model as it pertains to these coefficients is a more robust method than using average values for the entire site.

The draft CFAC FS should have implemented a 3-D modeling effort like that used in Zheng et al. (1991), which was the reference for the batch flushing model described in the draft CFAC FS. Zheng et al. (1991) used a particle tracking model coupled to flow model, with the batch flushing model at the Lone Pine Landfill site in Freehold Township, New Jersey.

The 3-D model was used to simulate existing groundwater flow conditions at the Lone Pine Landfill site. The flow simulation was needed to provide the head solution for the particle tracking calculations and to provide estimates of the amount of flow required for treatment. The model results achieved in Zheng et al. (1991) provide a more realistic evaluation of site groundwater flow conditions applying the tortuous and curvilinear path method through the subsurface, rather than a linear path like that used in the draft CFAC FS. At complex sites, 3-D modeling is routinely used to assess groundwater conditions. A 3-D model should have been implemented at the CFAC site to leverage the available data streams and derive realistic scenarios.

A 3-D model like the one used by Zheng et al. (1991) would have been useful in evaluating the various attenuation processes such as biodegradation, sorption, dispersion and dilution along the subsurface flow path from the potential source area to the river. In addition, 3-D model outputs would have allowed for a better understanding of the subsurface flow paths and velocities at the CFAC site. The draft CFAC FS batch flushing model used the shortest, linear flow paths with no evaluation of attenuation or dispersive processes. Furthermore, the key assumptions applied to the batch model include the use of average concentrations, average coefficients, and a distance value based on a feature boundary. These assumptions lead to questionable estimations of velocity and flushing volumes. With no sensitivity analysis on these batch flushing calculations, there is uncertainty in determining when RAOs will actually be achieved.

Again, the estimated timeframe for achieving RAOs is a key consideration in scoring remedial alternatives. Proper modeling would have shown that the time to achieve RAOs for the highest scoring Alternative LDU-1/GW-4A is significantly greater than estimated in the draft CFAC FS."

- **Comment 132A.** "Regarding the CFAC Superfund site, I am concerned about the longevity and long term affects of the proposed cap and semi-seal solution... Is there any analysis of the correctness of the modeling which is used to substantiate the claims of sufficiency of this solution?"

- **Comment 132C.** "How often does the model predict that groundwater will rise to a height which intersects the contaminated soil? Has this model been verified against site-specific historical data for accuracy?"

- **Comment 132D.** "Have you taken climate change into account in modeling the long term stability of the solution?"

- **Comment 132I.** "Has the system been modeled with earthquakes in mind?"

2.14.2 EPA Response

EPA and DEQ view the batch flushing model presented in Appendix A of the FS (Roux 2021a) as a simple means to compare the effectiveness of the remedial alternatives selected for detailed analysis in achieving the cyanide performance standard at the point of compliance, not as a prediction of when the standard will be achieved. FS Appendix A documents the model's limitations. These limitations apply to all scenarios, including source controls. The batch flushing model was sufficient for providing orders of magnitude level estimates of the time to compare source control to achieve groundwater and surface water RAOs, and downgradient hydraulic containment or in situ treatment to achieve surface water RAOs. EPA and DEQ also note that the model results were only one factor among several used to rank the effectiveness of the alternatives.

The capping alternatives all included monitoring and maintenance of the cap. This typically involves annual inspections which may recommend maintenance such as repair of erosion or weed spraying. Groundwater and surface water monitoring will be conducted to evaluate the success of the remedy at attaining remedial goals. Additionally, the entire remedy is reviewed for effectiveness every five years. If the remedy is not meeting performance objectives, evaluations of further action or change in operations and maintenance will be considered and implemented if warranted.

Based on Section 5.2.1 of the RI report (Roux 2020a), the bottom of the West Landfill is approximately 35 feet below the surrounding grade and the highest water level observed was approximately 35.5 feet below grade. The future high-water elevations were not modeled, but the data suggest that it is possible for the base of the West Landfill to intersect groundwater during future high groundwater conditions. The Center and East landfills were constructed above grade and substantially above the high-water elevation in this area. The South Percolation Ponds were in close proximity to groundwater but have been addressed by a removal action. No other areas of the site are expected to have groundwater potentially in contact with waste.

Potential effects of climate change on the remedy were not considered in the FS because the remedy is largely a waste isolation and groundwater control remedy. Climate change would have no effect on waste isolation. Groundwater levels could potentially be affected by climate change, but the year-to-year variation that has already been considered and factored into the model is expected to be much greater than any additional long-term changes. Long-term monitoring and the five-year review process will assess the effectiveness of the remedy and, if performance is not as expected, the cause(s) will be determined and addressed as needed.

No new structures or impoundments will be constructed, and earthquake stability was not a factor in alternative analysis. Remedial design will consider stability of any constructed features and be addressed as a part of the design process.

2.15 Monitoring – Drinking Water

2.15.1 Public Comments

Eleven comments were received from seven individuals, the TASC (#1), Montana DPHHS (#110), and CBF (#134) regarding the need to continue testing of the private drinking water wells in Aluminum City. Montana DPHHS also requested that certain parameters be added to the list of analytes currently reported.

- **Comment 1M.** "9. The Proposed Plan says that building the containment cell around the West Landfill and Wet Scrubber Pond will prevent future contaminant migration. It is not clear if the existing groundwater plume will create any human health or environmental concerns. It is assumed that continuous monitoring will help verify that the plume will not create a concern. This indicates that monitoring of key exposure pathways will be ongoing to verify this conclusion (such as monitoring of private residential wells). The document does not mention if drinking water monitoring will continue during remedy development, design and implementation. The community may want to ask EPA how the existing plume is to be addressed through monitoring to ensure that risk to human health is controlled, and if this monitoring will include sampling of private residential drinking water wells."
- **Comment 11G.** "7. Need to have EPA get an agreement just how long time wise, and frequency of well testing in Aluminum City...for the sanity and safety of those neighbors."
- **Comment 16K. "**We would also like to see more well monitoring from wells west of Highway 486, the North Fork Road."
- **Comment 47D.** "As well as soil testing, I want the well testing that has been ongoing (originally four time a year, now twice a year) continued into the future at least four times a year, to assure safe drinking water."
- **Comment 87E.** "Will the EPA continue indefinitely to monitor to assure human health is controlled and will the EPA continue to monitor private residential drinking wells?"
- **Comments 106H, 123N, and 134AW.** "14. Will the existing groundwater plume be monitored on a quarterly basis long-term in order to detect any human health or environmental concerns, such as sampling of private residential drinking water wells and sampling of water, soil, invertebrate, and macrophytes for contamination of arsenic, fluoride, and cyanide?"
- **Comment 110C.** "2. Regarding groundwater performance monitoring for Groundwater Decision Unit (DU) 6, DPHHS believes it is important to monitor nitrate, nitrite, and manganese as these analytes have been detected at elevated levels in onsite groundwater. Infants' exposures to elevated nitrates and nitrites can cause methemoglobinemia (blue baby syndrome due to insufficient oxygen uptake from the blood) and manganese exposure at high levels may affect early brain development. DPHHS also recommends that proper sampling and analytical methods be used in future monitoring to measure nitrate and nitrite separately. Combined concentrations of nitrate and nitrite based on total nitrogen were measured and reported in past site sampling events. This creates challenges for human health risk assessment as nitrate and nitrite have drastically different toxicities and combined concentrations would cause substantial uncertainties in risk conclusions."
- **Comment 110E.** "4. DPHHS emphasizes the need to continue long-term monitoring of private residential wells in Aluminum City to ensure that residents are not exposed to site contaminants in the event of potentially ineffective remedy or changes in groundwater flow pathways."

- **Comment 115B.** "Groundwater monitoring needs to be stepped up, both in intervals between testing and in number of test locations. We own a house in Aluminum City …The only drinking water available is a well. Our daughter lives there….. We had her well tested at our expense before we bought the house. Ours and all other nearby wells should be tested at CFAC expense on a regular basis and notifications made to area residents about any contaminants, not just those above current drinking water standards. Regular updates on ALL groundwater testing should be provided to all neighbors."

2.15.2 EPA Response

In 2013, EPA collected groundwater samples from five residential wells near the site as part of the site reassessment investigation. The EPA Site Reassessment Report, dated April 2014, documented that cyanide was detected in samples obtained from two domestic wells (one in Aluminum City at a concentration of 111 μg/L and one north of the site near Cedar Reservoir at a concentration of 18.5 μg/L) that exceeded the EPA human health tapwater residential screening level, but were below the EPA maximum concentration level of 200 μg/L. Only one well was able to be re-sampled, and the result was non-detect.

In 2014, two rounds of residential well sampling were conducted, with no detection of cyanide in any residential wells. Twenty residential water wells were sampled in April 2014, and 10 wells were sampled in November 2014 by EPA. In 2015, nine wells were sampled in June and 10 wells were sampled by CFAC in September. Cyanide again was not detected in any samples.

The 2015 sampling marked the beginning of a voluntary residential well sampling program conducted by CFAC for any Aluminum City resident who wanted their well to be tested. This sampling has been conducted by Hydrometrics, Inc., a local environmental firm, under contract to CFAC. Hydrometrics has sampled residential wells in Aluminum City on a quarterly basis from 2016 to 2018 and on a twice-yearly basis from 2019 to present. The samples are analyzed for cyanide and fluoride, the two primary COCs in groundwater at the site. After each sampling event, Hydrometrics provides the well owners with a report of the sampling results. In order to maintain privacy, the reports do not indicate the owner's name or address but use a coding system that allows each owner to identify the results that correspond to their well.

To date, cyanide has not been detected in any of the residential well samples that were sampled under the voluntary program. The typical detection limit for cyanide has been 10 μg/L, which is below the EPA and DEQ drinking water standard of 200 μg/L. Fluoride (a naturally occurring constituent in groundwater) concentrations have ranged from non-detect to a maximum of 280 μg/L and in all instances were below the EPA and DEQ drinking water standard of 4,000 μg/L.

Results of the RI (Roux 2020a) indicated that the direction of groundwater flow beneath the site is primarily to the south towards the Flathead River and not westward towards Aluminum City. The western edge of the groundwater contaminant plume beneath the site is approximately one-half mile east of Aluminum City. Based on these findings, EPA will require continued monitoring at the western edge of the groundwater plume under the long-term groundwater monitoring plan to verify that contaminated groundwater remains on-site and does not migrate towards Aluminum City. Monitoring will continue until groundwater performance standards are achieved at designated points of compliance. These monitoring wells will serve as "sentinels" in the unlikely event that the plume begins migrating towards Aluminum City. This is a far more effective approach than monitoring the residential wells at Aluminum City, as corrective actions can be taken if plume migration is detected. Contaminant detection in Aluminum City means that the plume has already migrated the half mile distance from the site when corrective actions could have been taken place earlier.

CFAC has indicated that they are willing to continue testing of Aluminum City residential wells to all residents who wish to participate in the voluntary program. As there are no detections of cyanide in Aluminum City residential wells and fluoride concentrations are consistent with background concentrations in local groundwater, it is not necessary to expand domestic well sampling west of the North Fork Road.

Groundwater monitoring parameters and frequency will be evaluated and determined during remedial design. Long-term groundwater monitoring will likely include performance monitoring to evaluate the effectiveness of the remedy, compliance monitoring to determine when groundwater remedial action goals have been achieved at designated points of compliance, and five-year review monitoring to evaluate the protectiveness of the remedy. Nitrite and nitrate analysis would be considered under five-year review monitoring. Continuous monitoring of groundwater elevations in select monitoring wells during the RI indicated that semi-annual monitoring (high and low water table conditions) adequately characterizes the hydrogeologic regime at the site.

2.16 Monitoring – DU5

2.16.1 Public Comments

Seven comments were received from four individuals, the TASC (#1), and CBF (#134) regarding proposed monitoring in DU5.

- **Comment 1R.** "14. A review of the proposed River Area Decision Unit monitoring yielded several concerns. The proposed sampling seems to be minimal and focused strictly on surface water and porewater quality during high and low flow conditions (June and October). TASC recommends the following additional monitoring considerations for the river monitoring:

    - Future monitoring within the river should be designed to evaluate surface water quality, porewater quality, biological health and sediment quality above, within and below the river segment potentially impacted by CFAC contamination. It is recommended that co-located measures of surface water, porewater, sediment and biological health be collected on a quarterly basis to observe any changes attributable to the combined remedy actions on site.

    - Seep water quality within the River Area Decision Unit would provide compelling information to determine the effectiveness of groundwater remediation. The Proposed Plan does not mention if backwater seeps will be sampled as part of the performance monitoring.

    - Historic sludge wastes contained calcium fluoride, calcium oxide, magnesium oxide, sodium oxide and iron oxide. Calcium, magnesium and sodium are common elements of minimal concern, however they lend to water hardness (the simple definition of water hardness is the amount of dissolved calcium and magnesium in the water [USGS 2018]). Hardness can act as a buffer that helps diminish metals toxicity to aquatic life, however high hardness can also be toxic. It seems important to monitor surface water quality for hardness above, within and below the river segment potentially impacted by CFAC.

The community may want to ask EPA if monitoring within the river could include co-located sampling of surface water, porewater, sediment and biological measurements from locations above, within and below the segment of river that may be impacted by CFAC."

- **Comment 1S.** "15. The preferred alternative for the River Area Decision Unit is designed to focus on surface water and porewater quality. These two media are the most important media that will reflect impacts attributable to groundwater seepage into the river. However, it should be noted that sediment quality and biological measurements are also very important in monitoring and can assist in determining the effectiveness of a remedy as follows:

  - Sediment can act as an absorptive media of contaminants, and can accumulate contaminants in the organic layer of the sediment particles. While this process provides a buffer by taking contamination out of solution (surface water or porewater) the sediment itself can become toxic over time. It may be important to include bulk sediment (solids) measurements for contaminant content as an additional monitoring parameter for the preferred alternative monitoring.

  - Wildlife is an important and valuable resource to the community. Aquatic life in the river is a very important and valuable resource as well. The health of the existing ecosystem is reflected in the biology and can be measured with the biological monitoring of species such as benthic macroinvertebrates, aquatic plants and fish.

  The community may want to ask EPA if monitoring of river sediment and river aquatic communities could be included as part of the planned monitoring."

- **Comment 16I.** "15. Is monitoring of river sediment and river aquatic communities could be included as part of the planned monitoring?"

- **Comments 106J, 123P, and 134AY.** "16. Will monitoring within the River include co-located sampling of surface water, porewater, sediment and biological measurements from locations above, within and below the segment of River that may be impacted by CFAC? Two of the three tributaries of the Flathead River have been federally designated as Wild and Scenic Rivers. It does not make sense that we protect the tributaries with such designations and then negatively impact the main stem of the River with contaminants. The River includes threatened bull trout and sensitive westslope cutthroat trout and is a popular site for outdoor recreation. What are the specific means in which the human health and environment will be protected?"

- **Comment 130E.** "Has the EPA considered soil testing in conjunction with the plan's water monitoring? Sediment can act as an absorptive media for contaminants, and can accumulate contaminants in the organic layer of the sediment particles."

2.16.2 EPA Response

Monitoring media, parameters, and frequencies at DU5 will be determined during remedial design, based on the needs of each media. They will include surface water and pore water monitoring to evaluate the success of the groundwater remedy. The surface water to be monitored will be the backwater seeps, which are fed by groundwater from beneath the site. Surface water in the Flathead River will not be monitored as the RI (Roux 2020a) demonstrated that water quality in the river is not impacted by the site. EPA does not plan to monitor DU5 sediment, as the sediment that posed a potential ecological risk was removed in the 2022 South Percolation Ponds removal action.

The primary ecological risk at DU5 is from cyanide to benthic organisms through groundwater discharge to the Backwater Seep Sampling Area and monitoring cyanide concentrations in surface water (seeps) and pore water will be the means to determine whether performance standards for the remedy are met.

Groundwater will be monitored twice a year (high- and low-flow conditions). As noted in Section 2.18 Groundwater Monitoring, groundwater elevation monitoring during the RI demonstrated that this semi-annual monitoring is sufficient to characterize site groundwater quality.

Benthic macroinvertebrate assessments could supplement the planned surface water and pore water monitoring and could provide information useful in evaluating temporal trends of remedy effectiveness and overall protectiveness to benthic aquatic life. The need for including benthic macroinvertebrate assessments in the long-term monitoring plan for the site will be evaluated during remedial design.

Sediments were sampled in the Backwater Seep Sampling Area and the Flathead River during the RI. COC concentrations were very low in those samples, indicating that accumulation of contaminants in sediments is not a concern at the site.

2.17 Monitoring – Gas Production

2.17.1 Public Comments

Four comments were received from two individuals, the TASC (#1), and CBF (#134) regarding plans to control and monitor gas production from the West Landfill.

- **Comment 1N.** "10. The Proposed Plan acknowledges that there is a potential risk to human health if the spent pot liner reacts with water to produce toxic and explosive gases. The West Landfill currently encompasses a suite of venting pipes to assist with the control of these gases. While the preferred alternative (LDU1/GW-4A) will be designed to manage the water balance within the containment cell to eliminate contaminated groundwater movement, there is no discussion as to how surface water will be managed proactively in order to continue the control of potential gas production. The existing cap (Proposed Plan pdf page 12) is the only cap feature proposed for the West Landfill (the Proposed Plan says the existing cap will not be modified, which may be due to the importance to not disturb the cap integrity due to the potential presence of unstable waste). In addition, it seems important to include monitoring of gases to be sure the remedy has not affected this contamination concern. The community may want to ask EPA if the preferred alternative to address the landfill and groundwater decision units will include components to control and monitor gas production from the West Landfill area portion of the containment cell area."

- **Comments 106I, 123O, and 134AX.** "15. What components will be included in the preferred alternative to control and monitor gas production from the West Landfill area portion of the containment cell area? The Proposed Plan acknowledges there is a potential risk to human health if the spent pot liner reacts with water to produce toxic and explosive gases."

2.17.2 EPA Response

The West Landfill was capped in 1994 with a synthetic cap that included a gas collection system and vents, as shown in Appendix G1 of the RI report (Roux 2020a). The vents were monitored during the RI for soil gas. Methane was detected at only one location at 0.1% of the lower explosive limit which does not pose a risk of explosion. Volatile organic compounds were detected at two locations at very low levels (CFSGS-006, 0.6 parts per million and CFSGS-005, 0.1 parts per million). As noted in *Section 2.41 Stormwater* the containment area will be designed to maximize the off-cell transport and disposal of surface water and stormwater. The need for soil gas monitoring will be assessed during remedial design and development of long-term inspection, operations, monitoring, and maintenance plans for the site.

2.18 Monitoring – Groundwater

2.18.1 Public Comments

Seven comments were received from five individuals and the TASC (#1) that dealt with groundwater monitoring under the remedial action.

- **Comment 1P.** "12. The groundwater conditions within the CFAC site boundary are very dynamic. Groundwater levels in a single year can vary substantially. The Proposed Plan states that groundwater fluctuated by 25 feet during the remedial investigation in the area near Teakettle Mountain and the Central Landfills Area. For instance, depth to groundwater ranges seasonally from 36 to 87 feet (high- and low-season, respectively) within the West Landfill area, and from 57 to 139 feet in the Center Landfill area. The Proposed Plan indicates that groundwater performance monitoring (Proposed Plan pdf page 13) will occur twice a year in June and October to capture high and low water level conditions, with a potential for annual monitoring thereafter. This seems very limited and can potentially miss seasonal groundwater conditions throughout the site. It seems important to conduct monitoring on a more routine and comprehensive basis until the impacts of the implemented remedy efforts are completely understood. At a minimum, it is recommended that monitoring occur on a quarterly basis. Once trends are established and repeated, then monitoring can be decreased. The community may want to ask EPA if groundwater monitoring efforts can be increased to a quarterly basis until such time as the groundwater quality patterns are established and understood."

- **Comment 8I.** "6) The proposed plan indicates that groundwater performance monitoring will occur twice a year. With groundwater fluctuating 25 feet during remedial investigation, can groundwater monitoring efforts be increased to quarterly basis until groundwater quality patterns are established and understood?"

- **Comment 18B.** "2. Require annual comprehensive monitoring of the CFAC site along with the complete treatment of contaminated groundwater and ponds."

- **Comments 43B and 80B.** "Require more extensive, annual, and comprehensive monitoring of the CFAC site along with the complete treatment of contaminated groundwater and ponds."

- **Comment 53D.** "3) Install eight pairs of extraction/monitoring wells (one within and one outside of the slurry wall) downgradient of the Wet Scrubber Sludge Pond, but interior to the slurry wall, with another series of monitoring wells downgradient of the slurry wall. I appreciate the foresight to incorporate wells to monitor the movement of contaminants. However, according to the Proposed Plan for Cleanup (page 4), the groundwater flow is complicated. Therefore, any network of monitoring and extraction wells must be robust enough to completely capture the movement of water inside and outside of the slurry wall and be able to monitor rising water levels before they get too high, as well as to adequately treat any contaminated groundwater that occurs. The proposed series of wells is not extensive enough to confidentially ascertain the extent of groundwater (and contaminant) movement. Will the EPA ensure its team of experts cuts no corners in this effort? Will the EPA provide more than eight pairs of monitoring wells downgradient of the slurry wall?"

- **Comment 53E.** "Additionally, groundwater monitoring efforts should be increased to a quarterly basis until such a time as the groundwater quality patterns are established and understood. This data should be given to the public in a timely manner to be reviewed as often as data is collected and analyzed by EPA officials. Will the EPA commit to monitoring these wells on a quarterly basis? Will the EPA provide this data to the public to peruse and provide comment on in a timely manner? Will you allow certain members of the public participating in this Proposed Plan for Cleanup commentary session to partake in the initial data review alongside the EPA team? If not, why not? *(extracted from a larger comment with the same ID#)."*

- **Comment 53F.** "5) Implement groundwater, surface water, and sediment pore water performance monitoring of the groundwater plume using existing and newly installed monitoring wells and at seeps and other floodplain areas within River Area DU5. The Preferred Alternative is consistent with EPA's presumptive strategy for landfill sites as containment remedies are preferred over treatment remedies, while extraction and treatment of groundwater is retained if necessary.

  In the case of the Columbia Falls Aluminum Factory Superfund site, containment remedies are not working as satisfactorily as hoped, and groundwater continues to migrate down gradient into precious drinking water and the river. Unfortunately, performance monitoring (otherwise known as "leave it in place to see what happens") is not an aggressive remedy and it needs to be coupled with pumping and treatment options. Performance monitoring also needs to be done on a regular basis, more frequently than "seasonal" in order to better define performance trends. Will the EPA adopt a more aggressive approach and actively pump and treat the groundwater? Will the EPA commit to monitoring these wells on a quarterly basis? Will the EPA provide this data to the public to peruse and provide comment on in a timely manner? Will you allow certain members of the public participating in this Proposed Plan for

Cleanup commentary session to partake in the initial data review alongside the EPA team? *(extracted from a larger comment with the same ID#)."*

- **Comment 53G. "**6) Groundwater monitoring: 30 years or until groundwater quality meets the preliminary remedial goals. This statement should read "30 years or until groundwater quality meets the preliminary remedial goals, whichever is longest". Monitoring should not stop after 30 years if the goals are not met, and monitoring should not stop short of 30 years if during one dry season the goals are briefly met. Additionally, what happens if/when the remedial goals are not met? After how long will you decide goals are not being met before you consider more aggressive and costly remediation measures? "Meets preliminary goals" should specify a time frame for how long the goals are to be met before any conversation of success is had. How and will the EPA define a time frame for how these goals are to be met before success is claimed?"

2.18.2 EPA Response

Seasonal groundwater elevations fluctuate substantially in the vicinity of Teakettle Mountain and the landfills. However, groundwater elevation fluctuations, flow directions, and quality have been well characterized. The RI included six rounds of groundwater monitoring (four quarterly events between 2016 and 2017, and one seasonal high and one seasonal low water level round in 2018), which indicated that the direction of groundwater flow across the site did not change seasonally (Plate 17 of the RI report [Roux 2020a]).

In addition to six rounds of groundwater monitoring and sampling for site characterization, pressure transducers were installed in several monitoring wells to record continuous groundwater elevations to develop an understanding of groundwater elevation fluctuations at the site. Six pressure transducers were installed in existing monitoring wells at the beginning of the RI at various areas around the site. These were later moved to other monitoring well locations, and augmented by additional transducers that were added to the network to better characterize the site.

Characterization objectives included developing a better understanding of the relationship between the upper and lower hydrogeologic units, fluctuations near the landfills and Teakettle Mountain, and the relationship between the upper hydrogeologic unit and the Flathead River. The data showed that the groundwater elevations in monitoring wells near Teakettle Mountain and the landfills fluctuated greatly because of snowmelt and precipitation events, while areas monitored further west were less susceptible to these seasonal fluctuations. At the same time, the pressure transducer data, which collected groundwater elevations every 30 minutes, confirmed the seasonal groundwater flow directions observed in the six sitewide monitoring events.

The commentors also questioned whether groundwater performance monitoring (as described in the Proposed Plan) which would occur twice a year during seasonal high and low water table elevations, would be adequate to address the effects of the Selected Remedy on groundwater flow and quality. EPA anticipates that a higher frequency of groundwater monitoring will be necessary to initially evaluate the effects of the containment remedy for DU2 on groundwater flow patterns. During remedial design, a short-term groundwater monitoring plan will be developed to address pre-design, design, construction, and shakedown post-construction monitoring requirements. The data obtained from the short-term groundwater monitoring plan will be used to develop the long-term groundwater monitoring plan.

The performance of the remedy, including DU1/DU5/DU6, will be evaluated as part of EPA's five-year review for the site. A comprehensive groundwater monitoring data analysis report will be prepared prior to each five-year review to evaluate whether groundwater quality downgradient of the containment cell is trending towards meeting site remedial action goals in meeting state water quality standards. Metrics to evaluate progress will be determined during remedial design. The remedial design will also determine additional measures to be considered if the monitoring data indicates the site is not trending towards compliance. Predicting what measures might be taken cannot, with a reasonable degree of certainty, be done until the Selected Remedy has been implemented. EPA agrees stating that groundwater monitoring may cease after 30 years, as inferred from the Proposed Plan, is misleading. Part II of this ROD now requires that long-term groundwater monitoring continue for as long as necessary. This will be described by the long-term monitoring plan completed during remedial design.

2.19 Monitoring – Wildlife

2.19.1 Public Comments

Three comments were received from two individuals and the TASC (#1) that addressed the desire to monitor wildlife and vegetation as part of the remedial action.

- **Comment 1T.** "16. Members of the community have expressed concern over the effects of remedy construction on the ecology. The community has observed significant changes in the area's vegetation and wildlife over the course of CFAC activity and closure. Historic observations indicate that vegetation on Teakettle Mountain may have been significantly denuded during active operations. Currently, vegetation appears robust and diverse. Wildlife patterns have also changed in response to site activity. Documentation of vegetation and wildlife changes can be a measure of remedy success (and failure). It seems important to establish baseline measures of vegetation and wildlife presence/absence prior to, during and after remedy construction in order to directly measure the benefits of remedy action to these important community values. The community may want to ask EPA if monitoring of vegetation and wildlife could be a component of the forthcoming remedy efforts in order to understand impacts (both positive or negative) to these valuable resources."

- **Comment 8J.** "7) Documentation of vegetation and wildlife changes can be a measure of remedy success and failure. Can we establish a baseline measure of vegetation and wildlife presence/absence prior to, during and after remedy construction in order to measure the benefits of remedy action? My biggest concern about the cleanup process is for the animals, including humans, as I live a half mile away. I would like someone to monitor the safety of all of us during the cleanup. I don't expect Glencore to care so much for the elk, coyotes and loons (all of which I saw this past week) but I do expect the EPA to care. That is their job. This property has been a wildlife corridor for generations. All around it the animals are protected, from Glacier Park to the north and Glacier institute to the south. Please protect this area as a safe haven for all that live here."

- **Comment 11I.** "9. EPA must involve Montana Department of FWP in fish, otter and any other testing for plant caused issues in the Flathead river from rock layers weeping on south face river bank."

2.19.2 EPA Response

For ecological receptors, the success of the remedy will be measured by whether the ecological remedial goals set forth in the ROD are met. Those remedial goals are:

- Eliminate exceedances of Montana DEQ-7 aquatic life criteria in surface water and porewater by reducing migration of metals, cyanide, fluoride, and PAHs from contaminated soils, sediments, and wastes.
- Eliminate unacceptable risk for terrestrial and transitional ecological receptors by reducing ingestion of and direct contact with elevated concentrations of metals and PAHs from contaminated surficial and shallow soils.
- Eliminate ingestion and direct contact that would result in unacceptable risk for aquatic and semi-aquatic ecological receptors by reducing contact with metals, cyanide, and PAHs from contaminated surficial and shallow soils and sediments.

Success in meeting these remedial goals will be measured by evaluation of the results of sampling and analysis. The details of those activities will be developed in the remedial design and will be documented in agency approved workplans and quality assurance project plans.

Measurement (baseline and post-remediation) of the presence or absence of vegetation and wildlife would be difficult to design and implement, and the results would not help to meet the remedial goals. Further, it would be impossible to know if a post-remediation increase or decrease in vegetation or animal life was a result of the cleanup or other unrelated factors (e.g., drought, changing migration patterns, local development, etc.) that are beyond EPA's control.

Ecological risk at the site was not evaluated using habitat or population assessment, rather it was a hazard quotient evaluation that relies on measured data in environmental media. This is standard risk assessment protocol. Confirmation of success of the remediation will be demonstrated with long-term monitoring that shows that the remedial goals listed above have been met and that risk levels (hazard quotients) are acceptable. Long-term monitoring of benthic macroinvertebrates in DU5 will be included in the remedial design as those receptors are key to the food chain for larger species and are the species most impacted by groundwater contamination of seeps at the site. The scope of such monitoring is manageable, and the sampling can be repeated as often as necessary to develop trends and assess continuing impacts as the water quality in the seeps improves. The Montana Department of Fish Wildlife and Parks will be consulted during the remedial design phase.

2.20 Monitoring – Other

2.20.1 Public Comments

Eleven comments were received from eight individuals and CBF (#134) that addressed monitoring for media other than groundwater.

- **Comment 11I. "**9. EPA must involve Montana Department of FWP in fish, otter and any other testing for plant caused issues in the Flathead river from rock layers weeping on south face river bank."
- **Comment 14A.** "Please add the phenanthrene question on the PAH...i.e....soot..coke oven emissions..coal tars...and COAL TAR PITCH..ALL CLASSIFIED AS HUMAN CARCINOGENS...TESTING SHOULD BE DONE WITHIN CITY LIMITS."
- **Comment 53F.** "Additionally, sediment can act as an absorptive media for contaminants, and can accumulate contaminants in the organic layer of the sediment particles. Soil testing (bulk sediments) in conjunction with the plan's stated water monitoring should be incorporated into this plan. Likewise, contaminants such as PAHs have been shown to bio accumulate in food chains. Thus, biological measurements in aquatic invertebrates and macrophytes should also be incorporated into this plan. Will the EPA pledge to incorporate sampling aquatic invertebrates and both aquatic and terrestrial macrophytes into their sampling design, especially near and around the river seeps? This would provide valuable research for the scientific community and EPA alike."
- **Comment 53U.** "11) Robustly sample water, soil, invertebrate, and macrophytes for contaminants on a quarterly basis."
- **Comment 75B.** "Furthermore extensive annual monitoring or the CFAC site and surrounding area soils and water wells needs to be done to ensure the safety of the local drinking water supply. Complete treatment of the contaminated ponds on the CFAC plant site is needed along with treatment of groundwater that is identified as contaminated. After removal of all contaminated materials, the EPS needs to commit to monitoring the site and surrounding area water wells over the long-term, say for the next 40 years to ensure the restoration work done has been thorough and complete. Please leave our community safe. Please pursue the Companies who are responsible for leaving these environmental messes and make them pay for the clean-up work."
- **Comment 79B.** "2. Please require more extensive annual monitoring of the CFAC site."
- **Comment 79C.** "3. Please provide additional seasonal testing at the site to ensure the contaminants are not entering the watershed."
- **Comments 106A, 123F, and 134AO.** "6. Has the EPA considered soil testing in conjunction with the plan's water monitoring? Sediment can act as an absorptive media for contaminants, and can accumulate contaminants in the organic layer of the sediment particles. Can you prove that soil contamination will not occur? Contaminants such as PAHs have been shown to bio accumulate in food chains. Biological measurements in aquatic invertebrates and in both aquatic and terrestrial macrophytes should be incorporated into this testing plan."
- **Comment 132F.** "How extensive is the monitoring such that failure of the system can be immediately identified?"

2.20.2 EPA Response

The findings of the baseline ecological risk assessment (BERA) indicate that there is potential risk to aquatic receptors in the Backwater Seep Sampling Area from exposure to site-related contaminants, but the BERA concluded that risk associated with direct and incidental wildlife ingestion pathways is minimal. The BERA also determined that there is no significant potential for adverse ecological effects in the Flathead River. Therefore, wildlife biomonitoring is not needed nor planned.

The need for monitoring of aquatic life will be assessed during remedial design. While cleanup success will ultimately be evaluated by surface water and groundwater monitoring and by achieving State of Montana standards, EPA agrees that monitoring of aquatic bottom-dwelling insects (benthic macroinvertebrates) provides useful information concerning remedy effectiveness and overall protectiveness.

The RI soils data (Roux 2020a) indicate that there was no significant migration of PAHs from surface soils at the site and soils impacted by PAHs are limited to the Main Plant Area and at waste handling areas north of the plant. Given that undisturbed soils west of the Main Plant Area had PAH concentrations below PRGs, there is no compelling reason to test off-site soils for PAHs.

Long-term operations, inspection, maintenance, and monitoring plans will be developed during remedial design. These plans will include, but are not limited to, groundwater and surface water monitoring, and inspection and maintenance of caps and stormwater controls.

2.21 Off-Site Disposal in Arlington, Oregon

2.21.1 Public Comments

Thirty-nine comments were received from 36 individuals and CBF (#134) that stated that the Proposed Plan for cleanup was not sufficient to manage the wastes currently buried on-site and that the waste should be removed. Most specified disposal in an out-of-state landfill designed to accept toxic wastes. Six commenters specified the RCRA landfill in Arlington Oregon.

- **Comment 2B.** “It wasn’t too long in the process where numbers started coming up and alternative points. One is keep the stuff on site, and the number was low, if you call 50 million low, okay; haul it away, and the number was greater. And right now the number seems to be 150 million. But what I’ve heard today reinforces if the less expensive route is taken, it’s still there, you know, and we’re talking about we’re gonna be safe and we’re gonna put, you know, big walls around it, and we’re gonna do this and this and this. And I’ve also heard today that, Well, we think it’s gonna work; it’s probably gonna work; we really like the science behind that we have that it’s gonna work. Of course, the other side of the coin is if it’s hauled away and it’s gone where it should have been taken, then I don’t think we have the problem about is it gonna work, because it’s gone, okay. So then -- kind of my final comment -- if you have 50 million but it stays on site and that’s what it cost, if it’s 150 million to haul it away, the question will be, Is it worth 100 million to clean the thing up totally, finally and get it out of here? Is that worth a hundred million dollars? Well, my guess is, for the people that live in Columbia Falls, the vast majority are probably gonna say, Yeah, it’s worth it; haul it away; we want it out of here. One of the things I’ve noticed over a period of time, because I’m not involved with this other than I want it cleaned up, is, Oh, we’re gonna have too many truckloads, and, Oh, it's gonna take a long time. The people in Columbia Falls that I know are not worried about how many truckloads it takes to get the stuff out of Columbia Falls. We're just not worried about it, you know. It's gonna take a long time, et cetera, et cetera. And so that's kind of what I'd like to put on the record, is it's basically a-hundred-million-dollar spread in what's going on. And I think that I'm on the side -- and I think if you ask the City Council, they would be unanimous in saying, Yeah, it's worth it; haul it away; get it out of here. And the City Council, as everybody knows, are the elected officials to represent the community, et cetera, et cetera. So I think you can take that in the logical direction, if we're actually trying to find out what the community is interested in, again, what the community would like to see, what the community feels we need, the answer is, Haul it away. It's a hundred million dollars, but it also -- what you're buying for that hundred million is you don't have to be worried about remedial action if something fails. I'm sitting back there thinking the choice -- I guess preferred choice is, Yeah, it's gonna last longer than I'm gonna last. You know what, that's just not gonna be long enough for the remedial things to show up. In other words, I'll be long gone; so it's not my problem. But it is the problem of the people that live in the community of Columbia Falls whenever that happens. But if it's hauled away, it's just not gonna happen, because it's gone. So thanks."

- **Comment 6E.** "I would like you to explain that if the solution -- and it sounds like what the council has voted for and the community has asked for is for a more permanent solution, the material being moved. I would like to see, if it's to be moved, where would it be moved, how would it be treated, and what are some of the results of that solution that have been done elsewhere. We want to make sure that we're not simply shipping our problems somewhere else, but that it will be effectively dealt with and treated properly."

- **Comment 11E.** "5. The buried asbestos fields need just plain removed, placed in covered secure BNSF rail hopper cars and taken to Hanford or secure area. Any future use would possibly reopen them for wind to scatter, or be moved around very similar to Libby Morning winds blow into Columbia Falls."

- **Comment 11J.** "10. Still believe that those "hot" areas of plant needs to be physically removed from plant-site, and sent to a secure area in contained boxcars......Glencore needs to pay for a study of contaminants in the area they sold south of plant..i.e. the new WMA...for public safety."

- **Comment 12A.** "Greetings, It seems the proposed concept of leaving the toxic material next to a river is not in the best interests of the communities downstream. Perhaps a more reasonable long term solution is to combine Montana's toxic waste sites. The Berkeley Pit in Butte could contain the full amount of toxic material and at the same time begin remediation of the pit itself. Leaving it at the site of convergence of three rivers is probably the least appropriate place to have toxic waste. The corporations that create these sites need to be forced to clean up the mess they have made. The tax payer received no profit from the product produced, and so should have no responsibility for the remediation project."

- **Comment 18A.** "I am writing to urge you to do more to protect the Flathead Valley's water quality by: 1. Removing the buried toxic contaminates at the CFAC superfund site away from the Flathead River to an approved landfill built to handle such toxic waste."

- **Comment 24A.** "I support the total removal of any toxic materials from the CFAC Superfund site, NE of Colombia Falls, MT, near the Flathead River. I am a resident of the Flathead Valley, MT and I am very concerned about any current and/or future chemicals entering the ground water and entering the Flathead River, which feeds the entire agricultural and residential valley as well as Flathead Lake. Please take this issue and this Superfund Site very seriously."
- **Comment 26A.** "We live a couple of miles downstream from the Columbia Falls Aluminum Company Superfund site. We have been following the progress on the EPA cleanup of this location and are very uncomfortable with the containment solution EPA has put forward. This is simply not an acceptable solution to the remediation of this site. A comprehensive removal of toxic materials is the only real solution, similar to what took place at the Milltown/Clark for River designated EPA Superfund site near Missoula, MT. This is the only real and acceptable solution to the CFAC site as well. Here are the questions that must be answered before any final plan is determined:"
- **Comment 26G.** "Please take care of the toxic waste at CFAC completely and finally by removing ALL toxic material to an off site location. Protect the residents of Columbia Falls and health of the Flathead River system now and well into the future."
- **Comment 29A.** "I join in the comments of the citizens for a better flat head. The intent of CERCLA is that toxic sites be cleaned up. There is no way the containment approach would work, since groundwater will course through the area. It does not matter that hauling the material to Oregon will cost three times as much. The full cost of cleanup is to be born by the companies in chain of title. Also it appears that the monitoring on a continued basis is not adequate. Please hold up against corporate grifting."
- **Comment 32A.** "I know this valley, having spent 50 years here. Ask anyone who lives near the plant and they know groundwater levels, historically. If you care about water quality in the Flathead drainage you have to revisit your decision to leave the toxic material in place. The migration of the toxic waste material left in place to the Flathead River is inevitable. Sooner or later the people of the valley will again be left holding the bag and suffering the consequences of your poor decision."
- **Comment 43A.** "I am writing to ask the EPA to revisit its proposed Cleanup Plan for the CFAC Superfund Site. Simple containment on site is not a good solution as we saw at the Milltown/Clark Fork River Superfund Site in Missoula, MT. I am respectfully requesting that the EPA: •Remove the buried toxic contaminates at the CFAC Superfund Site away from the Flathead River to an approved landfill built to handle such toxic waste as in Arlington, OR."
- **Comment 44D.** "Please, I urge you to insist on complete and thorough removal of the toxic waste from our pristine Flathead River watershed."
- **Comment 45B.** "I am confused about the decision to leave the toxic waste in a large pit rather than remove it completely as was done on the Milltown/Clark Fork River near Missoula where years of toxic waste build up was completely removed. Given the close proximity of the Columbia Falls Aluminum Plant toxic waste to the Flathead River and the impact on flathead Lake, not to mention the health, welfare and safety of current and future residents in the

community, why isn't this being removed and transported away from the river? If 26,000 tons of waste has already been removed and transported elsewhere, please explain why the job isn't being completed."

- **Comment 56A.** "Do not consider the shortcut of containment. For safety reasons, specifically ground water contamination concerns, this toxic waste needs to be removed."

- **Comment 67A.** "This is a foolish waste of time and money. Please require that all hazardous items bd fully removed by the company. This is the future health and safety of my son, his spouse and our two grandchildren you are placing in jeopardy as well as all those other who live in this valley. This is a complete cop out by our government to not hold the company accountable."

- **Comment 74A.** "It is feasible to actually cleanup the CFAC site. Capping pollution is not a cleanup. Do the right thing and protect the Flathead river and lake. The reality is that cfalls is already a pediatric cancer cluster area. It is time to remove these toxic chemicals forever."

- **Comment 75A.** "Please know I and my family are concerned about the EPA clean-up plans for the Columbia Falls Aluminum Plant's 960 acre site, Flathead County, MT. Many trees on Teakettle Mountain were killed by fluoride emissions from the plant many years ago. I am not aware of all the contaminants that may be on the plant site but want the contamination located, identified, and then removed from the site by rail cars. Rail cars were used to deliver the aluminum to the plant for processing. I endorse the buried toxic contaminates be loaded into rail cars and transported away from the Flathead River and the CFAC plant site to an approved landfill built to handle such toxic materials."

- **Comment 79A.** "Please help the Flathead Valley to preserve their water quality by improving the EPA clean up plan for the very contaminated Columbia Falls Aluminum Company Superfund site. Any plan that does not include removal of toxic waste or full restoration of the contaminated area will not be acceptable. 1. Please remove the buried toxic contaminants and take them to an approved landfill. The buried toxic contaminants should be far away from the Flathead River."

- **Comment 80A. "**We are writing with regard to the proposed cleanup plan for the Columbia Falls Aluminum Company Superfund Site. Our concern relates to leaving the hazardous landfill contents in place and surrounding it with a 100 foot deep "slurry wall", but nothing to seal the bottom. Because groundwater can reach this level, there would be no way to prevent contamination from the waste. We hope you will reconsider what you are doing at this site to include the following steps, which hopefully would protect our drinking water for the future: •Remove the buried toxic contaminates at the CFAC superfund site away from the Flathead River to an approved landfill built to handle such toxic waste as in Arlington, Oregon."

- **Comment 87C.** "For the record, I strongly encourage the mitigation plan to include removal of ALL contaminated materials. Is the EPA seriously considering an alternative plan to remove ALL contaminated materials instead of leaving a massive volume toxic waste in place?"

- **Comment 89A.** "As I understand it, this involves leaving a large volume of toxic waste in place with no plan for any kind of future removal. I believe this is an unacceptable idea. I do not see how leaving toxic waste (includes cyanide, fluoride, lead, PAHs) in an unlined "landfill" on site is a workable solution. What will prevent groundwater from infiltrating the landfill and leaching toxic material out of the waste? Even will an expensive containment wall, there will be leakage into the groundwater."

- **Comment 91D.** "Montana's existence as a supplier of resources, both raw and refined, such as metals, timber, and oil has continued for over a century. Due to the state's remoteness and historically very low population density it has been the victim of decades of extraction with little attention paid to how the extraction and refinement has occurred or consequences/responsibility of these processes. For over 25 years, I have lived less than 2 miles from the Flathead River and seen wide variations in water levels. Many people live far closer to the river than I do and that number is rapidly increasing. The accumulation and continuation of high concentrations of unsafe/deadly chemicals is increasingly worrisome in the Flathead River drainage system. It seems the EPA came into existence recognizing insufficiently regulated industry practices created environmental and public health problems those industries wouldn't fix. Please begin removal of the contaminated soil at the Columbia Falls aluminum plant site before more damage is done to the immediate aquifer/water table and further downstream."

- **Comment 98A.** "I am a Columbia Falls resident who is very concerned that I live next to a Super Fund site. At this critical juncture, as you contemplate the future of our environment in Columbia Falls, I ask why you've not made it a priority to remove all remaining toxic waste to a site that is designed specifically for that purpose? Why do some communities get this privilege and not others? Columbia Falls is home to grizzly bears, eagles, pollinators, wild and scenic rivers, young children and anxious parents who won't let their kids swim in the river that runs past the Super Fund site. Please do right by this community and take all necessary action to dispose of waste properly, in a site that is designed specifically for containment. Like other Montana communities, we deserve an offsite containment solution."

- **Comment 99A.** "I am sending this email to express my opinion regarding the CFAC cleanup plan. The EPA did a wonderful clean up at Milltown several years ago. The project was east of Missoula and upstream of the Clark fork River, and the toxic removal was a great success for the region and prevented a very serious disaster along that river. Here again we have another chance to protect a "wild and scenic" river, the Flathead River. I understand that the EPA's proposal is to leave the toxic waste in a containment area on the CFAC sight, but this solution would eventually leach into the water table. These river and ground waters are the pristine gifts that flow from the mountains of Glacier National Park. Please also take into consideration the location of the Hungry Horse dam of the South Fork River. It is a mere FIVE miles upstream from the EPA CFAC toxic project. If there was a breech of the dam, it would be a disaster which would most certainly flood the former CFAC location where a capped-off containment pond might be built, carrying all that waste south throughout the whole Flathead Valley and into the Flathead Lake and beyond. Kindly do consider the ramifications of such a decision as a containment pond. To leave the toxins here would be to be expose the toxins to floods or to leaching forever. My vote is for the permanent removal of the clean up toxins. Thank you for your consideration of my comments."

- **Comment 102A.** "The former Columbia Falls aluminum company superfund site is located where it poses a threat to nearby water wells of CFalls residents and surrounding subdivided neighborhoods. Plus the superfund site poses a threat of contaminating the Flathead River as it begins its meandering through Flathead County. It appears the best long term solution is to remove the contaminated soils via rail car. The point is to remove the threat and not just monitor and build a slurry wall around a few of the abandoned dumps used by the aluminum plant. If a slurry wall is constructed I wholeheartedly support a much larger wall surrounding more of the site."
- **Comment 103A. "**Leaving the waste next to the flathead River is a recipe for disaster. Please reevaluate the risk of leaving the waste in such a vulnerable location. It should be removed and put in a safer permanent place."
- **Comment 111A. "**I urge the EPA to require a total clean up of the former Columbia Falls Aluminum property. The community deserves a completely cleaned site. This community gave years of support to the aluminum company, regardless of ownership. In exchange the property should be returned as close to it's natural state as possible. All toxins must be removed. You must do all that is necessary to protect the health, safety, and welfare of Flathead Valley residents. You are also responsible for ensuring the health and welfare of the Flathead River and it's ecosystem, including the greater Columbia River Basin. What is required for the Clark Fork clean up is required for the Flathead. Do not devalue the Flathead."
- **Comment 112A. "**Temporary storage of toxic waste on site does not qualify as "cleanup" at the former aluminum plant in Colombia Falls, Montana. In this topologically narrow area with volatile weather events, upstream on the Flathead River system, and feeding into the Columbia River drainage; stored toxic wastes can easily be carried downstream. The resulting contamination would be hugely more expensive to correct or mitigate than removing the waste NOW to a more stable and maintainable area. Monitoring works best where environmental conditions are more predictable than the immediate western slope of the Continental Divide."
- **Comment 113A. "**These toxins should be removed as soon as possible. This process will not be less expensive in 30 years after even more environmental damage has been done! We experienced a TWO Foot rise in the Middle Fork of the Flathead river in front of our home in just 48 hrs with the recent rains August 28-29, 2023 The risk of flooding will likely increase in the future. Hiding the problem will not make it go away. Please do the right thing, act now to remove these toxins."
- **Comment 114A.** "Our beautiful corner of Montana needs your help! Please remove the buried toxic contaminates of the CFAC superfund site away from the Flathead River! Please require more extensive monitoring of the CFAC site along with complete treatment of contaminated groundwater and ponds. Please commit to long-term full restoration of this 960-acre industrial superfund site!"

- **Comment 116B.** "I do not support the Proposed Plan advanced by CFAC for this site. I believe that this remedy falls short of CERCLA's primary goals of long term effectiveness and permanence. The proposed remedy does not make use of treatment techniques that would reduce the volume or toxicity of wastes at the site. Instead, it would impose responsibility to maintain a large volume of toxic materials at the site in perpetuity. It does not consider long term impacts that could occur from flooding or seismic activity at the site. The proposed slurry wall containment structure will not remedy the problems at the site, only temporarily contain them. I do not believe that the feasibility study carefully and fairly reviewed alternatives that would include excavation and on site or offsite disposal in a RCRA compliant landfill, or other options that could treat the wastes to reduce toxicity and mobility."

- **Comment 116L. "**In conclusion, I thank you for the opportunity to comment on the proposed plan. I do not support the plan, and request that the agencies require a revised plan that includes excavation and removal of contaminated materials at the site, and disposal in a RCRA compliant facility on site or off site. Such a remedy would clearly provide the most long term effectiveness and permanence and will likely result in much greater degree of public acceptance than the current proposed plan."

- **Comment 120D. "**4- this precious wild river is at risk with your current plan to leave everything in place, even with the slurry wall. You have designated sites for this kind of waste. I urge you to use them."

- **Comment 126A. "**This is to urge you to require much more stringent and permanent clean-up of toxic wastes at the former CFAC aluminum plant in Columbia Falls. When I worked as a regional reporter for the Missoulian in the 1980s, we were assured by the EPA that capping these waste sites would be an adequate long-term pollution preventative. I reported as much, and I am now chagrined that this solution has failed. It seems apparent that high groundwater is leaching wastes from the site. It needs honesty now and a proper long-term cleanup. Thanks for the opportunity to comment."

- **Comment 128E. "**In conclusion, after 15 years, of CFAC Plant maintenance and caring for the land--I know the site and all of its' problems, very well. The only way to protect the Flathead River is to require Glencore to remove most of the contaminated soil and on-site treat the remainder. Glencore is stating that this process will cause many problems. Mainly, with rail car shipments. Rail shipments to Arlington, Oregon were used to dispose of the polluted materials, when the Plant was in operation. They are not being fully honest. 80 percent, of the necessary railroad trackage is still in place and useable. During the CFAC demolition, I used my past railroad experience, to personally move the thousands of railcar loads of scrap steel, carbon, etc. (The CFAC complex was supposedly the largest steel building ever built, in Montana). Instead, of spending 67 million dollars, for a shallow slurry wall system (which won't work), they need to spend closer to $780 million and do a proper job. Glencore is one of the largest companies, in the world, with nearly 75,000 commodity traders, alone. The Columbia Falls City Council was correct in wanting the contaminated material removed. See the May 16th 2021 Daily Interlake newspaper article. It is all about the money and may require a class-action lawsuit, from the various environmental groups, trying to protect the Flathead River Basin."

- **Comment 130H. "**If removal is reconsidered, a proposed option detailing transport by train (as opposed to trucks on the roads) should be studied. Much of the reasoning against transport by truck was based on highway data. The train tracks go literally thru the site. I imagine rail transport would be safer than via truck."

- **Comment 134G.** "6) The Hungry Horse News reported that Glencore's feasibility study didn't examine in detail the use of rail cars instead of trucks to ship the wastes. Why not, and isn't this an option you should explore before a final decision on leaving in place or removing the toxic material at the site. Were trains used to remove the SPL's during the reported early stages of the cleanup of the CFAC site which removed some 26,000 tons of pot liners containing cyanide and fluoride and another 2,750 tons of asbestos? Media reports establish that CFAC shipped contaminated spent potliner to out-of-state landfills from 1985 to when the smelter closed 24 years later without causing negative impacts to communities. Where in the clean-up plan is it documented how much how much contaminated waste has been removed from the CFAC site to date? Isn't this important to establishing what is possible in the future?"

2.21.2 EPA Response

Evaluation of cleanup approaches at a Superfund site includes consideration to excavate and haul wastes to an off-site disposal facility. However, this is often not the best approach to address the contamination and exposure to receptors at and near the site. Hazardous waste can only be disposed off-site at a licensed Resource Conservation and Recovery Act (RCRA) Subtitle C landfill. At the CFAC site, transporting excavated wastes to an off-site waste disposal facility would involve hauling an estimated 1.2 million cubic yards of waste.

Off-site waste disposal options were screened out in the technology screening phase of the FS (Roux 2021a) where effectiveness, implementability, and cost are used to assess the technology's ability to meet remedial action objectives. Reasons for not carrying the off-site disposal option forward include:

- **Distance.** The nearest RCRA Subtitle C landfill is located nearly 500 miles away in Arlington, Oregon.

- **Pre-Treatment.** Pre-treatment for the spent potliner-mixed waste from the West Landfill and the Wet Scrubber Sludge Pond would vary and would extend the time for cleanup. Pre-treatment of spent potliner-mixed waste is extremely difficult and increases the total volume of waste that ultimately will need to be handled and disposed.

- **Volume.** Transport of the 1.2 million cubic yards of waste from DU1 would require 60,000 trucks/rail containers.

- **Logistics.** Wastes would need to be dewatered and then packed in clean, leak-proof, vented containers and transported by truck or rail. Transportation would be in accordance with regulations of a licensed hazardous waste hauler with appropriate manifests, permits, training, equipment, insurance, and financial responsibility. The volume of waste for off-site disposal requires significant level of effort and time.

- **Carbon Footprint.** The carbon footprint and air emissions associated with 60 million total truck/rail miles would be significant.
- **Quality of Life Impacts.** Over 30 neighboring communities and communities enroute (including Columbia Falls and Aluminum City) would have an estimated 70 trucks and/or trains per day passing through for four to five years with associated noise, dust, congestion, traffic issues, and delays from railroad crossings. Trucks would drive through Spokane and the Tri-Cities (Hanford, Pasco, and Kennewick) region of Washington and trains would pass through Spokane and Seattle.
- **Long-Term, Intense Disruption.** Impacts would be longer and more intense than those for previous removal activities during demolition (70 trucks/rail cars per day over four to five years versus an average of 4 trucks per day over one year).
- **Health Risks to Workers.** Risks to workers loading and unloading trucks are significant. Spent potliner can react with water to produce toxic and explosive gases. Cyanide gas is poisonous if inhaled, and cyanide-contaminated dust can be toxic if ingested.
- **Potential Traffic Accidents.** Based on Federal Highway Administration statistics, if trucks were used for transportation, 35 persons could potentially be injured, including one fatality. The likelihood of injuries and contaminant releases is increased, as 130 miles of two-lane road (some along Flathead River and Flathead Lake) must be driven before reaching the interstate. Rail lines also follow lakes and rivers. A release of spent potliner waste to water could be catastrophic.
- **High Costs.** Disposal fees and transportation costs are very high. The volume and nature of waste from DU1 makes off-site disposal extremely expensive and is as protective as the containment approach. In citing a cost of $150,000,000 for the off-site disposal option, the commenters are mistakenly referring to the cost of excavation and on-site consolidation (DU1/GW6 Alternative 6), which has an estimated total present value cost of $165,590,849. The calculated present value costs of off-site disposal are $892,262,000.

Off-site disposal would negatively impact neighborhoods and the environment over a significant period while increasing the potential for injuries and inadvertent contaminant releases during transport. Off-site disposal was screened out as a remedial or cleanup alternative in the FS because on-site disposal, containment, and treatment options can achieve similar effectiveness with lower levels of risk, disruption, and cost, as was explained in the Proposed Plan. Transport by rail and by truck were both considered in the recent cost evaluation of off-site disposal. Rail transport was less expensive and was the method used to arrive at the present value cost of $892,262,000. Superfund law requires that the Selected Remedy be cost-effective and proportional to overall effectiveness (see response 2.1.2), and off-site disposal fails to meet that requirement.

2.22 Off-Site Disposal as at Milltown Dam

2.22.1 Public Comments

Like response 2.21, 65 comments were received from individuals expressing a desire to have the wastes at the site excavated and removed to an out-of-state landfill built expressly for that purpose.

However, these commenters cited the Milltown Dam sediment cleanup as an example of a large-scale removal as proof that such removals could be done safely. Fifty-nine of the comments were identical or had very slight variations in the wording.

- **Comments 19C, 20C, 21C, 22D, 23C, 25C, 26F, 27C, 28C, 30C, 33C, 34C, 35C, 36C, 37C, 38C, 39C, 41D, 42C, 44C, 58C, 59C, 60C, 61C, 62C, 63C, 64C, 66C, 68C, 69C, 70C, 72C, 73C, 77C, 78C 83C, 84C, 85B, 88B, 90C, 91C, 93D, 94D, 96D, 97C, 100C, 101C, 105C, 106A, 107C, 109D, 118B, 119C, 122A, 124C, 125C, 127C, and 131C.** "Far greater removal of toxic waste was accomplished at the Milltown/Clark Fork River designated EPA Superfund site near Missoula, MT. Initial plans to contain waste on that site were abandoned and over 3-million tons of contaminated sediment were removed to a safer location far from the River. It is estimated in the recent CFAC clean up plan that there are 1.2 million cubic yards/1.3 million tons (a far smaller amount) of heavily contaminated waste that would need to still be moved from the CFAC site. Early stages of the CFAC cleanup site have already removed some 26,000 tons of pot liners containing cyanide and fluoride and another 2,750 tons of asbestos. If some removal from the site has already been accomplished why can't the remaining 1.3 million tons also be removed to an out of state landfill designed specifically for this purpose? Why was removal acceptable for the Milltown/Clark Fork River site and not the CFAC site?"

- **Comment 50A.** "We are residents of Columbia Falls, MT (and one-time residents of Missoula and Great Falls). We live within a mile of the now abandoned Columbia Falls Aluminum Plant. We are concerned that the proposal to "contain" toxic waste materials on site is a stop-gap solution to the evident polluted site of this former plant. We cite the evident pollution of the Clark Fork River as an example of such degradation that removal rather than containment was deemed necessary in the area of Milltown. Our Flathead River is a pristine river akin to the Clark Fork (both being tributaries to the Columbia River Basin). And we are concerned for the long-term health of the lands and residences contiguous to the former Columbia Falls Aluminum Plant. We ask, by this petition, that the EPA give greater weight to removable of contaminated waste rather than containment."

- **Comment 92A.** "Please record my comments on the cleanup proposal for the Columbia Falls Aluminum Company (CFAC) property next to the Flathead River. I am not in favor of the current proposal to leave toxic contaminants on-site in lined holding pens. With intensifying global climate change, we are seeing more and more extreme weather and subsequent extreme natural disasters including flooding. These conditions make the likelihood of a catastrophic flood that would scour the CFAC site and send millions of tons of toxic waste into the Flathead River inevitable. The waste should be removed and sent to a facility designed to handle it and not kept on-site. If millions of tons of toxic waste can be removed from the Milltown/Clark Fork superfund site just east of Missoula and safely trucked to a secure waste site, then the same should be done for contaminants at CFAC. Multi-billion dollar corporations should be responsible for completely cleaning up their messes after they shut down their polluting businesses. Thank you for your time."

- **Comment 93A**. "My feelings are strong on this matter--the environmental health and well-being for all who use this essential wildlife corridor is a significant piece of our local ecosystem's fabric--and I apologize for using the "generic" reply in my initial response. I did want to add how impressed I've been over the years in passing by on the highway by the efforts gone to in the Milltown/Clark Fork situation. It sounds as if the CFAC site won't require such an extensive approach, but at the same time, I strongly feel that CFAC merits at least as strong and comprehensive an approach."

- **Comment 104A.** "We need this cleaned up as they did on the Milltown Dam in Missoula. The toxic waste needs to be REMOVED not just walled off and capped leaving the bottom open subject to natural events that can cause random dispersal of toxic waste. Remember, this is right next to the Flathead River, making it imperative that we ensure the waste is safely and permanently removed."

- **Comment 108A.** "I am writing because I am curious about the recommendation to leave the majority of toxic waste in place at the Columbia Falls, Montana aluminum plant site. – What were the reasons that you chose to dig up and transport the toxic material at the Milltown Dam site versus this one?"

- **Comment 116D.** "I request that the Environmental Protection Agency and the State Department of Environmental Quality re-examine their thinking on this site, and prepare a revised Proposed Plan that would provide a remedy that will be effective over the long term and provide permanent protection to human health and the environment. As I mentioned, I have worked on many federal and state superfund sites, and thus am very familiar with the process and everything that goes into a remedial investigation, feasibility study and proposed plan. At every site that I have worked on, from Milltown to Silver Bow Creek to Missoula white Pine Sash, I have observed a very consistent and dominant bias toward in situ remedies. This inherent bias comes through very strongly in the wording of documents at the CFAC site. Frankly, I have seen this bias at all of the sites I have worked on but in this case the bias is more blatantly apparent. It seems to me that the company, and its consultants have driven this process towards an in place remedy, and at every turn have expressed their inherent bias toward that goal. The documents lean heavily on potential negative impacts of removal options, stress the impacts of truck and train traffic on the community, the risks to workers if the materials are excavated. At the same time the documents overstate the long term effectiveness and permanence of the in situ remedies they advocate. And the documents do not fairly assess the long term impacts of in situ storage of wastes at the site. At other sites I have worked on, repeated attempts have been made to save money and time by leaving the wastes in place. One of the best examples of this is the Milltown Reservoir, where ARCo proposed to leave the dam and sediments in place and install a rubber dam on the crest of the aging dam to control ice flows. This proposed remedy fell by the wayside when we experienced extreme ice flows and flooding that scoured sediment from behind the dam and killed fish in the river downstream. Ultimately, a removal action was completed that truly protects human health and the environment. Similarly, along Silver Bow Creek, at the Colorado Tailings and the Clark Fork River, ARCo invested in proposed remedies that left mine waste in place in the river's floodway. Ultimately we learned that these remedies were not effective over the long term, and extensive removal actions have been required. At the Missoula White Pine Sash site, the responsible party proposed leaving materials in place containing contaminants including dioxins and cadmium. Ultimately, the State required removal, protecting the public health and allowing expanded beneficial use of the property in the future as well. In every example I can think of, the initial temptation to attempt an in place remedy either failed or was rejected due to public pressure demanding a permanent and effective solution."

2.22.2 EPA Response

Every Superfund site is unique and while it is possible to find sites that have similar sources, contaminants, layouts, and physical characteristics, that is not the case with the CFAC site and the Milltown Dam site on the Clark Fork River. A few reasons why the cleanup at Milltown Dam cannot be used as a model for the CFAC site are listed below:

- **Location.** The contaminants to be removed at Milltown Dam were in the Clark Fork River, behind an aging dam. There was a constant threat of release when river flows were heavy. The site's contaminants are in a landfill, almost a mile from the Flathead River. The only mechanism for release is contact with groundwater which flows toward the river.
- **Existing Environmental Impacts.** Sediments behind the Milltown Dam had concentrations of metals from upstream mining operations that were not hazardous to people But sediments released from ice jams and flooding sometimes caused exceedances of Montana surface water quality standards. At CFAC, DU1 landfills have released contamination to groundwater, the concentrations at the seeps along the river are relatively low. Some DEQ standards for aquatic life in sediment porewater are exceeded, but there are no measurable contaminants above background values in the Flathead River, and there have been no documented impacts to fish or other aquatic organisms. The remedy will reduce concentrations to acceptable levels by limiting contact between the waste and groundwater at the site. The EPA, in consultation with DEQ, supported by the RI (Roux 2020a), the FS (Roux 2021a), the BHHRA, and the BERA, have determined that the required risk reduction can be achieved without removing the waste from the DU1 landfills.
- **Ease of Removal.** While it is never easy to remove a dam, political and public sentiment favor the removal of these aging structures to create free-flowing waterways. The river was diverted to a channel beyond the dam, and standard construction equipment was used to excavate trapped sediments and load them onto rail cars for transport to the Anaconda Smelter site, which is owned by the PRP, and which is one of the sources of the contamination. The Milltown sediment removal required dewatering but no pre-treatment of hazardous contaminants, no specialized containers, and no enhanced health and safety gear. The materials removed were sediments with low levels of metals and presented no hazards to workers. Buried hazardous wastes at the CFAC site would need to be dewatered; treated to render them non-reactive; packed in clean, leak-proof, vented containers; and transported by truck or rail. Workers would likely need supplied air respirators and protective suits. Transportation would need to be in accordance with regulations of a licensed hazardous waste hauler with appropriate manifests, permits, training, equipment, insurance, and financial responsibility.
- **Disposal of Wastes.** Sediments removed from Milltown were clean enough to use as cover material over other wastes deposited in the Opportunity Ponds waste management area at the Anaconda Smelter site. The trip was less than 100 miles by rail, and the sediments served

a useful purpose and did not require special handling. In contrast, the materials that would be removed from DU1 at the site would likely require pre-treatment, packing into leakproof, vented containers, and shipment to a RCRA hazardous waste landfill nearly 500 miles away in Arlington, Oregon, where they would be reburied.

Prior removals of spent potliner from the site when the facility was still in operation and shortly after it closed were of stockpiled material that had not been buried. In contrast, the material in DU1 is spent potliner that has been in contact with water for an extended period of time. If excavated and exposed to air, there is the possibility that it will produce toxic and explosive gases. Cyanide gas is poisonous if inhaled, and cyanide-contaminated dust can be toxic if ingested.

Worries that future flooding on the Flathead River could reach the DU1 landfills are understandable but unfounded. The topography is not evident from maps without elevation contours, but the elevation of DU1 is over 100 feet higher than the riverbed and there is more than 1,000 acres of open land between the river and U.S. Route 2. Water that rose above the riverbank during a severe flood event would spill into this floodplain and continue moving south. It would never overtop the embankment between the river and the railroad tracks.

Superfund law requires that a remedy be cost-effective, which often favors an in situ remedy, rather than one that requires excavation, shipment, and disposal of waste off-site. If a much more aggressive remedy does not offer significantly greater protection, it is generally not selected. Successful waste-left-in place remedies are common.

2.23 Other

2.23.1 Public Comments

Four comments were received from individuals that were classified as "miscellaneous."

- **Comment 16H.** "I do, however, strongly commend the EPA and everyone who was involved with the early removal action completed on the percolation ponds adjacent to the Flathead River, in 2020-21. In this case, a potential imminent threat to the river and its aquatic life was averted through a very appropriate removal action. I want to express my thanks to the former project manager and everyone else who made this project happen, connecting the dots with the ecological risk assessment, negotiating a separate Order on Consent, requiring excavation of contaminated materials and removal of the dam, gravel berms, well house and production wells and all other man made materials to allow restoration of a free flowing Flathead River. Thank you, this is exactly the kind of work we all hope to see at contaminated sites adjacent to our rivers."
- **Comment 53Z.** "16) Increase the community's trust in you."
- **Comment 102D.** "This superfund site poses many challenges and I appreciate the efforts done by the EPA to date. Thanks for the opportunity to comment."
- **Comment 130A.** "I work as a science teacher and have a background in hydrogeology. I read the 32-page EPA report of proposed alternatives for cleanup of the CFAC Superfund Site earlier this month, but thought the comment period had already closed July 31. In speaking with concerned neighbors today I realized the deadline is extended. Sorry for the last minute

comment! I appreciated how thorough the study was and the wealth of text, diagrams, and charts included within. For a technical document, I actually thought the writing style and clarity made it reasonably accessible to a broader audience. While I recognize that moving forward in a timely fashion should be a priority. I do, however, believe there are some additional questions that should be addressed."

2.23.2 EPA Response

EPA is focused on transparency in the decision-making process. We are available to explain decisions to community members and to present at meetings or other gatherings. We follow the Superfund NCP guidelines for investigation and evaluation (EPA 1988a) and provide project technical documents, generated during the process, to the public. Because the Superfund process (40 CFR §300.430) is rigorous and involves many stakeholders, it does not move quickly, and understanding the technical aspects can be challenging for those who aren't involved throughout the entire process.

EPA appreciates feedback on the Proposed Plan (EPA 2023a) which is designed to distill and summarize the information found in thousands of pages of source documents into a single, user-friendly document that helps the public to understand the EPA's selection process and the Preferred Alternative for cleanup. The intention is to allow the affected community to understand the Preferred Alternative well enough to provide timely comment.

We also appreciate constructive feedback on the early removal action adjacent to the Flathead River.

2.24 Oversight Body

2.24.1 Public Comments

Ten comments were received from seven individuals and CBF (#134) that asked EPA to set up a mechanism to provide for non-partisan, independent oversight of the cleanup. In a related comment, EPA was asked to post data related to the cleanup as it is obtained.

- **Comment 16J.** "We see no non-governmental oversight. Government has not always been truthful, so how are we supposed to know that what's being done is actually being done?"
- **Comment 53W.** "13) Publicly post and provide all data associated with the plan's monitoring to the public for transparency."
- **Comment 53X.** "14) Allow non-partisan members of the public to be a part of the data review for oversight."
- **Comment 54GE.** "A technical assistance group of professional engineers, hydrologists, geologists, health specialists needs to be funded and report to the Flathead County Commissioners for the sole purpose of completing an independent review of all of your work to date for adequacy, correctness, and general applicability of feasibility study proposals for your ROD document."
- **Comment 95C.** "One of my questions is, how will the EPA provide factual data and reports to the public in a timely manner to be reviewed as often as data is collected and analyzed by the

EPA? How, will the EPA include nonpartisan members of the community as part of data review and oversight?"

- **Comments 106E, 123K, 130G, and 134AT.** "How will EPA include non-partisan members of the public to be a part of the data review and oversight?"
- **Comment 134E.** "4) Clearly, Superfund sites can contaminate groundwater and negatively impact air quality. Many of the sites claim to have monitoring plans, but the ones in charge of the monitoring can be the very entity that helped create the mess. Additionally, we understand companies that do pay for remediation don't have to report to the EPA how much is spent, further complicating efforts to track costs of Superfund site cleanups. What steps are being proposed in CFAC cleanup plan to avoid these past mistakes/criticisms and to ensure that independent firms are hired to monitor clean up processes and potential problems? Will or can we insist that an oversite body of local residents or organizations be asked to serve in an advisory capacity to public agencies such as EPA during the cleanup process, potentially representing thousands of citizens invested in clean water, during this cleanup process, as was done during the Milltown Superfund cleanup process?"

2.24.2 EPA Response

The national TASC program provides independent assistance to communities through an EPA contract to help them better understand the science, regulations, and policies of environmental issues and EPA actions. Under the TASC contract, a contractor provides scientists, engineers, and other professionals to review and explain information to communities. The services are determined on a project-specific basis and provided at no cost to communities. This assistance supports community efforts to get more involved and work productively with EPA to address environmental issues. TASC services can include information assistance and expertise, community education, information assistance needs evaluation and plan development, and assistance to help community members work together to participate effectively in environmental decision-making.

The TASC program benefits communities by explaining technical findings and answering community questions, helping them understand complex environmental issues, and supporting their active roles in protecting healthy communities and advancing environmental protection. The program can also provide opportunities for environmental education, bring diverse groups together and help them get more involved, and offer training and support environmental employment opportunities through the Superfund Job Training Initiative.

EPA has funded a TASC contract at the site since May 2023 and plans to continue that funding throughout the design and construction process, as long as there is community interest. The TASC contractor was instrumental in assisting members of the community during and prior to the public comment period for the Proposed Plan. The contractor held four meetings in that time (two on June 21 and two on July 12, 2023) and drafted questions that the community might want to submit on the Proposed Plan. The TASC contractor operates independently of the EPA CFAC project team.

In addition, the PRP, CFAC, helped organize the Community Liaison Panel in 2015 to engage with the local and regional community. CFAC spoke to 20 community leaders who identified candidates for the liaison panel representing different interests and serves as a cross section of the Columbia Falls and Flathead County community. The purpose of the panel is to "provide a forum for the discussion and exchange of ideas and opinions about the CFAC project". Meeting minutes are posted on CFAC's website (www.cfacproject.com/community/).

EPA, in consultation with DEQ, follows a rigorous set of Superfund protocols (40 CFR §300.430) and employs an in-house team of experienced managers, scientists, engineers, risk assessors, and supervisors as well as nationally known consultants to ensure that projects are executed with the highest quality. EPA consults regularly with our state and federal partners. We encourage public participation and engagement, and we make documents available to the public on our website.

2.25 Plans and Reviews

2.25.1 Public Comments

Four comments were received from two individuals and CBF (#134) related to site-specific plans and reviews.

- **Comment 53H.** "7) Reviews: Every five years. EPA will conduct five-year reviews to ensure continued performance of the remedy, consistent with Superfund requirements. The community of Columbia Falls requests reviews be conducted every year to ensure the continued performance of the remedy. 5 years in between reviews is too long a window for contaminated groundwater to move into residential drinking water and downstream to Flathead Lake. Reviews should take place on an annual basis with the data being easily and explicitly made available to the public for oversight. Non-partisan members of the public should be involved in this process for transparency. Will the EPA commit to annual reviews instead of the proposed 5 year reviews? Will the EPA allow certain members of the public participating in this Proposed Plan for Cleanup commentary session to partake in the initial data review alongside the EPA team? If not, why not?"
- **Comment 53V.** "12) Review the Plan's effectiveness on a yearly basis."
- **Comment 121B.** "Create a surface and groundwater testing plan."
- **Comment 134O.** "14) Does this clean up plan address safeguards that would be required to be put in place as part of this clean- up plan it there were a forest and grass fire in the area? What kind of fires have occurred at the site historically or recently? What technology is proposed or required to be in place to measure impacts to air quality during the containment period for waste, during any excavations, or during any fires?"

2.25.2 EPA Response

Superfund requires that EPA conduct five-year reviews when hazardous substances, pollutants, or contaminants remain on-site. These reviews evaluate the implementation, performance, and protectiveness of a remedy. They are conducted in addition to the various monitoring requirements for different media at the site. EPA also routinely reviews performance and long-term monitoring results in annual (and sometimes quarterly) reports that are prepared in draft form by the PRP for agency review and comment. Once finalized, these annual (or quarterly) reports are made available to the public online.

Performance and long-term monitoring plans are a key component of remedial design and require frequent review to determine data trends and measure remedy effectiveness. Such sampling requires an agency-approved quality assurance project plan in advance. As with the annual reports, the PRP will prepare these plans in draft form for agency review. Final versions will be available to the public.

Community involvement will remain an important component of the CFAC Superfund process. EPA will continue to discuss issues such as plans and reports with the Community Liaison Panel and will provide the services of a TASC contractor as long as there is community interest in those services. The community will be kept informed of the work being done.

2.26 Proposed Plan Clarification and Terminology

2.26.1 Public Comments

Thirty-one comments were received from Montana NRDP (#82), Montana DPHHS (#110), and CFAC (#135) requesting clarification or modification.

Montana NRDP Comments

- **Comment 82B.** "2. Page 4, Industrial Landfill, the proposed plan states, "Not a groundwater contamination source." We recognize that this may not be a primary source of contamination, but question whether there are no contaminants that exceed a leaching to groundwater cleanup level in the landfill. Also, it is unknown whether this landfill has a liner. Has this source of contamination been adequately characterized to make this determination? Please include the source of this statement, including a specific reference to the relevant section(s) in the Remedial Investigation."
- **Comment 82C.** "3. Page 4, Sanitary Landfill, the proposed plan states, "not a source of contamination to groundwater." We recognize that this may not be a primary source of contamination, but question whether there are no contaminants that exceed a leaching to groundwater cleanup level in the landfill. Has this source of contamination been adequately characterized to make this determination? Please include the source of this statement, including a specific reference to the relevant section(s) in the Remedial Investigation."
- **Comment 82D.** "4. Page, 4, North-East Percolation Ponds, "Not a continuing groundwater source." Please see previous comments 2 and 3 and provide the source of this statement, including a specific reference to the relevant section(s) in the Remedial Investigation."
- **Comment 82E.** "5. Page, 4, North-West Percolation Ponds, "Not a continuing groundwater source." Please see previous comments 2, 3, and 4 and provide the source of this statement, including a specific reference to the relevant section(s) in the Remedial Investigation."
- **Comment 82F.** "6. Page, 4, South Percolation Ponds, "Not a continuing groundwater source." Please see previous comments 2, 3, 4, and 5 and provide the source of this statement, including a specific reference to the relevant section(s) in the Remedial Investigation."
- **Comment 82J.** "10. Page 8, the proposed plan references the "upper hydrogeologic unit" but does not discuss the "below upper hydrogeologic unit," though there are exceedances of the

DEQ-7 standards and COCs were identified for the below upper hydrogeologic unit in the Remedial Investigation. How does the proposed remedy address the below upper unit?"

- **Comment 82O.** "15. Page 12, Groundwater DU6: There is not a remedial alternative that addresses the existing groundwater contamination (i.e., the existing groundwater plumes outside of the proposed slurry wall) that exceeds DEQ-7. How will the groundwater contamination plumes be addressed for the contamination that currently exists in the groundwater?"

- **Comment 82V.** "22. Page 29, the proposed plan states, "…if the slurry wall is not effective in stopping migration of the groundwater plume, they will be used to extract groundwater for treatment. If treatment is determined to be necessary, it would be seasonal and require much less volumes of groundwater to be treated compared to the downgradient extraction alternatives." This paragraph appears to include a contingent remedy for the groundwater, which requires more detail. What would be the trigger for determining whether to use this groundwater remedy (e.g., generally, a time frame is included for when ARARs need to be met)?"

Montana DPHHS Comments

- **Comment 110G.** "6. DPHHS would like clarifications on the preferred remedial alternative for North Percolation Pond DU4. On Page 20 under Alternative 4, "Alternative 3 is identical to Alternative 2…" may be a typo and perhaps was intended to describe that Alternative 4 was identical to Alternative 2. Additionally, this section states that all impacted material would be consolidated at the Wet Scrubber Sludge Pond in DU1 prior to capping. Later, on Page 30, it states that under Alternative 4, the remedy would "consolidate excavated materials with disposal on-site at the Industrial Landfill or an Agency-approved new, on-site engineered repository." Please clarify whether impacted material exceeding the preliminary remedial goals will be consolidated and disposed of at the Wet Scrubber Sludge Pond or at the Industrial Landfill/an Agency-approved repository."

- **Comment 110H.** "7. Page 9 Exhibit 7: To avoid confusion and facilitate public understanding, DPHHS suggests changing "10E-6 = 1,000,000, 10E-5 = 100,000" in the footnote to "1E-6 = 1 person per 1,000,000 people, 1E-5 = 1 person per 100,000 people" and indicating in the table that the human health PRGs are based on cancer risk."

CFAC Comments

- **Comment 135R.** "Comment 6: Page 2: On the timeline, the reference to Closure more accurately refers to "Plant Closure.""

- **Comment 135S. "**Comment 7: Page 3 – Landfills. The FS makes clear that the Center Landfill may be a very small secondary source but it is highly unlikely that it contributes a contaminant load to groundwater that would significantly effect achievement of PRGs. Section 2.1.4.1 (Landfills) of the EPA approved FS Report: "The RI results indicate the West Landfill and Wet Scrubber Sludge Pond area is the primary source of contamination to groundwater at the Site and that the Center Landfill is likely a secondary source area. The results of the RI indicate the East Landfill, the Industrial Landfill, the Sanitary Landfill, and the Asbestos Landfills are not significant contributing sources of contaminants to groundwater."

- **Comment 135T.** "Comment 8: Page 3; West Landfill. The West Landfill was closed in 1981. See Section 1.3.4.1 (Landfills) of the FS Report; "The landfill was closed in 1981 and capped with a synthetic (hypalon) cap in 1994 (CFAC, 2013)."

- **Comment 135U.** Comment 9: Page 3; Center Landfill. The Center Landfill was capped with "clay cap and till" rather than "fill." See Section 2.3.1 (Landfills DU1) of the FS Report; "The Center Landfill was reportedly unlined. The landfill was closed in 1980 and, based on historical drawings, capped with a 6-inch clay cap and 18-inches of till (Marquardt Billmayer, 1981)."

- **Comment 135V.** "Comment 10: Page 5 – Remedial Investigation Report (first bullet) and Decision Unit LDU- 2: The East Landfill is incorrectly described as being a secondary contributing source of contaminants to groundwater. The Center Landfill was identified as a secondary contributing source as noted above, not the East Landfill. The results of the RI indicate that the DU2 landfills, including the East Landfill, are not contributing sources of contaminants to groundwater. See Section 2.3.2 (Landfills DU2) of the FS Report; *The Landfills DU2 is defined as the remaining waste management units in the Central Landfills Area and Industrial Landfill Area exposure areas and the surficial and shallow soil (0-0.5 and 0.5-2 ft-bls, respectively), if any, within their footprints. This includes the East Landfill, the Industrial Landfill, the Sanitary Landfill, and the Asbestos Landfills. The results of the RI Report indicate these landfills are not contributing sources of groundwater contamination at the Site.* The EPA's definition of LDU2 in the Glossary (Page 33) states that LDU2 "includes East Landfill, Industrial Landfill, Sanitary Landfill, and Asbestos Landfills. They are not sources of groundwater contamination."

- **Comment 135W.** "Comment 11: Page 5; Remedial Investigation Report, second and third bullet. PAHs and metals were detected in all soil samples, but only in certain areas at concentrations that potentially warranted remedial action. See Section 4.4 (Nature and Extent of COCs Contributing to Risk) of the FS Report."

- **Comment 135X.** "Comment 12: Page 5; Remedial Investigation Report, third bullet. Metals are present in shallow soils in the North Percolation Ponds, Main Plant Area, and the immediate vicinity of all landfills."

- **Comment 135Y.** "Comment 13: Page 6, Exhibit 3. – Eastern and Western Extent of Seep Area labels are incorrect. Based on the extent of groundwater and surface water contamination determined during the RI, the extent of the Seep is much less. See Section 2.1.4.4 (Surface Water Features) of the FS Report; "The Backwater Seep Sampling Area represents the western portion of the "Seep Area";… "The Riparian Area is within the central portion of the "Seep Area" "The South Percolation Pond Area is located within the extent of the "Seep Area.""

- **Comment 135Z.** "Comment 14: Page 7; Human Health Risks; last sentence of last paragraph. The PAHs in soil, and cyanide and fluoride in groundwater are primary risk drivers (current wording is confusing and could be misinterpreted that PAHs, cyanide, and fluoride are all primary risk drivers in groundwater). See Section 8.1 of the Remedial Investigation Report."

- **Comment 135AA.** "Comment 15: Page 7, Exhibit 4 – Ecological Health Contaminants of Concern: For the River Area Decision Unit (i.e., the "DU5" column), copper is only an ecological COC for surface water (sw); not for sediment (sed) or porewater (pw). See Table 2-5 below which is an excerpt from Section 2.3.5 (River Area DU) of the FS Report.

Table 2-5 Summary of COCs in the River Area DU

COC	Ecological			
	Soil	Surface Water	Sediment	Sediment Porewater
Metals				
Aluminum		X		
Barium	X	X	X	X
Copper		X		
Iron		X		
Other Inorganics				
Cyanide, total		X	X	X
Cyanide, free		X	X	X

- **Comment 135AB. "**Comment 16: Page 8 – The Descriptions of Remedial Action Objectives ("RAOs") for solid media, groundwater, and surface water should mirror the descriptions of the RAOs in Section 3.2 (Remedial Action Objectives) of the FS Report. Comment 16a. The language of the second, third, fourth and fifth bullets under Solid Media in the EPA Proposed Plan is an incorrect characterization of RAOs for Solid Media. The language in the second, third, fourth and fifth bullets of the Solid Media portion of Section 3.2 of the FS Report is correct, except for the references to the specific metals in the bullets in Section 3.2 of the FS Report. Comment 16b: The language in the first and third bullet under Groundwater RAOs in the Proposed Plan is incorrect. The characterization in the first and third bullets of Groundwater portion of Section 3.2 (Remedial Action Objectives) of the FS Report is correct."

- **Comment 135AD.** "Comment 18: Page 10; Evaluation and Elimination of Off-Site Disposal; Pre-Treatment. The Center Landfill waste would require pre-treatment and the Wet Scrubber Sludge Pond waste material could potentially require stabilization in order to be excavated and handled. See Section 4.3.1 (Landfills DU1) of the FS Report, subsection Removal and Disposal.

  "Given that the Wet Scrubber Sludge Pond accepted sludges, the material in this waste management unit will be of low strength; physical solidification of the sludges via addition and mixing of amendments would likely be required prior to, or in conjunction with, the excavation of the Wet Scrubber Sludge Pond to facilitate material handling."

  "Because it would not be contained within the Area of Contamination, SPL-impacted material from the West Landfill and Center Landfill would need to be disposed of in a landfill permitted under RCRA Subtitle C Using this facility, the need for pre-treatment of the excavated material would be determined by the Oregon DEQ."

- **Comment 135AE. "**Comment 19: Page 11; Groundwater Treatment Technology Screening. Eight (not seven) ex- situ treatment technologies, including electrocoagulation, were screened. The technology electrocoagulation was screened but not mentioned in the EPA Proposed Plan."

- **Comment 135AF.** "Comment 7: Page 3 – Landfills. The FS makes clear that the Center Landfill may be a very small secondary source but it is highly unlikely that it contributes a contaminant load to groundwater that would significantly effect achievement of PRGs. Section 2.1.4.1 (Landfills) of the EPA approved FS Report: "The RI results indicate the West Landfill and Wet Scrubber Sludge Pond area is the primary source of contamination to groundwater at the Site and that the Center Landfill is likely a secondary source area. The results of the RI indicate the East Landfill, the Industrial Landfill, the Sanitary Landfill, and the Asbestos Landfills are not significant contributing sources of contaminants to groundwater."

- **Comment 135AG.** "Comment 20b. Years to Achieve RAOs in the EPA Proposed Plan deviate from the FS, especially for time to achieve groundwater and surface water RAOs. For example, the FS indicates Alternatives LDU1-3A and 4A will take 14–26 years to achieve GW RAOs, and 35 to 60 for SW RAOs; and that Alternative 4C and 5B would take 6–9 years to achieve SW RAOs. The figurers in the FS are correct and should be used in the ROD if this data is discussed there."

- **Comment 135AH (20c).** "The time period of "4 Years" is mistakenly repeated under Column "Years to Achieve RAOs" for Landfills DU1/Groundwater. Four years is the estimate for duration of remedial design and construction of the remedy; not the time to achieve RAOs for groundwater or surface water. See Table 6.1 of the FS Report."

- **Comment 135AK.** "Comment 22b: The Proposed Plan states that the costs for the preferred alternative "do not include the potential for extraction and treatment of groundwater." That is not correct. The FS evaluation of Alternative LDU1- GW4A did include costs for extraction and treatment of groundwater inside of the slurry wall (see Appendix J1 of the FS) in the total estimated cost for Option LDU1-GW4A."

- **Comment 135AL.** "Comment 22c: Third Column of text, second paragraph. It is unclear what is meant by "with another series of monitoring wells downgradient of the slurry wall." The 8 pairs of monitoring wells (one within and one outside of the slurry wall) along the perimeter of the wall as depicted in Proposed Plan Exhibit 13 is the correct configuration of monitoring wells."

- **Comment 135AM.** "Comment 22d: Third Column of text, third paragraph. The groundwater treatment facility will only be necessary if the slurry wall fails to work as intended. The excavation for the slurry wall will not need to be dewatered and no groundwater treatment facility will be needed during the construction phase. Slurry wall construction requires water, both during excavation and installation of the wall.[8] If the groundwater at the site has properties suitable for effective slurry wall construction, it may be used. If site groundwater is not suitable or there is insufficient groundwater, supplemental water will be required. Key EPA and U.S. Armey Corps of Engineers (USACE) slurry wall design documents do not mention the need for dewatering during slurry wall construction[9]Therefore, any groundwater treatment system should only be required if monitoring wells inside slurry wall and monitoring wells immediately outside the slurry wall as depicted in Proposed Plan

Exhibit 13 indicate that the slurry wall is not operating as intended. Crucial information necessary for the design of a ground water treatment system, such as system capacity and key constituents to be controlled, will only be known after the slurry wall is fully constructed and operating. Therefore, building an effective waste water treatment system prior to the receipt of such information will be difficult, if not impossible."

- **Comment 135AQ.** "Comment 26 Page 31; Time to Complete. CFAC and Roux believe the time to complete design and construction is underestimated. Design for the whole project will likely take 1 to 2 years, considering complexity, pre-design investigations, and EPA submittal/review requirements. Construction will likely take 2 to 3 construction seasons. *See Table 6.1 (Detailed Evaluation of Landfills DU1-GW Alternatives) under LDU1/GW-4A Short-Term Effectiveness; 'design and construction of the cap and slurry wall in addition to establishment of ICs… are estimated to be completed within 4 years.'*"

- **Comment 135AR.** "Comment 27: Page 27; River Area DU; Threshold Criteria. At the end of the first paragraph, the no action alternative would not demonstrate concentrations of cyanide in surface water and pore water are decreasing over time in response to implementation of the EPA Preferred Alternative for LDU1/Groundwater DU 6/River Area DU 5."

2.26.2 EPA Response

Montana NRDP

Industrial Landfill

Multiple sources of information were used in the RI (Roux 2020a) to characterize the Industrial Landfill and its potential as a source of contamination. The RI (Sections 1.3.4.1, 2.5.4, and 5.2.3) included a review of historical engineering and disposal records, surface and subsurface sampling, and groundwater sampling from the four wells surrounding the Industrial Landfill. Groundwater contamination immediately downgradient of a potential source is a strong indicator of an actual source. Data from these four downgradient wells had maximum cyanide and fluoride concentrations that were below the PRGs of 200 and 4,000 µg/L, respectively. This indicates that the Industrial Landfill is not a source capable of causing groundwater contaminants to exceed PRGs. It is not known whether the Industrial Landfill is lined but it is unlikely as the landfill received nonhazardous waste and debris.

Sanitary Landfill

The RI also characterized the Sanitary Landfill using multiple information sources, such as historical records, aerial photographs, past studies and a geophysical survey (Section 1.3.4.1), surface and subsurface soil investigations (Section 2.5.4) and a groundwater investigation (Section 5.2.2). Cyanide and fluoride concentrations in groundwater from the two wells immediately downgradient of the Sanitary Landfill were below PRGs. This demonstrates that the landfill is not a source which causes groundwater to exceed PRGs.

North Percolation Ponds

The North Percolation Ponds are hydraulically downgradient of the West Landfill and Wet Scrubber Sludge Pond and concentrations of cyanide and fluoride in groundwater downgradient of the North

Percolation Ponds are less than those upgradient (RI Section 5.3). This decrease suggests that the ponds are not a contributing source of these COCs. Although semivolatile organic compounds (common coal tar pitch and petroleum coke constituents) were detected often in the North Percolation Pond soil at concentrations exceeding EPA Protection of Groundwater risk-based soil screening levels, they were not detected in groundwater from monitoring wells immediately downgradient of the North Percolation Ponds. Thus, the North Percolation Ponds are not a source of contamination to groundwater. This holds true for both the North-East and North-West Percolation Ponds.

South Percolation Ponds

Information used to assess the South Percolation Ponds included that from the former Montana Pollution Discharge Elimination Permit and related applications and from sampling of sediment and groundwater. Groundwater sampling results show that the South Percolation Ponds are not a source of groundwater contamination above standards (Section 5.3.1). A removal action addressed barium in sediment above ecological risk standards, and cyanide was detected in low levels in excavated materials.

West Percolation Pond

Three soil borings were sampled in the West Percolation Pond and the results showed that the soils there were similar to the general soils near the Main Plant Area. Because of this, the West Percolation Pond data was combined with the Main Plant Area /Soil DU dataset in a subsequent evaluation. The pond was discussed in the RI and the Phase I site characterization sampling and analysis plan addendum. The RI stated that the West Percolation Pond received boiler blowdown water and stormwater (Section 1.3.4.2). The sampling and analysis plan addendum describes the pond as a small, excavated area (0.05 acres), approximately 5 to 7 feet deep, with steeply sloping banks. A narrow ditch (~1-foot wide) extended off the pond in the northwest direction. The bottom of the pond is rocky and vegetated with grasses. Animal feces and burrows were seen in the pond and the ditch, but no water was evident.

Upper Hydrogeologic Unit

The below upper hydrogeologic unit did not have exceedances of DEQ-7 groundwater standards that would require further evaluation in the FS (Roux 2021a) and a technical review determined that no remedy was required. Table 14 of the RI (Roux 2020a), "Statistical Summary by Hydrogeologic Unit – Groundwater Below the Upper Unit" shows that no results for arsenic, cyanide or fluoride exceeded DEQ-7 groundwater standards in that unit. Well 53a had three exceedances of the DEQ-7 standard for antimony as shown in the Phase II site characterization summary report on Table 17. Antimony was detected (RI Section 4.4.5) in the upper hydrogeologic unit above the DEQ-7 standard (6 µg/L) in only one of over 300 groundwater samples (at 8.8 µg/L). This suggests that antimony is not a site-related contaminant. This absence of site-related contamination in the below upper hydrogeologic unit conforms with hydrogeologic conditions (RI Section 6.1 and Section 2.4.3 of the work plan). Flow of impacted groundwater is primarily horizontal through the upper hydrogeologic unit, with very little, if any, hydraulic connectivity between the upper unit and the water bearing zones in the below upper hydrogeologic unit.

DU6

The Preferred Alternative presented in the Proposed Plan (EPA 2023a) uses source control and monitoring to address contaminants above PRGs in groundwater. After the contaminant sources are removed, natural flushing will reduce contaminant levels and PRGs for groundwater and surface water will eventually be reached. Technologies, such as a permeable reactive barrier, were evaluated in the FS (Section 5.1 and Table 6-1) but were not as effective at reducing groundwater contaminant levels as source control. There was no incremental effectiveness at reducing surface water contaminant levels when compared to the source control technology.

Additional Remedy

The FS (Roux 2021a, Section 5.1.6) details the potential extraction and treatment of groundwater from inside the slurry wall. This technology would be used if monitoring data indicated that, in the absence of inward gradient, concentrations of COCs downgradient were not decreasing to achieve RAOs and PRGs. Specific details of how extraction and treatment of groundwater would be triggered will be addressed in the remedial design. The statement referenced above refers to the extraction of groundwater inside the confines of the slurry wall and is not a remedy for groundwater outside of the slurry wall.

Montana DPHHS Comments

Alternative 4

The commenter is correct that there was a typographical error in the Proposed Plan (EPA 2023a), and the sentence under the Alternative 4 heading should read, "Alternative 4 is identical to Alternative 2 except…." The discussion of disposal of excavated waste reflects the description found in the FS. However, the description of the Preferred Alternative for DU3 and DU4 on page 30 of the Proposed Plan reflects the intended disposal site for excavated waste: "Consolidate excavated materials with disposal on-site at the Industrial Landfill or an Agency-approved new, on-site engineered repository." In the ROD, this language has been modified to read, "...disposal on-site at an existing waste disposal facility or a new, Agency-approved, on-site engineered repository to be selected during remedial design." This is discussed in Section 12.2.2.4 of the ROD.

Risk Language

The suggestions for presenting risk ranges to the public are noted.

CFAC Comments

- **Comment 135R (6).** Comment noted.
- **Comment 135S (7).** Comment noted. The ROD states that the Center Landfill is a secondary source of groundwater contamination.
- **Comment 135T (8).** Comment noted.
- **Comment 135U (9).** Comment noted.
- **Comment 135V (10).** Comment noted. The ROD notes that the Center Landfill is a secondary source of groundwater contamination, not the East Landfill.

- **Comment 135W (11).** The ROD clarifies where PAHs and metals concentrations in soils exceed risk-based screening levels.
- **Comment 135X (12).** The ROD clarifies that the remedial investigation identified metals in shallow soils in the immediate vicinity of all landfills.
- **Comment 135Y (13).** Comment noted. The site features figure in the ROD eliminates the eastern and western extent of the seep area labels.
- **Comment 135Z (14).** The Proposed Plan had a limited amount of space to discuss risk. The ROD is clear regarding groundwater risk drivers being cyanide and fluoride, it does not identify PAHs.
- **Comment 135AA (15).** The ROD is clear regarding surface risk drivers for surface water; text was copied verbatim from the FS.
- **Comment 135AB (16).** EPA considers the wording of the RAOs to be draft until the ROD. Changes were made in the Proposed Plan that have been carried forward to the ROD.
- **Comment 135AD (18).** Comment noted.
- **Comment 135AE (19).** Comment noted.
- **Comment 135AF (20).** EPA acknowledges some discrepancies between the Section 3.4 of the FS volume estimates compared to Exhibit 26 of the Proposed Plan. Upon review, EPA concluded that some of the discrepancies on volume estimates appears to be the Proposed Plan using loose cubic yard estimates for the volumes of waste and soils excavated for disposal as presented in Appendix J of the FS, compared to the bank cubic yard estimates presented in Section 3.4 of the FS. The ROD uses the volume estimates in Appendix F of the FS
- **Comment 135 AG (20b).** The Selected Remedy in the ROD clarifies the time to achieve RAOs for groundwater or surface water.
- **Comment 135AH (20c).** The Selected Remedy in the ROD clarifies the duration for remedial design and construction of the remedy and the time to achieve RAOs for groundwater or surface water.
- **Comment 135AK (22b).** Comment noted. Costs for the potential for extraction and treatment of groundwater have been included for the Selected Remedy in the ROD.
- **Comment 135A (22c).** This bullet describes one half of the 8 monitoring well pairs to be located within the slurry wall, with the other half to be located outside of the slurry wall. This description is consistent with the alternative described in the FS. The need to conduct groundwater treatability studies, conduct interim groundwater treatment, and the design of groundwater extraction/monitoring wells will be evaluated during remedial design.
- **Comment 135AM (22d).** The potential need and sequencing of a groundwater treatability study, design of a groundwater extraction and treatment system, and groundwater treatment

for reuse during slurry wall construction, will be evaluated during the remedial design work plan, preliminary design investigation work plan, and/or remedial design, as applicable.

- **Comment 135AQ (26).** Times to complete for various alternatives in the Proposed Plan were for construction only. The ROD (Table 10-2) notes that "Design will occur prior to construction and will include pre-design investigations and take up to 2 years to complete."
- **Comment 135AR (27)**. Comment noted.

2.27 Remedy – DU1

2.27.1 Public Comments

Fifteen comments were received from one individual asking for information about the remedy at DU1.

- **Comment 54BF. "**Let's look at what they are proposing for DU-1. A 3,000 foot circumference by 2 foot thick mixed gravel and clay wall that is 100 feet or more from the earth's surface straight down. Purpose - to stop ground water flow going through the material in the land fill from being spread underground to the Flathead River. Wells inside and outside of the slurry wall to tell them if it is working or if water is still flowing through the ring. Finally, if its still flowing, they will build a series of chemical plants to knock out the toxic components before discharging the treated water back into the river via an infiltration pond. The surface of the slurry wall cylinder will be capped with a modern fabric cap to stop rain and snow melt water from entering the structure. The bottom is sealed off from ground water entering the structure by a layer of soil called glacial till that has a clay content high enough to limit water flow through it. Limit means it slowly leaks, in this case. What should we also know to ask so we help EPA make the permanent record of decision?"
- **Comments 54BQ through CB**.
  - "11. Will the landfills run out of F and CN someday if we just let the water run through them? How long will that take?
  - 12. If you are successful in keeping water outside of the slurry wall, will the F and CN ever disappear or will it be trapped there in the ground forever?
  - 13. How sure are you that glacial till will not leak into the dump or let water flow at a slower flow rate and prolong or cause concentrations of contaminants to go higher in the water seeping into the river at a future date?
  - 14. What do you know about the glacial till layer? How deep, how thick, how chemically and structurally consistent is it? There is 715,000 sq ft under the landfill. Are there any coulees, sand lenses, gravel lenses, boulder or cobble fields, that would allow water to flow through this floor unimpeded?
  - 15. How sure are you that you can lock the slurry wall to this till layer and make it water tight for 3,000 feet?

- 16. Could an earthquake crack of shift the slurry wall causing it to fail as a water barrier?
- 17. Why don't you restart the production wells and pump more water thru these dumps to dilute the F and CN before it goes to the Flathead River? Will the extra water cause the CN containing carbon to structurally collapse? How many monitoring wells go directly through each landfill to the glacial till layer?
- 18. Why not do a pilot test as part of this R I on the down stream corner of the west landfill to see if pumping water, or water with pH modifiers, or other mild chemicals will get the F and CN out either quicker or in a safer chemical compound before sending it to the Flathead River?
- 19. What tests have been done to see if the wastes can be chemically modified in place, in the dump, to make them less toxic to the Flathead River?
- 20. Did you include DU-5 with DU-1 so that you could use the Flathead River to complete your out of site out of mind mother earth solution? Using the river flowing up on the seep bank to put them under the waters surface and completely washing the riparian area and backwater seep off the island? Good Plan.
- 21. Can you be more proactive handling the dumps in place? Idea wise could you use horizontal fracking technology to horizontal drill under the dumps and build a water proof floor say 60 feet under the surface. This would allow the slurry wall to be only 60 feet deep with a known solid bottom to lock into. This would improve your chances by reducing the amount of material your working with to a bare minimum and allow you to control the water/ chemicals you put into or out of the dumps at a constant known quantity. This will allow a treatment to be built at its smallest size and best efficiency for handling a known quantity of water daily. This may also allow for moving water into the Flathead River only at High water flow. Over the years groundwater under the slurry cell you created will clean the gravel and sand layers once you stop the continued addition of new CN and F every day.
- 22. If you just contain the dumps and control water in and out, could you build a 800 yard flume from the bottom of the 60 deep slurry wall cell to a treatment facility down by the potline basements? You could even fill a large flume with several hundred yards of removable iron shavings or whatever you can come up with to take the F out too (think of a long Brita filter) so that the natural water flow brings the water closer to drinking water quality before putting it back into the Flathead River. This is proactive as opposed to letting mother nature use time as the only determinant for clean-up."

- **Comments 54CH and CJ**.
  - "28. Why don't you remove it [Center Landfill] to a safer storage site if the contents are dry and easy to get at and don't require any pre-treatment or segregation of waste:
  - 30. Is it possible to put a fabric cap on this steep pile?"

2.27.2 EPA Response

The volume of cyanide and fluoride that remain in the West Landfill and the Wet Scrubber Sludge Pond is unknown and would not impact the Selected Remedy. The Selected Remedy requires containment of this waste unit through construction of a slurry wall, capping, and stormwater runoff controls. Allowing groundwater and surface water to continue to infiltrate and flow into Landfills DU1 was evaluated as the No Action alternative in the FS (Roux 2021a) and was rejected during the analysis of alternatives as it would not result in meeting groundwater standards.

The Proposed Plan (EPA 2023a) and Selected Remedy in this ROD address the commentor's concern that there is some degree of uncertainty regarding hydrogeological conditions beneath the West Landfill and the Wet Scrubber Sludge Pond, which is why groundwater monitoring, and groundwater extraction and treatment (if necessary) based on groundwater elevations within the containment cell was included in the Preferred Alternative (EPA 2023a) and is now part of the Selected Remedy.

Extracting groundwater from production wells located near the Flathead River and pumping it into the West Landfill and the Wet Scrubber Sludge Pond would only exacerbate groundwater contamination. Similarly, installing monitoring wells through landfills is not recommended, as the borehole into which the monitoring well is installed may act as a conduit for migration of contaminants to the groundwater. This may be the case for monitoring well CFMW-017, which was installed in 1980 through the Center Landfill. That historical monitoring well is the only well installed through wastes at the site.

Site characterization of the glacial till layer was summarized in the FS, as follows:

> *Glacial till was observed in the subsurface across most of the Site, typically beneath the coarse-grained outwash deposits. The glacial till layer is a dense, poorly-sorted deposit, consisting of varying amounts of sand, gravel, cobbles, silt, and clay. Based on field observations, the till was typically noted to be drier and denser than the overlying coarse-grained deposits. The maximum vertical extent of the glacial till is unknown in the areas to the north, west, and south of the Site, as the next lithologic layer was not encountered during drilling. This indicates that the till is typically at least 200 feet thick or greater in these areas.*

The remedial design of the slurry wall will include an analysis of expected seismic performance of the proposed slurry wall for the maximum credible earthquake in the Columbia Falls area. The remedial design will also evaluate the need to solidify the wet scrubber sludge prior to capping it.

The River Area DU5 was included with the Landfills DU1 and Groundwater DU6 in the Proposed Plan because the source of cyanide and fluoride contamination in the Backwater Seep Sampling Area is the discharge of groundwater, and the primary source of cyanide and fluoride contamination in groundwater is the Landfills DU1, as determined by the RI (EPA 2020a).

Construction of a 100- to 125-foot-deep slurry wall has been determined to be feasible, and data collected during the RI (Roux 2020a) indicate that the glacial till serves as an adequate aquitard in minimizing the transport of fluoride and cyanide to the lower hydrogeological unit beneath the West Landfill and Wet Scrubber Sludge Pond. Construction of a 60-ft deep horizontal slurry wall will not enhance the effectiveness of the vertical slurry wall to control migration of COCs in groundwater. The vertical slurry wall as described in the Selected Remedy is far more effective.

The RI determined that groundwater discharge is not impacting surface water quality in the Flathead River, so groundwater extraction and treatment downgradient of the containment cell was not included in the Selected Remedy.

There is no compelling reason to excavate and remove the contents of the Center Landfill because monitoring wells immediately adjacent to and downgradient of it are compliant with groundwater standards. A new low-permeability cap will be installed on the Center Landfill to meet modern standards. Monitoring well CFMW-017 which was installed through the Center Landfill in 1980 will be abandoned in accordance with State of Montana well abandonment regulations so that the borehole for this well will not act as a secondary source of contamination to groundwater.

2.28 Remedy – DU2, 3, 4, and 6

2.28.1 Public Comments

Seven comments were received from one individual and from CFAC (#135) that addressed the proposed remedy for DU2, DU3, DU4, and DU6.

- **Comment 54DH.** "19. How difficult would it be to remove the waste from the clay pad base and combine it with the center landfill waste? Would this lessen the risk of future CN and F leakage and provide a safer known environment for both of these dump wastes?"

- **Comment 54EG.** "There are seven areas north of the plant in this operating area generally. They are contaminated with PAH, metals and F and CN. The plan is to excavate them and dump them into the current industrial landfill or reopen the wet scrubber sludge pond. It would take 25,000 cubic yards of backfill to refill the holes caused by the excavations. Only comment I have about this is, why further contaminate the industrial landfill or the wet scrubber sludge pond? The industrial landfill should have none of this material so why create a new contamination site? The fact that neither has a waterproof bottom to them just means that these contaminants will become very mobile, water-borne toxic substances. The wet scrubber sludge pond is a fairly pure single source waste which would be easier to process without 25,000 cubic yards of dirt mixed into it."

- **Comment 54EJ.** "3. Just filling the deep water holes in this area knowing the carcinogens that were intentionally flushed out here into the groundwater is not protecting the people in the area or the environment."

- **Comment 54EP.** "9. Why do you want all these organic toxic chemicals mixed into the industrial landfill or the wet scrubber sludge pond?"

- **Comment 135AN.** "Comment 23: Page 30; NPP DU, last bullet. NPP-4 as presented in the FS includes consolidation of excavated materials at the Wet Scrubber Sludge Pond with physical solidification as needed, prior to construction of a low permeability cap over this area. It does not contemplate consolidation at the Industrial Landfill nor creation of new onsite engineered repository as described in the Proposed Plan. See Section 5.4.4 (Alternative NPP-4) of the FS Report which states: "The excavated material would be consolidated at an existing onsite repository (i.e., Wet Scrubber Sludge Pond) prior to capping of that waste management unit. Based upon the mix and concentrations of COCs in the soil/sediment that would be excavated from the North Percolation Pond DU as well as the presence of viscous waste, the Wet Scrubber Sludge Pond was determined to be the appropriate repository for this excavated material due to the comparability of the wastes." In addition to the comparability of the waste as described above, there are other reasons for selecting the use of the Wet Scrubber Sludge Pond as the appropriate repository for the NPP materials instead of creating new, onsite repository. These reasons include: The waste from the NPPs placed into the Wet Scrubber Sludge Pond will be contained beneath the cap, and inside the slurry wall, to be installed over and around the Wet Scrubber Sludge Pond, respectively, as described EPA's preferred alternative for Landfills DU1. The cap will minimize infiltration of water into the material. In the highly unlikely event that materials did leach from the NPP waste placed into the Wet Scrubber Sludge Pond, they would be likely contained within the slurry wall and would not impact groundwater. This would not be the case with a new repository built outside of the slurry wall area. Prior to capping, the existing grade of the Wet Scrubber Sludge Pond will need to be raised to ensure proper drainage of surface and storm water. Consolidating the NPP excavated materials into the Wet Scrubber Sludge Pond will raise the grade and minimize the amount of cover material that needs to be imported to the Site prior to construction of the cap. Minimizing the import of fill will reduce short-term impacts associated with truck traffic thru the neighborhood and eliminate the associated greenhouse gas emissions. The NPP materials and fill that will be used to raise the grade of the West Scrubber Sludge Pond will be covered by the cap. Use of the Wet Scrubber Sludge Pond as the repository for the NPP materials makes use of an existing waste disposal location that has capacity and could benefit from receipt of the materials; as opposed to constructing a new onsite repository that would limit the productive reuse of the site and become another feature requiring long term monitoring and maintenance."

- **Comment 135AO.** "Comment 24: Page 30; Soils DU, last phrase of bullet. Delete "an Agency-approved new, on site, engineered repository" and add in its place "beneath the cap, and inside the slurry wall, to be installed over and around the Wet Scrubber Sludge Pond, respectively." As described in the FS, since impacted soils from the Former Drum Storage Area may be a contributing source to the elevated cyanide and fluoride concentrations in groundwater, this material would be disposed of in the Wet Scrubber Sludge Pond prior to construction of the low-permeability cap and slurry wall. Depositing this material in the Wet Scrubber Sludge Pond will ensure that it covered by a low permeability cap and, in the highly unlikely event that it were to leach material, that would likely be contained by the slurry wall. Sampling showed that the soil from the remaining areas is not a source of groundwater contamination and therefore could be disposed of in either the Industrial Landfill or the Wet Scrubber Sludge Pond prior to construction of the caps over these areas as additional fill. The Industrial Landfill, similar to the Wet Scrubber Sludge Pond, could benefit from the addition of material to facilitate proper grading prior to cap construction. Therefore, use of the Industrial Landfill and/or the Wet Scrubber Sludge Pond as the repositories for the excavated soil makes use of existing waste disposal locations that have capacity and could benefit from receipt of the materials; as opposed to constructing a new onsite repository that would limit the productive reuse of the site and become another feature requiring long term monitoring and maintenance.

- **Comment 135P.** "Comment 25: Page 31; Remedial Design Details and Activities, third bullet. As described above in Comments 18 and 19, the Wet Scrubber Sludge Pond and Industrial Landfill should be used as the locations for consolidation of excavated wastes prior to the construction of caps over these areas, and construction of the slurry wall around the Wet Scrubber Sludge Pond and construction of a new repository is unnecessary and counterproductive."

2.28.2 EPA Response

The location for the final disposal of soils, wastes and sediment materials from the Soil DU3 and North Percolation Ponds DU4 will be determined during remedial design. The commenter's concern regarding the Wet Scrubber Sludge Pond and the Industrial Landfill is noted. The Wet Scrubber Sludge Pond is within the area that would be contained by the slurry wall and would later be capped. Data collected during the RI (Roux 2020a) show that the Industrial Landfill is not a contributing source to groundwater contamination and the Selected Remedy requires that it be capped. The contaminants in the DU3 and DU4 impacted materials (PAHs, metals) are relatively immobile and it is unlikely that they would leach downward into groundwater beneath a capped landfill. The need for constructing a new repository for these impacted materials will be evaluated during remedial design.

The location of the excavated soils from the North Percolation Ponds and Soils decision units will be determined during remedial design.

2.29 Remedy – DU5

2.29.1 Public Comments

Five comments were received from one individual asking for information about the DU5 remedy.

- **Comment 54AW.** "36. DU-5 - Did you go thru a public ROD process with a public involvement meeting before completing your ROD and actually completing the project? You may have violated your 9 step procedure and our trust. DU-5 was a last minute Flathead River bottom clean up. It was created in part by EPA ordering CFAC to build a steel sheet piling wall across the river channel that was an active part of the Flathead River in the early days of the plant. It protected the three south percolation ponds, the riparian area, and the backwater seep area. Was the final project ROD decision to remove all man-made structures, wells, buildings, power infrastructure, and roads from this area? Was it done to make the river reclaim its 1955 channel along the bank? Is cutting 3 foot diameter well casings 10 feet below the island surface acceptable as a final abandonment? Was more than that done? What? Why was the road at the west end of the percolation ponds partially left in place and the 60 year old poplar forest from there to the river not removed? Did your final fix create an absolute safety hazard for river floaters and defeat the intent of putting the river into its 1955 channel? Was the purpose of this fix to run the river through three known areas of DEQ-7 and other soil and sediment pollution violations using river dilution to put them out of sight? Why did the State of Montana grant a MPDES water discharge permit in 2014 and allow CFAC to change the 1984 seep area from 100 yards long to 1.25 miles long when this seep had never been changed from 1994 forward on any MPDES permit applications? Did CFAC hide the existence of the much larger seep for 20 years before applying for the 2014 permit? Why is the sewage plant that pumped sewage treatment water into the south percolation pond system since 1955 not decommissioned and destroyed? Its technology is not up to modern standards and its not eligible to be 'grandfathered' in any more."

- **Comment 54ES.** "This is the Flathead River island below the plant proper. It contains 3 South Percolation Ponds and received water from the south half of the plants ground drainage system, casting cooling water, sewer plant for human wastes, and in the late 1990's all of the water generated in the plant laboratory. This area is where large numbers of DEQ-7 violations are prevalent. They were in the human arena and at acute levels for organisms living in the island sediments. This area contains a large riparian area, backwater area, and many seeps flowing from the river bank into the Flathead River. It was already pushed thru the entire ROD procedure in 2020 and its clean-up was completed in early 2021. The intent of the clean-up was to re-route the Flathead River back into its 1955 channel on the North side of the canyon and make the island an actual island again. There was a road from the railroad tracks above onto the island that allowed service access to Drinking Water production wells 6 and 7 and two smaller monitoring wells drilled during phase 1. There was a well house with the two 3 foot diameter drinking water wells and the supporting electrical infrastructure. The road that serviced the production wells went from east to west on the island forming a dike that dammed the water in the two southern most percolation ponds. Questions are to late for the public on this DU, but maybe some constructive criticism of the final product is due."

- **Comment 54ET.** "Why didn't you provide a channel for the river from East to West on the north shore? That is what you told the people of the county you were doing? You left part of the road half way down the island at the west end of the southern most pond. The river in three short years has deposited more gravel at this high spot and has diverted the river from flowing west along the bank to a southerly direction and is cutting the island in half. You also left about 300 feet of Poplar forest that filled the area below the south pond after the 1964 flood. These trees and their associated undergrowth have captured all the debris coming down the river at hi water flows further reinforcing the dam with every piece of wood creating a dangerous log jam inside the poplar forest. This is a huge problem for the large numbers of recreational floaters who use the river every year. At low water they are forced to portage across the island to the main river. At high water they float into a debris filled forest at high speed. You really need to go back and remove the gravel and cut the forest out so there is a river channel along this bank. Besides floater safety issues, the new south channel being created causes a quick return flow to the bank and if it becomes to perpendicular to the shore it may well cause BNSF safety issues because they have already spent large sums of money and time to protect their mainline above from potentially sliding into the river in this area. Telling the public you followed your work permit for the work you did doesn't absolve you from creating a potentially serious safety hazard."

- **Comment 54EU.** "The other concern might be how you abandoned the four island wells. Cutting the steel casings a few feet below the ground surface may be ok; but did you do anything to cap them? Minimizing the chance of surface activities sending contamination down into the underground aquifer or at some future date when the river digs down to the steel stub is it possible someone may hit them of find a way to get sucked down into a 3 foot diameter well casing that is 50 to 60 feet deep? What was done to protect future recreationists from these wells?"

- **Comment 54EV.** "Last item is the sewer plant on the bluff above the island. Why hasn't it been torn down and decommissioned? It's an antiquated 1955 building with grand fathered in mechanical sewage equipment. It is hooked to the south percolation pond system and it needs to be removed and never repurposed. These are the shortfalls that should be corrected from your already approved ROD for this decision unit. It should be done before EPA and CFAC walk away from this island."

2.29.2 EPA Response

Notification letters for the South Percolation Ponds Removal Action were sent to agencies/ stakeholders in March 2020. Notification was provided again on January 14, 2021. The Phase II design package included: a project schedule; plans/design drawings; technical specifications; a joint application for proposed work in Montana's streams, wetlands, floodplains, and other water bodies; a biological assessment; and floodplain certification. EPA's website provided updates on the removal action during this time, and EPA's project manager was available by telephone to address any public concerns.

The removal action was performed because the Flathead River had been migrating northward during late spring/early summer high flow conditions and there was a high potential sheet pile wall and riprap protecting the South Percolation Ponds from river encroachment would fail, releasing shallow soils and sediments contaminated with barium above ecological risk based preliminary remedial goals for surface water and soil into the river. Infrastructure associated with the ponds was removed to allow the river to resume flowing in its original channel and return to natural conditions. Approximately 23,450 cubic yards of soil/sediment was removed from the South Percolation Ponds and disposed into the Industrial Landfill and covered with an interim soil cover. Soil samples taken after these materials were removed from the excavation floor confirmed that all the contaminated soil/sediments were removed. All removal activities are documented in the 2021 *South Percolation Ponds Removal Action Report*, which is available at EPA's website.

Abandonment of the three production wells and two monitoring wells was conducted in accordance with Montana regulations, specifically Administrative Rules of Montana 36.21.8 as required under the technical specifications. This required the wells to be backfilled with an impermeable material such as bentonite or cement. There are no open holes left in the ground.

The road to the South Percolation Ponds remains, as it is still needed to access this area for future surface water/pore water monitoring.

There were comments regarding the past operational and regulatory history of the South Percolation Ponds. The history of the South Percolation Ponds does not impact the Selected Remedy. The sewage treatment plant is on the plant site and outside the floodplain, so there is no reason to remove it. Superfund addresses releases and potential releases of hazardous substances to the environment, not the demolition of decommissioned facilities. The objective of the cleanup was to remove contaminated soils/sediments from the South Percolation Ponds, not to re-route the Flathead River. Similarly, Superfund removal actions are not intended to restore rivers or address safety concerns to recreational floaters from a naturally migrating river. Burlington Northern Sante

Fe Railroad, whose tracks are adjacent to the removal area, was consulted prior to and throughout the removal action and voiced no concerns about potential damage to their railway from the action.

2.30 Restitution

2.30.1 Public Comments

Eight comments were received from six individuals and CBF (#134) that addressed the issue of restitution in terms of payment for damages related to contamination and alleged loss of property value due to the Superfund designation. EPA was urged to pursue the PRP for reimbursement of costs related to investigation and cleanup and to compel them to donate a portion of the undeveloped land on the site for use as a conservation easement.

- **Comment 46.** "However, another thing occurred to me. In reading on the EPA's web site, I find that under the heading of "2017 Major Criminal Cases," they state that in 2017, "This year's cases resulted in a total of 153 years of incarceration for individual defendants, plus fines of $2,829,202,563 for individual and corporate defendants, with an additional $3,092,631 in court ordered environmental projects and $147,520,585 in restitution." * Well, it occurs to me that besides the cleanup, Glencore, et al., should make restitution to the community for the damage they have caused to our air, water, lands and the market value of properties which has been affected adversely by being "next to a Superfund site," as my property, for one, has been described to me. I feel strongly that Glencore as partial restitution should donate – not sell – the meadow lands to the west of the plant site (three parcels encompassing 70.5 acres) for a conservation easement that would benefit the community, add value to the attractiveness of their plant site, and placate nearby residential owners like me whose property values have been decreased with the news of the Superfund designation. Cleanup is one thing, but other types of criminal activity are usually assessed both a fine or jail time AND restitution."

- **Comment 51A.** "I have submitted several comments regarding the EPA's proposed Cleanup Plan for the CFAC Superfund Site. However, another element of the cleanup is also of great concern to me. In reading on the EPA's web site, I find that under the heading of "2017 Major Criminal Cases," they state that in 2017, "This year's cases resulted in a total of 153 years of incarceration for individual defendants, plus fines of $2,829,202,563 for individual and corporate defendants, with an additional $3,092,631 in court ordered environmental projects and $147,520,585 in restitution." Cleanup is one thing, but other types of criminal activity are usually assessed both a fine or jail time AND restitution. Well, it occurs to me that besides the cleanup, Glencore, et al., should make restitution to the community for the damage they have caused to our air, water, lands and the market value of properties which has been affected adversely by being "next to a Superfund site," as my property, for one, has been described to me. I feel strongly that Glencore as partial restitution for the damage they have done, should donate – not sell – the meadow lands to the west of the plant site (at a minimum, three parcels encompassing 70.5 acres) for a conservation easement that would benefit the community, add value to the attractiveness of their plant site, and placate nearby residential owners like me whose property values have been decreased with the news of the Superfund designation.

Other advantages of maintaining the open space between the plant site and the nearby residential community include:

- Open space is critical to our quality of life.
- Open space would preserve the current habitat of wildlife that have a right to live as they have in that space.
- Wildlife would maintain the ability to move freely and thrive in a space they have occupied up until now.

In addition, advantages to the plant site owner would be that it would:

- Lessen conflict between the industrial site's future activity and the nearby residential community.
- Preserve the character of the urban area.
- Provide places to recreate.
- Provide a buffer for wildland fire.

I realize that it is not the EPA's role thus far in the cleanup process to dictate what is done with the site post cleanup. However, when and if a cleanup is accomplished, the ongoing neighborhood will continue to have to deal with the stigma of being toxic. My home is my biggest asset and therefore my future and my quality of life are impacted by the EPA's decisions and recommendations. I ask that there be some qualifying conditions to the post cleanup lands so that my thirty-five year investment in my home does not vanish along with the game that make this area their home."

- **Comment 54GA.** "6. Glencore should be required to sign a legally binding financial document that guarantees the current property owners of Aluminum City, as defined by the red box outline on Plate #14 "Residential Well Sampling Locations" in the Phase 2 site characterization data summary report document dated 7/29/2019, a minimum selling price equivalent to the highest state appraised value of each individual property in the 2022 or 2024 appraisal cycle, when the property is sold by the owners of record as of January 1, 2022. Documents will be placed with the Flathead County Clerk & Recorder to become a permanent part of the property's legal description. This legal document is to compensate for trauma caused by CFAC/Glencore actions in the last 10 years that have caused emotional, mental, and physical stresses as a result of the "Superfund" designation. It will put a floor under future selling prices by the property owner should future efforts at cleaning up the superfund site cause a loss of value."
- **Comment 54GB.** "7. Make the IC and EC documents responsible for the financial damages CFAC's neighbors suffer as a result of CFAC's/Glencore's actions and not just exposures and integrity of caps."

- **Comment 55A.** "Please clean the site, and NOT just bury the contamination for future generations to suffer from the poor decisions of the small minded people of today. Make them pay for the cleanup, so we can move forward through these sad moments in time."
- **Comment 102C.** "I also think the EPA should strongly pursue the responsible parties for additional funding to help pay expenses."
- **Comment 117A.** "I like fairness in life and it is only fair that CFAC is held accountable for the restoration of this critical project. It is not fair for a company to come in and create long term pollution that will have long lasting effects. They need to be held accountable and do what ever is necessary to make sure all the contaminates are contained and removed to an acceptable standard. Please do the right thing, listen to the experts and make sure this property is returned to a level that will no longer cause harm to those who live, visit and recreate there. Thank you for your time regarding this critical project."
- **Comment 134L.** "11) Given that these court records also document how much money did ARCO, CFAC and Glencore actually spend and earn running the plant--or not running the plant in 2001-2002 during the West Coast Energy Crisis to which the latter answer is $659 million – the amount Glencore earned selling BPA-contracted electrical power on the open market. The company earned more than twice as much money selling power as smelting aluminum. What documentation has been done of investments made by ARCO or CFAC in cleaning up the toxic waste at the plant? Given likely documented lack of investment in the ongoing clean up and proper disposal of toxins in contrast to profits earned like during the 2001-2002 during the West Coast Energy Crisis where some reported $659 million were made from selling electricity, what justification have you documented in the proposed cleanup plan as to why you are not requiring that the corporations responsible for this pollution and toxic waste pay for full and complete restoration of this CFAC superfund site? Again how are the documents and facts created in the Molloy rulings being used to document actual investments in cleanup and to hold these corporations responsible for the clean up costs of the CFAC superfund site as opposed to US taxpayers? See prior question #2 which is related to these questions as well."

2.30.2 EPA Response

EPA seeks to identify parties responsible for hazardous substances released to the environment (polluters) and either compel them to clean up the sites, or EPA may undertake the cleanup on its own using the Superfund (a trust fund) and seek to recover those costs from PRPs through settlements or other legal means. Approximately 70% of Superfund cleanup activities historically have been paid for by the PRPs, reflecting the polluter pays principle.

The site was added to the National Priorities List on September 9, 2015. On November 30, 2015, EPA and CFAC, the PRP, signed an Administrative Settlement Agreement and Order on Consent to conduct a RI/FS to investigate the site for contamination and look at options for cleanup. Under the terms of the agreement, per EPA guidance (EPA 1988a), CFAC made a comprehensive investigation of soils, river sediments, and ground and surface water to determine the nature and extent of contamination at the site under EPA and DEQ oversight. The results were used to determine cleanup needs and identify and evaluate potential cleanup options. CFAC has been and will continue to be responsible for costs incurred in investigating and cleaning up the site.

EPA does not have the authority under the Superfund statute to compel a PRP to compensate nearby property owners for "emotional, mental, and physical stresses as a result of the 'Superfund' designation" or for negative impacts to property values. Similarly, EPA cannot compel a PRP, or any property owner, to donate their land for open space or wildlife corridors. These issues are best addressed between the landowner and the community.

2.31 Restoration

2.31.1 Public Comments

Four comments were received from four individuals that urged EPA to commit to full restoration of the site.

- **Comments 18C, 43C, and 80C.** "Secure additional testing at the site and EPA's commitment to long-term full restoration of this 960 acre industrial superfund site."
- **Comment 79D.** "4. Please commit to a long term full restoration of the 960 acre industrial superfund site. Thank you for your concern. Water quality in the Flathead Valley depends on the EPA developing a safe and responsible plan to clean up the Columbia Falls Aluminum Company Superfund site."

2.31.2 EPA Response

The goals of the EPA Superfund program (www.epa.gov/superfund) are to:

- Protect human health and the environment
- Make responsible parties pay for cleanup work
- Involve communities in the Superfund process
- Return Superfund sites to productive use

A property is considered ready for reuse when it has been investigated and requires no further action or it has been cleaned up to meet site-specific cleanup goals. Properties with site-specific cleanup goals normally have engineering controls (such as fencing and signs) and institutional controls (such as deed restrictions or prohibitions on groundwater use) in place to protect the remedy and isolate contamination that remains in place. As long as waste is left in place at concentrations that do not permit unrestricted use and unlimited exposure, EPA will conduct reviews every five years to ensure that the remedy, including institutional controls, remains protective.

At the site, this translates to returning the portion of the site once used for producing aluminum to productive use, most likely as an industrial or commercial business park. The ROD calls for institutional controls that will prevent residential development and use of groundwater in this area. It is not clear what commenters mean by "long-term, full restoration of this 960-acre industrial Superfund site." Under the Superfund statute, EPA does not return private property to predevelopment conditions, and we cannot require set asides of unimpacted, private lands for wildlife corridors or other uses, no matter how beneficial. Such uses can be negotiated with the landowner and private citizens or local government.

2.32 Risk – Cancer

2.32.1 Public Comments

Eleven comments were received from eight individuals and CBF (#134) that addressed potential occurrences of cancer which commenters believed might be related somehow to the site.

- **Comment 3A.** "I'm from Columbia Falls. And just kind of expanding on Dave's comments. I am one of at least six families, that we're aware of, that from 2011 has experienced pediatric cancer in our families, and of that -- because of HIPAA regulations, we're not privy to others who weren't out with what they were going through. Of those six children, three have passed away. We're one of the lucky families where we still have our child, if you call going through pediatric cancer lucky. But in 2017, when our child was diagnosed, we did talk to the pediatric oncologist -- and there was an outstanding young man that had just passed away -- and we said, Yeah, this seems to be happening a lot in our community. And she told me -- she said, You don't even know. She said, There's something wrong up there. The Flathead Beacon looked into the Department of Environmental Quality -- or -- yes, I think I'm saying that correctly -- to see if Columbia Falls had an uptick in pediatric cancer cases. At that point, we did not, but my child was not included, another one that was diagnosed three weeks before her was not included, and we've had at least one more child since then."

- **Comment 4C.** "You talk about the childhood cancer. In my neighborhood over there, there's been nine women with breast cancer. We have an inordinate amount of childhood diabetes in this city, and lymphoma. And it seems to be in this northern end of the valley. Not so much Whitefish, but this northern end of the valley. That's why I repeatedly ask -- my wife dug in the damn yard every year for 40-some years planting and unplanting and changing things and changing the walk, and making me do this and having me do that. She ended up with a very odd form of breast cancer and passed away. Carbon is on that hit list for cancer-causing agents."

- **Comment 7N.** "Well, then the story came out. We had 3 people out of 12 people that worked in laboratory there -- 3 women -- all three of them had cancer at the same time, and the rest of the staff agreed that they would walk out with them if they didn't stop the testing, okay. We stopped the testing. But they personally to a person believe that because they had to do tests for benzene, xylene, and toluene solubility in carbons, okay -- these are three known carcinogens, but you have to dissolve carbon in them to get at what you need to from a technical standpoint, okay, to evaluate them -- they believed it was there. Those three chemicals ran down the sinks and out to a dry well. And do you know how many tests they did at that dry well? None, because it's underneath the parking lot of the plant, okay. So there's reason for you to have these feelings. I can also tell you that I personally know six people that worked in the paste plant that are either still suffering with cancer or have died. And that's probably in a group of 25 or 30. And they died from pancreatic cancer, colon cancer, you know, you name it. They were all good people, but they didn't have long lives. And all of that is working with carbon and carbon chemicals, coal-tar pitch and all the crap that comes out of the coal-tar pitch when you start heating it. So you're on a track. They're not gonna let you go there, because when they did the studies on health and all that, they ran those through really quickly, and they refused to look at and even talk to the liaison panel about they're not gonna talk about cancer, because cancer is not something that's caused by, you know, what we're looking for. There are cancer chemicals out there."

- **Comment 7R.** "And the other thing that they wouldn't listen to us about -- Delbohms own the property at the end of that road. He was a logger and a farmer and a sawmill operator, and he had a backdoor road right into our dump. And if you would have went and looked before he died, his sawmill and all of his equipment had steel on it that you couldn't believe. It looked just like our collector bars right off from the bottom of our cathode where supposedly the cyanide comes from. He used that to counterweight every one of his vehicles. All the sawmills on a side hill, they were all mounted with that to support it. You know, there is cyanide in that creek. They washed it away, because it's not in any of the reports now. But back then, you know, that's how that property looked. He was a scavenger and a hoarder, and he used his property to -- you couldn't kick him off. He didn't own it. That's how one of those lawsuits was settled. They bought the property out from under these people, and allowed them to live there until they died. By the way, his wife died of cancer, too, living right there."

- **Comment 11A.** "1. Lots of health concerns over pollutants blowing west from plant every morning with orographic winds into the small city of Columbia Falls. Health concerns are women breast cancers, childhood diabetes, lymphomas…which may be related to carbon dust and fumes from Paste Plant, fluorides, cryolite etc. leaving the plant property. NO TESTING HAS BEEN WEST OF CFAC PROPERTY..IE NORTH FORK ROAD. THIS IS A MUST. Testing should be done in the City, remembering that the stream flows underground thru the city property also."

- **Comment 11F.** "6. During the last era of plant time, the coal tar pitch supplier was changed to a more benzene rich style. As we all know, the "zene" family is laden with tons of proven cancer causing histories. Where were the by-products buried? Certainly needs to be verified, as several women who tested its use in the lab were diagnosed with breast cancer."

- **Comment 76A.** "I am writing in regards to the proposed remediation plan for the Columbia Falls Aluminum Company site. As a science teacher in Columbia Falls, my students and I have studied groundwater contamination and other superfund sites around the state. Based on my conversations with former employees of the plant, local scientists and long time citizens of the area, I have questions regarding the plan. The major question that remains is the impact on human health. There is a high rate of cancer in Columbia Falls, and I know that many have wondered if there could be more testing of both soil and water outside of the superfund site to determine the scale of contamination. Will there be additional testing outside of the superfund site itself? Can more research be done to explain the rates of cancer in the area? If multiple women living in the Aluminum City neighborhood of Columbia Falls have the same type of rare cancer, can further testing be done to determine possible causes?"

- **Comment 87F.** "I would like to know what if anything the EPA and other project managers are doing to address the unusually high rate of pediatric cancer that has occurred in Columbia

Falls since 2011? Just one death is too much but Cfalls has experienced 6 cases since 2012, 3 young athletes have died."

- **Comment 120B.** "2- there have not been enough studies of the health consequences of this contamination. I know of an unusual number of young people's deaths and cancers that are anecdotally connected to CFAC but I want studies - especially if this slurry wall is built so all the contaminates are still on site."
- **Comments 123S and 134BB.** "An unusually high rate of pediatric cancer has occurred in Columbia Falls since 2011 as well as a high rate of cancer among lab employees performing tests. Did EPA pursue data regarding high cancer rates potentially linked to air, water and soil contamination. What is the threat of future human health issues that could occur from the carcinogens present on the property and potentially found in personal wells and the Flathead River in the future? Just one death due to pediatric cancer is one to many. Columbia Falls has experienced 6 cases since 2012; 3 of those young athletes are no longer alive."

2.32.2 EPA Response

Calculation of risk at Superfund sites nationwide follows strict guidelines to ensure that the science is credible and defensible. Cancer risks are estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to potential carcinogens. Excess lifetime cancer risks are calculated as probabilities. An excess lifetime cancer risk of one in one million, for example, represents the incremental probability that an individual will develop cancer as a result of exposure to a carcinogenic chemical over a 70-year lifetime under specified exposure conditions. This increment is in addition to the risk of developing cancer from causes unrelated to the exposure that is, it is in addition to the "background" cancer risk of 1 in 2 for men and 1 in 3 for women that currently exists in the U.S. (American Cancer Society 2009).

Health protective assumptions were used in the human health risk assessment to estimate non-cancer hazards and cancer risks from exposures to chemicals of potential concern for a range of current and potential future human receptor populations. Assumptions made throughout the human health risk assessment are conservative, meaning that they tend to overestimate exposure and resultant risk, rather than underestimate it. The human health risk assessment is in the administrative record available with the record of decision.

Where there is the potential for exposure to contamination by way of exposure pathways (such as direct contact with contaminated soils in landfill areas), unacceptable risk will be addressed by remediation (such as capping of contaminated material) or through use of institutional controls (for example, groundwater use for consumption on-site is and will continue to be prohibited). There are no complete exposure pathways for receptors beyond the site boundaries. Even so, risk associated with residential use of the Western Undeveloped Area was evaluated and does serve as a conservative representation of risk associated with off-site soil exposures. This evaluation determined that predicted risks are less than or within EPA's acceptable risk range and less than DEQ's cancer risk threshold. For this reason, there is no evidence of contamination at the site impacting those living off site.

The Superfund Program addresses current and future risks from contaminated sites and any unacceptable exposures identified in the BHHRA will be dealt with appropriately. Workplace exposures, such as those described above, fall under the jurisdiction of the Occupational Safety and Health Administration, not EPA Superfund.

The Agency for Toxic Substances Disease Registry has tasked Montana DPHHS with completing a health assessment for the area surrounding the site. The assessment will be a publicly available document when it is complete.

2.33 Risk – PAH Bioaccumulation

2.33.1 Public Comments

Two comments were received from the TASC (#1) and one individual that addressed the issue of PAH bioaccumulation.

- **Comment 1Q.** "13. Polycyclic aromatic hydrocarbons (PAHs) and metals are present in shallow soils at the North Percolation Ponds, Effluent Ditch (PAHs only) and Main Plant area. PAHs and certain metals have the potential to bioaccumulate in plants and within terrestrial food chains (Meudec et al. 2006 and Patowary et al. 2017). The Proposed Plan preferred alternatives for the Soils Decision Unit and North Percolation ponds are to excavate with on-site consolidation, in which all impacted material that exceeds preliminary remediation goals would be excavated. This is a comprehensive approach to remove and address the contamination, but it is not clear if follow-on monitoring will be performed to determine if residual contamination could cause a concern through bioaccumulation. The community may want to ask if the preliminary remedial goals for soils are sufficiently conservative to eliminate bioaccumulation as a potential future pathway of concerns."
- **Comment 16H.** "13. Are the preliminary remedial goals for soils sufficiently conservative to eliminate bioaccumulation as a potential pathway of concern."

2.33.2 EPA Response

Bioaccumulation, in and of itself, is not considered an exposure pathway. Exposure pathways include inhalation, ingestion, and dermal contact with contaminated media. Bioaccumulation was considered in the food web modeling and subsequent risk evaluations for the range of exposure pathways and receptors at the site. This information was used to determine site-specific risk-based PRGs for the protection of human health and the environment.

2.34 Risk – PAH Calculation

2.34.1 Public Comments

One comment was received from Montana DPHHS that was specific to the risk calculation method used for PAHs.

- **Comment 110B.** "Page 8 Preliminary Remedial Goals Section: DPHHS recommends EPA consider the total risk approach described in the EPA Regional Screening Levels User's Guide (https://www.epa.gov/risk/regional-screening-levels-rsls-users-guide) when assessing human health preliminary remedial goals for carcinogenic polycyclic aromatic hydrocarbons (cPAHs). DPHHS evaluates the cancer risk of PAHs using ATSDR's guidance on cancer evaluation of PAHs (https://www.atsdr.cdc.gov/pha-guidance/resources/ATSDR-PAH-Guidance-508.pdf). In this approach, PAH congeners with sufficient evidence for carcinogenicity are assigned a relative toxicity to that of benzo(a)pyrene (BaP). A health assessor calculates a BaP equivalent toxicity for each congener and estimates the cancer risk of samples containing multiple cPAHs by summing the BaP equivalent toxicity of these congeners. This method is also adopted by EPA. Per the EPA Regional Screening Levels User's Guide Section 2.3.6, the relative toxicity factors, called relative potency factors, have been applied to the toxicity values of cPAHs (i.e., cancer slope factor). The User's Guide also states that "if the adjusted toxicity values are used, the user will need to sum the risks from all cPAHs as part of the risk assessment to derive a total risk from all cPAHs." DPHHS recognizes in some circumstances the need to derive human health preliminary remedial goals for individual cPAH congeners identified as contaminants of concern. However, DPHHS recommends EPA also consider the total risk approach to ensure that the combined excess cancer risk of all cPAHs does not exceed 1E-5 or 1E-6."

2.34.2 EPA Response

EPA agrees that consideration of total cancer risk is important, for all carcinogenic chemicals of concern, to ensure that the combined excess cancer risk does not exceed 1E-05. This will be considered in evaluating the site following remedial actions. For PAHs, samples will be evaluated using potency equivalency factors to express the overall carcinogenicity as a single value, as a benzo(a)pyrene equivalent (BaP_{eq}). The following steps will be taken:

- Calculate the post-removal exposure point concentration for each PAH congener
- Calculate the BaP equivalent exposure point concentration using congener-specific potency equivalency factors and the congener-specific exposure point concentration
- Calculate the dose from PAHs using the BaP_{eq} exposure point concentration
- Calculate estimated cancer risk using the oral cancer slope factor for BaP

2.35 Risk – Process

2.35.1 Public Comments

One comment was received that was specific to the Superfund risk process.

- **Comment 48A.** "It would seem to me that the majority of the cleanup plan has been focused on water flowing in, on, around and under the five contaminated decision units that have been identified, although the EPA's baseline human health risk assessment report identifies potential receptors based on potential exposure to affected soils as well. But it also states that "default exposure assumptions were used for residential scenarios." Further, it uses such terms as "hypothetical future residential drinking water users." Well there is nothing hypothetical about my use of groundwater and while their report states that PAHs are present in the soil, only cyanide and fluoride, being the "primary risk drivers" seem to be of concern to human health. And they also state that, "Where more than one risk value exists, the most conservative number is presented." If these contaminants are present and acknowledged as a health risk for the future, it would seem to be a flippant assumption that PAHs can be disregarded because of the percentage of risk assumed – and it can only be assumed at this point. One cannot help but wonder if the EPA personnel would be as casual about their conclusions if they lived adjacent to the superfund site themselves. If, as stated on page 7, remedial action objectives "are based on the human and ecological risk assessments and on reasonable anticipated future use," then the EPA should state clearly how both the plant site and the surrounding land parcels may be used and for what purposes they are not suited because of the unknown future risk to human health."

2.35.2 EPA Response

Health protective assumptions were used in the BHHRA to estimate non-cancer hazards and cancer risks from exposures to chemicals of potential concern for a range of current and potential future human receptor populations. Use of contaminated groundwater is not currently a complete exposure pathway at the site, meaning that groundwater is not used for potable purposes, hence it is a hypothetical exposure scenario.

Assumptions made throughout the BHHRA are conservative, in that they tend to overestimate exposure and resultant risk, rather than underestimate it. When risk estimates indicate concentrations of multiple chemicals are present at levels of concern, primary risk drivers (i.e., those chemicals responsible for most of the estimated risk and those present more frequently above risk-based thresholds) are generally the focus of remediation. This does not mean that other chemicals are less important or are being disregarded, but that cleanup of primary risk drivers will also result in cleanup of other chemicals that may present a risk when the chemicals are co-located at the site.

People who are not on-site do not contact the site contamination and are therefore not evaluated as part of the BHHRA. However, use of groundwater in the Western Undeveloped Area was evaluated for potential human health risk for residential receptors. This evaluation presents a conservative surrogate for those who may reside adjacent to the site. The risk assessment concluded that there was no unacceptable risk from the use of groundwater in the Western Undeveloped Area.

2.36 Schedule

2.36.1 Public Comments

Four comments were received from two individuals and Montana NRDP (#82) asking about a the time frame or schedule for meeting cleanup goals and performing pilot studies and groundwater monitoring.

- **Comment 53Y.** "15) Define the time frame for preliminary goals to be met before the plan is considered a success."
- **Comment 54FT.** "1. Six to 12 months for pilot studies on multiple waste stream is ridiculously short."
- **Comment 54FU.** "2. Ground water monitoring for 30 years is short. It has been running fully polluted for 68 years already and hasn't shown any signs of becoming drinking water quality yet."

- **Comment 82U.** "21. Page 23, Exhibit 25, Page 26: This exhibit states that all of the alternatives except No Action meet ARARs. A similar discussion is included on the compliance with the threshold criteria, however, there is no description of how long it will take to attain DEQ-7 standards in groundwater and how the DEQ-7 standards will be met in the seeps and porewater. Please include a discussion of how DEQ-7 standards will be attained throughout the groundwater contamination plumes and the seeps and porewater connected to the Flathead River."

2.36.2 EPA Response

A time estimate for achievement of RAOs for groundwater, using a batch flushing model, was provided in Appendix A of the FS (Roux 2021a). The average time estimate to achieve the cyanide groundwater RAO at the Backwater Seep Sampling Area is 15 years and for the cyanide surface water RAO is 35 years. However, performance monitoring at groundwater monitoring wells downgradient from the containment cell are expected to show decreasing cyanide fluoride concentrations after construction completion. The batch flushing model calculations indicate the monitoring wells, halfway to the seep, will meet groundwater RAOs in 7 years.

The length of time for bench-scale testing or pilot test of groundwater treatment technologies will be determined during remedial design. Note that there are not "multiple waste streams" to be evaluated, only contaminated groundwater within the containment cell.

Note that the use of 30 years for calculating long-term operations, maintenance and monitoring costs is a standard technique for calculating net present value for FS cost estimates (EPA 1988a). Calculating the net present value of costs beyond 30 years adds very little to the total net present value of costs calculated for years 1 to 30. Monitoring will continue for as long as necessary to successfully achieve remedial objectives and to ensure protection of human health and the environment.

2.37 Slurry Wall – Capability

2.37.1 Public Comments

Six comments were received from five individuals and CFAC (#135) that were categorized as addressing the capabilities of slurry walls as applied to the site.

- **Comment 11H.** "8. On a scale of 1 to 10...the EPA needs to put in simple terms IF the bentonite walls and caps will contain contaminates with a water fluctuation of 50 plus feet in groundwater per year, allowing no bottom is in these structures."

- **Comment 53P.** "6) Ensure contingency plans are in place to prevent surficial and groundwater from entering the slurry enclosure."

- **Comment 85A. "**The EPA is supposed to be about PROTECTION. By 'securing' top, and sides of a toxic sludge and no protection at the base that can leach into groundwater, that is not protection. Not to mention it lies right next to the Flathead River. Do it right!"

- **Comment 108B. "**I would also like to understand: – exactly what are the methods that will be used. I'd like specifics. For instance, if you're proposing to bury it in place, #1-how do you prevent toxic substances leaching into the river? – How long would you expect it to last before reasonably being breached? (Is your estimate based on actual data from similar projects in similar climates?)"

- **Comment 128B. "**I recently visited the Butte Anaconda Company Berkeley Pit. The trip made me realize that CFAC founder, (Anaconda Company), and later owners have left Columbia Falls with its' own Berkeley Pit. It is nearly as large, but invisible, underground. I know this because, for a number of years, I personally collected the polluted water samples, from the CFAC test wells and the riverbank seepage. I discovered pollution, deeper than Glencore's proposed slurry wall pollution containment disastrous proposal. A decent slurry wall is nearly impossible, in the CFAC river gravel-type soil."
- **Comment 135AI.** "Comment 21: Page 25; Primary Balancing Criteria, Last Paragraph. Slurry walls and capping technologies have been used at numerous EPA Superfund sites. They are a proven technology and are an effective containment remedy to contain source materials and prevent migration of contaminants to groundwater."

2.37.2 EPA Response

The remedy relies on the effectiveness of a containment cell. The cap uses stormwater controls to shed precipitation away from the cell and the fully encapsulating, low-permeability slurry wall will keep upgradient groundwater from percolating into the bottom of the cell. As with any engineered remedy, there are uncertainties. For DU1, these uncertainties include:

- The ability to construct a slurry wall in the glacial till containing boulders to a depth in some locations greater than 100 feet
- The homogeneity of the underlying aquitard that the slurry wall will key in, as there may be localized transmissive zones (stringers of sand and gravel that allow groundwater flow at an increased rate compared to the rest of the aquitard) surrounding the designed slurry wall
- The potential for unknown groundwater source(s) beneath the containment cell that were not identified during the RI, such as groundwater recharge to the uppermost aquifer through fracturing in the underlying aquifer or potential transmissive zones underlying the containment cell as previously noted

Recognizing this, EPA added groundwater treatment (if necessary) to the highest-rated remedial alternative identified in the FS (Roux 2021a), which was described in the Proposed Plan (EPA 2023a) as DU1/DU6 Alternative 4A. This would consist of conducting groundwater elevation monitoring within the cell. If a groundwater elevation level determined through the remedial design is triggered, groundwater within the cell will be pumped, treated at a treatment facility so that arsenic, cyanide, and fluoride concentrations are below groundwater and surface water performance standards, and then discharged into an infiltration basin, possibly a constructed wetland.

The containment cell will also greatly reduce the flux of groundwater within the cell. EPA anticipates that if groundwater treatment is required, pumping and treatment of groundwater will be seasonal or even occurring once every few years, and the volume of groundwater to be treated will be much less than the volume if the containment cell did not exist.

The glacial till underlying the West Landfill and Wet Scrubber Sludge Ponds has been shown through the RI (Roux 2020a) to be an adequate aquitard, or base of the cell, to key in the slurry wall because no groundwater contamination was detected in the deeper aquifer below it (the statement that infers that pollution is deeper than the base of the slurry wall is incorrect). Since the slurry wall will be constructed out of impermeable materials such as bentonite and cement, and the leachate is not acidic, the slurry wall is expected to remain functional for a very long period of time (an evaluation of the expected period of functionality will be included in the remedial design). The containment cell would be approximately one mile away from the river, not "right next to the Flathead River" as stated in one of the comments.

2.38 Slurry Wall – Design

2.38.1 Public Comments

Eight comments were received from two individuals, CBF (#134), and CFAC (#135) in the category of slurry wall design and selection.

- **Comment 53C.** "2) Construct a fully encompassing slurry wall around the West Landfill and Wet Scrubber Sludge Pond to depths that key into the underlying low-permeability, glacial till layer (typically between 100 and 125 feet). If dewatering is needed, treat captured groundwater in a treatment plant and return effluent to groundwater via infiltration basins. The slurry wall should be set to depths at the maximum depth the glacial till layer is found (>125ft) in order to prevent groundwater infiltration into the slurry containment. Will the EPA commit to setting the wall to its maximum depth of 125+ feet below the ground? Will the wall be packed with bentonite or other impermeable material to ensure water does not infiltrate down along the sides of the wall and leach into the groundwater? Dewatering is essential for the success of the modified A4 remediation plan. Hydraulic control at the source area via pumping and treatment of water within the fully encompassing slurry wall should be considered regardless of a potential groundwater plume migration, and contaminated water should be removed in the initial phase prior to, during, and after the construction of the slurry wall.

  Primarily, water should be removed immediately to ensure it does not come into contact with underlying, reactive waste within the West Landfill, and before it has a chance to migrate any further down gradient than it already has. As the EPA states on page 15 of the Proposed Plan for Cleanup, "lessening the migration of contaminants from the source area would reduce the rate of contaminant loading to the hydrogeologic system." Will the EPA include the addition of groundwater extraction and treatment at DU1/DU5 before the construction of the slurry wall?

  Secondly, dewatering treatments should be done during the construction when the disturbance has a chance to mobilize the groundwater, and certainly after the construction to capture and treat any ground water that has accumulated during the disturbance phase. Will the EPA pump and treat the contaminated groundwater throughout all the construction stages of the slurry wall to capture mobilized contaminants?

Third, this wall should also encompass the Center Landfill, as it is a secondary source of groundwater contamination, and is recognized as being part of (DU1). Seeing the proximity of the Center Landfill to the other contained features, will the EPA consider incorporating the fully encompassing slurry wall to include the Center Landfill? If not, why? Cost should not be part of the answer, as our risk of cancer (2:10,000 according to page7 of the Proposed Plan for Cleanup) and death dwarfs any cost associated with contaminant removal.

In addition, although the slurry wall is an excellent idea and will help in cleaning up the CFAC Superfund Site, it has the potential to accumulate surface water overflow from Cedar Creek, precipitation, and basal flow seepage underneath the wall. For this reason, pumping should be done much more frequently as ground water accumulates and gathers contaminants from the compromised soils. The modified proposal only mentions "seasonal" pumping and treatment, which would be inadequate given the high hydraulic conductivity of the area, inevitability for groundwater accumulation, and potential for slurry wall compromise. Will the EPA pledge to pump and treat more frequently than the seasonal timeline? If not, why not?

Consideration should also be made to where the diverted runoff and flow paths from the slurry walls would go. The slurry wall will prohibit groundwater migration across the wall into the waste areas, and act as an obstacle for groundwater movement, thus forcing the water to travel around and/or below the wall. Any newly created flow paths could potentially encounter unknown wastes and carry them to the river and into residential wells. Will the EPA ensure the network of monitoring wells will be extensive enough to capture this movement and be able to adequately treat any contaminated groundwater that occurs?"

- **Comment 53L.** "2) Drain and treat the contaminated groundwater currently in the DU6 and specifically under DU1."

- **Comment 53N.** "4) Continue pumping and treating the contaminated groundwater during and after construction of the fully encompassing slurry wall."

- **Comment 53Q.** "7) Maintain a negative hydraulic head within the slurry wall."

- **Comment 116G.** "The company and its consultants go to great lengths to support their proposed 3,700 foot, 125 foot deep bentonite slurry wall. The feasibility study states that there is no reason to believe the slurry wall won't be effective over the long term. But in fact, EPA's consultant CDM strongly questioned the constructability of the slurry wall, citing the potential for large boulders to impede construction and require use of more expensive grouting techniques. CDM cited another site in Washington where this difficulty was encountered. The feasibility study cites a national study of slurry walls, stating that it concluded that there were no significant problems with the slurry walls investigated. However, a closer reading of that study indicates that long term performance was as designed at only 25 of the 36 sites investigated. Many sites experienced failures, which when detected required extensive repairs."

- **Comment 116H.** "The proposed slurry wall will not be keyed into bedrock, which is approximately 300 feet below ground. It is hoped that it can be successfully keyed into a less permeable glacial till material, 125-150 feet below ground This will push the limits of the proposed methods of installation for the slurry wall, using the clamshell bucket excavation and hydro mill techniques proposed. The feasibility study admits that the wall may be constructed as a hanging slurry wall, not keying into an impermeable layer. This calls into question the effectiveness of the wall in meeting its objectives, and the effectiveness of the proposed internal pumping system to maintain an internal flow gradient. Furthermore, the proposed slurry wall would be installed in groundwater that fluctuates more than 25 feet in elevation seasonally. This calls into question potential wetting and drying that may result in cracking and degradation of the bentonite wall. The FS fails to acknowledge this risk."

- **Comment 134M.** "12) Other than general assertions in the proposed cleanup plan for the CFAC, which calls for the building slurry walls around much of the toxic waste on site as a "commonly accepted practice today" at such sites, what site-specific-based factual and scientific based (including site specific studies and tests) have been compiled as a basis for recommending the use of slurry walls? Where is your research that has looked at the weaknesses or unsuitability of slurry walls:

  - What specific research has been done to examine the containment capability and stability of slurry walls in the Flathead River corridor where they would be built in porous glacier till and gravelly soils;

  - What specific research has been done to examine the containment capability of slurry walls in the Flathead River corridor where much of the toxic waste exists in unlined landfills or dump areas and ponds and thus are impacted directly where the rise and fall of groundwater is known to be as much as 35 to 50 feet, creating a hydrologic connection in the Flathead Basin between surface water and ground water—such a connection has been documented by the Flathead Lake Biological Station in studies they have done. Where in your proposed record of decision have your reviewed and considered these studies?

  - What specific research has been done to examine the containment capability of slurry walls in the Flathead River corridor where earth quakes are a real risk—has the potential for soil liquification at this site been examined that could affect the stability of slurry walls?

  - An article on the EPA web site states that it is important that the slurry wall barrier is extended and properly sealed into a confining layer (aquitard) so that seepage under the wall does not occur---what studies have been done at the CFAC site to determine if or where the proposed bottom of the slurry wall can be properly sealed?

  - What specific research has been done to examine the containment capability of slurry walls in the Flathead River corridor where potentially climate change related and increasing catastrophic weather, rain and flood events might damage or cause breaches in these walls,

- What specific research has been done to examine the potential impacts of the uses of slurry walls where they may alter the ground water flow pattern at this site in negative ways?
- What specific research has been done to examine the relative fast movement of groundwater in this river corridor and glacier till soils and how it might negatively impact the stability or containment function of slurry walls in this location?
- What specific research has been done to examine the potential impacts of the uses of slurry walls and surface caps on contaminated waste where they may alter the storm water flow pattern at this site in negative ways after installation?
- What specific research has been done to examine the potential impacts of the uses of slurry walls where they may alter the biological presence or lifecycle of bugs that inhabit these gravely wet substrate areas as documented by the Flathead Lake Biological Station Studies and normally play an important ecologically important role in cleaning water in these areas?
- What specific research has been done to examine the potential effectiveness or stability of slurry walls when they do not reach and cannot thus be stabilized by reaching bedrock---where will or won't the proposed slurry walls reach bedrock?
- What specific research has been done to examine the potential effectiveness or stability of slurry walls in contaminated soil beneath the unlined West Landfill that contributes to cyanide pollution in the groundwater and likely extends to 115 feet below the surface, which is well within the groundwater table during high-water season?
- There are apparently two types of slurry walls—soil-bentonite and cement bentonite—which type is being proposed for use at CFAC and why? What studies have been done to determine at the CFAC site the proper backfill material to avoid the potential susceptibility to chemical attack from buried waste to this backfill material?
- What is the identified lifespan of the proposed slurry walls at the CFAC site and what site-specific studies to the CFAC site are relied on for this lifespan?
- According to media reports "Stroiazzo said Roux examined statistics on 86 slurry walls used at other Superfund sites. "From what we can tell, all of them worked," he said. The Hungry Horse News reported they looked at an EPA study on 36 slurry walls in 1998 that found eight had met objectives, 17 "may have" met objectives and seven "may not" have met objectives. A 2002 EPA study looked at fewer walls but noted they were working as designed." Where and if not why has this 1998 study and the failures it identifies been examined to show if potential similar problems might occur at the CFAC site?
- Will certified uncontaminated soils need to be purchased and brought to the CFAC site for use in the slurry walls given the findings of the studies cited below in the following bullets so that the walls are not compromised or degrade over time?

- Where will excavated soils for the slurry walls be deposited and what research has been done to show if what volume of soil this might be and what volume may be needed for the slurry walls.

- What water source will be used for the slurry walls and what research has been done to show possible negative impacts of using contaminated water for this purpose or of withdrawing from the site of large volumes of clean water and how it might draw-in potential pollution into new or larger areas?

- What specific research for the CFAC has been done to examine the potential impacts of the uses of slurry walls and their limitations as discussed in these studies: "Slurry walls have been used as a long-term solution for seepage control for over 50 years and have demonstrated its effectiveness to the point that they are considered baseline barriers. Therefore, the requirements, equipment, and practices for design and installation are well established (Pearlman, 1999; Van Deuren et al., 2002). In terms of pollution control, they have been used since the 1970s; the issue with this application is that specific contaminant types may degrade the slurry wall and therefore reduce the long-term effectiveness. Therefore, even though the design and installation criteria may be established, the process of choosing the proper wall materials for that specific contaminant is less developed (Van Deuren et al., 2002). Ressi and Cavalli (1985) adds that some suggest that this technology on its own should not be the final measure for remediation due to the fact that long-term performance of these walls when chemicals are present is not known. The most effective vertical configuration of slurry walls for site remediation or pollution control is keyed in, where the wall is keyed 2-3 feet into a low permeability layer, such as clay or bedrock, providing a foundation with minimum leakage potential (Van Deuren et al., 2002). The following list contains factors, according to Van Deuren et al. (2002), that must be assessed prior of designing the slurry wall:

  – The maximum allowable permeability;
  – Anticipated hydraulic gradients;
  – Required wall strength;
  – The availability and grade of bentonite to be used;
  – Boundaries of contamination;
  – Compatibility of wastes and contaminants in contact with slurry wall material;
  – Characteristics of backfill material;
  – Site terrain and physical layout."

- Again, how have limitation and additional studies recommended as in these studies specific to the CFAC site been studied prior to the recommended use of slurry walls? "Bentonite provides a high sorptive capacity, thixotropic nature, high dispersibility, sufficient deformability, and low-permeability (Garving & Hayles, 1999; Katsumi et al., 2009). Figure 6, shows they hydraulic conductivity as a function of percent fines and coarse fraction of the backfill. However, Katsumi et al. (2009) suggest that in order to promote the application of soil bentonite walls there are several issues to be solved such as "achieving the higher construction quality and understanding the chemical compatibility." The hydraulic conductivity of bentonite-based material is affected by the chemical components of the permeant. It has been observed that bentonite does not swell and/or shrinks in the presence of inorganic solutions or some organic compounds. In the case of inorganic solution containing polyvalent cations the hydraulic conductivity can be increased, even at low concentrations (Katsumi et al., 2009). Table 3 shows a qualitative list of hydraulic permeability increase of certain contaminates through the SB wall. Therefore, its chemical compatibility should be assessed under the given conditions in the field. Advantages (Pearlman, 1999; Pedrotti et al., 2012; USEPA, 1998)

  - Among the slurry walls this is the most economical one;
  - Most cases allow reuse of all or most of the material excavated during trenching;
  - Construction techniques are well understood, practiced, and accepted;
  - Typical hydraulic conductivity are around 10-7 cm/s, but can be as low as 5 x 10-9 cm/s.

- Disadvantages (Pearlman, 1999)

  - Installation requires excavation, therefore produces substantial quantities of spoils that must be disposed of, and requires a mixing area;
  - Wet/dry cycles and freeze/thaw cycles can cause deterioration;
  - This configuration is limited to vertical orientation;
  - Assessment of performance is difficult;
  - It is difficult to ensure proper emplacement;
  - May degrade over time due to contaminants in the soil, for example:
  - Silica and aluminum in the bentonite and/or soil may dissolve in the presence of strong organic and inorganic acids (pH 11) increasing the porosity of the barrier;
  - Inorganic salts and some neutral polar and nonpolar organic compounds result in shrinkage of bentonite clay particles.

- Cement-bentonite (CB) slurry walls are a common form of vertical barriers in Europe, especially for seepage control in the UK (Garvin & Hayles, 1999; USEPA, 1998). They were initially used for water exclusion but now their use has extended to control migration of contaminants from industrial or landfill sites (Garvin & Hayles, 1999). Originally for the CB walls, cement was mixed with the bentonite slurry before refilling the trench. The first trials with CB slurry walls had problems since bentonite and cement start to react when mixed together, the slurry became nonhomogeneous and unstable, and due to flocculation and sedimentation, the solid and liquid phase separated. Therefore, now the bentonite and cement are mixed together as powder. These powders are available as commercial products (Koch, 2002). CB walls are used if greater structural strength is needed, if there is chemical incompatibility between bentonite and the site contaminants, if there is a lack of soil for backfill, if insufficient space is available for mixing of backfill, and/or for applications in steep slopes where shear strength of the cutoff walls is am issue (Pearlman, 1999; USEPA, 1998; Van Deuren et al., 2002). The most common cement used is Portland (Garvin & Hayles, 1999; Pearlman, 1999). Even though the CB imparts strength to the wall, it also increases the permeability of the backfill up to 10-5-10-6 cm/s, this becomes a problem since the typical required permeability is of 10-7 cm/s (Pearlman, 1999; USEPA, 1998). This behavior can be observed in Figure 7. However, additives such as ground-blast slag can be incorporated to the cement in order to reduce the permeability to 10-7-10-8 cm/s (Pearlman, 1999). Another concern with the CB walls is that contaminants can affect its long-term durability and performance (Garvin & Hayles, 1999). Pearlman (1999) suggests that adding fly ash can reduce the degradation of the concrete. Table 4 shows the typical composition of a cement-bentonite slurry. Table 5 and 6 compare some properties of soil bentonite and cement-bentonite for the slurry and backfill, respectively."

- To what extent were the costs for recommend additional testing and construction costs based on the result of this testing for slurry walls incorporated into the cost comparisons between the removal of toxic waste at the CFAC vs the use of slurry walls? Note "Cost (as presented in Pearlman, 1999) In 1991, the cost ranged from $5 – $7/ft2, however these costs do not include cost needed for chemical analyses, feasibility, or compatibility test. Therefore, cost varies depending on site conditions, type of slurry/backfill, depth, among others."
- Given the potential added costs as identified in the questions above, what cost benefit analysis has been done to justify that retaining the waste on site within a slurry wall as opposed to hauling the material to a hazardous waste landfill facility? Where is the documentation and facts to support it that the slurry wall is a less costly and more or as effective option?

Please explain what criteria the EPA has used to rank leaving waste in place and construction of a slurry wall as opposed to removal of toxic waste away from the Flathead River corridor to an approved tripled lined hazardous waste landfill designed to safely handle such waste. How does the current EPA criteria differ from the flaws in the Roux criteria pointed out in local media reports including the following description; "During their April 19, 2021, meeting the Columbia Falls City Council received a 24-page slide presentation from Glencore's environmental consultant Roux and their subsidiary Columbia Falls Aluminum Co. -- the "CFAC Project Update: Draft Feasibility Study Report" – explaining their rationale for choosing a remediation solution for the uncontrolled groundwater pollution at the former CFAC aluminum smelter site. Roux and CFAC came up with seven alternatives ranging from no action to excavation and removal of waste in the large unlined industrial landfill used to dispose of spent potliner from 1955 to 1985. This landfill currently leaks cyanide into groundwater, which can seasonally rise above the bottom of the unlined landfill. Roux and CFAC recommend Alternative 4A, which calls for building a slurry wall around the landfill and capping it. They rejected Alternative 6, which calls for excavating thousands of tons of hazardous contaminants that were irresponsibly dumped in this landfill and hauling the waste to an approved disposal site, probably out of state. On page 10 of the presentation, Roux and CFAC claim that "Offsite transport of waste would have adverse impacts on affected communities" and that "Other options would protect human health and the environment and achieve applicable rules without community disruption." CFAC shipped contaminated spent potliner to out-of-state landfills from 1985 to when the smelter closed 24 years later without causing negative impacts to communities. Roux and CFAC's incredible claim, which needs to be explained and proven, is further used on page 14, which provides a chart with seven criteria for scoring each of the seven alternatives – the highest score wins. Unbelievably, the excavation and removal alternative received only 37 points. The next lowest (excluding no action) was 60 and the selected alternative received 77 total points. While excavation and removal received the highest score for "long-term effectiveness and permanence," it received the lowest score for "short-term effectiveness" with only 5 points compared to 16 for the selected alternative. Excavation and removal also received 0 points for cost compared to 14 for the selected alternative, and 0 points for "implementability" compared to 15 for the selected alternative. This presentation might work in a cheap magic show, but the people in Columbia Falls and Montana are smarter than that. Take the criteria of short-term effectiveness and implementability – the positive impact on groundwater would be immediate (unless the project is further delayed by Glencore), and digging up waste and putting it into rail cars can't be any more complicated than constructing a giant slurry wall around the landfill. The people of Columbia Falls and Montana need to push Glencore for a detailed and reasonable explanation of these bizarre conclusions. How can Roux and CFAC score implementability at zero? Because they can't figure out how to excavate and remove waste from a landfill? It's easier to understand why they scored the excavation and removal alternative at zero under the cost criteria – it's expensive, and that's the key point to understanding their process."

- **Comment 135AJ.** "Comment 22: Page 29: EPA's Preferred Alternative. Comment 21a.: The monitoring/extraction wells. The first paragraph states that "the interior wells installed during construction are assumed to be needed for long term groundwater extraction and treatment." However, the third paragraph states "the wells will be used initially for monitoring and, if the slurry wall is not effective in stopping the migration of the groundwater plume, they will be used to extract groundwater for treatment." The sentence in the first paragraph is not consistent with the FS. The sentence in the second paragraph is consistent with the FS and should be used if this is discussed in the ROD. Proposed Plan Exhibit 13 correctly depicts the approximate anticipated locations of the extraction/monitoring well pairs and should be used to describe monitoring well configuration in the ROD. See Section 5.1.6 (Alternative LDU1/GW-4A) of the Feasibility Study Report; '*However, if necessary, the wells inside the slurry wall containment cell could also serve as groundwater extraction wells if and when the inward gradient cannot be maintained in the absence of pumping and the absence of an inward gradient is preventing the achievement of RAOs and PRGs.*'"

2.38.2 EPA Response

The preliminary design investigation, through several geotechnical borings, will determine the slurry wall depths needed to key into the low-permeability glacial till layer. These findings will be the basis for the target depths of the slurry wall design. EPA will ensure that these depths are achieved to the extent practicable.

More specifics on the composition of the slurry wall will be deferred to the remedial design; however, the wall will likely be constructed of bentonite. Additionally, the sequencing of the hydraulic control component of EPA's preferred DU1/DU6 alternative will be determined during the remedial design. Alternative 4A outranked all of the hydraulic control alternatives (Alternatives 5A/B/C). As such, the main remedial action for EPA's preferred DU1/DU6 alternative will remain containment with hydraulic control with interior groundwater extraction to only be implemented in the instances where the RAOs are not being achieved. Any contaminated groundwater extracted during the remedial action will be treated before being discharged.

The Center landfill is discussed in Section 2.40 and the interaction of surface water to groundwater at the Cedar Creek overflow ditch is discussed in Section 2.2.

The potential lifetime cancer risk rate for groundwater of 2 in 10,000 is for a hypothetical future resident scenario. There are no current residents being affected by the current extent of groundwater contamination. Modified Alternative 4A is designed to contain and reduce the extent of groundwater contamination.

Groundwater modeling will be a component of the remedial design and the effects of the slurry wall will be carefully considered. Long-term monitoring will also be a component of remedial design and will ensure that the extent of groundwater contamination is being reduced, and not dispersed to other areas or nearby residents. There will be changes to the monitoring well network as part of the remedial design.

The remedy relies on the effectiveness of a containment cell. The cap uses stormwater controls to shed precipitation away from the cell. The fully encapsulating, low-permeability slurry wall will prevent migration of existing contaminated groundwater away from the cell. As with any engineered remedy, there are uncertainties. For DU1/DU6, these uncertainties include:

- The ability to construct a slurry wall keyed into the glacial till containing boulders to a depth in some locations greater than 100 feet
- The homogeneity of the underlying aquitard that the slurry wall will key into, as localized transmissive zones (stringers of sand and gravel could be present that allow groundwater flow at an increased rate compared to the rest of the aquitard) below the designed slurry wall
- The potential for unknown groundwater source(s) beneath the containment cell that were not identified during the RI, such as groundwater recharge to the uppermost aquifer through fracturing in the underlying aquifer or potential transmissive zones underlying the containment cell as previously noted

To address uncertainties, EPA added groundwater extraction to the highest-rated remedial alternative identified in the FS (Roux 2021a), which was described in the Proposed Plan (EPA 2023a) as DU1/DU6 Alternative 4A. If the measured groundwater elevation inside the cell exceeds the action level determined as part of the remedial design, groundwater within the cell will be pumped, treated at a treatment facility so that arsenic, cyanide, and fluoride concentrations are below groundwater and surface water performance standards, and then discharged to an onsite treatment process prior to discharge.

The containment cell will also limit the flux of groundwater flow from the cell. EPA anticipates that if groundwater treatment is needed, pumping and treatment of groundwater will be seasonal or even occurring once every few years, and the volume of groundwater to be treated will be much less than the volume if the containment cell did not exist. Should groundwater extraction be required from the interior of the slurry wall, the frequency of pumping will be determined based on the available groundwater and the amount of pumping required to meet the RAOs.

The exhaustive list of questions presented in Comment #134 regarding the evaluation and design of the slurry wall are more appropriately addressed during remedial design where these details will be determined. Cleanup options were evaluated using EPA guidance and protocols and the FS was approved by EPA and DEQ. Section 3.11 provides more information on the FS process and outcomes. A discussion of the remediation conducted at aluminum smelters in nearby states is provided in Section 2.46. A discussion of short-term effectiveness in the FS evaluation process is presented in Section 2.6 and Section 2.22 addresses how the SPL moved from the site in previous years differs from that which is buried and contacts groundwater at certain times of the year. Other sections of interest to the commenter regarding the slurry wall include Sections 2.9, 2.10, 2.37, and 2.39.

The design of the extraction/monitoring well network for this decision unit will be determined during remedial design.

2.39 Slurry Wall – Impacts on Monitoring Well Network

2.39.1 Public Comments

Eight comments were received from six individuals, the TASC (#1), and CBF (#134) that expressed concerns about the slurry wall changing groundwater flow patterns that might potentially allow contamination to be missed by monitoring wells.

- **Comment 1O.** "11. Groundwater flows southwest away from Teakettle Mountain toward the Central Landfills Area. Groundwater in this area ranges from 36 to 105 feet in depth (capturing the range of levels for both the West Landfill [36 – 87 feet] and Wet Scrubber Sludge Pond [60 – 105 feet]) and the proposed slurry wall will extend from the ground surface down to 100 – 125 feet below ground surface. The slurry wall will prohibit groundwater migration across the wall into the waste area, and act as an obstacle for groundwater movement; forcing the water to travel around and/or below the wall (if the wall is not tied adequately to the underlying bedrock). This flow pathway may alter the effectiveness of using downgradient wells for monitoring depending on the well development specifications. In addition the altered flow pathway may create a new groundwater route that could encounter unknown, buried wastes etc. It seems appropriate to ensure that the "groundwater effectiveness monitoring" program should be robust enough to capture all possible future pathways, and to include a thorough list of all possible contaminants that may be encountered. The community may want to ask EPA if the agency has considered the possible impacts the buried slurry wall may have by interrupting the existing groundwater flow pathways, and if the existing monitoring well field will capture possible pathways and contaminants of concern for monitoring."

- **Comment 8H.** "5) Have you considered possible impacts the slurry wall may have by interrupting the existing groundwater flow pathways, and if the existing monitoring well field will capture possible pathways and contaminants of concern for monitoring?"
- **Comment 53R.** "8) Monitor and mitigate any diverted groundwater affected by the fully encompassed slurry wall."
- **Comment 82R.** "18. Page 14, Alternative 4A, Page 29: How will the slurry wall impact groundwater hydraulics at the Site? Evaluation of this alternative should consider whether groundwater will encounter additional contamination sources after flow paths are altered by construction of the slurry wall. Is there potential to increase groundwater elevations beneath the Center Landfill (which is reportedly unlined) and cause additional groundwater contamination?"
- **Comments 106A, 123D, 130C, and 134AM.** "4. Will the network of monitoring wells be robust enough to capture the course of the diverted runoff and flow paths from the slurry walls? The slurry wall will act as an obstacle for groundwater movement and newly created flow paths could potentially encounter unknown wastes and carry them to the Flathead River and into residential wells."

2.39.2 EPA Response

The slurry wall will extend into the glacial till which is an aquitard at the site. It is not necessary to extend the wall to bedrock. Groundwater flow will not be interrupted but will be diverted. Groundwater will not be able to flow under the wall, thus all flow will be around the slurry wall surrounding the West Landfill. Monitoring wells are in place around the planned slurry wall and eight additional well pairs are planned (Roux 2021a, Section 5.1.6). Following remedial action, groundwater conditions will be reassessed for the proper placement of the existing monitoring well network. Any critical gaps in the network will be filled based on the new information.

Long-term groundwater monitoring will evaluate groundwater conditions following installation of the slurry wall and document any changes to groundwater flow and depth (Roux 2021a, Section 5.1.6).

It is anticipated that the depth to groundwater may decrease on the upgradient (northeast) side of the slurry wall and the depth to water may increase on the downgradient side (southwest). Based on Section 5.2.1 of the RI report (Roux 2020a), the Center Landfill was built up from existing grade and the depth to water is approximately 35 feet in this area. A groundwater rise of 35 feet is not expected.

Several wells and well pairs were installed during the RI and eight additional well pairs will be installed as part of the remedy in the vicinity of the fully encapsulating slurry wall (Roux 2021a, Section 5.1.6). All groundwater alternatives included a robust groundwater monitoring program to document groundwater conditions following construction and to evaluate the success of the remedial action and natural attenuation.

2.40 Slurry Wall – Include Center Landfill

2.40.1 Public Comments

Thirteen comments were received from eight individuals, the TASC (#1), NRDP (#84), and CBF (#134) asking that the remedy be changed to include the Center Landfill. One person requested that the slurry wall encompass the entire site.

- **Comment 1E.** "1. The Proposed Plan's preferred alternative for the Landfills Decision Unit 1 (LDU1) and Groundwater is alternative 4A (modified). This alternative includes construction of a slurry wall to encircle the West Landfill and Wet Scrubber Sludge Pond areas. This encircled feature will effectively create a waste containment cell capturing waste sources considered to be the primary sources of groundwater contamination. The Proposed Plan also acknowledges that the adjacent Center Landfill is the secondary source of groundwater contamination, yet only proposes additional capping (low-permeability membrane cap or geosynthetic clay liner) for this landfill. Since the Center Landfill is near the primary areas of concern, it is not clear why an alternative including an all-encompassing perimeter slurry wall around all three features was not considered. It seems prudent to consider a more comprehensive encompassing slurry wall feature that could address all three of the significant groundwater contamination features. The community may want to ask EPA if a slurry wall encompassing all three landfill features (West Landfill, Wet Scrubber Sludge Pond and Center Landfill) should be an alternative to review as part of the proposed plan."
- **Comment 8D.** "1) Why doesn't the slurry wall encompass all three landfills? I believe the center landfill should be included in the slurry wall."
- **Comment 11B.** "2. Concerning wall/cap on West Landfill and Wet Scrubber Landfill Pond, it is to me unfeasible that the third part is NOT included..i.e... the Center Landfill. Those of us who worked in the Materials Department know that various parts of plant had access to get rid of any kind of materials, from coal tar pitch, to garage wastes, including drums of waste oil/greases etc., plus materials from pot rebuild, that were disposed of anywhere anytime. No Plant Engineering over-site was ever involved. Thus as time and water break these down more pollutants are waiting to enter the groundwater plume. Center Landfill must be walled and capped too."
- **Comment 16A.** "1. The slurry wall encompassing the three land fill features should be an alternative to review as part of the proposed plan."
- **Comment 52A.** "I'm wondering why the Center landfill is not included in the slurry wall plan? There seems to be serious contaminants, why would you leave it out of the slurry wall? Couldn't the center landfill be a secondary source of ground water contaminates, therefore needing better containment."
- **Comment 53O.** "5) Expand the slurry wall to include the Center Landfill."
- **Comment 54CD.** "24. The center landfill is in DU-1. Why aren't you including it inside the slurry wall?"

- **Comment 82Q.** "17. Page 14, Alternative 4A, Page 29: Center Landfill is identified as a secondary source of contamination to groundwater. Accordingly, the Capping and Fully Encompassing Slurry Wall should include Center Landfill or a different portion of the remedy should address Center Landfill."
- **Comment 106A.** "In the event that EPA, MT DEQ and Glencore will not choose full removal of the contaminated materials then address the following questions. 1. Should a slurry wall encompassing all three landfill features (West Landfill, Wet Scrubber Sludge Pond and Center Landfill) be an alternative to review as part of the proposed plan? Since the Center Landfill is near the primary areas of concern, it is not clear why an alternative including an all-encompassing perimeter slurry wall around all three features was not considered. Was it considered? If this was considered why was it not included in the proposed plan?"
- **Comment 115A.** "Thank you for giving us the opportunity to comment on the EPA's clean-up plan for the Columbia Falls Aluminum smelter site. The site should be cleaned up completely, and all waste taken off site. I realize this is not going to happen, despite the billions of dollars in profit made by current and past owners of the site. As a very minimum, the slurry wall needs to be constructed around the entire site, not just a portion of the area where waste was discarded."
- **Comment 121A.** "Suggestions for dealing with the former aluminum plant in Columbia Falls: *Put a slurry wall around all of the landfill areas, not just the 'worst offenders'."
- **Comment 123A**. "After attending Environmental Protection Agency presentations and the public hearing in Columbia Falls, listening to comments at the hearing, reviewing documents, and speaking with knowledgeable professionals, it is my belief that the investigation and resulting proposed plan for cleanup of the CFAC Superfund Site is not adequate. Consider the following issues and questions. 1. Should a slurry wall encompassing all three landfill features (West Landfill, Wet Scrubber Sludge Pond and Center Landfill) be an alternative to review as part of the proposed plan? Since the Center Landfill is near the primary areas of concern, it is not clear why an alternative including an all-encompassing perimeter slurry wall around all three features was not considered. Was it considered? If this was considered why was it not included in the proposed plan?"
- **Comment 134AJ.** "35) We ask that you provide answers to the following issues that have been raised by others but deserve your careful consideration: 1. Should a slurry wall encompassing all three landfill features (West Landfill, Wet Scrubber Sludge Pond and Center Landfill) be an alternative to review as part of the proposed plan? Since the Center Landfill is near the primary areas of concern, it is not clear why an alternative including an all-encompassing perimeter slurry wall around all three features was not considered. Was it considered? If this was considered why was it not included in the proposed plan?"

2.40.2 EPA Response

The Center Landfill is not a significant source of groundwater contamination and does not need to be isolated within a slurry wall. As noted in the FS (Roux 2021a), the Center Landfill is a potential secondary source area for the observed elevated cyanide and fluoride concentrations in groundwater, based on the elevated concentrations in groundwater detected directly beneath the landfill during two of the six groundwater monitoring events during the RI (Roux 2020a).

The FS states:

> *The identification of the Center Landfill as a secondary source was based upon the detection of total cyanide at a concentration of 1,880 µg/L in monitoring well CFMW-017 in March 2017, exceeding the PRG of 200 µg/L. Monitoring well CFMW-017 was installed in 1980 through the Center Landfill. However, in all other sampling rounds the maximum concentration of cyanide in this well was 103 µg/L. In addition, the two wells installed adjacent to the Center Landfill on its downgradient side (CFMW-016 and CFMW-020) have exhibited a maximum total cyanide estimated concentration of 2.9 µg/L; and are typically non-detect with a detection limit of 2 µg/L).*

It is highly unusual to install a monitoring well through a landfill, as was done in 1980, because it introduces a potential pathway for movement of contamination from an otherwise secure landfill. The one-time high concentration seen in monitoring well CFMW-017 is likely the result of the empty space within the well (the well annulus) acting as a conduit for cyanide migration, especially since March 2017 was the first time this well had been sampled in several years. Whatever the cause for the elevated concentration, it has not been repeated. The well will be abandoned in accordance with State of Montana Regulations (ARM 36.21.670) when the cap is enhanced, which should prevent any future migration of contaminants through the well boring into the uppermost aquifer.

2.41 Stormwater

2.42.1 Public Comments

Fifteen comments were received from six individuals, the TASC (#1), and CBF (#134) regarding the need for stormwater controls in the remedy design.

- **Comment 1G.** "3. Waste containment systems rely on effective control of water entering or exiting the system. As a result, these systems are commonly vulnerable to flooding or significant impacts from stormwater. The preferred alternatives rely on a balance of water management (water being controlled as it comes into or leaves a remedy feature such as the containment cell). For instance, the Proposed Plan preferred alternative creates a containment cell that will envelop existing waste and exclude groundwater movement into the cell. However, there is the potential for surface water sources of snow melt, rainfall and stormwater to create an input of water into the cell. There is no mention if these sources will be controlled and perhaps routed away from the cell. The community may want to ask EPA if the preferred alternative designs will include features to control sources of water into the containment cell."
- **Comment 1H.** "4. Similar to Comment #3 above, under the preferred alternatives for the Landfills DU2, existing caps on East Landfill and the Sanitary Landfill will be maintained, a cap will be placed on the industrial landfill and soil covers at the asbestos landfills will be improved. These are effective methods to control and cover wastes in the landfills; however, these features can be compromised by erosion from snow melt, rainfall, and stormwater.

There is no mention of the use of water control methods for the preferred alternatives for the Landfills DU2. The community may want to ask EPA if the preferred alternative designs that require the installation and maintenance of caps will include engineering features that control sources of water that may erode and compromise these caps."

- **Comment 8E.** "2) Is there a plan to include features to control snowmelt, rainfall, and stormwater into the containment cell?"
- **Comment 8F.** "3) There is no mention of the use of water control methods for the preferred alternatives for landfills DU2. Will you include engineering features that control sources of water that may erode and compromise these caps?"
- **Comment 12A.** "(CFAC comments to EPA on pts 1 and 3) I had an admirable father with a scrupulous work ethic. When he saw a job that had been poorly done, he would say it had received only "a lick and a promise." That is how I feel about the EPA's proposed cleanup plan for the CFAC Superfund site. EPA has proposed to surround the most contaminated portion of the site with a slurry wall. Why only the "most contaminated portion"? If the contamination is to be left on the site, shouldn't the proposed slurry wall encompass not only the primary sources of groundwater contamination but also the water flowing into, around and over these sites? If water is the enemy in the spread of contamination, a plan to reduce or eliminate the inflow of water from various sources should also be a part of the solution. I realize that the cost to do the best job possible of containment will be astronomical, but rather than give it "a lick and a promise," shouldn't it be done the best way possible from the beginning."
- **Comment 16C.** "3. Will the alternative design control sources of water into the containment cell?"
- **Comment 16D.** "4. Will the caps in the preferred design control sources of water that may erode and compromise these caps?"
- **Comment 87D.** "Another question I have is: How or what is the mitigation plan for effective wet weather entering or exiting the vulnerable contaminated sites to flooding from excessive rain or snow? There is no way in my mind if containment was were built around contaminated sites that water will not drain through to the river and or aquifer. Are there any plans to manage the surface water to the reservoir overflow channel or runoff into the West Landfill, west scrubber sludge pond and the center landfill?"
- **Comment 106B.** "8. Will the preferred alternative designs that require the installation and maintenance of caps include engineering features that control sources of water that may erode and compromise these caps? How often will the current cap at the West Landfill, as well as all caps installed, be inspected and mitigated for structural and functional integrity?"
- **Comments 106A, 123B, and 134AK.** "2. Has EPA considered that the slurry wall has the potential to accumulate surface water overflow from Cedar Creek, precipitation, and basal flow seepage underneath the wall? Will the preferred alternative designs include features to control sources of water into the containment cell?"

- **Comments 123H and 134AQ.** "8. Will the preferred alternative designs that require the installation and maintenance of caps include engineering features that control sources of water that may erode and compromise these caps? How often will the current cap at the West Landfill, as well as all caps installed, be inspected and mitigated for structural and functional integrity?"
- **Comment 134R.** "17) According to media reports, "Residents of North Carolina's Badin Lake community celebrated in June 2019 when the Southern Environmental Law Center negotiated a settlement requiring the former Alcoa aluminum smelter in Badin, closed in the 1990s, to construct a stormwater system to stop groundwater contaminated by cyanide and fluoride from being discharged into nearby waterbodies." Have law suits like this been review so that similar mistakes with stormwater are not repeated at this CFAC site? Given the proposal to contain waste on site as part of this clean-up plan, what studies have been done to demonstrate that the proposed long-term stormwater plan for the CFAC is protective of this site and will not result in additional contamination of groundwater, surface water, the river, or adjoining properties?"

2.42.2 EPA Response

As noted in the Proposed Plan, all containment alternatives include engineered controls, which include surface water and stormwater runoff controls. Newly constructed caps, enhanced caps, and maintained caps on all the landfills at the site will all be designed/maintained to manage surface water and stormwater runoff in order to minimize percolation into the subsurface near the contained waste materials. Captured surface water and stormwater within the West Landfill and Wet Scrubber Sludge Pond will be routed for disposal outside of the slurry wall containment area, as determined in the remedial design process. The cap that was constructed over the West Landfill in 1994 was graded to drain, with a drainage layer installed within the cap, and a perimeter ditch to collect surface water and stormwater runoff. The caps constructed at the East Landfill and Sanitary Landfill also have existing stormwater controls.

The FS (Roux 2021a) included costs for stormwater controls for each of EPA's Preferred Alternatives for DU1 and DU2 that were identified in the Proposed Plan (EPA 2023a):

Landfill	Description	Cost	FS pdf Page No.
Wet Scrubber Sludge Pond	Installation of Stormwater Conveyance Swales/Ditches	$300,000	476
Center Landfill	Installation of Stormwater Conveyance Swales/Ditches	$150,000	476
Industrial Landfill	Installation of Stormwater Conveyance Swales/Ditches	$450,000	512
Asbestos Landfill	Limited Stormwater Conveyance Swales/Ditches	$118,000	512

In addition to these stormwater management features that will be designed or have been constructed to collect surface water and stormwater runoff from the impermeable caps, a long-term inspection and maintenance program will be developed to maintain the integrity of the caps and stormwater features.

The existing caps have a vegetative cover, and the caps to be constructed under the Selected Remedy in this ROD will also have a vegetative cover to protect the cap from erosion by wind and water. The caps have or will have a sufficient soil thickness to retain moisture to keep the grasses alive, while including a drainage layer beneath the vegetative cover to shed excessive moisture. The excess snow melt and stormwater will be routed to a stormwater retention basin far enough away from the waste areas as to not cause a potential impact to groundwater.

2.42 Supports Preferred Alternative

2.43.1 Public Comments

Seventeen comments from three individuals, Atlantic Richfield (#49), Montana DPHHS (#110), and CFAC (#135) supported all or part of the Preferred Alternative.

- **Comment 10A.** "I love Columbia Falls. I live here and my property development business is located here. I have been developing mixed use residential and commercial developments in the Flathead Valley, including in downtown Columbia Falls. We are building a legacy in the gateway to Glacier National Park. I'm not technical expert. But it seems to me that the best way to deal with the Columbia Falls Aluminum site is to solve the problem as quickly as possible with the least disruption to the community. It's a prime site for development and it would be best for the community if it were available as soon as possible. As far as I can tell, the EPA proposed plan will do that and there isn't any need to delay in getting started on the work. It's just common sense to me that if the problems at the site can be solved without digging that mess up and hauling it through town to dump in someone else's back yard that it should be done that way. Columbia Falls traffic is bad enough without 70 more trucks a day hauling hazardous waste through town. Sending the stuff by train would be even more dangerous. We've had two trains dump their cargo into rivers in Montana this year and those accidents would have been much worse if it were the hazardous waste from the Aluminum plant that was dumped into the river. Also, the plan says that it will take more than twice as long to fix the problem by digging it up and hauling it away and that it will make the water quality worse in the beginning. That's a bad outcome for the environment and the community. Looking into the future, I see nothing but upside for Columbia Falls. Demand for housing is high because this is a good place to live and raise a family. With that comes the need for commercial space. I think that there is a real opportunity to make Columbia Falls and this part of Montana an even better place to live and I intend for me, my family, and my companies to play an active role in that redevelopment."
- **Comment 15A. "**I am a retired employee of CFAC and was the Environmental Manager for the plant from mid-1996 until retirement in October 2022. I am a chemical engineer by training and a registered Professional Engineer (PE) in-Montana (I gave up the PE license when I retired). I live within 2 miles of the CFAC site, so am very interested in remediation of the site. I have reviewed EPA's proposed cleanup plan for CFAC's former aluminum production site. I agree EPA has chosen the best approach to manage the environmental liabilities of the site. Some vocal members of the community have suggested all the spent potliner landfills should be excavated and waste shipped to a hazardous waste landfill in Oregon. Disadvantages of this option have been well described in the Feasibility Study and EPA documents and include transportation risks, health/safety risks, and timeliness of completion. It seems the people advocating for the excavation option believe excavation will clean the site quickly and eliminate future problems. This is not the case. The landfills that leached cyanide and fluoride into the groundwater also contaminated the soil directly below

and down-gradient of the landfills. Just excavating the landfills will not remove all the contamination between the landfills and the Flathead River and it is not feasible to remove all the soils between the landfills and the Flathead River (located about a mile away from the landfills). Even with excavating the landfills, the remaining contaminated soils will continue to leach cyanide and fluoride for many years and remediation goals will not be met."

- **Comment 15C.** "I encourage EPA to move forward with their preferred and recommended slurry wall option as quickly as possible to return the property to use. The site has many positive attributes (proximity to power and railroad access) that could attract a variety of industries. The demolition and RI/FS started in 2015. It's time to start the remediation process and ultimately remove CF AC from the Superfund CERCLA list."

- **Comment 49A.** "This letter transmits Atlantic Richfield Company's (Atlantic Richfield) comments on the Proposed Plan for Cleanup of the Columbia Falls Aluminum Company Superfund Site (Site), published by EPA on June 1, 2023. Atlantic Richfield agrees with EPA's determination that off-site disposal of landfill wastes should be screened out as a remedial alternative for the reasons stated in the Proposed Plan. Atlantic Richfield also generally agrees with EPA's remedial action focus on Landfills Decision Unit (DU) 1, which, as stated in the Proposed Plan, is the primary source of groundwater contamination in DU6. Beyond these points of agreement, Atlantic Richfield offers comments of the two topics set forth below."

- **Comment 110D.** "3. DPHHS supports the proposed measures to implement institutional controls to prevent human exposure to impacted groundwater for Groundwater DU6. DPHHS recommends that the institutional controls also prohibit other potential uses of groundwater in addition to potable use, such as agricultural, industrial, and commercial uses, until preliminary remedial goals are met."

- **Comment 110F.** "5. DPHHS concurs with the remedial alternative of containment via capping for landfills in DU2 along with institutional and engineering controls. Among all landfills in DU2, the Asbestos Landfills were used to dispose of asbestos-containing materials from 1993 to 2009. As stated in the 2019 Baseline Human Health Risk Assessment, "Disturbance of asbestos-containing subsurface soils, if present, may expose receptors to asbestos. In addition, subsurface asbestos-containing building material, if present, may have a tendency to rise in the soil column due to uplift of soil and materials in the soil from annual freezing and thawing cycles." To prevent any human exposures to asbestos and other contaminants in DU2, DPHHS agrees with implementing stringent restrictions on any agricultural, commercial, residential use, or other activities that could result in failure of the cap or soil cover to contain the contaminants. These restrictions are important to prevent human exposures to site contaminants in DU2 and protect public health into the future."

- **Comment 133A.** "Wooden Haus Supply is a supplier and distributor of Cross Laminated Timber currently located in Whitefish Montana. Cross Laminated Timber ("CLT") is a form of mass timber that uses a European manufacturing process to sustainably harvest trees of all diameters, even small diameter trees, to make a lumber product that is attractive, strong, and has a lower carbon footprint than regular wood. To date, Wooden Haus has used mass timber products imported from Europe. We intend to open our own production facility in the United

States and are very interested in the former Columbia Falls Aluminum Co. ("CFAC") site as a potential location for our storage, assembly and, ultimately, manufacturing operations. The former CFAC site has several very attractive attributes for this business: its proximity to our affiliated saw mill and processing center (F.H. Stoltze Land and Lumber Co.) and the growing housing and commercial building market in the Flathead Valley; its existing large buildings; and the fact that it is being prepared for commercial and industrial uses. We advocate for turning the former CFAC site into an Industrial Business center as soon as possible in order for us and others to start producing products and creating jobs for the local community."

- **Comment 135A.** "Comment 1: The Preferred Alternative in the Proposed Plan is Consistent with the National Contingency Plan. The Requirements of the National Contingency Plan for Proposed Plans. Pursuant to §105(a) (42 U.S.C. §9605(a)) of the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), actions to address hazardous substances under the act must be consistent with the National Contingency Plan (40 CFR Part 300). Section 300.430(f)(ii) states that to select a remedial action to address a CERCLA site, "the lead agency, in conjunction with the support agency, identifies a preferred alternative and presents it to the public in a proposed plan, for review and comment." That preferred alternative is the alternative that best satisfies the requirements in §300.430(f)(1). Section 300.430(f)(1)(ii) requires the use of the nine criteria in §300.430(e)(9)(iii) to select a remedy that achieves the following objectives:

  - Protective of human health and the environment;
  - Attains applicable, relevant and appropriate requirements ("ARARs") or justifies the need for a waiver from ARARs according to the requirements in §300.430(f)(ii)(C);
  - Cost effective; and
  - Uses permanent solutions and alternative treatment technologies or resource recovery techniques to the greatest extent possible.

  When comparing remedies to each other, §300.430(f)(i) categorizes the criteria in §300.430(e)(9)(iii) into three groups

  - Threshold criteria: each alternative must meet the minimal criteria of protective of human health and compliance with ARARs to be considered for the remedy;
  - Primary balancing criteria: the lead agency must balance the five criteria of long-term effectiveness and permanence, reduction of toxicity, mobility or volume through treatment, short-term effectiveness, implementability and cost.
  - Modifying criteria: state and community acceptance. The EPA assesses this criterion after reviewing public comments after release of the Proposed Plan and therefore in the Record of Decision for the final remedy but not in the Proposed Plan."

- **Comment 135B.** "Comment 1a. The Remedies in the Preferred Alternative are Consistent with the Requirements for Remedies in NCP Section 300.430(f)(1) (40 CFR 300.430.(f)(1). Pages 22 – 28 of the Proposed Plan describe how the Preferred Alternative for each decision unit compare to the Threshold and Primary Balancing Criteria and meet the requirements for a remedy in §300.430(e)(9)(iii). After screening out alternatives that clearly do not meet the applicable criteria, the Proposed Plan uses the comparative analysis system in the Feasibility Study to rank the various alternatives according to the applicable criteria.

Guidance issued by the EPA states that the "presentation of the comparative analysis in the FS should describe the strengths and weaknesses of the alternatives relative to one another with respect to each criterion. An effective way to organize this section is to discuss for each individual criterion the alternative(s) that performs best overall under that criterion, with other alternatives then discussed in order of performance."[1] The guidance goes on to state that "[t]he differences among alternatives may be measured either qualitatively or quantitatively, as appropriate." [2] The guidance also states that "[t]he detailed analysis, like other phases of the RI/FS process, should be tailored to the scope and complexity of the site or operable unit."[3]

The detailed comparative analysis in the FS fully complies with the criteria for detailed and comparative analysis in the EPA guidance. Section 6 and Tables 6.1- 6.5 of the FS contain detailed evaluations of each of the remedial alternatives against the threshold and balancing criteria. This assessment then feeds into the comparative analysis of remedial action alternatives in Section 7. Section 7 begins with a detailed discussion of the application of the applicable criteria to each of the described alternatives under each decision unit. The FS effectively uses tables to bring together complex and disparate analysis so that they can be compared in one visual element. Table 7.2 presents a comparative analysis of seven alternatives to address conditions a Landfill Decision Unit 1 (LDU-1) and Groundwater Decision Unit.[4] Because the landfills in LDU-1 are the drivers for exceedances of ARARs and Preliminary Remediation Goals (PRGs) in groundwater, addressing releases to groundwater from the LDU-1 landfills will be necessary to achieve ARARs in groundwater. The use of the ranking system is an effective method of assessing the best performing alternatives among each of the criteria and comparing all of the alternatives with respect to those criteria. The use of the ranking system and table allows the comparison of alternatives with different approaches using a common scale across criteria and is a helpful supplement to the narrative of the comparative analysis, as envisioned in the EPA guidance cited above. Furthermore, the tables include cost estimates for the various alternatives effectively incorporating quantitative information into the comparison of alternatives."

- **Comment 135C.** "Comment 1b. The Remedies in the Preferred Alternative Protect Human Health and the Environment and comply with ARARs as required by NCP Section 300.430(f)(1)(ii)(A). Table 3.1 of the Feasibility Study lists 59 pages of ARARs promulgated or developed by either the United States government or the State of Montana that were used to evaluate the remedial options. These ARARs were classified into three categories (i) chemical specific; (ii) location specific; and (iii) action specific. The vast majority of the ARARs were action specific and specified either technology or activity-based requirements or limitations or actions taken with respect to hazardous substances. Tables 6.1 – 6.5 of the Feasibility Study evaluate each remedial alternative against both threshold criteria, including compliance with ARARs. Table 6.1 shows that with caps over the landfills impacting groundwater and a fully encompassing slurry wall to prevent the leaching of contaminants of concern from the waste management unit and any impacted soil below, concentrations of contaminants in groundwater would achieve compliance with chemical specific water quality ARARs down gradient of the landfills and in the surface and pore water at the River Area Decision Unit. The new caps of the landfills in the Landfill Decision Unit-1 would be required to comply with design and construction requirements for landfill caps which constitute action-specific ARARs. The slurry wall construction would be required to comply with standards for worker protection, health and safety, onsite waste handling and stormwater and erosion control that would also constitute action-specific ARARs. Tables 6.2 - 6.5 specify how the other EPA preferred alternatives would achieve ARARs. Section 7 of the Feasibility Study assess the extent to which the retained alternatives for each decision unit would achieve compliance with ARARs. With the exception of the No Action alternative, each of the evaluated alternatives would ultimately achieve compliance with ARARs."

- **Comment 135D.** "Comment 1c. The Remedies in the Preferred Alternative Are Cost Effective as required by NCP Section 300.430(f)(1)(ii)(D). Section 300.430(f)(1)(ii)(D) of the NCP requires that each remedial action be cost-effective and that cost-effectiveness be determined by evaluating the effectiveness balancing criteria – long term effectiveness and permanence, reductions in toxicity, mobility and volume through treatment and short-term effectiveness – against cost. The remedy is cost effective if its costs are proportional to its overall effectiveness. Section 6.1 of the Feasibility Study describes each of the evaluation criteria, including cost. The cost criteria combine both the direct and indirect capital costs and annual operations and maintenance cost expected to be incurred over the life of the project and discounted to a net present value to allow for comparison across alternatives. The Feasibility Study provides detailed descriptions of the elements that are included in both capital and operating costs and the discount rate used to determine net present value and the level of accuracy of the expected costs given current conceptual designs available at the time of the assessment. Appendix J of the Feasibility Study provides detailed costs estimates for each alternative. The present value costs of each alternative are provided in Tables 6-1 through 6.5. Section 7 of the Feasibility Study compares the cost of each alternative that met the threshold criteria for each decision unit against the other evaluation criteria to develop a qualitative proportionality of cost to effectiveness for each of the final alternatives for each decision unit, including the preferred alternatives. Tables 7-2, 7-3, and 7-4 of the Feasibility Study compare the alternatives for Landfill DU1/Groundwater, Soil DU alternatives and the North Percolation Pond DU alternatives respectively. Each table ranks each of the alternatives for each decision unit that meet the threshold criteria according to the balancing criteria and shows the present value cost for each alternative.

  For the landfill DU1/groundwater alternatives, the preferred alternative (modified 4A) was ranked as only slightly less effective than alternative 4C (effectiveness scores 48 vs 54) but also has the second lowest present value cost whereas alternative 4C had the second highest estimated present value cost showing that the cost of the preferred alternative was proportional to its effectiveness. The cost of alternative LDU1/GW – 6, Excavation and Onsite Consolidation is not proportional to its effectiveness and selection of this alternative as the final remedy for the LDU1/GW decision unit in the Record of Decision would not be consistent with Section 300.430(f)(1)(ii)(D) of the NCP. The Feasibility Study ranked alternative 6 both significantly lower in overall effectiveness compared with the preferred alternative (37 vs 48) and its present value cost exceeds that of the preferred alternative by a factor of three. Crucially, alternative 6 ranks second lowest among the alternatives for the long-term effectiveness criteria of reduction of toxicity, mobility and volume through treatment and is the lowest ranked alternative for short term effectiveness. Because alternative 6 is both significantly less effective and significantly more costly than the preferred alternative for the LDU1/GW decision unit its cost is not proportional to its effectiveness and selection of this alternative would be inconsistent with section 300.430(f)(1)(ii)(D) of the NCP.

With respect to the soil decision unit alternatives, the preferred alternative, alternative 4 in the Feasibility Study, was both the most effective (effectiveness score of 50 vs 45 for alternative 3 and 40 for alternative 2) and its present value cost was essentially the same as alternative 3 and less than alternative 2, making its cost proportional to its effectiveness and consistent with section 300.430(f)(1)(ii)(D) of the NCP. With respect to the north percolation ponds decision unit, the preferred alternative, alternative 4 in the Feasibility Study, was both the most effective alternative (effectiveness score of 55 v 48 for alternative 3 and 40 for alternative 2) and it has the lowest estimated present value cost so its cost is proportional to its effectiveness consistent with section 300.430(f)(1)(ii)(D) of the NCP. The landfills decision unit 2 had only one alternative that met the threshold criteria. Since it is the only remedy that is effective, its cost is proportional to its effectiveness."

- **Comment 135E.** "Comment 2: The Preferred Alternative in the Proposed Plan is Supported by the Facts in the EPA Approved Remedial Investigation and Analysis of Alternatives in the EPA Approved Feasibility Study. Comment 2a. The Preferred Alternative Addresses the Risks Identified in the Remedial Investigation for Each Site Decision Unit. Consultant EHS Support LLC produced a 2019 baseline ecological risk assessment that was incorporated into the remedial investigation and showed the potential for adverse ecological risks in three ecological types of exposure areas in different parts of the site: (i) terrestrial exposure areas in the main plant area, the central landfills area and the soil sampling grid area; (ii) the transitional exposure area in the north percolation pond and south percolation pond; and (iii) aquatic exposure area in the Flathead River riparian area channel and the backwater seep sampling area. The consultant also produced a 2019 human health risk assessment that identified potential receptors that could be exposed to affected soil, groundwater surface water and sediment. Current potential receptors include trespassers and recreationists. Receptors in the future could include industrial or commercial workers, construction workers, residents, trespassers and recreationists. The risk assessment concluded that the north percolation ponds area, the main plant area, central landfills area, and the industrial landfills area could pose potential excess lifetime cancer risks or potential for non-cancer risks. Exposure to groundwater in the plume core could pose a risk to hypothetical future residential drinking water users. This assessment was used to identify within the Remedial Investigation remedial action objectives, qualitative outcomes that the overall cleanup is intended to accomplish. These, along with ARARs, were used to develop a set of preliminary remedial goals which are target concentrations of specific contaminants in a given media within specific areas, the achievement of which is designed to reduce risk below applicable levels and achieve ARARs. The preliminary remedial goals for the various areas, contaminants of concern and exposure pathways are described in Section 3 of the Feasibility Study and are presented in Tables 3-2 – 3- 15.

The discussion of each of the retained alternatives in Section 6 of the feasibility study describes how each alternative will mitigate human health and ecological risks. These mitigation actions are summarized in Feasibility Study Tables 6-1 – 6.5. Specifically, the preferred alternative for the landfill DU1/groundwater/river area decision units would mitigate human health and ecological risk through the maintenance and upgrading of landfill caps by eliminating the potential for direct contact with impacted waste and containing constituents at concentrations in excess of preliminary remedial goals. The proposed new and refurbished caps and a fully encompassing slurry wall would isolate the waste material and impacted soil preventing the infiltration of precipitation and runoff and groundwater into those areas preventing the release of contaminants of concern to groundwater providing the opportunity for groundwater and porewater to be flushed by clean water and ultimately achieve groundwater preliminary remedial goals at the site. Institutional controls ("IC") would prevent use of and exposure to impacted groundwater until preliminary remedial goals and standards in ARARs are achieved. The preferred alternative for the landfills DU2 would mitigate potential human health and ecological risk by eliminating the potential for direct contact with impacted soil and waste material containing contaminants of concern in excess of preliminary remedial goas and standards in ARARs through maintaining, improving or constructing new landfill caps on the waste management units with the decision unit. The preferred alternative for the soil decision unit would eliminate potential human health and ecological risk from direct contact with impacted soil by excavating all impacted soil consolidating the impacted material in another part of the site with effective caps and or covers. The preferred alternative the north percolation pond decision unit would mitigate potential risk to human health and the environment by eliminating direct exposure to impact soil and sediment by excavating that soil and sediment and consolidating it in another part of the site in a facility."

- **Comment 135K.** "Comment 3d(i). The Excavation and Off-Site Disposal Option Would Be Significantly Less Effective than the EPA Preferred Alternative. The National Contingency Plan states that the effectiveness considers the extent to which the alternative reduces toxicity, mobility, and volume through treatment, minimizes short term impacts, and how quickly it achieves protection. "Alternatives providing significantly less effectiveness than other, more promising alternatives may be eliminated." 400 CFR 300.430(e)(7)(ii). The excavation and off-site disposal alternative would be significantly less effective than the Preferred Alternative using these criteria. The excavation alternative would increase the mobility of pollutants in both soil and groundwater because it would require that the landfill cap be removed and the waste material in the landfill to be exposed for at least 4-5 years and probably longer.6 During the period of excavation, the landfill caps will have been removed and the landfilled material will be open to the elements, allowing rain and snow to fall into the open pit and leach through the impacted material transporting additional contaminants to the groundwater below. This will increase the concentrations of site constituents in groundwater, especially when compared to the EPA Preferred Alternative for Landfill DU1/Groundwater DU6/River Area DU5, which calls for both preserving and improving the exiting caps on the subject landfills, resulting in less infiltration from the elements, and surrounding the impacted material with a low permeability slurry wall that will prevent leaching and migration of constituents to groundwater. Increasing the constituent concentrations in groundwater will increase the amount of time it will take to achieve ARARs for groundwater and pore water and reduce the resulting human health risk associated with impacted groundwater and the ecological risk associated with impacted pore water in the Flathead River Riparian and Backwater Seep areas when compared to the EPA Preferred Alternative.

The EPA Preferred Alternative is designed to prevent any material increase in the concentrations of site constituents in groundwater in contrast to an excavation alternative. Construction of the EPA Preferred Alternative would be completed more quickly than the excavation alternative – within two to three years after necessary remedial design and engineering. Once construction was complete, the EPA Preferred Alternative is designed to stop or greatly reduce leaching of site constituents to groundwater beginning the process of reducing the concentrations of those constituents in groundwater and down gradient sediment pore water. This will result in the early achievement of ARARs and reduction of human health and ecological risk under the EPA Preferred Alternative compared with the excavation alternative.

Furthermore, removing the landfill caps and excavating that material will create human health risks that are nonexistent or are highly unlikely under the EPA Preferred Alternative. Removing the landfill caps will result in workers being exposed to hazardous materials and the potential emissions from those materials, such as toxic cyanide gas resulting from the cyanide in the landfilled materials coming into contact with rain water to an extent that is highly unlikely if it were to occur at all under the EPA Preferred Alternative.

In addition, the EPA estimates that transporting this material to an off-site disposal facility will generate "significant" greenhouse gas and air emissions. The transportation of materials to off- site disposal locations by truck would require at least 60 million total truck miles of travel as estimated by EPA in the Proposed Plan. This number is likely an underestimate since it is based only on transport of the 1.2 million cubic yards of waste material and does not include the estimated 380,000 cubic yards of underlying impacted soil that could also be required to be disposed of at an off-site location. The EPA estimated that "the carbon footprint and air emissions associated with 60 million total truck" miles "would be significant." Because the EPA underestimated the amount of material to be removed from the site and the number of needed truck trips and truck miles traveled, EPA likely underestimated the total greenhouse gas and air emissions and expected emissions from transporting the material off-site would be more significant that EPA estimated. Although there will be some greenhouse gas and air emissions associated with installation of the EPA's Preferred Alternative, this category of significant greenhouse gas and air emissions from off-site transport would not occur under the EPA's Preferred Alternative since the material would not be excavated and transported off-site."

- **Comment 135L.** "Comment 3d(ii) The Excavation and Offsite Disposal Alternative Would Cost Significantly More to Implement Than the EPA Preferred Alternative While Being Less Effective. The National Contingency Plan states that "[t]he costs of construction and any long-term costs to operate and maintain the alternatives shall be considered. Costs that are grossly excessive compared to the overall effectiveness of alternatives may be considered as one of several factors used to eliminate alternatives." 40 CFR 300.430(e)(7)(iii) The EPA estimated the total cost of implementing its Preferred Alternative for the Landfill DU1/Groundwater DU6/River Area DU 5 at $45,642,497. The EPA estimated the total cost of excavation and on-site disposal for LDU1/GWDU6/RADU5 in Option 6 at $165,590,849. The excavation option with off-site disposal was screened out and therefore a total cost for that option was not estimated but would be much more than the cost of Option 6 because of the additional cost of transporting the material and the fees for disposing of it at an off-site location. Yet, as described above, the off- site disposal option would be much less effective than the EPA Preferred Alternative and would increase environmental impact and human health risk in the short term whereas the EPA Preferred Alternative would decrease environmental impact and would prevent an entire category of human health risk that would be created by the excavation and off-site disposal option. This cost is "grossly excessive when compared to the overall effectiveness" of the excavation and offsite disposal alternative."

- **Comment 135N.** "Comment 4: A Record of Decision that Required Excavation and Off-Site Disposal of the Materials in the Landfills in Decision Unit LDU-1 Would Not Be Consistent with the National Contingency Plan and Applicable EPA Guidance. Comment 4a. A Final Remedy that Required Excavation and Off-Site Disposal of the Materials in the Landfills in Decision Unit LDU-1 Would not be Consistent with the National Contingency Plan Because it Would not be as Effective as the Preferred Alternative in the Proposed Plan for that Decision Unit.

  Section 300.430(f)(ii) (40 CFR 300.430(f)(ii) requires EPA to select a preferred alternative that best satisfies the criteria in Section §300.430(f)(1) (40 CFR 300.430(f)(1)). That section requires that EPA use the nine criteria in §300.430(e)(9)(iii) to select a remedy that is protective of human health and the environment (40 CFR 300.430(e)(9)(iii)(A)) and effective over the short term (40 CFR 300.430(e)(9)(iii)(E)). In addition to the reasons cited in Comment 3.d(i) above, if the EPA were to choose a final remedy for the Landfills DU1/Groundwater/River Area DU5 that consisted of excavation of the landfilled material in the Landfills DU1 and off-site or on-site disposal of that material, that remedy would not be consistent with the National Contingency Plan because it would not be as effective in achieving ARARs or reducing human health or ecological risk as the EPA Preferred Alternative in the Proposed Plan. In determining short term effectiveness, the EPA is required to consider the "short term risks that might be posed to the community during implementation of the alternative." (40 CFR 300.430(e)(9)(iii)(E)(1)). The EPA's RI/FS Guidance elaborates on these criteria. In Section 6.2.3.5 "Short-term Effectiveness" it states that "[t]he following factors shall be addressed as appropriate for each alternative:

  - "Protection of the community during remedial actions – This aspect of short term effectiveness addresses any risk that results of implementation of the proposed remedial action, such as dust from excavation, [and] transportation of hazardous materials..."

- "Protection of workers during remedial actions – This factor assesses threats that may be posed to workers and the effectiveness and reliability of protective measures that would be taken."

- "Environmental impacts – This factor addresses the potential adverse environmental impacts that may result from the construction and implementation of an alternative and evaluates the reliability of the available mitigation measures in preventing or reducing the potential impacts."

- "Time until remedial response objectives are achieved – This factor includes an estimate of the time required to achieve protection for either the entire site or elements associated with specific areas of the site."

The EPA estimates that transporting excavated material the nearly 500 miles (including over 130 miles of two-lane road) that would be required to move materials to the nearest offsite disposal location capable of accepting the material could result in injuries to more than 35 persons due to auto accidents. Again, EPA underestimated this risk since more material would need to be transported than EPA estimated resulting in greater truck miles traveled and a greater likelihood of traffic injury. While transport of the material via rail would reduce the risk of traffic injuries it would not reduce the risk of significant community disruption and could increase the risk of impact to the environment. There have been at least three freight car derailments in Montana in 2023, two of which resulted in materials being spilled into rivers. These included a June 24, 2023 ten car derailment that sent molten asphalt and sulfur into the Yellowstone River (see https://www.nytimes.com/2023/06/24/us/montana-train-derailment-yellowstone.html) and an April 2, 2023 25 car derailment that sent spilled freight contents into the Havre Rover (see, https://www.nbcnews.com/news/us-news/freight-train-derails-western-montana-25-cars- rcna77859).

In addition, the EPA states in the Proposed Plan that community disruption impacts from trucking material off-site "would be longer and more intense than those for previous removal activities during the demolition (70 trucks/rail cars per day over four to five years versus and average of 4 trucks per day over one year)." For the reasons stated above, EPA underestimated the expected duration of disruption and the resulting expected duration of community impacts. During the period described by EPA in the Proposed Plan, Columbia Falls Aluminum Company received multiple complaints regarding the noise, dust and vibration associated with an average of four trucks and sometime up to six trucks per day hauling hazardous waste in the form of spent pot liner and non-hazardous materials through the community. These complaints included but were not limited to

- Complaints about the use of Nucleus Avenue (Montana State Highway 486) in Columbia Falls as a truck route;

- Complaints about material that allegedly fell from trucks hauling demolition debris from the site.

Complaints about the noise, vibration and dust from an average of 70 truck-loads per day traveling through the community are likely to be more numerous than those for an average of four truckloads per day traveling through the community. The community disruption would not be present or would be materially less under the EPA Preferred Alternative that does not require excavation and off-site disposal.

Many of the same facts cited in Comment 3.d(i) as significantly reducing the effectiveness of the excavation and off-site disposal option under the screening analysis would also significantly reduce the short-term effectiveness of this alternative and require its ultimate rejection were the EPA to consider it beyond the screening stage. As described in greater detail in Comment 3d(i), the excavation alternative would pose risks to workers that would either not be present or be highly unlikely during the implementation of the EPA Preferred Alternative. Furthermore, as described in Comment 3.d(i), the excavation and off-site disposal alternative would significantly increase greenhouse gas emissions and the time to obtain ARARs and achieve risk goals when compared to the EPA Preferred Alternative. As discussed in comment 3d(i), excavation of material in Landfill DU-1 would also increase the time necessary to achieve remedial response objectives."

- **Comment 135O.** "Comment 4b. A Final Remedy that Required Excavation and Off-Site Disposal of the Materials in the Landfills in Decision Unit LDU1 Would not be Consistent with the National Contingency Plan Because it Would Cost Significantly More than the Preferred Alternative for that Decision Unit and Would not be Cost Effective. The National Contingency Plan requires that EPA select remedy that is cost effective (40 CFR 300.430(e)(9)(iii)(D)). The excavation remedy for the LDU1 landfills with either on-site or off- site disposal is not cost effective under the applicable provisions of the National Contingency Plan. For the reasons stated above in Comment 3d(ii), both the excavation and on-site and off- site disposal options would be significantly less effective in achieving ARARs and reducing human health and environmental risk, especially when compared to the EPA Preferred Option. At over 3.6 times the estimated cost of the EPA Preferred Option, Option 6 is not cost effective. Excavation with off-site disposal would cost more to implement and would be less effective than Option 6 and therefore would be even less cost effective."

- **Comment 135P.** "Comment 4c. A Final Remedy that Required Excavation of the Materials in the Landfills in Decision Unit LDU-1 Would be Inconsistent with the Expected Remedy for This Site in the National Contingency Plan. Section 300.430(a)(iii)(B) of the National Contingency Plan states that "EPA expects to use engineering controls, such as containment, for waste that poses a relatively low long-term threat or where treatment is impracticable." (40 CFR 430(a)(iii)(B)). The landfills in the Landfills DU- 1 all qualify as facilities where the waste poses a relatively low long-term threat and where treatment is impractical. The subject landfills ceased operation on or before 1980, some 43 years ago. The West Landfill reportedly stopped receiving spent pot liner waste, the source of impacts to groundwater, some 53 years ago in 1970. For 35 years, the cyanide and fluoride discharges from the landfills were covered by a water discharge permits issued by the State of Montana (Ground Water Pollution Control System Permit Number MGWWPCS0005 issued in 1984 and Montana Pollution Discharge Elimination System Permit MT-0030066 issued in 1994 and terminated effective April 17, 2019. See, RI Section 1.3.2.2 p.5). Their impacts to groundwater pose relatively minor human health and ecological risks that are already well managed and will be reduced below applicable levels by implementation of the EPA's Preferred Alternative. Furthermore, the excavation and treatment of the waste in the landfills is impracticable in part for the reasons stated above in Comment 4a and because of the community impacts discussed in the EPA Proposed Plan. This provision of the NCP is cited by the EPA in its guidance citing containment as the presumptive remedy for municipal landfills ("Presumptive Remedy for CERCLA Municipal Landfill Sites" EPA, September 1993 p.2) and the rationale for the expected remedy of containment that is in the guidance for municipal landfills at CERCLA sites applies equally to the Landfill LDU-1 landfills."

2.43.2 EPA Response

EPA agrees that the Preferred Alternative presented in the Proposed Plan (on-site disposal, containment, and treatment) is protective and effective and has lower levels of risk, disruption, and cost than other alternatives, including off-site disposal. As the first commenter points out, rail accidents are not uncommon, and transportation of these hazardous wastes would be dangerous if the containers were submerged or damaged in an accident as happened with the recent asphalt binder spill into the Yellowstone River in July 2023.

We agree with the statement that public perception seems to be that the contamination in specific landfills in DU1 can be easily removed and shipped off-site leaving an otherwise clean site. As the commenter points out, significant contamination would remain in the soils below and beyond the landfills. Leaving the wastes capped in place, managing stormwater run on and runoff, and controlling the flow of groundwater through this area is preferable.

Institutional controls are key to successful implementation of the remedy and the asbestos wastes in DU2 are best left in place with controls that will protect the cap.

As required by Superfund law (see Response 2.1.2), the remedy that is selected in this ROD is cost-effective and proportional to overall effectiveness and EPA believes it is the best combination of all possible alternatives evaluated. The Selected Alternative will return the site to productive use without significant delays, and, as the last comment shows, the property has industrial appeal that could provide needed tax revenue for Columbia Falls and jobs for local residents.

While there is increased potential for precipitation to infiltrate into wastes during a waste excavation scenario, construction best management practices such as stormwater run on and runoff controls and temporary liner covers could be employed to minimize this potential groundwater loading source. Therefore, excavation and off-site disposal is not significantly less effective than the Selected Remedy. However, EPA concurs with the increased human health risk and increased carbon emissions associated with off-site disposal as noted by the comment, and that the Selected Remedy would achieve groundwater and porewater remedial action objectives more quickly.

2.43 Supports Wildlife Corridor

2.43.1 Public Comments

Five comments were received from five individuals that stressed the need for a wildlife corridor as part of the remedy to protect habitat and allow migration of species.

- **Comment 8B.** "Growing up people thought that Teakettle Mountain was all rock. No trees grew on it. Not until the plant curtailed operations did we see the beautiful green vegetation that grows there today. For me it has always been about the land. From the first meeting in 2015 to the last, I seek a wildlife corridor. I've asked for it, brought it up at almost every meeting. My attendance these last 8 years has been about the land and the animals that inhabit it. The grizzlies, the wolves, the loons and everything in between. All of them dwell on this property. We have a chance to save this beautiful land that runs from the Rocky Mountains to the wild and scenic Flathead River. To protect the animals that have called it home for centuries. Someone wiser than me said: "We Spoke about the land. If we lose the land, We lose the culture. Lose the culture, Lose the peace Lose the peace Lose the community. Lose the community, Lose our way of life, forever. Please create a conservancy easement from Teakettle to the Flathead River."

- **Comment 9B.** "There is no single way to do conservation, but the core idea is very straightforward: plants and animals need somewhere suitable to live. Over harvesting and habitat loss are the main threats to their existence, but for any conservation strategy to work it depends on the existence of a suitable environment. Now, we all agree that conservation is a popular idea, one of the few issues that brings together our deeply divided United States. Agreeing on the specifics of conservation is where the issue becomes contentious. Most of us would agree that thoughtful use of our lands is, or can be, compatible with conservation. So, to safeguard animal species and their ecosystems, and to make sure that they have resources and space to adapt as the climate continues to warm, requires that we adopt conservation everywhere. We must consider those private landowners who make a living using the land as well as those of us who use it as a means of recreation. So said Interior Secretary Deb Haaland to National Geographic reporter Emma Marris. Humans and threatened species can thrive together. To this end, large buffers must be left around streams, the habitat needs to remain diverse with stands of timber, meadows and routes for game to traverse to water; enough continuity for them to move freely. Without these essentials we cannot continue to have the elk and deer that have made this open space their winter range and spring calving area. Their numbers have already been severely depleted. Maintaining urban spaces and providing equitable access to nature for all are key goals in conservation. The burning question in the case of the CFAC site is can Glencore work together with conservationists, or will the pursuit of profit win out and lead to the destruction of a natural environment that has the potential to benefit the wildlife and the local population in its natural state.

  Nothing illustrates the promise of this urban conservation proposal more vividly than to note the species that currently make the parcels their home. Besides the ungulates, deer, moose, elk, there are the large predators, cougars, wolves, coyotes and bears that hunt the woodlands and meadows. The fowl making this their home include turkeys, crows, hawks, eagles, seasonal geese, magpies, swans, blue jays, Stellar's jay, Flickers, doves, robins and three species of woodpeckers – just to mention a few. We have heard the beautiful warble of a loon regularly as it flies from its nesting site every morning. The smaller mammals: raccoons, skunks, rabbits, lynx, fox and bobcat have been spotted in the meadows as well. Not to protect and provide for the ongoing survival of these species in their habitat would be unthinkable. I've given a brief rundown of what we have here and what we would like to see survive the CFAC debacle, specifically a conservation easement on the western side of the plant site. The Nature Conservancy professes a vision where the diversity of life thrives and people act to conserve nature for its own sake and its ability to fulfill our needs and enrich our lives. I ask that the EPA reconsider their evaluation of the work that needs to be done at the CFAC cleanup site to include more than a short paragraph on page 4 regarding potential future uses – to include provision for the existing animal population."

- **Comment 13A.** "My biggest concern about the cleanup process is for the animals, including humans, as I live a half mile away. I would like someone to monitor the safety of all of us during the cleanup. I don't expect Glencore to care so much for the elk, coyotes and loons (all of which I saw this past week) but I do expect the EPA to care. That is their job. This property has been a wildlife corridor for generations. All around it the animals are protected, from Glacier Park to the north and Glacier institute to the south. Please protect this area as a safe haven for all that live here."
- **Comment 52C.** "As always, I'm concerned about the wildlife which have used the corridor along the Rocky Mountains for generations. Please consider a conservancy to protect their shrinking environment."
- **Comment 54AK.** "24. Local authorities have not adopted local land use plan? Correct! Where are the County Commissioners? Gone missing when they should be leading land use planning. You can plan the future of the area and dictate goals to EPA and Glencore. Don't let Glencore/ EPA dictate commercial or industrial zoning while the city is actively courting residential zone changes to CR 4. The area south of the river has fought the city of Columbia Falls and developers over subdivisions over the Hwy 2 bridge and won. Glencore has found a way to get 700 acres of land into the hands of the bike path folks and the conservation community. All these people use one recurring talking point - It's a migration corridor for animals. You guessed it. The CFAC property is the birth place of the migrations. It is a magnificent winter range at the base and up on Teakettle Mountain because of the terrain, cover, forage and water all in one neat location. EPA should tell the local community the truth about the dump areas. It will be a "no go" area for decades because they don't know what is there and what will show up some day in the future that won't be CN or F. There will be a large portion of the 960 acre site that will be inside a high locked fence. Its best land use purpose could very well be a wild place with two or three underpasses under the railroad tracks between Teakettle Mountain and the North Fork Road overpass to stop the stupid, senseless slaughter that occurs every winter in this 1.5 mile stretch. EPA use an IC with the help of the County Commissioners to get this done."

2.43.2 EPA Response

Protection of the environment is a key concept in assessing Superfund cleanup alternatives. Alternatives must meet federal, state, and tribal environmental statutes or obtain appropriate waivers. Long-term protectiveness and short-term impacts to the environment during construction are also assessed. EPA's focus is on cleanup, and the agency does not have the authority under Superfund law to dictate uses of private land, except where restrictions are required by the findings of the human health or ecological risk assessments. For instance, residential land use will not be permitted at the site based on risks related to the groundwater aquifer. CFAC, the property owner, is free to develop the former facility for commercial, industrial, or recreational uses. *Ready for Reuse* is an EPA initiative that encourages beneficial use of formerly contaminated sites to help improve local economic conditions.

Interested members of the community may work with the property owner to consider setting aside a portion of the as yet undeveloped land for the uses described by the commenters. Non-governmental agencies may be able to provide advice on conservation easements and other tools that may benefit both the community and the property owner.

2.44 Wants Best Possible Cleanup

2.45.1 Public Comments

Eleven comments were received from 11 individuals that were classified as stating that the community deserved the best possible cleanup.

- **Comment 12B.** "The community has been endangered, devalued and threatened by the multiple owners of the CFAC site. I believe we deserve to be compensated for the loss of our quality of life, our assurance of a safe future and the peaceful enjoyment of our homes that has been stolen from our neighborhood. A good start in that direction would be the best possible cleanup effort."

- **Comment 18D.** "There has to be a comprehensive plan to protect our lake. Please, please make that happen!"

- **Comment 22A.** "I am copying and pasting from a wonderful group in the Flathead Valley who is always looking out for our healthy environment in Montana. I worked at the Aluminum plant and I believe the clean up should be done properly. Also in light of the recent lawsuit regarding our clean and healthful environment as protected in Montana, I would think that you would follow suit and avoid future lawsuits."

- **Comment 31A**. "Hello, I have a question as to why the "clean up" of the Columbia Falls Aluminum Plant toxic waste is not moving forward. We owe it to future generations to not foul their nest. Is it not our responsibility to protect our precious water?"

- **Comment 40A.** "Clean it up."

- **Comment 41C.** "Will these recommended efforts be following our constitutional right to protect, maintain and improve a clean and healthful environment in Montana for present and future generations?"

- **Comment 53AA.** "Will the EPA side on the voice of reason for the sake of humanity, including the current and future residents of Columbia Falls, by incorporating these requests into their preferred plan for cleanup of the CFAC Superfund site? Will the EPA utilize all available technology and resources to ensure the groundwater and soil contamination is remediated, and not cut costs by leaving the source of contamination in place, just to wait and see what will happen? Trust in the government federal bureaucracy is waning rapidly. This is your chance to help improve the EPA's image and trust by going the extra mile to protect America's valuable resources and by allowing public oversight in the valuation process. I appreciate the EPA's initial willingness to claim the CFAC site under its jurisdiction, but I also implore them to go above and beyond their remediation status quo guidelines and embrace a more aggressive and expensive plan."

- **Comment 54GD.** "It is my hope and goal that you use your 40 plus years of experience with superfund sites to put actual goals and timelines in this document so the community has a sense of your commitment to the residents of the area. Also the area of the island should be revisited to fix the safety problems you have left in place with the DU- 5 ROD you have already implemented. Revisit the Aluminum City drinking water system protections and develop something that actually looks at the water sources we are using. The carcinogens from the paste plant scrubber water should also be traced so you are not leaving a serious health risk unaccounted for like you currently have with the two mercury loaded rectifiers buried on the site."
- **Comment 66D.** "We recently tested our well water 15+ miles away from the Superfund site and it had higher levels of lead than is safe to consume, indicating a level of damage is already done. I have toddlers and this freaks me out. Please help us protect our valley's watershed."
- **Comment 94A.** "Please note this message comprises two homeowners and two distinct voices, voters, and community members: As a resident that lives within a few miles of CFAC, this cleanup plan deeply affects me, my family, my livestock, and the future generations of Montanans in my community. This also affects the wildlife that seek home and shelter on my property, and the very water that I drink and consume daily."
- **Comment 129A.** "I am a long-ago graduate of Kalispell's Flathead High ('57), a Stanford chem engineer by training, business manager, and conservationist. I am also a descendent of several Anaconda executives, and due to the latter, committed wherever and whenever I can to help remedy the horrific environmental pollution left by Anaconda in both the Deer Lodge and Flathead Valleys. I hope you hear the words of the many Montanans who accept the responsibility we all share to remove this poison. Please hear also the voices of the many generations who will follow us. We must not leave them this legacy. My thanks to you, the EPA team, and our fellow citizens for joining in the monumental task of keeping our environment healthy."

2.45.2 EPA Response

EPA's goal at every Superfund site is to implement cleanup to protect human health and the environment. To that end, the Superfund process is deliberate and methodical, with specific objectives and standards for data collection and analysis, risk assessment, site characterization, and remedy evaluation. EPA guidance documents include, but are not limited to, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988a) and *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (EPA 1999). The Preferred Alternative set forth in the Proposed Plan (EPA 2023a) is the result of this careful process. EPA uses the technical evaluations in the FS (Roux 2021a) that weigh seven criteria (protectiveness, compliance with regulations, long-term effectiveness and permanence, reduction of waste through treatment, short-term effectiveness, implementability and cost) to select a remedy that is protective of human health and the environment and cost-effective (see response 2.1.2). EPA presents that remedy to the public for public comment and evaluate the comment received to gauge public and state acceptance.

2.45 What if It Fails?

2.45.1 Public Comments

Six comments were received from four individuals that asked what would happen if the Selected Remedy were to fail. There were concerns that the Superfund process would start over from scratch. One commentor stated that EPA should plan for the costs involved in replacing the Aluminum City water system in the event that the remedy fails, and another asked about guaranteed lifetimes for remedies.

- **Comment 3B.** "So just expanding on what David said, I was disturbed with the response that this process would have to start all over again if the first remedy failed. And if that's the case and if things are still breaching, then what about those children in the future? And like I said, three of the six are no longer here. Of those six that were diagnosed since 2011 -- four of them are high school students; all of them are outstanding athletes -- two of the four high school students are no longer here. So I think it's a valid question for the future of our community: How does this affect our children, and since the government is not known for being a fast entity, if this does fail, how long is this response time?"

- **Comment 11D.** "4. A scenario may unfold in the future over wells being contaminated in Aluminum City...IF this plan is adopted and fails. THUS an EPA alternate must is for GLENCORE to assist the City in engineering a new water system for Aluminum City, and paying for said water system, replacing all wells with clean city water, as our main line runs parallel to the North Fork road."

- **Comment 15B.** "At one EPA meeting there was much discussion that EPA's plan did not have a "Plan B" in the event the slurry wall doesn't achieve objectives. I don't think these people have read EPA's document. In addition to the slurry wall, EPA proposed a groundwater treatment plant that could be used if it is determined the slurry wall is not operating effectively. The groundwater treatment plant would pump groundwater from within the slurry wall perimeter and then treat this water prior to disposal. This groundwater treatment plant could serve as "Plan B" if the slurry wall doesn't meet expectations. Hopefully, the slurry wall will perform and the groundwater pump and treat system will not be needed."

- **Comment 132B.** "Have the situations which would result in the failure of the proposed solution been provided to the public for scrutiny, and have those situations been fully accounted for in the design with something like a 20% or similar margin of error?"

- **Comment 132G.** "What is the backup plan if/when it is discovered that this solution has failed or is failing?"

- **Comment 132K.** "What is the guaranteed lifetime of the proposed solution? What is the guaranteed lifetime of other studied but rejected solutions?"

2.45.2 EPA Response

The remedy for soil (capping in place or excavation and consolidation) is straightforward to design and implement. The groundwater and surface water remedy works in conjunction with the slurry wall. This slurry wall technology has been used successfully since the late 1970s. Given the characteristics of the slurry wall backfill, (i.e., blend of soil and bentonite clay, which are natural earthen materials resistant to degradation and consequently are not rigid “walls” that would crack and break during earthquakes, such as concrete walls) and the environmental conditions of the subsurface, (e.g., insulated from freeze-thaw cycles, locked-in-place by surrounding earthen materials), a properly designed slurry wall should continue to perform over time.

The remedy will include a prohibition on-site groundwater use for drinking water, so there is no complete risk pathway for groundwater contamination. That is, groundwater will not be consumed.

Risk from contamination in seeps fed by site groundwater is ecological and is not an unacceptable human health risk. If the discharge from the seeps along the Flathead River does not achieve DEQ water quality standards in an acceptable period of time, modifications would be made to the remedy to improve performance or to evaluate potential changes to the remedy without “starting over.” Site cleanups are most often an iterative process where information gained over time is used to improve the original remedy. The need for modifications is not a failure. A modification to the Selected Remedy will not cause the site to start over in the Superfund process. The level of modification will dictate how much process is required—a more major modification may require a focused feasibility study for example, but a lesser modification would not. The statutory five-year review process will evaluate the remedy every five years to ensure that performance objectives are met, and the remedy remains protective.

The groundwater plume beneath the site flows downgradient from the source toward the river and has not moved east or west in over 10 years of monitoring. Regular sampling and analysis of monitoring wells between Aluminum City and the plume would provide an early warning in the unlikely event that the plume were to drift to the west and modifications (such as more groundwater pumping) could be implemented to redirect the plume and prevent it from reaching residential wells. There is no expectation that such contamination would happen given the history of contaminant migration at the site. As such, a city water system in Aluminum City is not deemed necessary at this time.

2.46 What Worked Elsewhere?

2.46.1 Public Comments

Six comments were received from four individuals, Atlantic Richfield (#49), and CBF (#134) asking about what had been done to address contamination at other aluminum sites in the western U.S.

- **Comment 6B.** “I would like you to provide, as was asked earlier, of the approximately 21 other aluminum plants that are in the country, the solutions that have been used at those plants. I realize they’re different geographic areas, but I think we can learn, and your report should inform the community of the solutions that were used there and how effective they’ve been. If there are slurry walls being used where they’re failing in other places, we need to know why and what were the situations. So we need a good bit of information yet. And with that, if there are successful treatments, what they are.”
- **Comment 11C.** “3. EPA needs to review the cleanup of our sister plant at the Dalles, as she was a mirror image of ours, and an assessment of it should be done in relation to this project.”

- Comment **49L.** "2.2.4. Similar Site Comparison. The implementability of constructing a slurry wall to depths of approximately 150 ft (possibly deeper) in an aquifer with cobbles and boulders does not prove out. This conclusion was reached in the FS published for a similar site, the Kaiser Mead National Priorities List (NPL) site near Mead, Washington. Slurry wall implementability issues caused Kaiser Mead to remove this alternative from further evaluation at the screening stage for installation to a similar depth as the slurry wall included in the draft CFAC FS (up to 160 ft deep). Implementability was designated "unlikely, unproven at depths required" for the Kaiser Mead site (Hydrometrics 2018)."

- **Comment 116F.** "Similarly, an in situ remedy was rejected and removal was required by the Washington Department of Ecology at a former Aluminum Smelter in Tacoma, Washington in 2016. At this site, the final remedy included complete excavation and removal of spent pot liner and related wastes for the site, and shipment to the hazardous waste landfill in Arlington, Oregon. This was accomplished without detrimental impacts. There was no apparent crisis for the community involving too many haul trucks. There were no impacts associated with reactivity of the wastes, no explosions, no cyanide poisoning of workers or neighbors or anything suggested by the consultants who prepared the CFAC proposed plan. The wastes were fully characterized, excavated and hauled off site. It does make you wonder, if a State Agency in Washington can require a permanent and effective cleanup at a former aluminum smelter, and can implement the remedy without negative impacts, then why can't the EPA and State of Montana handle the task at CFAC? The EPA and State should reexamine their thinking. Clearly the statements made by the company to justify their proposed in place remedy are not fully reliable and accurate."

- **Comment 134B.** "1) The EPA is expressing concerns about explosive and toxic cyanide gas being released if the main industrial landfill is excavated in order to ship the waste to an approved landfill site out of state. What documentation was done of dozens and dozens of aluminum smelters in the U.S. and around the world that dug up and hauled away spent potliner over the past decades and how was this information used and incorporated to identify a viable and best solution for the health, safety, and welfare of not only Columbia Falls residents but those downstream as well and for the long-term health and recovery of the ecosystem? The problem of spent potliner disposal exists at every single aluminum smelter in the world. Many never dealt with it correctly, causing groundwater contamination. This problem was well known when Glencore decided to buy the Columbia Falls smelter in 1999, what factual basis is being used to not require removal of all toxins from the CFAC site and its full restoration?"

- **Comment 134F.** "5) The EPA's own website report that 1) The 300-acre Alcoa (Vancouver Smelter) site is located next to the Columbia River in Vancouver, Washington, that clean up activities included Alcoa completed dredging PCB-contaminated sediments from the Columbia River at the end of January 2009. Smelter demolition and final removal of contaminated soils from the site was completed in March 2010…. The site's long-term remedy included excavating and disposing of 50,000 tons of spent pot liners and reclaimed alumina… If removal 50,000 tons of spent pot liners (SPL) were possible here what basis is there for assuming it is not possible at CFAC?

https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.Cleanup&id=10 00597#bkground"

2.46.2 EPA Response

Ongoing and completed cleanups at former aluminum reduction plants differ for each site, as cleanup depends on the nature and extent of contamination, the condition of the remaining wastes, and the environmental setting. This response focuses on remediation of nine former aluminum smelter sites in the northwestern U.S. These are the most relevant to the CFAC site. Seven of these sites are in Washington and two are in Oregon. Several of these sites are under the purview of the Washington Department of Ecology under its Model Toxics Control Act, which is a state RCRA program. Consequently, the criteria for evaluating cleanup alternatives are somewhat different from the nine criteria used in Superfund. For example, Washington allows a "substantial and disproportionate" analysis to compare alternatives. This allows costs for alternatives to be compared to the incremental degree of protection afforded by each alternative.

- **The Dales, Oregon.** The Dalles plant (referred to as the Martin-Marietta Aluminum Co. site) operated from 1958 to 1987 and is a Superfund site. EPA's selected remedy in the 1988 ROD (EPA 1988b) included consolidating remaining waste materials into an existing landfill, capping that landfill with a multi-media cap that meets RCRA performance standards for hazardous waste landfills, and capturing contaminated groundwater and landfill leachate for treatment and discharge. The 15-acre landfill includes 200,000 cubic yards of industrial waste and construction debris and 5,000 tons of SPL. Treatment of landfill leachate continues, as documented in the sixth five-year review, *Sixth Five-Year Review Report for Martin-Marietta Aluminum Co. Superfund Site, Wasco County, Oregon*, completed for the site in May 2023 (EPA 2023b).

- **Vancouver, Washington.** The Alcoa aluminum smelter operated from 1940 to 1985. SPL was transported off-site for recycling until 1973. From 1973 until 1981, operators piled 50,000 tons of SPL on the ground outside the smelter. The SPL was excavated and hauled to the Arlington, Oregon licensed RCRA hazardous waste disposal facility from 1992 to 1996 under *Cleanup Action Plan. Alcoa Vancouver Potliner NPL Site, Vancouver, Washington* by the Washington Department of Ecology (Washington DOE 1992). These were piles of SPL stored aboveground. In contrast, SPL at the site—in what would eventually become the West Landfill—was buried in a former gravel pit and is in seasonal contact with groundwater. As the Proposed Plan notes, buried SPL in contact with water can produce explosive gases, which is one of several reasons why excavation of this material was not selected for the remedy. The Vancouver site was placed on the NPL in 1990 and was delisted (after cleanup) in 1996. However, contamination remains, which is now under the purview of the Washington Department of Ecology. As the commentor noted, sediments contaminated with PCBs were removed from the adjacent Columbia River in 2009. The remedy also included consolidation of contaminated soil into an existing landfill and capping of that landfill as described in *Periodic Review Report, Alcoa Vancouver, Facility Site ID#: 21, 5701 NW Lower River Road, Vancouver, WA* (Washington DOE 2015), similar to the Selected Remedy for the CFAC site.

- **Spokane, Washington.** The Kaiser Aluminum Mead Site is a state-led Superfund site that operated from the 1940s until the late 1970s. The 1996 FS included three alternatives, one of which was off-site disposal of 128,000 tons of SPL. In 1999, the Washington Department of Ecology ordered the PRP to complete a substantial and disproportionate cost analysis to compare the benefit provided by permanent removal of wastes and cleanup of groundwater alternative to each of the engineered containment alternatives. Costs for each cleanup alternative were compared to the incremental degree of protection afforded by each. The state agreed with the PRP that the incremental degree of protection provided by removal when compared to the incremental increase in cost was not justified, and a containment remedy (consolidation and capping) with groundwater pump and treatment was selected in the *Cleanup Action Plan. Kaiser Aluminum National Priorities List Site, Mead, Washington* (Washington DOE 2002). Groundwater cleanup goals have not been achieved, and groundwater capture and treatment is ongoing.

  One commenter noted that a deep slurry wall was screened out of detailed analysis of the Kaiser site because of issues similar to those found at the CFAC site, namely the depth of the slurry wall and presence of cobbles and boulders that may affect constructability. This is somewhat misleading. EPA reviewed the *Final Supplemental Feasibility Study Report (SFS) for the Kaiser Aluminum Mead Site* (Hydrometrics 2018) and the geology, hydrogeology, and physical setting of the two sites are quite different. The capped SPL pile at Kaiser is not seasonally saturated by a high groundwater table as the depth to groundwater is roughly 150 feet. The overlying geology consists of sand with minor gravel and silt. Thus, an injected grout wall was selected for detailed analysis in the SFS at Kaiser as it was more feasible given site geology. A similar wall was screened from further analysis in the CFAC FS as the site geology at the West Landfill and Wet Scrubber Sludge Pond was less amenable to that technology due to the potential presence of cobbles and boulders. FSs commonly select a remedial alternative, such as containment, and then screen the various technologies to select the best technology to retain for detailed analysis depending on site-specific conditions. This was done for both CFAC and Kaiser.

- **Tacoma, Washington.** The Kaiser smelter operated from 1942 to 2001, and the Port of Tacoma purchased the site in 2003. SPL was stored on bare ground from 1943 to 1967, and exposure to rainwater which caused cyanide and fluoride to leach into soils and groundwater. The SPL was eventually shipped off site for disposal. No SPL was left in piles or entombed in site landfills (Port of Tacoma 2013). The commenter is incorrect with the statement that "the final remedy included complete excavation and removal of spent pot liner" at this site as there was no SPL. Rather, there was black carbon waste mixed with soil in the upper 0.5 to 4.5 feet of the soil profile where the SPL had been placed on bare ground before off-site disposal. This waste was leached from SPL (the term used was SPL *material*), so it was disposed at a licensed hazardous waste disposal facility as described in *Ecology Cleanup Action Plan, Former Kaiser Aluminum Property, 3400 Taylor Way, Tacoma, Washington* (Washington DOE 2016).

- **Longview, Washington.** The Reynolds Aluminum smelter operated from 1941 to 2001, and Reynolds also operated a cryolite recovery plant to recycle SPL from their smelter and other smelters in the Pacific Northwest. No SPL was stored or buried on-site, but residual carbon waste generated by the recovery process was disposed of on-site (Washington Department of Ecology 2002b). During smelter decommissioning, SPL was transported for disposal to a licensed hazardous waste facility, similar to what was done at the CFAC site from 1990 (shortly after SPL was listed as a RCRA hazardous waste) until plant decommissioning was completed in 2019. A 2018 cleanup action plan (Washington Department of Ecology 2018) included off-site disposal of soil contaminated with petroleum compounds, on-site consolidation and capping of contaminated soils, and construction of a semi-permeable reactive barrier to treat groundwater contamination. Cost was estimated at $28 million.

- **Wenatchee, Washington.** Alcoa's Wenatchee Works aluminum smelter operated from 1952 until its temporary shutdown in 2015. In 2021, Alcoa announced that the closed plant would be permanently decommissioned. The decommissioning process is estimated to take seven years and cost $75 million dollars. The wastewater treatment plant remains in operation while final closure solutions are being evaluated.

- **Troutdale, Oregon.** The Reynolds Metals Company aluminum smelter operated from 1941 to 2002 along the Columbia River, about 20 miles east of Portland. The site was listed on the NPL in 1994. Early removal actions included excavation of 13,900 tons of cryolite from settling ponds and 11,000 tons of SPL from a storage area, for disposal at an off-site disposal facility. EPA's review of these interim actions could not determine if the excavated SPL was from a pile or a landfill. After early removal actions, Reynolds conducted a RI/FS from 1996 to 2000. It identified remaining contamination in soil, waste, and debris in several disposal areas and in process waste and sediment at the bottom of a settling pond known as Company Lake. An interim ROD was issued in 2002 that required excavation of contaminated soils and wastes from historic site landfills and consolidation into the on-site North Landfill. A final ROD was issued in 2006. It required further groundwater extraction and treatment, as well as continued groundwater monitoring. In 2018, EPA conducted an optimization review of the remedy and recommendations from that review are currently being implemented. As noted in *Fourth Five-Year Review Report for Reynolds Metals Company Superfund Site* (EPA 2023c), groundwater is still being captured and treated, despite previous removals, off-site disposals of soils and wastes, and ongoing treatment.

- **Goldendale, Washington.** The Columbia Gorge Aluminum Smelter operated from 1970 until its closure in 2003. Located next to the John Day Dam along the Columbia River, it is being cleaned up under the oversight of the Washington Department of Ecology. SPL was initially stored on concrete pads, one of which was later capped under solid waste disposal regulations. A 1989 report estimates that 120,000 tons of SPL was closed in this landfill. The *Final Draft Remedial Investigation Report, Columbia Gorge Aluminum Smelter Site* was completed in 2022 (Lockheed Martin and NSC Smelter 2022). The feasibility study is not yet available.

- **Ferndale, Washington.** The Intalco Aluminum Corp smelter operated from 1966 to 2020, when Alcoa announced that it would be permanently closed. The site has five landfills, three which were unlined historic landfills that operated from the start of smelter operations until the mid-1970s. Site investigations from 2000 to 2002 indicated that waste in two of the historic landfills consisted of brick, concrete, metal and wood fragments, aluminum, and sand

and gravel mixed with black organic material that was interpreted to potentially be pot room bath, minor potliner debris, construction debris from plant construction, and paste plant waste (Washington Department of Ecology 2006). The two other landfills were built in the late 1980s. One was double-lined for solid waste and the other was triple-lined per RCRA Subtitle C design criteria for hazardous waste. A 2001 RI/FS evaluated two remedial alternatives for the historic landfills that contained process wastes and were releasing contaminants to the environment. Those alternatives were excavation and disposal to: (1) a permitted, off-property landfill; or (2) the on-site solid waste and RCRA hazardous waste landfills. In *Cleanup Action Plan, Intalco Landfill Closure Program* (Washington DOE 2006), the Washington Department of Ecology selected excavation and disposal of wastes into the two existing on-site landfills. The department noted that "on-site disposal was considered to have less difficulty in managing short-term risks and is less costly than removal and disposal of waste in an off-property landfill." Cleanup was conducted in 2006. Samples collected from seeps below the historic landfills since then have had fluoride, WAD cyanide, and total PCBs that are below cleanup levels, indicating that cleanup was successful.

Section 3
Public Comments and Responses Related to the Remedial Investigation or the Feasibility Study

Public comments related to the RI (Roux 2020a) or FS (Roux 2021a) are organized alphabetically by topic. EPA's response follows.

1. Characterization - DU1
2. Characterization - DU2
3. Characterization - DU3 and DU5
4. Characterization - DU4
5. Characterization- DU6
6. General Characterization
7. Groundwater Issues
8. Historical Data - Drinking Water Data
9. Historical Data -Production Well Data
10. Input from Others
11. Issues With the FS
12. Legal Reviews
13. Supports the FS
14. Supports the RI
15. Unknown Wastes

3.1 Characterization – DU1

3.1.1 Public Comments

Twenty-eight comments were received from Atlantic Richfield (#49) and one individual inquiring about the characterization of DU1 in the RI and FS.

- **Comment 49F.** "1.2 The nature and extent of the source and groundwater contamination in the area of the West Landfill and Wet Scrubber Sludge Pond area have not been determined. The RI identified the West Landfill and WSSP as the primary source of cyanide and fluoride contamination in groundwater. Despite this, no soil or groundwater samples have been collected from beneath these areas (Roux 2020c, at pp. 10–11). Figures 7 and 8 in the draft CFAC FS show inferred iso-concentration lines for total cyanide and fluoride in groundwater beneath both landfills (Roux 2020c). No borings or wells have been installed in either of these landfills. Therefore, all the groundwater concentration lines encompassing the landfills are inferred.

It also appears that Roux altered the depiction of cyanide and fluoride concentrations in groundwater beneath the West Landfill and WSSP between the completion of the RI and the drafting of the FS. The groundwater total cyanide and fluoride iso-concentrations as depicted on Figures 7 and 8 in the draft CFAC FS are inconsistent with those depicted in the RI on Figures 17 and 18 (Roux 2020a). The RI figures show the seasonality of the total cyanide and fluoride concentrations in the wells. Additionally, total cyanide and fluoride were below 200 and 4,000 μg/L, respectively, for all sample events except March 2017. These data clearly show that the data in the draft CFAC FS are inferred without substantiated groundwater measurements.

Reporting of groundwater conditions in the FS is also internally inconsistent. Figure 7 in the draft CFAC FS shows well CFMW-017 with a concentration of 1,000–2,000 μg/L total cyanide (note this was for the March 2017 sampling event). The two wells immediately southwest and downgradient of this location (CFMW-016 and CFMW-020) are shown with concentrations <200 μg/L, yet they are within the 200–500 μg/L total cyanide iso-contour lines. Figure 8 in the draft CFAC FS shows the >4,000 μg/L fluoride iso-concentration lines through the West Landfill and WSSP as not inferred with no data to support that depiction. This is a misrepresentation of the groundwater concentration data because of the lack of data in the area of the West Landfill and WSSP.

Again, no soil or groundwater sampling was performed in the West Landfill or in the WSSP in the RI according to the sampling location maps on Plate 2 and Plate 6 (Roux 2020a). Thus, the concentrations and amounts of contaminants in soils and groundwater within these areas are unknown. The December 4, 2019 Agencies' comments on the FS work plan included a request for "an estimate of the volume of wastes/impacted soils" in the WSSP (EPA and MDEQ 2020a, Comment 35). Therefore, this data gap had already been identified by the Agencies before the draft CFAC FS was issued. The December 4, 2019 Agencies' comments on the FS work plan also stated that "[a]nother source could be present that is contributing to lower concentrations" (U.S. EPA and MDEQ 2020a, Comment 18). Additional source characterization was not performed to address these data gaps.

It is inappropriate and inconsistent with the NCP for the draft CFAC FS to identify a highest scoring remedial alternative that would fully hydraulically enclose the West Landfill and WSSP without identifying and characterizing the source area(s). Source area investigations are needed to conceptualize and evaluate the implementability and long-term effectiveness of a hydraulically isolating slurry wall around the source. Because source area(s) have not been fully characterized, this remedy cannot be properly evaluated in the FS."

- Comments 54N through T.

"1. Your dimensions of landfills is wrong if aerial photo of plant is correct. Wet scrubber sludge pond – 10.8 acres West landfill – 7.8 acres East landfill – 2.4 acres The west landfill appears to be almost as big as the wet scrubber sludge pond and the east landfill appears to be at least ⅔ the size of the wet scrubber sludge pond. What are the correct sizes of these three dumps?

2. What are the other wastes in the west landfill?

3. Is water coming from below the ground surface into the west landfill and wet scrubber sludge pond that is dissolving the COPC's into the ground water? Why didn't you clearly state this in the 25,000 pages of the RI-FS documents.

4. Are the center and east landfills holding any other waste besides spent pot liner.

5. Your concentration of CN charts for 2017 and 2018 show levels of CN at drinking water standards at the center dump well MW-17 in both years and MW-18 and MW-23 on the southwest (front) side of the east landfill in 2018. How do you know, definitely this finding isn't coming from a tear in the back of the east landfill Hypalon lining via the destroyed north leachate collection pond for that landfill?

6. Same question for F in 2018 maps?

7. Monitoring well #17 on the center landfill never measured F or CN concentrations from 1993 to 2017. Why did it start leaking after 24 years?"

- **Comment 54AS.** "32. DU1 – What are the contents of the west land fill? How many of the 1.2 million cubic yards are from this land fill? Did you listen to the comments from the tape recorded July 12, 2023, SKEO meeting in Columbia Falls? Does Mr. H's comment about his early career job in the Anaconda Company's service crew as a laborer pique your curiosity? He plainly stated part of his job entailed gathering barrels of liquid waste from the plant and rolling them down the north face of the west land fill into a grass swamp, where some floated and others got stuck in the muddy bottom. Do you remember my 2015 meeting where I told you about the hundreds of barrels in the center/north of that land fill? Wasn't a swamp at the bottom in 1979/80 when I rolled one barrel into the same pile of barrels he is talking about? Why doesn't the RIFS ever talk about all these barrels? People of the community might want to know about this eventuality and how you are protecting them from it."

- Comments 54BH through BQ.

  "2. What and how toxic are these chemicals?

  3. What are the safety standards numericals for each chemical?

  4. How are they getting into our environment?

  5. How long have they been leaving these landfills?

  6. Has it caused any health problems or deaths?

7. You claim toxic levels are stable at about 7000 micrograms/liter F and 1000 micrograms/liter CN at the center of the dumps; yet you found 50,000 micrograms/liter F in this same area at high water. Is that still stable and safe? What happens if I drink 50,000 micrograms/liter F from a cup? How many cups before I am seriously ill? Dead?

8. You claim above the landfills have been flowing to the river since 1955, how do you know this?

9. You claim the seeps and riparian areas are contaminated at or below drinking water standards (200 microgram/liter CN and 4,000 microgram/liter F). Why will they stay at this level in the future, or decrease?

10. Are the landfills collapsing with time feeding more and more CN and F contaminated material into the water table?"

3.1.2 EPA Response

There is no need to drill through the West Landfill and Wet Scrubber Sludge Pond. Soil borings and monitoring wells installed around these disposal areas, during the RI and in earlier studies, identified the direction of groundwater flow. The monitoring wells downgradient of these features clearly indicate that groundwater beneath these disposal areas has concentration of arsenic, cyanide, and fluoride above the remedial goals established by Part II of this ROD.

The isoconcentration maps of cyanide and fluoride in Figures 7 and 8 of the FS (Roux 2021a) represent the maximum concentrations of those chemicals detected in groundwater during the six rounds of FS groundwater sampling FS. The FS assumes the "worst case possible" in order to develop remedial alternatives per EPA guidance. Figures 7 and 8 cannot be compared to the isoconcentrations maps presented in the RI (Roux 2020a) for the individual rounds of groundwater sampling presented in the RI, as those represent a snapshot of contaminant distribution for those sampling events. Isoconcentration maps of groundwater monitoring wells screened in different stratigraphy represent at best a graphical rendition of groundwater plumes at the site to convey information to the general public. Scientists and engineers conducting site investigations rely on the actual concentrations as reported in the data tables.

3.2 Characterization – DU2

3.2.1 Public Comments

Fifty-two comments were received from three individuals and Montana DNRP (#82) asking for information about the characterization of DU2.

- **Comment 7Q.** "And here another one, okay. During Phase 1, they found cyanide in the water samples in Cedar Creek that comes through your property. And I have never seen where they told us where that was. Now, we gave them information -- the liaison panel -- that you've got an industrial landfill up there, and Mike put it to you pretty straight. It was an industrial landfill for garbage out of the potlines everywhere in the plant, and the food -- leftovers from the houses where people ate -- but there was no monitoring of it. None of those dumps ever had anything like that. The chances of there being potliner in that dump are -- in my opinion, now, because I can't prove it -- they're 100 percent, all right. They just didn't find it with the well they drilled over there."

- **Comments 8B and 54AT.** "33. DU2 – The secondary source of contaminants is up to 4 dumps from the previous paragraph on this page where only 2 are listed. What are the secondary contaminants of concern? None of these dumps have an engineered bottom liner. They either sit on the natural ground surface or in pits dug into the natural gravels. The industrial and 4 asbestos dump have no clay cap. The wet scrubber sludge pond is exactly the same way. Why didn't you drill all of them to get accurate information as to contents, depths, plus water flow through them? Sanitary landfill has no bottom protection and is claimed to have a clay layer on top that is covered by pit run gravel. Why not drill it to see how sanitary its contents are? You might get lucky and find two mercury rectifiers. Alongside the original land fill a 1.4 million pound addition was made to this dump area in the mid-1990s that was 100% fluorided alumina and -¼ in. screened cryolite bath. Not as closed as you thought in the 1980s. That would be a huge chunk of highly fluorided material that should be removed from the gravel it is buried in and this area doesn't have a clay cap so you're not disturbing anything. Finally, the east land fill did have a synthetic cap on it; but it ruptured in the spring of 1997 and was not re-welded. It was buried under pit run gravel. It is accumulating water from the atmosphere and draining it all into the ruptured liner of the north leachate pond. When you find that the east and center land fills are 100% potliner, wouldn't it make sense to get these 2 easy targets out of the ground and combine them into one, more secure, and monitored above ground site?"

- Comments 54W through AD.

  "10. Industrial landfill – how do you know it received only non-hazardous waste? You found CN in Cedar Creek in 2016 just below this area. How did it get into the creek?

  11. Why did you choose to contaminate the industrial waste dump you are still maintaining is "non-hazardous" by dumping thousands of cubic yards of the south percolation pound bottom sediment into it in 2021?

  12. There is no liner or cap on this industrial landfill. Why didn't you drill it to confirm the contents?

  13. Same question for the sanitary landfill?"

  14. Sanitary and industrial landfills were claimed to have been in operation at the same time. Sanitary is an interesting name for an industrial dump. Could this be the most plausible place to have put two huge mercury-filled rectifiers in the 1965 time frame? Drill it and find out. Mercury is a far more dangerous COPC than CN or F for this area."

  15. Sanitary landfill was covered with empty pallets in 1979 when I started work at ARCO Metals. It was already closed and not operating.

  17. Asbestos landfills – more spin – they were used long before 1993. In 1979 I rode my motorcycle past these areas routinely and they already had material in them. Where are those aerial pictures?"

- **Comments 54CO through CZ.** "There are at least 30 questions that the public should help you with to make sure your permanent ROD is accurate. DU-2 contains the east landfill, sanitary landfill, industrial landfill, two north asbestos landfills and two south asbestos landfills. The proposed solutions are: East landfill – Leave contents where they are with existing fabric cap. Upgrade soil cover over the existing cap. Sanitary landfill – Leave existing soil cap in place and place more soil on the site. Industrial landfill – Still operating with no cap or base under the waste. When closed put a new fabric cap and soil cover on the site. Staying open to possibly store waste in DU-3 and DU-4 on this site. Why not build a new standards meeting industrial landfill? Four Asbestos Dumps – Improve existing cover at all four sites.

  1.What is in all of individual dumps?

  2. What and how toxic are the contents?

  3. What are the safety standards for each toxic component?

  4. How are they getting into our environment?

  5. How long have the toxic components been leaving these dumps?

  6. Have the toxic components caused any health problems or deaths?

  7. Are any of the dumps thought to have waste buried below into the water table?

  8. Are all of these dumps dug into native gravel? Which ones are not? How many of these dumps have fabric or clay pads under their waste?

  9. Did any of these dumps have adjacent wells that sampled above DEQ -7 levels for water drinkability? Which ones?

  10. Which dumps have monitoring wells drilled directly through their surface? If not, why not?

  11. Do any of these dumps possibly contain the two mercury rectifiers buried on the site?"

- Comments 54DA through 54EF.

  "13. You answered a previous question that this dump had CN and F contamination on its southwest boundary. Where did it come from? Under the cap, or the uncapped north leachate pond?

  14. This cap failed in the spring of 1997. Was the cap repaired before being re-buried? Did you physically dig to check for the repair? GPR was not able to find the liner reliably in your write-ups.

  15. Are all the buried water drain pipes still intact leading to the north and south leachate ponds?

  16. Are the fabric liners on the floor of the north and south leachate ponds still intact?

17. Do these leachate ponds have a surface clay or fabric cap in place?

18. Is there a written document from the State of Montana authorizing the closure of the south pond? Same question for the north pond?

20. Did the north leachate pond ever physically overflow from natural runoff and empty its contents directly into the Cedar Creek overflow ditch? Was this leachate pond pumped multiple times into the wet scrubber sludge pond to prevent another recurrence of direct spill into the Cedar Creek overflow?"

21. Did violent winds coming down the face of Teakettle Mountain blow the equipment for CN destruction into the Cedar Creek overflow ditch; leaving the pump running, pumping leachate directly into the Cedar Creek overflow ditch?"

22. Why is there no vegetation around the north leachate pond or on the sides of the Cedar Creek overflow ditch next to this site?"23. Sanitary Landfill Questions:

24. What is in this landfill? Anything toxic? How do you know?

25. Where are the aerial photographs that prove your statements of open date, close date, and contents?

26. Is there a second landfill in this area that was opened and closed in the 1990s, and contains 1.4 million pounds of highly fluroided alumina and pure cryolite bath?

27. Is there a fabric or clay cap over this 1990s landfill? Is there a base fabric or clay pad under either of these two sanitary dumps?

28. Does it make sense for an industrial facility to have a sanitary landfill and an industrial landfill that were both operational at the same time in the mid 1980s? It was a flat storage place in 1979 for hundreds of empty pallets when I went to work for ARCO Metals.

29. Why are there no drilling results for the two landfills that go through the tops of these units?

30. Did the Cedar Creek overflow wash out in this area and send thousands of gallons of water into the waste landfills below?

32. Why do the potentiometric underground water flow lines in all of phase 1 follow the contours of Teakettle Mountain and water flows downhill away from the mountain except north of the industrial landfill?"

33. Why do phase 2 maps move all these lines away from the mountain and show waterflow to the southwest and parallel to the mountain?

34. Does this mean waterflow in this area now goes through the industrial landfill and not around it?

35. Where did the F and CN in Cedar Creek come from in this far north area of the site? Only landfill up in this area is the industrial landfill.

36. What is in the industrial landfill? Any waste barrels of chemicals? Any aerials to prove what is there?

37. Any potline waste that easily could have been dumped up there?"

38. This landfill is unlined and uncapped. How deep into the gravel are the wastes buried? Are they in the water table?

39. If Cedar Creek overflow ditch washed out above the industrial landfill, does the water flow to the base of this dump? Has that ever happened?

40. Was the top of the industrial landfill ever used as a crushing pad for "empty" barrels?

41. Did the plant ever sell full and empty barrels of waste oil to the public?"

42. Did Flathead County dig up and rebuild a quarter mile of county road because of PCB contamination from a private citizen dust oiling his road?"

43. What were the highest PCB levels in transformer oils that were placed on CFAC roads? Ask Lyle Phillips again."

44. Why did you place all of the south percolation pond diggings into this dump as part of your ROD for DU-5? They had exceedances of metal standards for soil, yet you diluted them and placed them into this landfill with no caps, top or bottom. Is this why you left it open, so DU-3 and DU-4 digging of PAHs and metals could find their way to this leaky dump? This isn't helping clean up the site.

Your claim in the RI documents about when these dumps were used is wrong. There was asbestos waste in all four of them in 1979. I road motorcycles through all those areas back then."

- **Comment 82S.** "19. Page 17, Alternative 2, Page 29: Have investigations been done to evaluate the current state of the existing cap on the East Landfill, which was reportedly constructed in 1990? The East Landfill is a secondary source of contamination to groundwater and NRDP recommends a cap that fully interrupts the leaching to groundwater pathway (e.g., an evapotranspiration cover)."

3.2.2 EPA Response

The site RI was conducted under *Remedial Investigation/Feasibility Study Work Plan, Former Primary Aluminum Reduction Facility, Columbia Falls Aluminum Company* (Roux 2015a) that was reviewed and approved by EPA, in consultation with DEQ. The study objectives were:

1. Identify and characterize sources of contaminants of potential concern (COPCs)
2. Determine the nature and extent of site-related COPCs in environmental media (soil, groundwater, surface water, sediment, and sediment porewater)
3. Understand the fate and transport of COPCs

4. Identify any complete or potentially complete exposure pathways (considering current and potential future land use)

5. Evaluate current and potential future human health and ecological risks posed by COPCs

Those objectives were met, as described in the RI report (Roux 2020a). The site characterization identified the West Landfill and Wet Scrubber Sludge Pond as the primary sources of cyanide and fluoride in groundwater, with the Center Landfill as a secondary source of cyanide and fluoride in groundwater. Based on the RI, the FS (Roux 2021a) categorized the West Landfill, Center Landfill, and Wet Scrubber Sludge Pond as Landfills DU1. The Industrial Landfill, East Landfill, and Sanitary Landfill were categorized as Landfills DU2 as they were found to not be significant sources of cyanide and fluoride in groundwater.

CERCLA addresses releases or threatened releases of hazardous substances that may endanger public health or the environment. Such releases were not identified from DU2. However, to address future threats of releases from DU2, the Selected Remedy requires installation of a low-permeability liner at the Industrial Landfill, improvement of the existing soil cover at the asbestos landfills, maintenance of those covers as well as the previously installed caps on the East and Sanitary Landfills, and institutional controls to restrict access to all landfills. CERCLA does not require forensic investigations to determine the contents of the landfills. Similarly, CERCLA does not require reconstruction of the operational history of the aluminum smelter, or determination of the condition of remaining infrastructure. The comprehensive RI achieved the objectives listed above.

Regarding cyanide detections in Cedar Creek, cyanide was detected in one surface water sample during Phase I sampling from Cedar Creek (CFSWP-015), with an estimated concentration of 2.3 micrograms per liter (µg/L) as reported in the Phase I site characterization summary report. Further sampling locations were added for the Phase II sampling rounds, and further estimated low levels of cyanide were detected at a few locations. These results were well below state and federal drinking standards and are thought to be the result of trapped cyanide in sediment, as cyanide was not detected in the filtered surface water samples.

Regarding the condition of the existing cap on the East Landfill, it was capped with a 6-inch clay layer, 30-mil PVC liner, geotextile layer, and an 18-inch vegetated soil cover. The vegetative cover over this double-lined cap is inspected by CFAC and was inspected again during the RI. It shows no sign of excessive erosion or subsidence. Downgradient monitoring wells indicate that the East Landfill is not a secondary source of groundwater contamination. The East Landfill cap will continue to be inspected under the long-term operations and maintenance plan that will be completed during remedial design.

3.3 Characterization – DU3 and DU5

3.3.1 Public Comments

Four comments were received from one individual and from the Montana NRDP (#82) that addressed characterization of DUs 3 and 5.

- **Comment 54AN.** "27. Is there a fifth active seep in the southeast corner of the superfund site north of the railroad tracks? If so, why wasn't it sampled?"
- **Comment 54AR.** "31. What contamination is present in the south percolation ponds, backwater seep and riparian area? Do any of the samples exceed DEQ-7 drinking water standards? Which contaminants exceed?"
- **Comment 54AU.** "34. DU3 – These open areas north, south, east and west of the plant have soil contamination from all the COPCs on the plant. What is the source of F shown in your concentration maps for a 7,000 microgram per liter isolated island of contamination? Is it the west land fill sending its contents to the east and not southwest as you claim all water flows in this area? Is it a leaking east land fill supplying the F to this area, or is it the operational area to the northwest where we watered failed cathodes for over a decade? Why did you remove the intermediate depth (10 foot to 12 foot) sampling event from this area? You did the surface, 6 in. to 2 foot, and then used an NS designation in the data sheets for the intermediate depth sample to indicate it was not sampled. Why?"
- **Comment 82G.** "7. Page 4: Exhibit 3 shows a "West Percolation Pond," which is not discussed here and only briefly addressed in the Remedial Investigation. How has this contaminant source been characterized and what is the proposed remedy for this contaminant source?"

3.3.2 EPA Response

The RI did not identify any active seeps north of the railroad corridor. All seeps south of the railroad corridor in the Backwater Seep Area were sampled, as discussed in the RI report (Roux 2020a).

Approximately 23,450 cubic yards of soil/sediment were removed from the three former South Percolation Ponds between October 12, 2020 and June 15, 2021. Porewater was monitored during this action and reported in Table 5 of the draft *South Percolation Ponds Removal Action Report* (Roux 2021b). The report summarized the results as follows:

> *"Of the five post-removal sediment porewater samples collected during the low-water sampling event in January 2021, dissolved free cyanide was detected at a concentration exceeding its PRG in one sediment porewater sample and dissolved barium was detected at concentrations exceeding its PRG in three sediment porewater samples. Of the five post-removal sediment porewater samples collected during the high-water sampling event in June 2021, dissolved barium was detected at a concentration exceeding its PRG in one sediment porewater sample. Concentrations of dissolved free cyanide were not detected in the sediment porewater samples collected during the high-water sampling event."*

Barium concentrations ranged from 89.9 to 280 µg/L with four samples (three locations) exceeding the goal of 220 µg/L. Because the source of contamination has been removed, natural attenuation is expected to further reduce these pore water barium concentrations.

It is assumed that the commenter (54AU) meant the 5,000 µg/L contour surrounding well CFMW-032. This well is generally downgradient from well CFMW-017 at the Center Landfill which has highly variable concentrations of fluoride including one sample at 13,400 µg/L. The Center Landfill was identified as a source of groundwater contamination in the RI report. The alternative GW4A includes installation of a low permeability membrane cap over the Center Landfill.

The commenter questions why soils were sampled from 0 to 6 inches, and then from 6 inches to 2 feet, but were not sampled from 10 to 12 feet. This is because sampling and analysis of soils was conducted in phases. If COPCs in soil samples collected from 6 inches to 2 feet were below the risk-based soil screening levels, there was no need to collect and analyze deeper soil samples as the COPCs had not migrated downward.

The West Percolation Pond collected boiler blowdown and stormwater runoff from the plant parking area. Three soil borings and one monitoring well were installed in the vicinity of the West Percolation Pond during the Phase I RI site characterization. The RI concluded that the West Percolation Pond was not a significant source of the cyanide and fluoride concentrations observed in groundwater. Soil sampling results indicated that there were no exceedances of human health and ecological preliminary remedial goals that were used in the FS to delineate areas where soils would be excavated and consolidated into an onsite repository.

3.4 Characterization – DU4

3.4.1 Public Comments

Nineteen comments were received from one individual and CBF (#134) asking for information about the characterization of DU4.

- **Comment 54U.** “8. North leachate pond was never permanently connected to west scrubber sludge pond. A large volume pump with flexible fire hose was used on those occasions that leachate overflowed into the Cedar Creek overflow ditch and the pumping was used to lower the pond level ‘sometimes successfully, others not,’ depending on how much additional water was coming off of Teakettle Mountain.”

- **Comment 54V.** “9. North leachate pond wasn’t closed in 1994. It was buried with a caterpillar. Before burying it, the cat drove over the pond liner with steel grousers and destroyed the liner with over a foot of liquid in the pond and a steady stream still running into it from the leachate still coming out of the east landfill piping system. Don’t spin this stuff, tell the truth.”

- **Comment 54AE.** “18. Northeast Percolation pond – what flowed into this pond? Any known carcinogens?”

- **Comment 54AF.** “19. You claim the northeast percolation pond is only 2 feet deep! No way. In mid 1990s we used an excavator to dig it as deep as the arm would reach on the east and west side, leaving a hump in the center. We dug roughly 20 feet down by the entire length of the pond and buried it in holes on the south, east, and west shore of the pond. It has refilled to only 2 feet deep since then. You were told this in 2015 and you published what?”

- **Comment 54AG.** “20. Northwest Percolation Pond – you claimed the two ponds were not a ground water source. They were the direct water injection points for 3 million gallons per day of cooling water from our utilities building (air compressors, air dryer etc.) and the cooling water for water scrubbing the off gas of the mixers in the paste plant and the cooling water for all the produced products. Coal tar pitch, petroleum coke, and anthracite coal were being water scrubbed at temperatures that vaporized all the chemicals in these products that were released under 400 degrees Fahrenheit. This water went right into the ground water and I asked that if the ponds were dry, please do a tracer test to see where these chemicals went and who would have been affected. Why didn't you do it? If you want to protect people, you should have investigated my concern and not wrote it off. You refused to do anything with the west percolation pond in a liaison panel meeting when I brought up the high cancer occurrence with our lab personnel over the years as well. Is that EPA procedure? Maybe for this plant the north percolation pond ground water source is of great concern to its employees."

- **Comment 54AV.** "35. DU-4 – North Percolation Ponds – Where is the concentration map for PAH material? You have them for F and CN. Metals concentration map is also missing. You claim the entire superfund site contains these PAH materials in shallow soils with some reaching 22 feet below the ground levels in the previous paragraph. Since they include highly carcinogenic components and you know they were spread throughout the site by the airshed from the potrooms why wouldn't you check for the most concentrated source of these chemicals? That would be the 66,000 gallons of paste plant mixer fume scrubber water. This water was directly injected into the groundwater in this pond system. Why not trace where this stuff went because it has tremendous potential to cause very serious long term diseases in humans and animals. The flow of underground water in a southwest direction from the North East Percolation pond location on site would bring the contents of the daily 66,000 gallons of contamination very close to the Aluminum City area. The log for the well in the south west corner of this percolation pond is the second well on site that has a large vertical sand lens going straight down several hundred feet making it a potential source for the deeper drinking water source in the Aluminum City drinking water wells. Why didn't you implement a specific investigation program for these chemicals outside of the groundwater wells. They work for currently flowing CN and F sources; but not for the dangerous organic chemicals potentially locked in the soils."

- **Comment 54EH.** "1. Why did you leave out the flat areas South, East and West of the North East Percolation Pond? You were told in 2015 that 100's of cubic yards of petroleum coke and coal tar pitch fines along with VOC's and SVOC's were dug out of the ponds and buried in these locations. What toxic chemicals did you find in these 3 areas? What are the chemicals of concern that were found?"

- **Comment 54EI.** "2. Did you trace the exact flow of the water borne chemicals from these ponds to the Flathead River? Are they trapped underground in this area? Or are they trapped in the deep sand layer in this area: Where are they?"

- **Comment 54EK.** "4. Why did this North set of ponds have a permanent oil sheen when they were in use?"

- **Comment 54EL.** "5. What killed the ducks and geese that landed on the North West pond during fall migrations? They lost their ability to fly and starved to death when the snow and cold weather arrived."

- **Comment 54EM.** "6. North West pond has a very sandy strata that is different from all wells but mw53 that has a vertical sand layer that goes straight down several hundred feet too. Is there no glacial till layer under the pond. Where did this sand transport the carcinogens?"
- **Comment 54EN.** "7. Did the cathode soaking pit water get pumped directly to the North East percolation pond in the 1950's? Where did it go?"
- **Comment 54EO.** "8. If you block the sewer lines to the North East pond and you have already blocked the South running lines to the South Percolation ponds where will all the runoff water go on the site? It will get contaminated by surface soil contaminants and flow to a low spot on site and create another potential toxic hot spot."
- **Comment 54EP.** "10. What chemicals did the plant utility cooling water put into these ponds?"
- **Comment 54EQ.** "11. What specific carcinogens were in the paste plant mixers wet scrubber water?"
- **Comment 54ER.** "12. Why didn't you do a more thorough job of investigating this large source of dangerous known carcinogens?"
- **Comment 134P.** "15) According to media reports "In mid-July 2020, CFAC announced plans to begin removing about 35,000 tons of sediment from settling ponds located along the Flathead River in October 2020 when the river level would be lower. In this pre-demolition aerial photo, the ponds are located next to the dead-end river channel just to the right of the plant site. According to Glencore-Xstrata environmental project engineer John Stroiazzo, the sediment was contaminated with barium, which he said posed moderate toxicity according to EPA standards. The sediment would be hauled to the approved lined industrial landfill on the plant site (in this photo, in the area to the left of the black potline buildings). Once the sediment is removed, a dam and some rip-rap will be taken out to return that portion of the river to its natural course. This information came from the Hungry Horse News. According to Montana Public Radio, Stroiazzo said river flow was eating away at the banks holding back the settling ponds and the company didn't think the ponds would last two more years. It was for that reason that the EPA approved the work ahead of schedule." • Where were these removed sediment contaminated with barium and likely other toxins moved to and was it a lined landfill?
- Of the lined landfills on the CFAC site what type of liners were used and what is their expected life expectancy for the type of chemicals they are supposed to be containing?
- Are any of these lined landfills known to be leaking?
- What if any systems or wells are in place to monitor if the lined areas are leaking?
- What records are available and were they examined regarding these lined landfills that are now being proposed for use of deposit of proposed additional soils that are to excavated?

- What research and test were relied on as a basis to assume that these landfill areas can be safely used for additional waste or for containing their existing waste?"
- **Comment 134AD.** "29) According to testimony made on your record, in 1997 this individual reported to CFAC and authorities that the east landfill PVC cap slumped and sheared wide open. They stated that this large tear was never repaired and was covered with gravel per managements orders. They went on to say that all the water that drained from this dump was captured in the north collection pond by under the pile piping and it is still doing so today. They testify, however, that the liner for this pond was intentionally destroyed by driving a tracked caterpillar thru it multiple times in the spring of 1994 and that everything that drains to this pond is going directly into the ground about 20 feet upstream from the Cedar Creek Overflow ditch at this location. They report that while GPR was used to investigate the pile, but that even with GPR investigators were barely able to find the PVC liner let alone the torn area. It was stated that the Phase 1 study did nothing to address this problem area and that the north pond is still running everything that runs to it into the ground. Pollution is still going into the ground at this location because rainwater is probably still running into the tear. Their testimony concluded that because of their autopsy experiences they also have trouble believing your findings with the PID and gas sampling equipment. Cathode wastes when wet generate copious volumes of ammonia, hydrogen fluoride gas. They also point out that based on a series of self- igniting fires in the west dump, that were blamed on acetylene production when water was sprayed on spent potliner and potline off-gas scrubber catch, there is a VOC issue that was not found in the Phase 1 study. They point to support for these conclusions in the design document Hydrometrics generated when they designed the gas collection system in the current west landfill. Based on their PID readings and knowledge of dump design they believed the system would be needed to last 30 years to handle organic off-gases. How and in ways has this contradictory testimony to some of your findings in phase one of these investigations been considered and how has this information been incorporated into the analysis and/or further testing of this site and the clean-up recommendations being made?"
- **Comment 134AE.** "15) According to media reports "In mid-July 2020, CFAC announced plans to begin removing about 35,000 tons of sediment from settling ponds located along the Flathead River in October 2020 when the river level would be lower. In this pre-demolition aerial photo, the ponds are located next to the dead-end river channel just to the right of the plant site. According to Glencore-Xstrata environmental project engineer John Stroiazzo, the sediment was contaminated with barium, which he said posed moderate toxicity according to EPA standards. The sediment would be hauled to the approved lined industrial landfill on the plant site (in this photo, in the area to the left of the black potline buildings). Once the sediment is removed, a dam and some rip-rap will be taken out to return that portion of the river to its natural course. This information came from the Hungry Horse News. According to Montana Public Radio, Stroiazzo said river flow was eating away at the banks holding back the settling ponds and the company didn't think the ponds would last two more years. It was for that reason that the EPA approved the work ahead of schedule."
- Where were these removed sediment contaminated with barium and likely other toxins moved to and was it a lined landfill?

- Of the lined landfills on the CFAC site what type of liners were used and what is their expected life expectancy for the type of chemicals they are supposed to be containing?
- Are any of these lined landfills known to be leaking?
- What if any systems or wells are in place to monitor if the lined areas are leaking?
- What records are available and were they examined regarding these lined landfills that are now being proposed for use of deposit of proposed additional soils that are to excavated?
- What research and test were relied on as a basis to assume that these landfill areas can be safely used for additional waste or for containing their existing waste?"

3.4.2 EPA Response

The RI (Roux 2020a) reported that the North-East Percolation Pond has a maximum depth of approximately 14 feet and contains approximately 0.5 to 2 feet of waste (black carbonaceous material). The North-West Percolation Pond has a maximum depth of approximately 22 feet and also has approximately 0.5 to 2 feet of waste material. The RI determined that these waste materials contain elevated concentrations of cyanide, fluoride, metals, and PAHs (a known carcinogen).

The RI also reported that the North-East Percolation Pond was constructed in 1955 when the plant was built, and received discharges from the Main Plant Area from various operations (including the Anode Paste Plant Briquette System, non-contact cooling water, non-process wastewater from the masonry shop, battery shop, garage, garage steam clean and pin steam clean, boiler blowdown water from the lab, air conditioner condensate, Paste Plant Wet Scrubber Blowdown [until 1999], Carbon Cathode Soaking Pits [prior to 1978], and process area stormwater) until the plant closed in 2009. Anode paste is made from petroleum coke and coal tar pitch, which explains the oil sheen. It is not necessary to determine the chemical composition of historic waste streams, because the RI characterizes the nature and extent of hazardous waste at the site as it exists, today.

Monitoring wells installed for the RI provided a better understanding of site geology, which forms the hydrogeologic framework for understanding groundwater elevations, groundwater flow, and contaminant migration at the site. The upper hydrogeologic unit consist of glacial outwash and alluvium and is present throughout the site. Although the soil matrix varies, this unit has a high permeability. It is underlain by glacial till, which has a lower permeability compared to the glacial outwash and alluvium, except for lenses of sand and gravel within the till that forms the lower hydrogeologic unit. Site stratigraphy as defined by the completion of 52 new monitoring wells (44 in Phase I and 8 in Phase II) to supplement the existing 20 wells, depicts a well-defined plume of contaminants migrating toward the Flathead River, not Aluminum City. There were no unusual perturbations in the potentiometric surface measured during four rounds of RI groundwater sampling to indicate otherwise. Thus, from evaluation of the comprehensive data set, there was no reason to conduct a tracer test. Due to the high hydraulic conductivity (determined by slug test data) in monitoring wells (11 feet per day), any contaminants disposed of during operations likely would have already migrated to the Flathead River and are no longer an environmental concern at the site, as determined by the RI.

Maps displaying data for cyanide, fluoride, selected PAHs, and selected metals that show the areal distribution and magnitude of exceedances of each compound in soils can be found Appendix N, Plates N8 through N12, of *the Phase I Site Characterization Data Summary Report* (Roux 2017).

The Phase I and Phase II site characterization investigations were determined by EPA, in consultation with DEQ, to have adequately characterized soils, wastes and groundwater at and around the North-East Percolation Pond and the North-West Percolation Pond.

From March 2017 to September 2017, pressure transducers were installed in monitoring wells CFMW-053 (screened in the upper hydrogeologic unit) and CFMW-053a (screened in the lower hydrogeologic unit) to measure groundwater elevations and to evaluate differences in groundwater elevation fluctuations in the upper hydrogeologic unit and lower hydrogeologic unit. Monitoring well CFMW-053a fluctuated by less than 10 feet between March and September. These fluctuations were gradual and do not correlate with the short-term precipitation events like those in wells in the upper hydrogeologic unit. The slower, gradual responses observed in well pair CFMW-053/053a further suggests limited connectivity between the deeper unit and the upper hydrogeologic units proximal to these well pairs. In addition, cyanide, present at concentrations between 238 and 386 µg/l in upper hydrogeologic unit well CFMW-053, was non-detect in monitoring well CFMW-053a (screened in the lower hydrogeologic unit) in all four Phase I sampling rounds. These results further support that there is limited connectivity, if any, between the lower unit and the upper hydrogeologic units proximal to this well pair.

The Selected Remedy requires a sitewide stormwater management plan to be completed during remedial design. In addition to the Landfills DU1 and DU2, this sitewide plan will also address the Main Plant Area, including the North-East Percolation Pond and the North-West Percolation Pond to address drainage, given that an estimated 32,500 cubic yards of impacted soil and 35,180 cubic yards of impacted materials from the North-East Percolation Pond, North-West Percolation Pond, influent ditch, and effluent ditch will be removed and consolidated into an existing waste disposal facility or a new Agency-approved, on-site repository to be identified during remedial design. Since the impacted materials will be removed, stormwater runoff from the remediated areas is anticipated to be clean.

Sediments from the South Percolation Ponds were disposed of in the Industrial Landfill. The presence of a liner beneath the Industrial Landfill is unknown. The Selected Remedy requires that a low-permeability cap be placed on the Industrial Landfill. EPA notes that barium was the only contaminant of concern exceeding soil/sediment preliminary remedial goals in the South Percolation Ponds sediments.

The Sanitary Landfill and the East Landfill are the only two landfills that have clay liners. Clay is a naturally occurring mineral that will not degrade over time. As discussed in the RI report (Roux 2020a), the data and analysis to date indicate that the Sanitary Landfill and the East Landfill are not sources of groundwater contamination. Neither landfill will receive additional impacted material under the Selected Remedy.

3.5 Characterization – DU6

3.5.1 Public Comments

Sixteen comments were received from one individual asking for information about the characterization of DU6.

- **Comment 54AX.** "37. DU-6 – Ground water under the potlines – Did you leave the potlines with the electrical tunnels under the basement floor full of contaminated water? Is this water from the electrical tunnels that connected the Rod Mill and Paste Plant to the main plant rectifier? Is the water in these tunnels slowly filling the gravel-filled basements to overflow above the ground surface?"

- **Comment 54EW.** "This is the soil under the potline building, but should be expanded to include the potline basement that was left in the ground unprotected. Public questions in this arena might be: 1. I didn't see a published plan for this DU-6 in your proposed ROD document. I'm assuming there will be one? My assumption is the plan was to drill a dozen bore holes over the 43 acre site and then fill the 10 basements with gravel and call it good. If so, we might want to know:"

- **Comment 54EX.** "2. What toxic chemical were found under the concrete that would either trigger an outright soil concentration problem or a substance that gets flagged because it would be a future ground water problem if it migrates down to the water table."

- **Comment 54EY.** "3. Probe samples 285 and 287 are another look in the northeast corner of the potlines; but never clearly discussed why a second sample was needed. Why?"

- **Comment 54EZ.** "4. Probe sample 287 has some weird notes in the driller's log from 8 to 22 feet deep. What were you looking for and what did correlate to a wet, odor filled, multiple different organic chemical containing drill core? Where did those organic chemicals come from?"

- **Comment 54FA.** "5. Are they from the waste oil burner across the road from this drill site?"

- **Comment 54FB.** "6. If not, are they from the hundreds of drums in the west landfill?"

- **Comment 54FC.** "7. Did you drill the electrical tunnel site where, in 2001 or 2002, an oily substance was leaking through the tunnel wall? Steve should have shown you where to set the drill rig."

- **Comment 54FD.** "8. Was the two miles of electrical tunnels under the basement stripped of all large electrical cables?"

- **Comment 54FE.** "9. Were all penetrations of the cables up through the basement floor or over to the rod mill, paste plant switch gear plugged after cable removal?"

- **Comment 54FF.** "10. What was done to positively insure that water would never enter these tunnels and form a long underground contaminated lake?"

- **Comment 54FG.** "11. Is there water in these tunnels today?"

- **Comment 54FH.** "12. Will the basement gravel or crushed concrete you filled them with become or are currently saturated with water?"
- **Comment 54FI.** "13. Will this water become highly contaminated as it dissolves the F from potline operations that is inside the concrete walls or crushed pieces?"
- **Comment 54FJ.** "14. If this happens, what is your plan for handling this 14 foot deep by 43 acre lake in the future?"
- **Comment 54FK.** "15. Why was this 43 acre concrete basement structure left in the ground and currently sticks up about 4 feet above the surrounding terrain? It is an eyesore or a great start on a ponding system to treat contaminated dump water and meter it into the Flathead River as river flows permit?"

3.5.2 EPA Response

Groundwater investigations conducted during the RI (Roux 2020a) indicated that the West Landfill, the Wet Scrubber Sludge Pond, are the primary sources of contaminants (cyanide and fluoride) to groundwater. The former two features were grouped together with groundwater to form Landfills DU1/Groundwater DU6 for the FS (Roux 2021a) to evaluate remedial alternatives.

The RI also noted that the Main Plant Area and the North Percolation Ponds were not determined to be a primary source of groundwater contamination. Consequently, the presence or absence of electrical tunnels beneath the Main Plant Area is not germane to the cleanup of site groundwater contamination. Source control measures identified in the Selected Remedy for DU1/DU5/DU6 (slurry wall installation, capping of the Wet Scrubber Sludge Ponds and construction of stormwater run on/runoff controls) are expected to eventually meet groundwater performance standards at designated points of compliance that will be determined during remedial design.

The RI did not identify PAHs as a contaminant of concern; consequently, the reported incidence of an "oily substance was leaking through the tunnel wall" in the early 2000s, if true, did not result in groundwater contamination. We do know that the utility tunnel was equipped with a gravity-based drainage system. During demolition clean fill was placed into the utility tunnel. The existing drainage system was left in place. As part of the site assessment, CFAC performed extensive sampling of soil beneath the former potroom basements and to investigate soil quality surrounding the Main Plant utility tunnel after the bulk of the demolition had been completed. The soil sampling activities are described in Section 3.4.4 of *Phase II Site Characterization Data Summary Report, Columbia Falls Aluminum Company, Columbia Falls, Flathead County, Montana* (Roux 2019) and the results of the sampling are described in Section 4.2.3. The soil sampling results indicate that the utility corridor was not a source of contamination.

3.6 General Characterization

3.6.1 Public Comments

Twelve comments were received from two individuals, Montana NRDP (#82), and CBF (#134) that addressed what they believed were general deficiencies in the site characterization.

- **Comment 7S.** "The other thing I was gonna tell you -- and you're not gonna believe this, but, you know, they've been sampling the wells in Aluminum City -- they're down to 13 -- at the end of Phase 1, just out of happenstance, I tried to call Mike Cirian in Libby where he was headquartered, and I got the -- this gal who was there, the clerk. And I said, I need to talk to Mike. I told her who I was. And I told her I lived in Columbia Falls, and I was on the liaison panel. And I said, I need to speak with him. And she told me he wasn't there. I said, Well, where is he? He's in Columbia Falls. I said, He's here? This is the middle of the week. And I said, What the hell is he doing here? She said, Well, they had a little problem; they got a sample in Aluminum City that was way up, and he needed to get back there. So I just left it at that. And I'm sure you didn't hear about it. I was waiting, because the next week we had a liaison panel meeting. And he shows up, and he does this big presentation, and all at once we went from having one outfit that was a laboratory running our water samples and giving the data to now they're bringing in two, because the levels are so low we don't know if we can -- you know, if this company can reliably read down there; so we're bringing on another company in Salt Lake to also read these samples, and you'll be getting two analyses of each one; we'll split the samples. I thought, I'm not gonna say anything, because I knew that he was here. And the reason he was here was because they had a hot sample. And this is in like 2016. Never a word was mentioned. You know, he completely kept it quiet. He basically kept it under the rug and didn't tell anybody and made up a story and ended up with two companies sampling our water every time they take a sample still. So take it from there. That's the guy that ran your RI/FS."

- **Comment 7V.** "And, again, what I've done here tonight was not to talk about specific things, but I want you to know that RI/FS is not a technical product that deserves being used to make decisions on, okay. And then one last statement, and I'll be all done. If you do go forward with your record of decision, make sure you put in black and white what will happen if you follow your plan, okay. In other words, the reason the EPA is so unsuccessful in getting these things done, they don't put goals that are measurable with dates and put it on a project-management sheet and hold people accountable to doing it. You need to tell the community, you know, this is going well or bad, and here's where we're at; we're gonna get there in such and such a time, you know, based on a spreadsheet, and then go to it. Find somebody to run the projects that truly drives the thing to that schedule. I mean, there's no reason that a -- you know, capping something should take six years. It should be done in a summer. I mean, if it's that simple, if you're doing it in the private industry, the government needs to adapt their processes. And I know it's a different -- I've never worked for the government, but it needs to have some sense of urgency. And to do that, you have to put in end points, milestones, and hold people accountable for it, okay. That's why you get it done and get these things off the list. If you just let these things keep festering, that's how you get 38-year projects. I put in, "No good intentions, just goals, timetables, and what the effects may be to get the Superfund site off the list by making this plan do the work on a specific date." Basically it needs to be, like I say, monitored -- designed, monitored, and then tracked, and with some very specific guidelines. That's the only way you ever make a project work. You guys don't have a good management system to work with because you're allowing these things to go for years and years. And this one should be cleaned up not in years and years but, you know, in my lifetime. I'm hoping to live at least another five years, okay. Anyway, I'm done."

- **Comment 54B.** "The Remedial Investigation: It's time to get an honest and accurate technical review of this plant site before it is pushed through the permanent EPA approval process. There are too many assumptions without technical, scientific backup. There are mercury-filled rectifiers unaccounted for. The incompetence of how the Aluminum City water was not properly investigated and how the Flathead River island was left further support a need for additional site investigations and a professional, independent technical review of EPA's work and assumptions to date. It was started with EPA using an engineering study performed in 2013 by Weston Engineering out of Denver. Their findings with the groundwater were used to get the CFAC Superfund Site designated. Weston told EPA based on sampling the existing 25 wells on site in September 2013 that the water flowed in three general directions: southeast down the east side of the Potlines, south on the west edge of the Potlines and possibly west toward Aluminum City because of cyanide (CN) and fluoride (F) being found in two of 30 wells in that area. These same 25 on site wells were used by Hydrometrics in 1993 to note that the contamination came from the west landfill area, accumulated at the north end of the Potlines before flowing down the west side of the Potlines and quite possibly down the east side as well. Their work was used to cap the west landfill in 1994 with assurances to the State of Montana that this would permanently stop all CN and F flow to the Flathead River. This flow was first reported to the EPA and state DEQ by ARCO Metals in 1984. In both of these studies CN and F were found to exist in ground water at differing levels from the Aluminum City fence line to the base of Teakettle Mountain and from the landfills south to the Flathead River."

- **Comment 54F.** "What were they up to at the EPA and Glencore? Setting the narrative very early? Rather than tell people about studies that identified up to 3 plumes, they combined this prior knowledge and created one plume that covered two of the three possible plumes under one bigger roof. They followed up on the specific location by creating a scenario that there was a 2-layer stratigraphy under the site with a top glacier alluvium layer that carried all the water flow and a second flat structure under it called 'glacier till' that was filled with clay to stop additional downward water flow. Finally, they told everyone that the plume is not flowing toward you, just toward the river. Great narrative to keep the public calm about the site if you are Glencore or EPA.

  How did this team make all these grand projections after looking at two sets of 40 samples? Was it by inventing a narrative that was in both their interest - or is it science based and protective of the Flathead Valley? Their science appears to have overlooked some data or never looked for data that appears to show a broad plume into the Flathead River. It overlooks the fact that all sampling events have confirmed CN and F on most of the 960 acre superfund site at varying concentrations. Water contamination found below the magic glacier alluvium layer and even below the glacier till. Aluminum City wells, getting their water from a very specific underground soil layer that is consistently identified and found between 120 feet and 241 feet at the CFAC site west boundary. Slug testing that identifies two places where underground soils transfer waters at very high rates of speed down to the Flathead River. One coincides with a strange anomaly in potentiometric curves that just happen to be above the original seep area found in 1984. All this data argues against what EPA/Glencore are selling with the two layers and minimum water flow into the till, let alone completely underneath it. This is a major technical problem with their science."

- **Comment 54K.** "Question #1 again is: Is the RI inadequate and probably wrong or just missing important information that could greatly affect the correctness of your final and permanent ROD decision?"

  Comment 54L. "Other smaller issues with adequacy: Where are the giant rectifiers "12 total - 12 feet tall, 10 feet wide, 20 feet long" that are filled with thousands of liquid mercury-filled switches? In 2017 Mike personally told me, "I'll only look for them if you tell me exactly where they are at." He then quantified that by adding, "Check that! I will never drill a hole in a closed dump." Is that protective of your charter and your 9-step procedure? They are still out there!

  Through March 2017 the CN levels in Aluminum City water were reported above EPA's tapwater standard of 80 micrograms/liter. After that date everything dropped to 0.1 micrograms/liter with most having a "U," meaning 'under that level.' The numbers that triggered you turning the area into a superfund site came from 2 out of 30 wells in our area of 130 micrograms/liter. What was the change? Why in summer of 2017 did Mike make an emergency trip to Columbia Falls because several Aluminum City water results were high again; yet this was never reported to the residents. The Fix was to get a second lab to run the samples. Some Fix.

  A new home about 2 miles north of the plant tested at 111 micrograms/liter CN in 2014. Was it ever resampled? And what were the results compared to Aluminum City?

  Riparian and back water seep areas had samples as high as 630 micrograms/liter CN. DEQ-standard for drinking water is 200 micrograms/liter. What affect does water at 600 micrograms/liter have on mammals that weigh ⅓ pound to 20 pounds, such as a mouse to a small beaver?

  In 2018 ESH Corporation claimed the Flathead Valley water averages 160 micrograms/liter F. What sources were used as they are higher than Aluminum City?"

  And finally, monitoring wells #8, #51, and #52 were recorded as having water table levels that are below the bottom of those existing wells. How is that possible?"

- **Comment 54AH.** "21. Land Use - There are no commercial activities from 2009 to today, yet I witnessed commercial trucks delivering and removing different pieces of equipment routinely on my daily walks. Also all those maintenance staff you have used the last 14 years do not use the industrial dump for their waste and supplies? Did you lock the gate so Calbag couldn't get rid of an occasional ugly find? Be honest, you have used the industrial landfill as needed the past few years."

- **Comment 54AI.** "22. Add horn hunting and camping on the island."

- **Comment 54AJ.** "23. Nearest residents aren't in Aluminum City; but up by the Cedar Creek Reservoir and south across the Flathead River by Hwy 2."

- **Comment 54AO.** "28. Remedial investigation - Why didn't the investigation carefully examine the waste oil burning system and the area close to it?"

- **Comment 82A.** "1. Page 3, the proposed plan states, "The tracks of the Burlington Northern Santa Fe Railroad run between the site buildings and the river." Has EPA fully characterized the railroad tracks to determine whether there are any contaminants distinct to the railroad operations? Please include this information, including a specific reference to the relevant section(s) in the Remedial Investigation."
- **Comment 134J.** "9) The EPA has proposed designating certain PFAS compounds as hazardous substances under the Superfund program. The agency has identified 180 Superfund sites as having PFAS contamination. What studies have been done at the CFAC site and of company records to determine the volumes of PFAS chemicals that may be present and what forms of PFAS are present on the site now and or were used at the site and may need further investigation to determine where they exist and at what volume? What plans have been proposed for the cleanup of PFAS? present on the site now and or were used at the site and may need further investigation to determine where they exist and at what volume? What plans have been proposed for the cleanup of PFAS?"

3.6.2 EPA Response

As stated in Section 3.2, the RI (Roux 2020a) was completed in accordance with CERCLA guidance (EPA 1988a) and was approved by EPA, in consultation with DEQ. It defined the nature and extent of contamination in groundwater, surface water and soils, and provided sufficient information to complete the human health and ecological risk assessments, which were also approved by EPA, in consultation with DEQ. Similarly, the FS (Roux 2021a) was completed in accordance with CERCLA guidance for conducting an evaluation of remedial alternatives (EPA 1988a) and was approved by EPA, in consultation with DEQ. Both the RI and FS were completed by CFAC, the PRP, in accordance with the schedule set forth in the 2015 Administrative Order on Consent. The intent of the RI is not to investigate the contents of the landfills, but to determine the nature and extent of releases of contaminants from these landfills.

In addition to the 20 existing monitoring wells, 44 additional monitoring wells were installed by CFAC during Phase I site characterization. After a data gap analysis, an additional 8 monitoring wells were installed by CFAC during Phase II site characterization. This provided a more accurate representation of the direction of groundwater flow than previous studies had indicated. Groundwater potentiometric surface measurements collected from these monitoring wells clearly indicate that groundwater is not flowing from the site towards Aluminum City. This is confirmed by the isoconcentration maps of cyanide and fluoride.

Aluminum City domestic wells are being sampled voluntarily by CFAC (*Section 2.15 Monitoring – Drinking Water*). Domestic wells 2 miles north of the site are upgradient from CFAC and are not part of the site. Similarly, responding to questions on sources of information from reports unrelated to the site prepared by other parties is beyond the scope of this Responsiveness Summary.

Regarding per- and polyfluoroalkyl substances (PFAS) substances, these are emerging contaminants that were not required for analysis by EPA when the RI/FS work plan was finalized in 2015. EPA is currently formulating a national policy to address PFAS contamination at sites characterized before EPA proposed listing the two PFAS compounds as hazardous substances in 2022.

3.7 Groundwater Issues

3.7.1 Public Comments

Four comments were received from one individual and CBF (#134) that addressed the characterization of groundwater in the RI and FS.

- **Comment 54I.** "In 2014/15 I sent multiple letters to CFAC and EPA, that asked, on behalf of the families on the Gadow Well, that EPA protect this area by increasing their vigilance at our shared property boundary. They responded by offering to increase the sampling of any well in the area to quarterly. They also were going to re-drill the existing well that was 100 yards east of the boundary and drill a second well in the southwest corner of their property. The re-drill of MW #57 was MW #57A and was found to be too deep and lacked water. A second well, MW #57B was drilled 40 feet deep and screened at 30 feet to 40 feet deep. MW #59 was drilled deep and screened at 158 feet to 168 feet; but lacked water and was re-drilled and screened at 80 feet to 90 feet. They were trying to protect us from polluted drinking water. With the finding in 2013 of small amounts of CN and F in two Aluminum city wells: two of the eight Gadow Well families opted to drink bottled water and use the well for irrigation only.

  Both families have since sold their property and left the area. Since 2010 we've experienced 3 cancer deaths from long term residents who were using this well for domestic water.

  So the new wells protecting us are screened at 30 to 40 feet deep and 80 to 90 feet deep. The strata under Aluminum City is similar to that of the adjacent CFAC property. I looked up 6 well logs for Aluminum City residents that parallel the boundary with the CFAC property at the Montana DNRC office in Kalispell as part of my research. There are some interesting findings; but first the Aluminum City data.

  Well Log Owner Well Log Owner HB JG

  Date Drilled Date Drilled 9/18/80 5/11/64

  Depth/Strata Depth/Strata

  0-5'/sand, gravel 0-2"/topsoil, sand

  5-20'/dry gravel 2-35'/gravel

  20-31'/sand, clay, boulders 35-78'/brown sand, silt

  31-73'/brown sandy clay 78-88'/gray silt, gravel

  73-83'/light gray clay, cobbles 88-123'/gray clay, gravel

  83-93'/brown cemented gravel 123-127'/water bearing gravel, sand

  93-115'/gray sandy clay, cobbles

  115-135'/golden brown sandy clay

  135-220'/brown sandy clay, pebbles/seepage

220-229'/Gravel, clay, sand, water

Well JG is roughly 500 feet southwest of MW57 and well HB is 300 feet north of well MW59. Starting at MW 57 and moving straight south to MW 59 on the Aluminum City side of the fence there were 6 wells that span the roughly 2,000 foot distance. They were all completed in a layer labeled gravel, sand, water and they were all drilled by a local drilling company.

Starting across the fence at MW 57 and moving straight to the Flathead River the water bearing layer the Aluminum City residents along the boundary are drinking came from these depths:

Well 1	Well 2	Well 3	Well 4	Well 5	Well 6
123-127'	158-168	160-170	168-180	220-229	241-285

Notice how much deeper than the CFAC wells, the fact they targeted a very specific water bearing strata and finally they were all drilled by a local well drilling company and not a Spokane Washington based company. If your short of local knowledge and history of the site why compound the problem with a well driller from out of the area. The drinking water bearing layer is in the same strata across Aluminum City and is going deeper as it gets closer to the Flathead River. (120 to 241 feet below the ground surface) CFAC protection wells for the people were at 40 and 90 feet deep. It is incompetence if you tell people you are protecting them from underground water pollution and not go to the DNRC to learn about the existing wells in the area before deciding how deep and where to drill the so called monitoring wells. You might want to rethink your hydrology knowledge of the site, slug test our wells to see where this water flow is coming from and going to, and possibly drill wells across the Flathead River. Our water source is deep enough to possibly be running under the river down towards Creston. Bottom line, the specific location you are touting for water flow above the Glacial Till layer is not true under Aluminum City."

- **Comment 54AH.** "First the small problem. The plume they talk about starts at the west landfill as a point source and flows roughly 1200 yards to the Flathead River. Along the river it is entering at over 2000 yards in width. Is that small? It is known, yes! They had two previous studies, 1993 and 2013, that showed the contamination under most of the 960 acre super fund site with high concentrations in the plume, as discussed above. The specific location they alluded to may be more of a convenient fabrication that both EPA and CFAC wished was true! A polluted ground water layer flowing in the top 40 to 60 feet deep in a flat gravel glacial alluvium, underlined by a flat layer called glacial till that has enough clay embedded in it to stop water flow downward. This was later redefined from stop to having a limited water flow down. It turns out that this has some scientific drawbacks that were overlooked. Flow of plant water is generally 20 feet per day or less over most of the plant except in one channel that starts southeast of the leaking dumps, flows down to the north side of the potlines before running down the west side of the potlines to the Flathead River. Wells in this channel generally indicate a water flow of 100 to1500 feet per day. Water flows from the wells in this upper glacial alluvium has been logged by the well driller (Cascade) as sandy, cobbles and gravel, little clay. One exception is at the railroad tracks in Monitoring Well #53 above the river where this sand is over 200 feet thick. At this same railroad crossing point the potentiometric underground water flow lines form and funny pattern indicating something very different exists in this area. Possibly a steep underground coulee! The third item is the 1984 seep that ARCO reported to the State of Montana that is directly below this area on the river. The flat glacial till narrative that keeps water in the upper 60 foot of gravel glacial alluvium fails badly here. The seep is over 90 feet below the railroad tracks. Well logs and computer generated soil layers show an area just west of the west land fill where many different underground soils/rocks/clay were found with a huge second formation of glacial alluvium with little evidence of significant glacial till between them. This second layer of alluvium would take any water flowing into it almost 200 feet lower. Does the glacial alluvium really carry most of the water above 60 feet from the ground surface. Their theory has some significant problems!

This mixture of layers 200 to 300 yards out away from the face of Teakettle Mountain is probably at the transition point of the lateral moraine against the mountain and the flatter strata underlaying the property to the west. It definitely is an odd collection of the underground structures that could easily allow water to get in to a second large deeper alluvium layer that exists in the same area. Are the problems really at a specific location? Is the water really trapped above the glacial till and does it take 3 to 5 years for the water to reach the river from the west landfill as Hydrometrics and CFAC claimed in 1994 to secure a MPDES water discharge permit? Probably not unless you used the 20 feet per day water flow movement found under most of the plant, and not the channel that leads from this landfill to the river. At 1500 feet per day water reaches the river in 3 days. At the more probable number of 100 feet per day, the water leaving the landfill reaches the river in 36 days.

Are there a lot of water samples from the deep wells (300 feet)? No. EPA allowed CFAC to seal them off at much shallower depths! Why? It is those type of decisions that promote their early narrative, but don't really investigate the site very well. The RI is flawed and the Aluminum City wells prove it."

- **Comment 54AL.** "25. Groundwater – Does the groundwater really average only 25 feet? Under the landfills section on Page 3 you already told us that in these critical areas under the dumps the west land fill was measured at:
- *West land fill – 36 feet to 87 feet below surface delta 51 feet Center land fill – 57 feet to 139 feet below surface delta 82 feet Wet scrubber sludge pond – 60 feet to 105 feet below surface delta 45 feet East land fill – 109 feet to 130 feet below surface delta 21 feet 199'/4 = 50'
- *The 35 foot depth is way into the west land fill contents. Electronic measuring systems think the west land fill could be 105 feet deep.

See what happens when you selectively choose to tell people 25 feet. This is why the dumps are being attacked from water rising up into them and not from surface rain and why caps don't work all that well. In this same vein, the four years from 2015 to 2019 when all the sampling was done, hide another important fact. The high water vs low water numbers are misleading. High water were 6 of 18 total samples and the 6 ranged from 13,000 to 28,000 cubic feet per second. Average annual high water in the Flathead River at Columbia Falls is 45,000 to 50,000 cubic feet per second. The 12 low water samples were at 3,000 to 4,000 cubic feet per second which is the normal low water values for the Columbia Falls water gauge. Did we really capture how high the ground water rises when the river is running 50,000 cubic feet per second?"

- **Comment 134N.** "13) How many existing wells are there and at what depths and in what year are installed within the established superfund site and how many additional wells are proposed? I understand that there may be 70 plus wells already drilled within the CFAC site.
  - Particularly for the historical wells, but also for new wells, what well drilling techniques were used or will be used to prevent contamination for traveling down or entering the well casings to further contaminate ground water?
  - The EPA has studies that point to safety limits for the density of septic systems and private wells that should not be exceeded, what studies are available and should be considered to ensure that existing wells or new wells do not create more pathways for pollution to enter groundwater?
  - What evaluation has been done of the condition of existing well casing to establish if they are still safe or intact?
  - Are there abandoned wells on site and how are they being proposed for clean up?
  - What studies have been done to show that the area on influence or draw down of high productions wells including public and agricultural will not risk attracting contaminated ground water?
  - What if and limits on new water well permits in this area are part of this clean-up plan?"

3.7.2 EPA Response

The conceptual site model for the site, as shown in the RI report (Roux 2020a), is a shallow solid waste source with percolation down to the aquifer. This is top-down movement of contaminants until it encounters groundwater. In this model, the shallowest part of the aquifer will be the most contaminated and the shallow groundwater is most heavily investigated. Deep parts of the aquifer were investigated throughout the site, and no wells completed below the upper hydrogeologic unit exceeded the PRGs for arsenic, cyanide, or fluoride. The contamination was limited to the upper hydrogeologic unit. To evaluate water quality in the Aluminum City area, several residential wells were sampled during the 2013 Weston investigation and several residential wells were monitored during the Phase I site characterization from 2015 to 2018. All results are below the PRGs for cyanide and fluoride. This is the best indication that the residential wells are not impacted by site contamination. The monitoring wells east of Aluminum City are intended to evaluate if concentrations of COCs in groundwater are changing. Based on data presented in the RI report, the monitoring wells mentioned by the commentor were sampled six times and all results are below the reporting limit for cyanide and far below the PRG for fluoride. Based on the results from multiple dates at up to 19 different wells, there is no evidence that groundwater in the area is impacted by site contamination.

The well log of CFMW-053A indicates that the sediment changes at a depth of 123 feet below ground surface from a brown sand with some silt to a light gray fine sand and silt. This demarks the transition from alluvium to glacial till. There is no unusually deep alluvium at that location. The bend in the groundwater contours reflects attempting to contour wells at different depths. Note that wells CFMW-053 and CFMW-042 are screened at similar depths and have nearly identical water elevations. Wells CFMW 053a and CFMW-054 are deeper and have lower water elevations. There is no "funny pattern" on Plate 17 of the RI report, just mixed source data. Regarding the cross section in the vicinity of the West Landfill, the log of well CFMW-12a indicates clay from 128 to 198 feet separating the upper sand from the lower sand. That is very strong evidence of a hydrogeologic separation between the shallower and deeper units. There are no sample results in the deeper units at the site exceeding any PRGs. This is also strong evidence that the glacial till is a hydrogeologic barrier to downward migration of contamination. The conceptual site model of percolation from solid waste sources to the upper groundwater followed by lateral flow to the river is supported by abundant evidence with no significant evidence to contradict the model.

The RI report indicated that the depth to water fluctuates by 25 feet near the Central Landfill area, and this may have been incorrectly relayed as average depth to water. Groundwater is typically much deeper than 25 feet across the site. The difference in river stage (elevation) between 3,000 and 50,000 cubic feet per second is 11 feet. The peak flow is of short duration and would not propagate a great distance inland and affect groundwater levels to such a difference. The fluctuations seen on on-site wells is much greater than the change in river stage.

During the RI, up to 76 groundwater samples were collected per round. In addition to monitoring wells, samples were collected from 19 residential wells. Depths range up to 220 feet. Wells installed during the RI were installed using rotosonic methods, which involves driving continuous steel tools and sampling from the interior of the tools. This method prevents contamination from entering the hole during drilling except in the bottom few feet that are being actively drilled and sampled. Monitoring wells were constructed to include grout seals in accordance with State of Montana rules. Historical wells were likely drilled using rotary method with driven casing. Grout seals have long been required and all previous wells are expected to have been grouted.

The careful installation of ground seals during monitoring well construction is an industry standard and will prevent vertical movement of contaminants as a result of well installation. The oldest wells, such as the PW series, may have had only surficial seals. Typically, there is no method of inspecting grout seals without destroying them. Failed seals are typically revealed as a result of unexpected water quality results. No suspected seal failures have been identified. Residential wells do not require a permit, but institutional controls will be in place to prevent installation of new wells within the CFAC site.

3.8 Historical Data – Drinking Water

3.8.1 Public Comments

Two comments were received from one individual and CBF (#134) asking about the incorporation of existing drinking water data into the RI and FS and alleged modifications to the data.

- **Comment 7P.** "The other thing, in 2013 what started all this, they hired Weston Engineering out of Denver to come and just do a quick check of the plant to see if there was anything there after it was shut down, okay, and they did. And when they drew their map, major plume under the plant: one going down the left side of the plant, oh, and another one to Aluminum City. And in the end of that, there was two wells. There's over 30 wells in Aluminum City. Today they're only testing 13, because people opted out. But in those two wells, okay -- and they changed all the numbers now; so I can't tell you what they were back then -- they were both above -- you know, they were 15 significant, but they weren't above the 200 milligrams per liter, which is the State drinking-water standard, all right. So it's to their advantage to make sure nothing goes that direction, okay."

- **Comment 134T.** "19) Why have findings from earlier studies done in 1993 and 2013, noted in public testimony in local hearings, which tracked the long history of drinking water wells in this area and the existence of other known contaminated plumes of ground water under the plant through four phases of data that not been provided the public or included in the analysis of cleanup recommendations? Please provide complete copies of the 1993 and 2013 studies and the four phases of data on which they are based for the public. Additionally, show how you have analyzed these studies and their complete findings and incorporated their findings into your clean-up options and recommendations. We understand that the related Phase I data is the basis for a BRAWP, and Phase 2 sampling plan establishes and provides an important Human Health Risk Analysis. Disclosure and understanding of understanding of the plant's historical operation and its pollution footprint should be an integral part of the analysis of the clean-up recommendations. Please also allow additional time for public comment once these studies are made publicly available. How or how not these studies have been considered in drafting the clean-up plan?"

3.8.2 EPA Response

The 2014 report, *Site Reassessment for Columbia Falls Aluminum Company, Aluminum Smelter Facility* (Weston 2014), did not contain a plume map. It had a potentiometric contour map of groundwater elevations, labeled as Figure 3. The western part of the figure showed some unusual, dashed contours. The dashed lines indicate some uncertainty due to lack of data in that area. The potentiometric contour maps presented in the RI supersede this figure with many more locations and six different dates. Figure 3 in the Weston report should not be used.

Residential well results for 2015 to 2018 are in Appendix FF of the Phase II site characterization data summary report (Roux 2019). Roux residential well results for 2013 are in Appendix E of the Weston report (Weston 2014). None of the results exceeded the PRGs for cyanide or fluoride. The 1993 results are not currently available, but the more recent results indicate that the Aluminum City area is not impacted by contamination from the site.

3.9 Historical Data – Production Well

3.9.1 Public Comments

Three comments were received from one individual and CBF (#134) asking about historical production well data.

- **Comment 54M.** "26. Why did EPA and CFAC eliminate the 5 water production wells (drinking water wells) from all phase 1 samples? We were told they turned power off to the wells and the machinery was too massive to remove from the wells; yet in phase 2 they were all cleared of the machinery. Why leave the longest historical monitoring wells out of the data until 2018? You sampled them without a power source then, just like all the other wells on the site. Historical data from these wells and the phase 2 samples you took prove a significant source of CN and F has been on the east side of the potlines and still exists today."

- **Comment 134U.** "20) Where is the data from production wells 3, 5 and 7 that was promised in an April 2017 by Mr. Stoiazzo? Please make this available and show what analyses was made of this data and how it was incorporated into the clean-up recommendations you are asking the public to comment on. And if it was not incorporated or considered please explain why not and why it should not still be considered."
- **Comment 134AB.** "27) Have and to what extent have the well logs and sampling history of production wells 1-7 at CFAC been made a part of this record and analysis?
  - Testimony provided at hearings and meetings state that historic sampling in 1993 and in 2013, and perhaps additional years, from some of these wells, including five and seven, prove that there is contamination or a plume of contamination including fluoride and cyanide that flows south and east of the dump sites. Where and in what ways has this information, testimony, and this well sampling data been made part of the analysis and the clean-up recommendations and this testimony confirmed or disproved?
  - Testimony provided at hearings and meetings state that well 7 is only 61 feet deep and has historically been contaminated with both fluoride and cyanide and yet well 6 in the same building only six feet away is 72 feet deep has never tested positive for high fluoride or cyanide. Both wells are in the alluvial layer above the deep aquifer and appear to provide evidence that rather than a blanket flow of water under the site there are mini-streams that concentrate flows from a contamination source which deliver them to very specific underground locations. Testimony further suggests that in review of production wells 3 and 5 you will encounter similar problem scenarios, especially if you read the results of the drawdown tests that were done in 1993 with wells 3 and 5 and a contingent of upstream test wells that were drilled for the Hydrometrics study. Testimony suggests these test results appear to point to a serious data gap in phase one data relied on in recommended clean-up strategy because no new wells or data found this second plume. Additionally, the depths and location of the pollution appear to discredit the clean-up report's proposed theory on where pollution starts and how it gets to these locations. How and in what way has this testimony and the data it points to been reviewed and analyzed against the phase one conclusions of the CFAC clean-up recommendations."

3.9.2 EPA Response

The groundwater investigation conducted during the RI (Roux 2020a) included the installation of 44 monitoring wells during Phase I to supplement the existing network of 20 monitoring wells that existed at the site prior to the RI and FS (Roux 2021a). After review of the Phase I data, 8 additional monitoring wells were installed in Phase II to address data gaps. Additionally, five production wells were added to the groundwater sampling network after the ongoing plant decommissioning removed pumps and other hardware from the well casings to allow for sampling.

The results of six rounds of groundwater sampling conducted during the RI over a three-year period provided adequate characterization of groundwater flow directions and nature and extent of groundwater contamination to allow for the FS to be completed and EPA to select a Preferred Alternative in the Proposed Plan (EPA 2023a) and a Selected Remedy in this ROD.

Groundwater flow directions and contaminant plume isoconcentration maps were expected to be (and are) markedly different from when the plant was in operation compared to current conditions. While CFAC was operational, wells pumping thousands of gallons per minute created cones of depression that drew groundwater to the production wells. As these wells are no longer pumping, groundwater flow directions were expected to change. This was verified during the RI. There is no need to consider historic groundwater flow and contaminant distribution data from the operational history of the plant any further than what was considered from the historical site investigation information reviewed during preparation of the RI/FS work plan (Roux 2015a).

These data sources included the following:

- Evaluation of Potential Locations for the East Landfill – 1980
- Preliminary Site Assessment – 1984
- Hydrogeological Evaluation – 1985
- E&E Site Investigation Analytical Results Report – 1988
- PCB Remediation in Rectifier Yard – 1991
- Hydrological Data Summary Report – 1992
- Hydrological Conditions at the Closed Landfill, Sludge Pond, and Well #5 – 1993
- Second PCB Remediation in Rectifier Yard – 1994
- Suspected SPL Removal from Wet Scrubber Sludge Pond Landfill – 1998
- EPA Investigation – 1996
- CECRA Priority List – 1989
- EPA/DEQ Waste Characterization Investigation – 2001
- CFAC Environmental Issues Investigation – 2003
- USEPA Site Reassessment – 2014
- Residential Water Well Sampling – 2014 and 2015

In response to the commenter's request to provide an analysis of data from production wells 3, 5, and 7, EPA conducted additional analyses. Based on a review of the Phase II investigation report (Roux 2019) and the RI report (Roux 2020a), there is inconsistency on the use of well identifiers. In 2013, well CF-GW-MW-10 was sampled southeast of the rectifier yard. In 2018, this same location was sampled via well CFMW-048, which is also referred to as PW3. It seems that CFMW-048, CF-GW-MW-10, and PW3 are the same well.

Well CFMW-036 has a well log (GWIC 85195) indicating it was drilled in 1957 to a depth of 53.6 feet and had a production rate of 1,000 gpm. The 2014 site reassessment report indicated well "CF-GW-MW-11 is a production well with a flow rate of approximately 1,000 gpm…" Both wells are plotted on figures as being on the bank of the Flathead River. In 2013, well CF-GW-MW-11 was sampled. In 2018, this same location was sampled via well CFMW-036, which is also referred to as PW7. It seems that CFMW-036, CF-GW-MW-11, and PW7 are the same well.

Based on a figure attached to the well log of GWIC 87873, PW6 and PW7 are adjacent to each other between the south percolation ponds and the Flathead River. Plate 4 of the RI report (Roux 2020a) indicates CFMW-036 is adjacent to CFMW-062. It appears that CFMW-062 is the same as PW7. Using the same figures, it appears that CFMW-051 is the same as PW5 and CFMW-052 is the same as PW4. The locations of PW1 and PW2 are unclear. None of the wells indicated as being production wells (PW) have well logs included in the Phase I site characterization report, indicating that these were existing wells.

Available analytical data for cyanide and fluoride in samples from the production wells are presented below.

Well IDs	Date Sampled	Cyanide	Fluoride	Source of Data
CFMW-036, CF-GW-MW-11, PW7, 85191	9/25/2013	9.1	400	Site reassessment report
	6/25/2018	8.1	259	RI
	10/18/2018	3.4	273	RI
CFMW-048, CF-GW-MW-10, PW3, 87873	9/25/2013	59.6J	1,000	Site reassessment report
	6/20/2018	192	912	RI
	10/15/2018	178	975	RI
CFMW-051, PW5, 85180	6/20/2018	17.9	248	RI
	10/12/2018	90	221	RI
CFMW-052, PW4, 85181	6/21/2018	<2	114	RI
	10/15/2018	<2	<12	RI
CFMW-062, PW7, 85191	6/26/2018	14.6	422	RI
	10/18/2018	<2	349	RI

< – less than

Based on the data in the table, the only well with elevated cyanide and fluoride is CFMW-048. That well is included in the plumes shown on Plates 18 and 19 of the RI report (Roux 2020a).

3.10 Input From Others

3.10.1 Public Comments

Nineteen comments were received from four individuals and CBF (#134) questioning the input used to develop the RI and asking if EPA considered the input of others knowledgeable about the historical operating procedures of the facility. Eighteen of the comments came from two individuals (#7 and #54 are the same individual).

- **Comment 7C.** "I'm gonna talk a little bit about myself and what's happened with this. It took me six months, starting in April of 2015, to get permission to come on the site that I worked for 25 years and to personally tour -- I'm gonna -- Mike Cirian, John Stroiazzo, Steve Wright, Mike Ritorto, those are all the head people that have done everything that you've heard about so far. One of them is EPA -- one's the EPA project engineer, who's Amanda's predecessor, okay. Glencore had two people there and Roux had the project engineer for their -- to be there at the same time. And I took them on a tour, because I have firsthand knowledge of what was there, why it's there, what they should look for, and where the hell to find it, okay. And, again, it took me until October 8 of that year to get permission to do that. They really didn't want me back on that site, okay. The tour lasted three hours and was tape-recorded. The result was a document that the Roux project manager put together a paper on, and it basically was about 15-or-so pages of, Here's what Nino said in his three-hour tour. It's all recorded. Even had to stop and change cassettes multiple times. So I know that he had exactly what I said. Okay. And then two weeks later, I got a call to come out to the plant. Same people were there. And in the conference room, they provided a document to me to read and then, if it was okay, to sign it. Well, I read it. And like I said, it was kind of uncomfortable. They bring me in, and I get in about five pages, and I say, Okay, it's time to stop. The actual verbiage in it was very wrong. I mean, locations I went to, misplaced. I mean, I took them with a map in hand and gave it to them. And what I said about things -- distances, depths of wells, where this was buried -- they were all wrong. I went, Okay, that's correctable. But what stopped me from signing it, at the bottom of it, there was a little box on every page -- and they wanted me to initial every page -- and that box said, "This information is protected by attorney-client privilege," all right. I wouldn't sign it, because that was their way of, you know, basically getting me out of the picture early on.

  I asked John two weeks ago to get me a copy of that document, because I left it with them, and -- there were several copies; none signed by me -- and he was gonna look for it. Went today to pick it up, and they can't find it. Surprise, surprise. On a project this big, with all the documentation that's been done, you write a 7,000 page RI/FS, and you can't find the only piece of information that those guys really had a good start on this project. You had people in the -- Cirian, John, Mike Ritorto. In total you had zero knowledge of that aluminum plant, okay. They didn't know anything about it. I asked to answer questions from Mike, for one, and I've had better questions from chemistry classes that I've toured over the years. That's the people that we're relying on to do this work and tell us how we're gonna handle this problem. There was a problem there, okay. Anyway, it didn't show up again today. They haven't found it. And Mike Cirian got blamed for taking the copies. He apparently sent it to Gunnar's company. They were gonna review it and give comment on it, or so I was told. If you guys have it, I'd like to have your comments and that original document. Or, as long as we're talking to EPA, would you guys get that for me? I'd like to have that part of the information in your RI/FS, because it certainly was never provided to me even when asking for it. Other than -- I'm just gonna say that CMD -- right? CDM -- did I get it right that time? : I had to think about that for a second. -- they're the expert that the EPA -- it's an engineering firm. They were hired to basically tell the EPA everything they need to know to do this work on the aluminum plant. I'm sure they were very good at following the Superfund process. That's probably a big reason they were hired. But how much do you really know about that aluminum plant?"

- **Comment 7F.** "I'm gonna leave a copy of two letters with you. One of them I wrote on March 31, 2018, after Phase I of the RI was complete. It was addressed to Mike Cirian. I know he got it, because I talked with him. And it discusses not just the two little gaps in their RI data that -- and, again, John and Mike put this in a story in the Hungry Horse News, okay, that there was two little gaps of data at the time and that the good news was there is a plume, but it's on a flat surface. Okay, great, okay. That's called "spin," okay; that's not truth. That was back on 3-17. As part of this, I wrote a letter to him. That's what this March 31, 2018, letter is, okay. It's about a 25-page letter that went through piece by piece some of the things they missed. It lists the gaps that I identified. And they knew about these gaps, because remember I took them on a tour two and a half years earlier, and I showed them where it was and what it was and what they needed to look for. Did they not look for it, or did they just decide, I don't know if we want to look there?"

- **Comment 7M.** "(Second Round) When I last spoke, we were talking about five things that I felt that a professional engineering program would do to learn more about the plant. And I was talking about the pictures, okay. I even gave them a hint: Go get ahold of the Hungry Horse News and look for Mel Ruder's pictures. You know, I've seen pictures in our paper for years showing the aluminum standards of sulphur and other chemicals that the State didn't want us putting out. And there came a time where my boss came to me and said, We're gonna stop the tests for these carbons. And we'd been doing it for two, three years at the time. And I said, What the heck is going on?"

- **Comment 7O.** "All right. Okay, second document -- oh, Russ, I want to talk about what you said. They're doing the samples -- a company call Hydrometrics is doing them. In 1993, we were in trouble with the State. They sent us a letter. They wanted to know how fluoride was getting to the river. Hydrometrics got the contract, and they did all that. They drilled a bunch of wells and came back and had to evaluate. And sure enough, they found the dump and the scrubber were the source. And that was 1993 that the company knew that. But they had to go back to the State with it, the company, Hydrometrics; so they had to write a report. And when they wrote the report, okay, on the dump, basically there's -- they needed help. The dump was a problem because they wanted to cap it, okay -- the company did -- and there was an area between the dump and the north end of the potlines that had very high readings of fluoride and cyanide. The higher reading is still on the maps. If you look at the RI/FS from Phase 1, you've heard about out by the barrels, okay, at 8700 micrograms. This site is real close to the plant and at 5,000, okay. You haven't heard much about it. And the reason you haven't is because they do not want a plume to show up going anywhere to that river. They can't have that. And there is a plume in the Hydrometrics study that goes down the east side of the plant all the way to the river. And it was found because they tested our water wells that we were drinking, and the fluoride and PF were in there. They then adjusted how we took water out of those wells to -- one's on the river, so they blended it. They never would run those three wells that are up there on the bluff. So, yeah, there was something there in 1993. It's not there today. It absolutely disappeared, okay. Maybe not. Because the source area -- they don't want a source going down alongside the mountain, and there is one."

- **Comment 7T.** "The second letter that I'm providing is a response letter to EPA's meeting in September 2022. That was last year. I was gonna try to get it published in the local paper, and

I decided to hold it because you had committed to bringing this meeting in 2023. So I wrote it, and I never did submit it, okay. You've got the only copy -- or a copy of a copy of the original letter in your hands there, okay. In that letter, it basically talks about other information that I haven't talked with you yet about the RI/FS documents and faulty and the need for technical review by a qualified engineering firm that can technically decipher all aspects of the findings and help get a complete set of RI data to be used as a basis to make a good decision for the people of Flathead County. The liaison panel they formed has been used to say -- in fact, I look back, John, you had a nasty comment for me when I responded to an opinion piece a couple years ago about, Oh, the liaison panel reviewed this and accepted it. You know, the liaison panel didn't review or accept anything. That makeup of people would be like me taking you (indicating), and we're gonna go to a technical analysis of a document that you probably have never seen one like it in your life, all right. So we didn't review or change anything. We tried to make comments that we thought were in the best interest of their study, and the reality of it was, we probably went to 20 meetings over that time. You know who the only layperson was that actually got permission to talk? And the only reason I did was because the rest of the people in that liaison panel basically told the gal that was running the meeting and the EPA and Glencore people there, No, we want him to speak; we want to hear what he has to say, okay. It wasn't -- you know, so if you see things in the paper about liaison panel, it's a rubber stamp of what they did or were going to do, not a technical review or ask questions, and we'll answer them for you. Okay, and that's what's in that letter, okay; it goes through a bunch of things like that. I intend to submit a bunch of written comments between now and July or whatever your date of extension is, if you do that."

- **Comment 54AC.** "16. A critical point here! CFAC could only find 6 aerials for the entire plant to produce the original RI-FS document. There were roughly 200 aerials that CFAC lost between 2003 or more probably between 2009 and 2014. (Engineering staff would have been using them to the final day of shut down). Sure would have been handy to have the past 8 years. You didn't even take my suggestion in 2016 to look for Mel Ruder's old photos of the plant at the Hungry Horse News or in his collection in the Mansfield Library in Missoula. The federal government Landsat pictures of Montana from the late 1960s to today were also mentioned as possible aerial picture sources. This is one more reason that goes to the question of competence of the RI-FS team."

- **Comments 106F, 123L, and 134AU.** "12. Why were former employees of CFAC as well as other community members and information sources not included in all phases of the investigation? Comments are on record at the public hearing on June 28, 2023 that indicate such concerns as a recording and subsequent hard copy of a 3-hour tour given by long-time employee to EPA, DEQ and other officials has been misplaced. Was information from this tour used in the investigation and development of the proposal? Photos that could have been helpful in determining location of areas of concern were not located and effort was not made to search out photos from the local newspaper. Were state regulators contacted to gain information about permit and pollution problems and how the company responded? Why was the Liaison Panel of community members not utilized in gathering of data and site information?"

- **Comment 134S.** "18) According to media sources, "Alcoa announced Dec. 15, 2019, that it would permanently close its 2.3 million ton per year alumina refinery at Point Comfort, Texas, after operating on Lavaca Bay for 70 years. The refinery was part of Alcoa World Alumina and Chemicals, a group of companies owned 60% by Alcoa and 40% by Alumina Limited. Alcoa had already laid off hundreds of employees in 2016, so only about 45 remained at the plant. Environmental liabilities remained. From 1965 to 1981, the refinery discharged wastewater containing inorganic mercury into Lavaca Bay. The contamination was not illegal at the time, as dangers posed by mercury to public health and the environment were not as well known at that time. The amount of mercury discharged could have been as much as 67 pounds per day in the 1960s. An EPA report published in 2016 showed that the average mercury concentration in red drum in Lavaca Bay was twice what state health officials considered safe to eat over a sustained period when samples were taken in 2015.
  - What levels or volumes of mercury has been identified/documented at the CFAC site and do existing Montana legal standard ensure it will be dealt with as a hazardous waste and not allowed to be diluted through discharge for the plant site going forward?
  - Public testimony at local hearings have raised concerns by former plant authorities that mercury containing materials have been dumped/buried at the CFAC site but are not being properly addressed in this proposed clean-up plan. Will the clean-up plan be amended to assure the public that currently unidentified locations for waste like mercury are identified and a clean-up plan for these additional wastes are part of this clean-up plan?
  - Given that numerous advanced technology is available to detect items buried underground what menu of technology has been utilized to identify buried waste at the CFAC superfund site to date and what additional technology should be considered for use to better ensure that all waste is identified and addressed with a sound scientific basis?"
- **Comment 134V.** "21) According to testimony made at public hearings you held, Nino Berube a former CFAC manager took CFAC and EPA officials on a tour of 11 separate sites with known problems on the facility grounds in 2015. This tour was recorded but has not been made part of this current clean up investigation, why not and why have you not made efforts to obtain this and include this information in your analysis for these clean-up recommendations?"
- **Comment 134W.** "22) Why has the EPA and MT DEQ failed to identify and provide independent professionals to depose former employees of CFAC who can provide detailed accounts of how materials were handled and disposed of at the CFAC plant and its grounds?
  - i)Why have you not worked with CFAC to waive any non-disclosure confidentially agreements that former or current employees were routinely required to sign, as we understand was the case, so that these employees can come forward and share information which could be critical/vital to your analysis of the best clean-up strategy?

- ii) Are there whistle blower provision that you should have and can going forward make former employees or others with valuable information aware of such as former inspectors or government employees?

- iii) Testimony on your hearing record shows that after the 2015 tour Mr. Berube provided CFAC and EPA, Mr. Berube was asked to sign such a document, which he did not, because that would have made the information he provided on that tour inadmissible in the proceedings before you currently.

- iv) Why should you not table the current clean up recommendations and go back with your investigative authority and just common research protocol, seeking waiver of confidentially where needed or whistle blower protection, and actively recruit former employees, those knowledgeable, and other officials involved in the CFAC operations and interview these individuals as a critical part of this investigation? Please show why failing to do this will not result in overlooking critical information that should be secured and analyzed as part of the basis for your clean-up recommendations."

- **Comment 134X.** "23) How have the following key decisions made by company owners, and identified by former employees, that allowed the pollution to claim the CFAC site, been considered in the scope of clean needed at the site and the need for additional information from former employees who may be blocked from testifying under non-disclosure? Can former employees be given whistle-blower status so that crucial information about the history of this site can be made public and part of the factual record that is used as a basis for clean-up recommendations?

  Key Decisions:

  - 1. Diverting main stem of Flathead River and placing Sewer Lagoons and Water Wells on river island.
  - 2. Allowing fluoride and cyanide to flow unregulated into Flathead River for 35 to 55 years.
  - 3. Allowing Spent Potliner to be stored underground or sit on surface where water can leach.
  - 4. Allowing Fluoride to be stored underground or sit on surface where water can leach.
  - 5. Allowing process cooling water that contains heavy metals or organic carcinogens to be forced back into the underground water aquifer.
  - 6. Unsupervised in-holdings causing environmental damage.
  - 7. Rectifier transformer oil, used vehicle lubricants used for dust suppression on roads and dumps.
  - 8. Minimal segregation of wastes and no manifest records or knowledge of what is buried in dumps.

- 9. Non-transparent process to regulators that was used to prepare plant for sale in 1990’s. Building removals, compromised waste dump caps.
- 10. Potential contamination from unknown single wall tanks used for fuels and waste oils. - rectifier, garage, oil incinerator.
- 11. Conscious decision to exclude ex-CFAC employees from RI-FS preparation and technical review by EPA and Glencore.”

- **Comment 134Y.**“24) What efforts were made and are part of the investigation for this record of decision to obtain plant records from the 1950’s through the 1980’s, and later through the plant closure and initial clean-up efforts, to secure plant records and documents that would provide evidence of CFAC’s record keeping, even if lacking, as to materials that it placed in the 7 to 9 on site dump sites on the plant property?
  - If these records were sought and obtained, where are they found in this record and how were they used in the analysis that led to the recommended clean-up plan?
  - If these records were not sought or included in the clean-up plan analysis, why not?
  - What state or federal permits were issued to allow the placement of hazardous or potentially hazardous materials in these dump sites over this time period, and where are these permits and findings included in this record?
  - Has a time line of permit decisions for placement of materials in these dump sites been compiled and placed in this record of investigation?
  - Has an analysis been done of state and federal successful or failed or faulty permitting oversight and procedures that allowed vast and unknown quantities of hazardous waste to be placed in these dump sites for years leading to it being designated a super fund clean-up site and if not why? We would assert that it is fundamental to any analysis or recommendation of future clean-up options to first document where past mistakes and oversight through permitting and testing has failed so that they are not repeated.
  - How have the permits that allowed waste to be placed in these dump sites at the plant and the findings they were based on been included in the analysis that is required as a basis for the clean-up plan recommendations?”

- **Comment 134Z.** “25) Public testimony from former employees has held that of these 7 to 9 dumpsites only one has a clay base under the waste and all of the other dump sites have no liner or clay base but are exposed or open to groundwater, and groundwater movement and influence.
  - Is there evidence in the super fund records for the site to disprove this?
  - Is it known what dump does have a clay liner?
  - If there is no evidence or minimal evidence in the clean-up study to disprove that these dumps do not have liners underneath them, how and in what ways has this fact been

considered in the analysis that is the basis for these clean-up recommendations, and why is shouldn't this fact be given more consideration and study given that the recommendation is currently to leave this waste and contamination in place with little or no treatment plan to reduce the toxicity of the waste in these dump sites.

- How has the containment effectiveness of proposed slurry walls been analyzed for dumpsites whose bottoms sit in gravelly soils above groundwater or in groundwater?
- How has the stability and containment ability of the slurry walls themselves been analyzed when they will not rest on bedrock but rather on gravelly soils?
- Was consideration given to where have these proposed slurry walls been used before and the success, problems, or failures that were found elsewhere? Where is this information included?"

- **Comment 134AA.** "26) We understand from public testimony that in there is an existing seep that extends both up stream and downstream for a considerable distance. We further understand that in 2014 CFAC got a new Montana Pollutant Discharge Elimination System permit (MPDES) from the state that added a 1.5 mile stretch of the river as part of that seep, while this additional area was not included in the earlier permits. Why did they need a MPDE for the seep? What is the significance of CFAC waiting five years to add this to their permit?
  - Are these MPDES permits and the factual record and reporting they were based on part of the analysis that was done to arrive at the recommended clean-up options for this site. How and where were they considered?
  - How has this seep or these seeps been addressed and protected in the clean-up recommendations? What risks were identified? What mitigation was recommendations were made regarding these seeps?
  - Were comparisons or studies done of the differences between the combination of gravelly soils, speed of groundwater movement, and the absence of bedrock at the CFAC site at the depth proposed and the different geological conditions and depth these walls were installed at other sites?"

- **Comment 134AG.** "32) Please identify if the following issues were examined and if so how and where they were incorporated and influenced the analysis done and the clean-up recommendations made:
  - Findings of 1990 pm-10 study that included CFAC.--Important issues in this document include the size and shape of the pollution cloud that hung over the plant daily and the areas north, south and east of the plant. Air dispersion model for the plant and location of CFAC's chosen monitoring station directly south east of the rod mill. Air pollution from the plant is responsible for the high metals, fluoride, cyanide, and PAH concentrations in the area of the plants soil, water, and groundwater.
  - Operating procedures from 1955 to 1978- Old Anaconda cells and wet anode technology were responsible for huge fluoride emissions that led to two legal actions and when these

court actions prevailed the plant changed its operating procedures and the chemical supplies it used. Tree farms and other measurements were established to look at build - up of fluoride. In 2009 the plant had a permitted standard of 1.64 pounds of fluoride per ton of Aluminum produced and emitted through the plant's roofs. This compares with actual reported emissions by the plant of numbers between 9.39#'s/ton and 26.18 #'s /ton produced for the years from 1955 to 1968. At 26.18 #'s/ton and 180,000 tons of annual production the plant was dumping 4,702,000 pounds of pure fluoride into the plants airshed. This material is reported to have chemically reacted with every chemical element in nature and poisoned the soil and water in the plant's vicinity.

- Reported lack of any regulation of PAH resulting in the plant dumping millions of pounds of these organic carcinogens into the environment. Testimony in the hearing record establishes that wet anodes were totally soupy on the surface and the pitch percentage was above 30% so 180,000 pounds of coal tar pitch were being boiled daily at temperatures above 400 degrees Fahrenheit on the anodes surface. At this temperature all the organics that make up creosote were going airborne out the roofs and it has been reported they reached 600 degrees Fahrenheit because that is the temperature that is required to boil off benzo(a)pyrene that was found in most of the soil, water, and groundwater samples in the phase 1 data.

- Production and Consumption data which is available every month from 1955 to 2009 and provides the statistics on plant's chemical usage and contained impurities that allows you to know what was used and reported as emissions.

- Aerial pictures of the plant. CFAC claims only 6 useable pictures are in their possession. What efforts have been made to obtain Mel Ruder's picture files from the Hungry Horse News or to get them from the Mansfield Library in Missoula. These images would likely provide a more accurate picture of what was where and the changes that occurred. Numerous historical photos are available on this site https://www.facebook.com/people/From-Superstar-to-Superfund/100057080184839/ Have they been evaluated?

- All permits and correspondence related to permits issued to CFAC by state and federal bodies and the requests for variances and the reasons argued for these variances as these documents contain the information on where the plant was impacting the environment and where it may have failed or was unwilling to cure a known pollution problem.

- All files and documents written by Steve Wright, Don Ryan, Shari Halloran, Brian Hohn, Tim Furlong and Nancy Guilliland. These were the environmental employees that measured and responded to the regulator's requests."

▪ **Comment 134AF.** "31) Please explain how testimony provided you by individuals who worked for many years at the CFAC plant, which is often contradictory to some of the information provided by CFAC officials has been considered and how has this information been incorporated into the analysis and/or further testing of this site and the clean-up recommendations being made? Please disclose where such testimony has been disregarded and reasons why."

- **Comment 134AG.** "32) Please identify if the following issues were examined and if so how and where they were incorporated and influenced the analysis done and the clean-up recommendations made:
  - Findings of 1990 pm-10 study that included CFAC.--Important issues in this document include the size and shape of the pollution cloud that hung over the plant daily and the areas north, south and east of the plant. Air dispersion model for the plant and location"
- **Comment 134AJ.** "34) We ask that you give full consideration to detailed comments submitted by former employees and those with first-hand experience of the operations of the CFAC plant including Nino Berube. If for any reason the comments will not be given full consideration, please explain why."

3.10.2 EPA Response

EPA has a policy of not identifying private citizens by name in responsiveness summaries to protect the privacy of individuals within the communities impacted by Superfund sites. During the Proposed Plan public comment period, EPA received extensive comments from a former CFAC employee and addresses several specific issues raised in those comments below. The former CFAC employee attended a site visit on October 9, 2015, with EPA and CFAC. The meeting minutes from this site tour were recorded, and the team visited several areas around the plant where the former CFAC employee raised concerns which are addressed below. The input was carefully considered in the development of the *Remedial Investigation/Feasibility Study Work Plan, Former Primary Aluminum Reduction Facility, Columbia Falls Aluminum Company* (Roux 2015a)*; Phase I Site Characterization Sampling and Analysis Plan, Former Primary Aluminum Reduction Facility, Columbia Falls Aluminum Company* (Roux 2015b); and *Phase II Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company* (Roux 2018a).

The concerns were addressed in the RI (Roux 2020a) and are summarized as follows:

- **Diverting the Flathead River and placing water wells on a river island.** The South Percolation Ponds were investigated during the RI and sediments were determined to contain barium above ecological risk-based screening levels. A Time-Critical Removal Action was conducted in 2020 and 2021 to remove impacted sediments. The sheet pilings that diverted the Flathead River were also removed to allow the river to flow naturally. The water wells referred to were production wells that may yet be abandoned, as determined during the remedial design.
- **Allowing fluoride and cyanide to flow unregulated for 35 to 55 years into the Flathead River.** This was investigated and remedial alternatives were evaluated under the DU1/DU6 decision unit. The RI characterizes the current nature and extent of contamination, and site history is noted in site background discussions.
- **Allowing SPL to be placed underground or sit on the surface where water can leach material.** All known and potential SPL storage and disposal locations that the former CFAC employee identified were investigated during the RI.

- **Allowing fluoride contaminated material to be placed underground or sit on the surface where water can leach material**. All areas where the former CFAC employee indicated such practices may have occurred were investigated during the RI.
- **Allowing cooling water that contains heavy metals/organic carcinogens to be purposely forced into the underground water aquifers.** The two-phase groundwater investigation conducted during the RI was comprehensive and monitoring wells were strategically placed in areas where the former CFAC employee suggested might be near sources of contamination.
- **Unsupervised in holdings caused environment damage.** The RI characterized contamination in soils, groundwater, and surface water to allow the FS to present an evaluation of alternatives, which provided EPA the basis to choose the Selected Remedy.
- **Rectifier transformer and used vehicle lubricants used for dust suppression on landfills and roads.** PCBs were included in the analytical list for the soil samples collected during the Phase I site characterization and were present in 2% of all soil samples (10 samples), primarily in the Central Landfill Area. PCBs were not detected in any sediment samples and were excluded from the BERA on the basis of low frequency of detection. The two remedial actions conducted by CFAC in 1991 and 1994 to address PCBs in soils at the Rectifier Yard appear to have adequately addressed past PCB contamination.
- **Minimal segregation of wastes in all dumps and no record or knowledge of what is buried in them.** The RI installed multiple monitoring wells downgradient of the landfills to investigate the release or potential release of hazardous substances from the landfills. Arsenic, cyanide, and fluoride were identified as the contaminants of concern in groundwater downgradient of the landfills.
- **The nontransparent process (to the regulators) that was used to prepare plant for sale in the 1990s**. **Phony caps, building removals**. This is irrelevant to the CERCLA RI/FS process.
- **Potential of contamination from unknown single-wall tanks used for fuel, waste oils from rectifier, and maintenance garage waste oil incineration.** The Main Plant Area was thoroughly investigated during the RI, and the results are documented.
- **Conscious decision to exclude ex-CFAC employees from the 1960s, 1970s, 1980s, and 1990s for RI/FS document preparation and technical review by EPA and Glencore**. There were numerous engagements with former CFAC employees to acquire their knowledge about plant history, potential locations of sources of contamination, and community involvement concerns on the future anticipated land use.

A subsequent transmittal from the former CFAC employee in late 2016 or early 2017 provided further comments to EPA. EPA reviewed the comments and forwarded them to CFAC in February 2017 with recommendations for further sampling. In consideration of the comments, the Phase II work was modified to include additional soil characterization outside of the rectifier yards, and additional PCB soil sampling within the Main Plant Area.

Numerous comments have been received from the former employee throughout the RI/FS process. They were considered as they relate to defining the nature and extent of contamination at the site throughout the Phase I and Phase II site characterization investigations. Those comments contend that historical information regarding CFAC operations from 1955 to 2009 are being ignored and that there hasn't been enough investigation into determining the contents of the landfills.

Historical information provided by the former employee concerning CFAC operations was evaluated during the RI if it was relevant to determining where releases of hazardous substances have occurred. EPA has considered the following historical concerns:

- **Aluminum City residential wells.** Cyanide was detected in 2013 by EPA's START contractor in one Aluminum City drinking water well. Additional residential well sampling has been conducted by Hydrometrics, Inc., a local environmental firm, under contract to CFAC. Hydrometrics sampled residential wells in Aluminum City on a quarterly basis from 2015 to 2018 and on a twice-yearly basis from 2019 to present. The samples are analyzed for cyanide and fluoride, the two primary COCs in site groundwater. After each sampling event, Hydrometrics provides the well owners with a report of the analytical results. To maintain privacy, the reports do not indicate the owners name or addresses but use a coding system that allows each well owner to identify the results that correspond to their well.

  Cyanide has not been detected in any of the residential well samples. The typical detection limit for cyanide has been 10 μg/L, which is well below the EPA and DEQ drinking water standard of 200 μg/L. Concentrations of fluoride (a naturally occurring constituent in groundwater) have ranged from non-detect to a maximum of 280 μg/L, well below the EPA and DEQ drinking water standard of 4,000 μg/L. The absence of cyanide and fluoride in these samples is consistent with RI site characterization that the plume boundary is one-half mile east of Aluminum City, and that groundwater flow is not toward Aluminum City, but rather toward the Flathead River.

- **Groundwater contaminant plume configuration.** The former employee maintains that the depiction of the cyanide and fluoride contaminant plume, as determined through multiple rounds of sampling during the RI, is inaccurate as it contradicts previous studies showing the plume migrating in as many as three different directions. Specifically, the former employee cites a 1993 study (Hydrometrics 1993) entitled *Assessment of Hydrological Conditions Associated with the Closed Landfill, Calcium Fluoride Pond and Production Well Number 5 at the Columbia Falls Aluminum Plant, Columbia Falls, Montana*. That report noted that based on the water levels measured in June and July 1993, the potentiometric surface indicated that groundwater from the north central area of the plant site can flow to both the southwestern and southeastern portions of the plant site. The report also noted that gradients created by production wells were believed to be responsible for the general flow of groundwater toward the southeast.

  The direction of site groundwater flow has changed significantly since plant operations ceased, which put an end to the withdrawal of millions of gallons of groundwater per day. This has caused the configuration of the cyanide and fluoride groundwater plumes to change. The Proposed Plan addresses current site conditions, rather than historical conditions.

- **Rectifiers containing mercury in site landfills.** EPA does not dispute the former employee's contention that there may be rectifiers buried in one or more of the site landfills. However, monitoring wells were installed downgradient of the landfills, and mercury was not detected in any groundwater samples collected from site monitoring wells, indicating that mercury is not a groundwater contaminant of concern.

As noted elsewhere in the responsiveness summary, the RI (Roux 2020a) was completed in accordance with CERCLA guidance (EPA 1988a) and was approved by EPA with concurrence from DEQ. It defined the nature and extent of contamination in groundwater, surface water, and soils, and provided sufficient information to complete the human health and ecological risk assessments, which were also approved by EPA with concurrence from DEQ.

3.11 Issues With the FS

3.11.1 Public Comments

As part of their comment submission, Atlantic Richfield (#49) resubmitted their comments on the FS for the record. Those comments are addressed in various sections of this document. Fourteen comments of those comments were categorized as specifically relating to the FS.

- **Comment 49B.** "On November 30, 2020, Atlantic Richfield submitted written comments to EPA on the October 12, 2020 draft Feasibility Study report (FS) for the Site. See Attachment 1. Atlantic Richfield questioned whether a remedy as extensive, technologically complex, and costly as a fully-encompassing slurry wall is justified under applicable NCP remedial alternatives assessment criteria, given that several lines of evidence described in the February 21, 2020 Remedial Investigation Report indicate groundwater contaminants at the Site are not posing an imminent threat or unacceptable risk to human health or ecological receptors (see Comment 2.1). Atlantic Richfield also raised concerns about the implementability and effectiveness of the proposed slurry wall, based on the information about Site geology and groundwater conditions presented in the FS report (see Comment 2.2). And Atlantic Richfield commented that the groundwater flushing model used in the FS failed to demonstrate that remedial action objectives would be achieved substantially faster by the preferred remedial alternative than by other less aggressive alternatives. On May 12, 2021, EPA responded to Atlantic Richfield's submission, stating that "EPA will formally consider Atlantic Richfield Company's technical comments on the draft Feasibility Study following the public comment period for the proposed plan." Atlantic Richfield expects EPA to address its prior comments in the Responsiveness Summary of the Site Record of Decision. The concerns remain, and we again urge EPA to consider them and to respond to Sections 2.1, 2.2.1, 2.2.3, 3, and 4.4 of our November 30, 2020 submittal."

- Comment **49D.** "1. The RI is incomplete for the purpose of supporting the remedial alternatives developed and evaluated in the draft CFAC FS. Data gaps that impact the draft CFAC FS were not filled during the RI and persist. Rather than filling data gaps with additional investigation, analysis/modeling, and studies, unsupported assumptions were made to develop and compare alternatives in the draft CFAC FS. Examples are detailed below. These data gaps preclude a necessary understanding of potential site-specific risks to develop RAOs, which form the basis of the draft CFAC FS."

- Comment **49E.** "1.1. The primary pathway driving a key RAO and the remedy has not been fully evaluated. The BERA identified the need for further evaluation of the primary pathway that drives RAOs and remedy selection in the draft CFAC FS: groundwater flow from the CFAC property discharging at the groundwater/surface water interface (seeps) in the western seep area. As stated in the BERA (Roux 2020a, Appendix E, at p. 134):

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

  This data gap has not been filled. The BERA-recommended "further evaluation" was not performed.

  Despite the acknowledgment in the BERA that further evaluation is warranted to assess ecological risk to aquatic life in the Backwater Seep Sampling Area, the FS assumes this exposure pathway is complete and that associated unacceptable ecological risks have been confirmed. It then proceeds to evaluate and score remedial alternatives, in part, based on the relative extent to which they are successful in mitigating the pathway. This is a key weakness in the FS foundation and process.

  For example, alternative LDU1/GW-4A receives the highest score, in part, because it is judged to "cut off the source of contamination to groundwater…to reduce concentrations of COCs in groundwater downgradient…and, subsequently, concentrations of COCs discharging to surface water in the River Area DU" (Roux 2020c, at p. 143). However, the BERA suggests there is a lack of adverse impacts to ecological receptors for this pathway because of the physical/chemical characteristics of cyanide, mixing along the seep area, and a history of passing whole effluent toxicity testing, among other factors.

  Coincidentally, this pathway and the need for a higher level of site-specific ecological evaluation in the western seep area were issues that were emphasized recently by MDEQ in relation to CFAC's Montana Pollutant Discharge Elimination System (MPDES) permit. These issues were not resolved before the permit was terminated. In 2018, the Board of Environmental Review of the State of Montana (BER) held a hearing on the matter. Like the BERA, the hearing examiner noted that significant evidence has been collected indicating that the discharge does not result in adverse ecological impacts. The hearing examiner's recommended order reversed and remanded the 2014 MPDES Permit No. MT0030066 relating to the western seep area, which is "contaminated groundwater seeping from underneath the Columbia Falls Aluminum plant into a back channel of the Flathead River" (Clerget 2018). The recommended order states that MDEQ:

> *…may require CFAC to perform additional studies or provide additional information to accomplish the permit re-write…including but not limited to: providing specific additional locations for Outfall 006, providing a proposed compliance schedule, performing a mixing zone study, or performing a biological survey.*

The BERA does not refer to this compliance issue or provide further study information that would address the MPDES issues and fill a critical data gap in the RI/FS. A complete RI and ecological risk assessment that adequately addressed the acknowledged uncertainty would have enabled completion of an FS that may have reached different conclusions."

- **Comment 49G.** "2. The draft CFAC FS is incomplete and premature, and as such, it does not meet regulatory standards, including NCP provisions. A few examples of this discrepancy are discussed below related to identification of remedial alternatives, implementability, and effectiveness.

  2.1. Identification of Remedial Alternatives. The draft CFAC FS does not clearly identify and discuss:

  - The level of impact,
  - The magnitude of potential risks and hazards, and
  - The commensurate, appropriate remedial actions.

  Alternative LDU1/GW-4A with a fully-encompassing slurry wall scored the highest (Roux 2020c, CFAC0553176) (despite serious implementability concerns described herein), although several lines of evidence demonstrate that groundwater contaminants are not posing an imminent threat to human health or ecological receptors. The need for "further evaluation" was identified in the BERA and in the 2018 MPDES hearing, but it has not been completed. As noted by EPA, slurry walls are considered in certain circumstances that warrant such a costly containment measure: "slurry walls are often used where a waste mass is too large for practical treatment, where residuals from the treatment are landfilled, and where soluble and mobile constituents pose an imminent threat to a source of drinking water" (EPA 1992).

  Further assessment should be performed to determine if remedial action is needed to reduce cyanide concentrations in the western seep area. If so, the draft CFAC FS should identify reasonable and cost-effective alternatives that focus on RAOs in this area rather than relying on or combining with a deep slurry wall containment remedy at the CFAC site that costs over $45 million with implementability concerns and without demonstrated effectiveness to reduce seep concentrations. Given the lack of information regarding the sources, nature and extent of the plume, and flow paths, and implementability issues, it is unclear whether containment at upgradient source areas will adequately reduce western seep area concentrations. Remedial actions just upgradient from or within the western seep area may be more appropriate and cost-effective (e.g., biotreatment and/or monitored natural attenuation [MNA]). This was also recognized by the Agencies in their comments to the FS work plan (EPA and MDEQ 2020a, at pp. 2–3). Actions would be limited to addressing low levels of cyanide in groundwater and surface water, since the draft CFAC FS notes that the other site-related contaminants of concern (COCs) are attenuated in this area. A more robust independent assessment of downgradient alternatives (i.e., not in combination with an upgradient or fully encompassing slurry wall) is warranted.

Two types of downgradient remedial alternatives are presented in the draft CFAC FS. Both are paired with an upgradient or fully encompassing slurry wall: a PRB (LDU1/GW-4B) and groundwater extraction and treatment (LDU1/GW-4C). The location of these remedies is between 250 and 400 ft upgradient from the seep. Installation of an approximate 3,800-ft long PRB (Roux 2020c, at p. 108) to a depth of 130 ft in this area has significant implementability issues as discussed below for a deep fully-encompassing slurry wall. This was acknowledged in the draft CFAC FS, and the downgradient PRB alternative was consequently dropped (Roux 2020c, at p. 134).

In addition, the proposed area of groundwater extraction on Figure E5 (within Appendix E of Roux 2020c) is based on the inferred extent of the groundwater plume in this area. It includes extraction and treatment of groundwater discharging to the Flathead River, east of the Flathead River Riparian Channel, where acceptable ecological risks were determined for this stretch of the river in the BERA. Remedial measures are not warranted in areas with sampling data and BERA analysis that demonstrate compliance with MDEQ-7 standards and EPA risk ranges (e.g., the Flathead River). The proposed extraction and treatment area appears to be much longer than warranted given discussions in the draft CFAC FS (e.g., "flowing seeps have been observed and documented along the Flathead River for over 1,000 feet") (Roux 2020c, at p. 16) and in the 2018 MPDES hearing documents (Clerget 2018). Further ecological evaluation and investigation in the area of the seeps must be completed to provide better information to develop RAOs, assemble alternatives, and select a cost-effective alternative to address the seep area, if needed.

A complete understanding of the flow path from the source(s) of groundwater contamination at the site, which has not been fully characterized, discharging at the western seep area is needed to develop and evaluate remedial alternatives. This flow path description has also been requested by the Agencies (U.S. EPA and MDEQ 2020b, Comment 42), Section 5.6, PRBs (and generally). How does the depth of the groundwater plume compare to the backwater seeps/river elevation? What is the flow path of the contaminated groundwater to the River DU that needs to be interrupted to address the backwater seep and porewater? Is there any way to more specifically target a "zone" of the groundwater affected these areas [sic]? Would a "hanging wall" PRB treat the correct zone of the plume discharging to the river?

Although information is provided on cross-sections (see Appendix A of the draft CFAC FS; Roux 2020c), this pathway is not described in a manner that is responsive to EPA's questions. Cross-section C-C' terminates east of the channel. It would be helpful to evaluate discharge at the western seep area. Cross-section B-B' depicts a mound at CMW-053 that is not discussed (Roux 2020c, Plates A2 and A3)."

- **Comment 49H.** "2.2 Implementability. Alternative LDU1/GW-4A with a fully-encompassing, deep slurry wall scored the highest (Balancing Criteria Score; Roux 2020c, Table 7-2). This alternative was retained (Roux 2020c, Table 4-6) rather than being screened out based on an

NCP-compliant implementability review that is a required element of an FS (40 CFR §300.430(e)(7)) as described in Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) RI/FS guidance (U.S. EPA 1988). The draft CFAC FS acknowledges regulatory requirements and practice for screening to ensure that remedial alternatives are technically implementable (Roux 2020c, at pp. 64, 66). Excerpts from the draft CFAC FS emphasizing this point include:

> *The technology screening includes a broad range of technologies and process options with an emphasis on treatment technologies that are technically implementable, effective in mitigating potential risks posed by materials remaining at the Site, and capable of achieving the RAOs.*
>
> *The various remedial technologies, described in the following sections, were screened based on their effectiveness, implementability, and cost. Technologies that are not viable based on these considerations were eliminated from further consideration.*
>
> *The technology screening qualitatively assesses each technology's ability to achieve the RAOs using the CERCLA criteria of effectiveness, implementability, and cost as defined in the NCP (40 CFR 300.430(e)(7)). Technologies that are not viable based on these considerations were eliminated from further consideration.*

Notably, the draft CFAC FS raises questions about the implementability of deep slurry wall installation at the CFAC site (and deep PRB installation, which was eliminated due to effectiveness and implementability concerns), but these concerns are not reflected in the review and scoring. Specifically, the draft CFAC FS acknowledges that the actual required depth of the slurry wall is not yet known, and "the presence of cobbles and/or boulders can complicate installation" (Roux 2020c, Table 4-6). This is an even greater concern with installation to a target depth of approximately 150 ft (possibly deeper). In addition, the chemical compatibility of the slurry wall materials with site groundwater quality and contaminants (e.g., "water that could be highly alkaline and contain high total dissolved solids" [Roux 2020c, at p. 116], and cyanide, fluoride and arsenic) has not been determined. In summary, the conceptual design and feasibility of installing a deep slurry wall has not been evaluated for the CFAC site. Specific comments on slurry wall construction, the target depth, and groundwater extraction are summarized below."

- **Comment 49I.** "<u>2.2.1. Slurry Wall Construction</u>. Site geology was evaluated as part of the RI as discussed in the draft CFAC FS. The geology of the upper hydrogeologic unit at the site is described as "loose and wet when water was encountered at the water table" (Roux 2020c, at p. 18). This subsurface condition, and the presence of loose cobbles and boulders, will make it very difficult to install a deep slurry wall. These conditions will likely create a loss of circulation in the slurry trench, causing dense slurry to enter the formation leaving the trench in jeopardy of collapsing. This unit is contiguous throughout the site. The water table has a quick and pronounced response to precipitation/seasonal changes (Roux 2020c). Simply put, constructing an effective slurry wall under these conditions will be extremely challenging and may be technically impracticable."

- **Comment 49J.** "2.2.2. Slurry Wall Depth. The required depth of the slurry wall for the CFAC site that will meet the RAOs is a significant data gap. The draft CFAC FS includes multiple references to varying depths of a competent low permeability zone, and the competency of "weathered bedrock" is a concern that is not discussed. This major data gap must be filled to enable remedy evaluation and selection.

  The FS acknowledges in several places that the considerable depth of the low permeability zone complicates installation of a PRB or slurry wall:

  > *A slurry wall could also be constructed immediately upgradient of the Landfills DU1 to divert uncontaminated groundwater around the source area. At either location, slurry walls could be keyed into the lower permeability zone found at the top of the below upper hydrogeologic unit (i.e., the glacial till) that serves as an aquitard at the Site. This stratum is typically 120 to 150 ft-bls near the Landfills DU1 (Roux 2020c, at p. 97).*
  >
  > *However, the low permeability zone is typically located at depths of 150 ft-bls or greater along the path of the conceptual PRB; and 130 ft-bls (i.e., bottom of the target zone) is at the practical technological limits for PRB installation (Roux 2020c, Appendix A, at p. 8).*
  >
  > *The contemplated depth of the PRB (130 ft) would complicate the feasibility of trench excavation and media placement. While experienced slurry wall/PRB construction contractors indicate such depth is feasible, the target depth is greater than any applications reviewed in the published literature (which are typically less than 75 feet). The presence of coarse-grained material at depth (e.g., cobbles/boulders) would further complicate installation (Roux 2020c, Table 6-1, at p. 12 of 40).*
  >
  > *Bedrock was encountered in soil boring CFMW-023a, which is located to the east of the Site near Teakettle Mountain, at an approximate depth of 150 feet below land surface (ft-bls). Weathered bedrock was also encountered in soil boring CFMW-008a (also located to the east of the Site near Teakettle Mountain) at approximately 130 ft-bls, and a more competent bedrock within the same boring at approximately 245 ft-bls. Bedrock was not encountered in any of the other deep soil borings completed at the Site, indicating that depth to bedrock is greater than 300 ft-bls across most of the Site (Roux 2020c, Appendix A, at pp. 2–3).*
  >
  > *Soil bentonite slurry wall 3,705 feet long by 2 to 3 feet wide by 100 to 125 feet deep (Roux 2020c, Appendix E, Figure E6).*
  >
  > *Slurry wall installation is an established and proven technology, with effective installation to depths of 150 ft reported by contractors. However, achieving depths greater than 100 ft is dependent upon subsurface conditions and generally require specialized equipment. The ability to reach target depths at the Site of 125 ft (or greater in some areas) to key into the low permeability glacial till unit may be affected by the presence of cobbles/boulders (Roux 2020c, Table 6-1, at p. 18 of 40).*

These draft CFAC FS excerpts show that the depth of the low permeability zone is not well understood, and that the authors have misgivings about the implementability of the proposed slurry wall. In fact, PRB installation, which would have similar limitations as the slurry wall, was dropped due to effectiveness and implementability concerns (Roux 2020c)."

- **Comment 49K.** "2.2.3. Groundwater Extraction. The need for and required rate of groundwater extraction is not identified with sufficient certainty in the draft CFAC FS to enable evaluation of alternative LDU1/GW-4A.

  Alternative LDU1/GW-4A includes a 3,700-ft long fully-encompassing slurry wall that would divert uncontaminated groundwater around the suspected source area, including groundwater within a fluctuating water table. The discussion of an expected inward gradient to the encompassed area and a lack of certainty regarding the depth of and ability to key a wall into the low permeability zone clearly shows that this alternative has not been sufficiently evaluated to ensure effectiveness (NCP [40 CFR 300.430(e)(7)(i)]). The draft CFAC FS lacks clarity on the expected hydrogeologic conditions and the need for and anticipated schedule of groundwater extraction (Roux 2020c, at p. 112):

  > *…if necessary, the wells inside the slurry wall containment cell could also serve as groundwater extraction wells if and when the inward gradient cannot be maintained in the absence pumping and there is concern that the absence of an inward gradient is preventing the achievement of RAOs and PRGs [preliminary remediation goals]. The pumping rate required to maintain the inward gradient, if any, is expected to be periodic and minimal given that the containment cell would be designed and constructed in a manner to prevent entry of water into the cell.*

  Important factors such as areas of higher permeability in the wall (due to collapse and locations where the wall is not keyed into a low permeability zone), infiltration, recharge, the degree of downward aquifer leakage, and reliability of the groundwater extraction system have not been fully considered in the draft CFAC FS. Also, groundwater would be extracted from within the plume area, but the RI did not place wells or collect samples from these areas to define water quality and the level of treatment that would be required. Uncertainties in the amount of groundwater pumping required from within the encompassed area and groundwater quality, preclude complete analysis of this element in the draft CFAC FS.

  Groundwater extraction cannot meet the objective included in the draft CFAC FS to "ensure contaminated groundwater has no hydraulic potential to migrate out of the containment cell, further enhancing reliability of the controls" (emphasis added) (Roux 2020c, Table 6-1, p. 17 of 40). The slurry wall barrier would not be impervious."

- **Comment 49M.** "2.3. Effectiveness. Slurry wall defects are likely, particularly for deep, complex installations. The draft CFAC FS does not include a discussion of effectiveness including potential slurry wall defects. Windows from sloughing of loose boulders and cobbles, and from a "hanging wall," which is referred in the draft CFAC FS, will likely have a significant impact on effectiveness. Had the real potential for slurry wall defects been adequately considered in the detailed assessment of effectiveness, alternative LDU1/GW-4A would have scored much lower."

- **Comment 49O.** "4. The draft CFAC FS has not adequately costed the highest scored remedial alternative to enable a comparison of alternatives, evaluate costs/benefits, and select a remedy. As discussed above, the implementability of constructing a slurry wall to depths of 150 feet (possibly deeper) in an aquifer with cobbles and boulders does not prove out. However, even if the wall could be built to the specification required to meet RAOs, it would be more costly than a shallower construction. Because the slurry wall and likely issues have not yet been fully acknowledged and evaluated, preliminary remedy cost estimates provided in the draft CFAC FS would not be usable to compare this alternative against the others and select a remedy. The actual high cost of a deep slurry wall installation in the targeted zone to the actual depth required must be evaluated against all criteria (e.g., implementability, risks, benefit, etc.). Consideration of the actual cost of constructing, operating, and maintaining alternative LDU1/GW4A and implementability issues, would likely show that the cost is disproportionate to its overall effectiveness in comparison with other alternatives. In addition, despite multiple references to depths of approximately 130–150 ft bls, the draft CFAC FS slurry wall cost is based on an installation of 100–125 ft bls (Roux 2020c, Appendix J, at p. 17 of 36)."

- **Comment 49P.** "4.1. Use of Kaiser Mead Remedy Costs. The draft CFAC FS appears to incorporate groundwater extraction and treatment remedy approaches and some of the same estimated costs published in the Kaiser Mead FS (Hydrometrics 2018). However, the draft CFAC FS does not reference the Kaiser Mead FS or describe why Kaiser Mead remedy costs published in that document are relevant and directly applicable to the CFAC site. While there are similarities between the CFAC site and Kaiser Mead site (a former aluminum smelter near Mead, Washington), there are also significant differences in the site settings, the completeness of the RI (identification of the nature and extent of impact and associated risks), impacts, knowledge regarding treatability, and the remedial alternatives. NCP-compliant site-specific technology and cost evaluation enables careful design and consideration of each element of the remedy guided by site conditions such as the nature and extent of impacts determined in the RI. Site-specific remedy costs presented in an FS are expected to be a "[l]ogical and organized presentation of cost estimate summaries and detailed backup information" (U.S. EPA and Corps 2000). This presentation should be provided in the draft CFAC FS as a basis and to demonstrate whether use of Kaiser Mead remedy costs are appropriate."

- **Comment 49Q.** "4.1.1. Operation, Maintenance, and Monitoring Costs. The draft CFAC FS has not adequately costed long-term operation, maintenance, and monitoring (OMM) for the highest scoring remedy. Costs are estimated for a 30-year timeframe, although the timeframe estimates to achieve RAOs are greater and more appropriate for the draft CFAC FS evaluation9 (EPA and Corps 2000). According to cost guidance from EPA and U.S. Army Corps of Engineers (Corps),

> *Site-specific justification should be provided for the period of analysis selected, especially when the project duration (i.e., time required for design, construction, O&M, and closeout) exceeds the selected period of analysis.*

Without providing a basis, the draft CFAC FS uses the exact same annual OMM costs—$486,000—as those estimated in the Kaiser Mead FS for a groundwater extraction and treatment remedy. The treatment system flow rates are similar (20 gallons per minute [GPM] for CFAC and 25 GPM for Kaiser Mead); however, there are many differences between the two sites that would likely result in different remedy costs. As an example, the proposed Kaiser Mead system utilizes wetlands along with engineered components. The CFAC system utilizes more engineered components without biotreatment. In addition, FS remedial alternative cost estimates were deemed "reasonably accurate" in the Kaiser Mead FS because estimates were "based on lab scale and field pilot scale testing of technologies" (Hydrometrics 2018, p 5-7). Similar study data have not been developed for the CFAC site. The conceptual CFAC groundwater treatment system relies on more engineered elements and will treat arsenic in addition to cyanide and fluoride. Therefore, annual OMM costs are expected to be higher. Treatability studies for the Kaiser Mead site identified many issues that guided FS development that will also need to be considered in evaluating remedial alternatives for the CFAC site, such as issues with chemical precipitation (Hydrometrics 2018, at p. 3-6 and 5-53):

> *The chemical precipitation treatment methods tested by Hydrometrics (2013) have potentially significant shortcomings of excessive cost and treatment waste generation. An alternative wetland + electrocoagulation (EC) treatment process train was identified to potentially avoid these shortcomings.*
>
> *…the combination of the iron precipitation process with the EC process has not been verified.*

The draft CFAC FS groups potential ex situ groundwater treatment technologies together without a detailed FS evaluation (e.g., "coagulation/flocculation/precipitation" and "chemical precipitation, filtration, ion exchange and/or reverse osmosis")."

- **Comment 49R.** "4.1.2. Treatability Study Costs. Similarly, the treatability study costs presented in the CFCA FS are exactly the same as those published in the Kaiser Mead FS: $100K to support a groundwater extraction and treatment remedy. However, the two sites have not been shown to be directly comparable. Significant additional investigation and site-specific treatability studies have been conducted for Kaiser Mead to develop focused costs for that site. It is unlikely that costs will be the same for the CFAC site, with investigation not yet complete (data gaps) and no preliminary treatability studies completed to date."
- **Comment 49S.** "4.1.3. Groundwater Extraction and Treatment Costs. Groundwater extraction and treatment system process equipment costs published in the Kaiser Mead FS are $1 million for electrocoagulation. The draft CFAC FS includes a similar but lower cost estimate for groundwater extraction and treatment system equipment costs of $900K, despite the fact that the CFAC system includes more engineered features. The draft CFAC FS costs have greater uncertainty given an incomplete RI identifying the nature and extent of groundwater impacts, no site-specific treatability studies, and a general set of potential groundwater treatment options. It is not clear how the total capital cost for the complete CFAC groundwater extraction and treatment system is estimated at approximately $1.3 million (Roux 2020c, Appendix J, at p. 17 of 36). In comparison, an estimate of approximately $2.4

million was developed for the Kaiser Mead system that is more clearly defined and includes electrocoagulation and wetlands treatment (Hydrometrics 2018, pdf p. 5-27, Table 5-6). Adoption of estimated remedy costs from the Kaiser Mead FS requires a demonstration that these estimates are directly applicable to the draft CFAC FS with supporting detailed cost assumptions and explanation of deviations.

<u>4.2. Assumptions for Groundwater Extraction and Treatment Costs</u>. The draft CFAC FS cost estimate assumes that treated groundwater will be re-infiltrated in close proximity to the treatment system (and plume) to reduce costs. The feasibility of this assumption and potential impacts to the plume have not been evaluated. The groundwater plume extraction well design is not yet at a conceptual level in the draft CFAC FS (Roux 2020c, at p. 96) without definition of if and when it will be needed. The extracted water would require ex situ treatment followed by discharge, and a number of alternatives are discussed and may be selected. Given this lack of knowledge and insufficient conceptual design, this system cannot be costed with the necessary requirements outlined in EPA Guidance (U.S. EPA 1988; U.S. EPA and Corps 2000).

Groundwater extraction and treatment costs appear to be unreasonably low. A few examples include:

- The system must be equipped with elements that ensure adequate treatment prior to infiltration into the groundwater. Typically, large holding tanks are utilized for treated water. The storage volume will need to consider the anticipated flowrate. At 20 GPM, approximately 29,000 gallons per day (GPD) will be generated and managed.
- Operational costs of $3,500 per million gallons of extracted groundwater are low, and the cost notes lack clear assumptions that would provide a basis for the estimate.11 The system will need to be continuously maintained.
- Fouling should be expected in the glacial aquifer with iron in the plume area up to 20.4 mg/L and manganese up to 0.829 mg/L (Roux 2020a, Appendix D, Table 2-40, at p. 1 of 4). This will result in higher OMM cost for cleaning and equipment replacement.
- Screening remedial alternatives in accordance with the NCP requires appropriate determination of the construction and long-term OMM costs, such as the groundwater extraction and treatment costs for LDU1/GW-4A. As stated in 40 CFR § 300.430(e)(7)(iii),
- The costs of construction and any long-term costs to operate and maintain the alternatives shall be considered. Costs that are grossly excessive compared to the overall effectiveness of alternatives may be considered as one of several factors used to eliminate alternatives. Alternatives providing effectiveness and implementability similar to that of another alternative by employing a similar method of treatment or engineering control, but at greater cost, may be eliminated.

An underestimate (or overestimate) of these costs does not provide the basis for an NCP compliant remedial alternatives analysis and remedy selection. It can result in flawed decision-making. Representative costs for the groundwater extraction and treatment system need to be evaluated for the timeframe of expected operation. These costs must be considered along with other criteria, notably the effectiveness of LDU1/GW-4A (that is similar to other alternatives as discussed in Section 4.4 below), and implementability (which is questionable as discussed in Section 2.2.2 above). A thorough analysis of these criteria would not likely have resulted in scoring alternative LDU1/GW-4A the highest.

4.3. Waste and Residuals. The highest scoring alternative, LDU1/GW-4A, assumes that "approximately 80 to 90% of excavated soils would be reused in the slurry wall, minimizing the need for disposal" (Roux 2020c, Table 6-1, at p. 18 of 40). This assumption is not reasonable, and a technical basis was not provided. A fine-grained slurry will be required that could not incorporate site soils with cobbles and boulders. If these soils cannot be reused, disposal costs will need to be added and may require hazardous waste handling and disposal as K088 waste as described below.

> *The draft CFAC FS assumes that waste and residuals (including treatment residuals such as sludge) will not require management and disposal as hazardous K088 wastes. The draft CFAC FS notes that EPA was asked for written confirmation but has not provided confirmation. If this assumption is not valid, significant additional costs will be incurred for any remedial alternative involving the generation of large quantities of waste materials, including long-term treatment residuals and contaminated material excavated for installation of the 3,700 ft by approximately 130-150 ft (or more) slurry wall.*

4.4. Limited Cost-Benefit Evaluation. The draft CFAC FS does not include adequate cost benefit evaluation. Estimated costs for the remedy with the highest score, alternative LDU1/GW-4A, do not balance with the assumed benefits and timeframes to achieve RAOs. In addition, the semi-quantitative cost scoring methodology does not appear to be well founded. The draft CFAC FS notes that "the scores have no independent value, they are used as a tool to compare alternatives." However, independent scores are assigned and added to calculate the total score of each alternative to arrive at the highest scored alternative, LDU1/GW-4A. The assigned independent scores and differentials across alternatives have meaning and are not well explained.

An example is the comparison of alternative LDU1/GW-2, containment via capping and MNA, with LDU1/GW-4A. Both alternatives provide containment and contaminant reduction through MNA. Neither alternative provides source treatment, and the time to achieve RAOs is the same or similar for both alternatives. A summary of the comparison for the two alternatives to achieve RAOS is provided in the following bullet points.

- Alternative LDU1/GW-4A is projected to meet the human health RAO preventing ingestion of or direct contact with impacted groundwater in the same timeframe as LDU1/GW-2, following establishment of institutional controls in 1 year.

- Alternatives LDU1/GW-4A and LDU1/GW-2 are projected to meet the RAO to reduce groundwater concentrations within the upper hydrogeologic unit to levels below Montana DEQ-7 standards 14 to 16 years following "elimination or full containment of the source," in approximately 17 to 20 years (with estimated cap construction in 3 years and cap and slurry wall construction in 4 years).

- Alternatives LDU/GW-4A and LDU1/GW-2 are projected to meet the RAO to reduce migration of cyanide in groundwater that results in exceedances of Montana DEQ-7 aquatic life criteria in surface water and porewater at the River Area DU 35 to 60 years following "elimination or full containment of the source," in approximately 38 to 64 years (with estimated cap construction in 3 years and cap and slurry wall construction in 4 years).
- Alternative LDU1/GW-2 is projected to meet the River Area RAOs to reduce potential ecological risk to acceptable levels in "longer than 60 years." It is not clear why this timeframe is presented differently from the timeframe to reduce migration resulting in surface water and porewater exceedances at the river. In any case, the projected timeframe for LDU1/GW-2 of longer than 60 years to meet the River Area RAO appears to be within the timeframe estimated for LDU1/GW-4A of approximately 38 to 64 years.

Given these similarities, the evaluation and scoring have not identified benefits of spending approximately $30 million more (over three times more) for LDU1/GW-4A. In addition, the evaluation indicates that LDU1/GW-4A "would achieve full containment of the source," although the assumed source area has not been characterized, and it is suspected that contamination is present outside of the proposed location of the slurry wall. As noted above, technical challenges associated with slurry wall construction in the geologic matrix also cast doubt on the full containment assumption.

The discussion and comparison of times to achieve RAOs for all retained alternatives is provided in Roux (2020b). This one-paragraph discussion lacks sufficient analysis, such as but not limited to describing the RAOs, providing timeframes for each alternative, and defining the basis for the actual scoring differentials. There is no comparison of LDU1/GW-2 and LDU1/GW-4A because LDU1/GW-2 was dropped from the final screening and analysis. A one-paragraph discussion explaining why LDU1/GW-2 was screened out is not sufficient in consideration of the facts noted above,

Alternative LDU1/GW-2 comprises construction of low-permeability caps at the Wet Scrubber Sludge Pond and Center Landfill as well as maintenance of the low-permeability cap at the West Landfill. However, it does not include any additional source control measures to address underlying soils beneath the West Landfill that are likely contributing to groundwater contamination, nor does it include any downgradient groundwater treatment measures to mitigate impacts to ecological receptors in the River Area DU. Therefore, there are concerns Alternative LDU1/GW-2 would not satisfy threshold criteria (i.e., overall protection of human health and the environment; compliance with ARARs [applicable or relevant and appropriate requirements]). For this reason, Alternative LDU1/GW-2 was screened from further consideration.

Given the comments above, it is appropriate to retain alternative LDU1/GW-2 through the detailed remedial alternatives analysis required by 40 CFR § 300.430(e)(9). Alternatives LDU1/GW-2 and LDU1/GW-4A appear to offer comparable protection with similar timeframes for achieving RAOs, while alternative LDU1/GW-2 appears to be substantially more cost-effective."

3.11.1 EPA Response

Comment 49B

The comment asserts that the RI (Roux 2020a) failed to characterize the site adequately and that it is premature for EPA to select a remedy based on the inadequate characterization and a subsequent inadequate analysis of alternatives in the FS. EPA disagrees. The RI was conducted in two phases, with a data gap analysis conducted jointly by CFAC, EPA, and DEQ after the first phase to address identified data gaps. The RI identified the nature and extent of contamination in all media at the site, as was responded to in other comments to the proposed plan, as well as addressed data gaps necessary to complete the BHHRA and BERA. EPA determined the RI to be complete and approved it on February 27, 2020.

EPA and DEQ's final comments to the draft FS work plan relate to reorganizing; adding remedial alternatives, preliminary RAOs, and COCs; and asking clarifying questions. The agencies did not request additional site characterization. The FS work plan was revised in accordance with the comments and approved by EPA on April 7, 2020. Additional groundwater investigation is not needed to characterize the site. The West Landfill and potentially the Wet Scrubber Sludge Pond were identified by the RI as the primary source of arsenic, cyanide, and fluoride contamination to groundwater that flows towards the Flathead River. The suspected transport mechanism for these COCs is seasonally high groundwater fluctuations into these unlined waste management units. There are uncontrolled releases of arsenic, cyanide, and fluoride that exceed Montana DEQ standards for groundwater and surface water. Additional risk assessment is not necessary.

The FS was completed in accordance with EPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA 1988a). The highest-ranking alternative, construction of a fully- encompassing slurry wall with capping, was selected by EPA in the Proposed Plan as part of the Preferred Alternative, along with provisions for groundwater extraction and treatment interior to the proposed containment cell. There is sufficient information from the RI site characterization for the FS to complete a conceptual design and cost estimate for this remedy.

Comment 49D

EPA disagrees that data gaps were not addressed during the RI. The RI was conducted in two phases. After completion of Phase I, the Phase I data were analyzed for data gaps to be addressed during Phase II. These data gaps included data needed to complete the BHHRA and BERA as well as completion of site characterization. Phase II included assessments of temporal variability of surface water discharge, groundwater elevations and precipitation, and seasonal variability of contaminant concentrations in surface water and groundwater. Data collected during Phase II to address data gaps identified from the evaluation of Phase I data included, among many others: (1) topographic surveying of the landfills; (2) installation of additional monitoring wells to better understand groundwater flow in the undeveloped portions of the site; (3) collection of sediment porewater samples in the River Decision Unit; (4) assessment of conditions beneath the Main Plant building; and (5) collection of additional soil and groundwater samples downgradient of the Rectifier Yards. Phase II also included a background soil concentrations study in areas near but away from the site.

CFAC submitted the *Phase II Site Characterization Sampling and Analysis Plan* (Roux 2018a) and *Background Investigation Sampling and Analysis Plan* (Roux 2018b) for EPA and DEQ review and addressed agency comments. These sampling and analysis plans were approved, and additional sampling and analyses was conducted. Following the completion and approval of the Phase I site characterization data summary report; Phase II site characterization, groundwater, and surface water data summary report; BHHRA; and BERA; EPA and DEQ agreed that the identified data gaps were adequately addressed to allow CFAC to complete the RI report. EPA, in consultation with DEQ, approved the RI report (Roux 2020a) on February 27, 2020.

Comment 49E

As noted, the BERA suggested that further evaluation be considered for chronic, direct contact exposure to cyanide in surface water and pore water in what became the River Decision Unit in the FS. Consequently, CFAC submitted a technical memorandum entitled "*Technical Basis for the Development of a Preliminary Remediation Goal (PRG) for Cyanide in Benthic Habitats Based on Aqueous Exposure to Free Cyanide Porewater*" (EHS Support 2020) submitted on March 3, 2020, as part of the *Feasibility Study Work Plan* (Roux 2020b). While EPA and DEQ concurred that free cyanide can be used as an indicator for protectiveness for benthic organisms as identified in the technical memorandum, DEQ noted that DEQ-7 acute and chronic surface water quality for total cyanide in the surface water seeps and porewater is an applicable requirement. Recognizing this, EPA, DEQ, and CFAC agreed that there was no need for additional ecological assessment to complete the FS since the RAO was established to "restore metals, cyanide, fluoride, and PAH concentrations in DU5 surface water to the aquatic life criteria identified in Montana DEQ-7 as applied to State of Montana B-1 class waters" (Final FS, page 50). EPA also notes that a review of remaining issues from CFAC's expired Montana Pollutant Discharge Elimination System permit was not within the scope of the BERA.

EPA acknowledges that isoconcentrations of total cyanide and fluoride beneath the West Landfill and Wet Scrubber Sludge Pond are inferred. These isoconcentrations are based on monitoring conducted at monitoring well locations upgradient, cross gradient and downgradient from these source areas. Early in the development of the RI/FS work plan (Roux 2015a) and subsequent Phase I (Roux 2015b) and Phase II (Roux 2018a) site characterization sampling and analysis plans, it was agreed that there will be no drilling and test pit excavations through the landfills because of safety concerns. As the Proposed Plan (EPA 2023a) noted, SPL, when interacting with water, can create toxic and explosive gases. Instead, geophysical surveys combined with topographic surveys of the landfills were conducted to estimate the volume of wastes within the landfills.

Comment 49G

The comment ignores that arsenic, cyanide, and fluoride concentrations exceed DEQ-7 human health drinking water standards. Although the site is a former industrial facility and no one drinks the groundwater, future uses of the property may include residential use in the undeveloped western portion, and future industrial use in the former plant area, excluding the landfills. There is no basis to waive the ARAR requirement of meeting DEQ-7 human health drinking water standards at the site, as Section 121(d)(4) of CERCLA specifically identifies six circumstances under which ARARs may be waived. No current use of the aquifer is not one of them. Given that, there is no reason to focusing on lesser measures to meet surface water DEQ-7 standards at the backwater seep area while leaving groundwater contamination emanating from the West Landfill and Wet Scrubber Sludge Pond unaddressed.

The statement "Additionally, total cyanide and fluoride were below 200 and 4,000 μg/L, respectively, for all sample events except March 2017" is incorrect. Exceedances of these DEQ-7 standards occurred in various monitoring wells within the groundwater contaminant plume for all six rounds of sampling. The two wells downgradient from the Center Landfill should not have been included within the isoconcentration contour lines indicating an exceedance for total cyanide and fluoride. Iso-concentration contour lines are presented as a means to graphically present a map of a plume. The color-coded concentration well locations are a more accurate representation. However, the FS is an approved document and will not be revised.

EPA believes that the groundwater contaminant plume has been adequately characterized by the groundwater investigation conducted around the West Landfill and the Wet Scrubber Sludge Pond. Cyanide and fluoride concentrations are highest immediately below these features, as confirmed by six rounds of RI monitoring supplemented by nearly 25 years of groundwater monitoring conducted at the site. Additionally, there is no need to characterize the waste material within the West Landfill and the Wet Scrubber Sludge Pond as plant records confirmed that spent potliner was disposed of in the West Landfill and spent potliner is well documented as a source of cyanide and fluoride groundwater contamination at many aluminum smelter sites in the world. EPA disagrees that additional source area investigations are needed at the West Landfill and the Wet Scrubber Sludge Pond.

Comments 49H through M

Slurry walls are a well-established engineering control and successful construction of this technology has been documented worldwide. However, EPA and DEQ acknowledge that there are concerns about the constructability of a slurry wall given the site setting (depth to the lower permeability layer and potential presence of large boulders). CFAC addressed the agencies' concerns by noting that they had several discussions with three slurry wall specialty contractors, who reviewed the existing site data and stated that they believe a slurry wall can be properly constructed around the West Landfill and Wet Scrubber Sludge Pond to meet remedial requirements and RAOs. Note that based on the monitoring wells installed in this area, the depth of the slurry wall is anticipated to be between 100 and 135 feet, not 150 feet or deeper.

EPA believes sufficient data was collected in the RI to allow slurry wall alternative to be adequately evaluated in the FS (Roux 2021a). However, EPA agrees that several remedial design investigations need to be performed before the design for this containment cell can be completed. These were discussed in the FS and include, but are not limited to, geotechnical borings to determine the depth to the lower permeability layer and other parameters of interest, hydrogeologic investigations, treatability studies for treatment of contaminated groundwater, and bench-scale studies to determine slurry wall composition (this would address the compatibility of the slurry wall in the presence of alkaline groundwater). Again, several of the "data gaps" identified by the commenter from the RI are actually pre-design data gaps that will be addressed during the remedial design.

Comments concerning the placement of the PRB are not relevant to the placement of the slurry wall surrounding the West Landfill and Wet Scrubber Sludge Pond. The PRB was located further downgradient from the slurry wall. The comment concerning weathered bedrock is also not relevant, as the two borings that encountered weathered bedrock are away from the proposed location of the slurry wall. Cited text from the draft FS addressing an inward gradient in the containment cell as evidence that the alternative has not been thoroughly evaluated. In reality, an inward gradient within the containment cell is a design goal, and the Selected Remedy includes provisions for groundwater extraction and treatment if the groundwater within the containment cell rises to a (to be determined) target groundwater elevation in a designated sentinel monitoring well(s).

EPA reviewed the *Final Supplemental Feasibility Study Report* for the Kaiser Mead site that was identified as a site similar to CFAC where a deep slurry wall was screened out of detailed analysis. The geology, hydrogeology, and physical setting of the two sites are quite different. The capped SPL pile at the Kaiser Mead site is not seasonally saturated by a high groundwater table. The depth to groundwater is approximately 150 feet at the Kaiser Mead site, and the overlying geology consists of sand with minor gravel and silt. Because of these characteristics, an injected grout wall was selected for detailed analysis in the supplemental FS for the Kaiser Mead site as it was more feasible given the geology at the site, whereas a similar wall was screened from further analysis in the CFAC FS as the site geology at the West Landfill and Wet Scrubber Sludge Pond was less amenable to that technology due to the potential presence of cobbles and boulders. Feasibility studies commonly select a remedial alternative, such as containment, and then screens the various technologies to select the best technology to retain for detailed analysis for the site conditions. This was done for both the CFAC FS and the Kaiser Mead supplemental FS.

In summary, measures to address the implementation of the slurry wall will be addressed during remedial design and will include a construction quality assurance plan. The Selected Remedy also includes provisions for groundwater extraction and treatment.

Comments 49O through S
The cost estimates presented in Appendix J of the site FS were determined by EPA to be adequately documented as it included the assumptions for the estimate and used vendor quotes. The cost estimates were conducted in accordance with *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* (EPA and Corps 2000). Any similarities to the Supplemental Feasibility Study estimates for the Kaiser Mead site are likely due to both FSs being completed around the same time frame and both used vender quotes. It is likely that similar venders were contacted to provide quotes.

3.12 Legal Reviews

3.12.1 Public Comments

Four comments were received from one individual and CBF (#134) asking if EPA performed legal reviews of documents and judgments related to CFAC v. ARCO or other aluminum sites as part of its decision-making process.

- **Comment 7H.** "Operating procedures and court judgments against Anaconda Company in the '60s and '70s when wet-anode technology was used and not the current day dry technology. Back then we were emitting 12-, 1300 pounds of fluoride per ton of aluminum. In today's world, when they were still operating, we were meeting -- and did for 30 years the last -- most of the time I was there -- 1.64 pounds per ton, you know. They are using current data, okay, and saying, Oh, well, we don't have to worry about this and this and this. I got news for them, in 1955 to 1978, you wouldn't have recognized that plant, okay. It was a completely different technology, and it was a freaking mess. So if you look at that and you get the court judgments, you'll see why -- the plant owns 4,000 acres, okay -- a lawsuit on fluoride pollution that destroyed trees and grasses and things like that. You'll also see a veterinarian from Kalispell talking about the dentition of animals that was being destroyed because of what was leaving that plant. Those two documents alone are an interesting read as to what the plant was doing and what it had to correct. And a lot of what they did, okay, it's still out there. I mean, you're talking about the same pollution stuff that we put in there. I didn't. Back in 1955, I was pretty young then. But it all came out of that plant."

- **Comment 134A.** "28) Testimony provided at hearings and meetings state that at the cathode soaking area, 1/3 of a mile north of the plant, it was known and this individual witnessed that CFAC poured millions of gallons of water on freshly failed cathodes from the early 1970's into the late 1980's. The testimony when on to say the cathodes were dumped on the ground there and 2 or 3 one-inch water lines sprayed this two-acre area day and night for most of 20 years. Testimony states that in preparation for the plant's sale, it was observed that the owners at the time-early 1990's, ordered the service crew to push the gravel hill behind this site on top of it to make it go away. During the SAP and Remedial Phase 1 investigation, testimony on your hearing record states that, CFAC carried out sampling of this of this 43-acre site by drawing 3 samples per bore hole that were taken at the inadequate depth of 2 feet from a one-acre plot grid. It also notes that additional samples were taken of 10-12 feet depth but that these samples were removed from the lab results even though they were the only ones taken at a depth that would have been able to find expected contamination. Additional testimony indicates that this individual did over 50 complete cathode autopsies on this exact site and experienced horrendous off gases from the intense ammonia and gaseous hydrogen fluoride that was coming off these watered cathodes despite wearing a charcoal filtered respirator. How has this testimony been considered and followed up on in the analysis and fact finding done for this report and how was it incorporated into the findings and recommendations for this clean-up plan?"

- **Comment 134I.** "8) Stories of inadequate monitoring of and clean up at former aluminum plants like this one discussed in the attached link point to lax state standards, inadequate fines for violations, use of "mixing zones" to dilute accountability for what is being discharged without clear science to support such practices, ongoing impacts from lax storm water containment or monitoring and more. As past enforcement of existing State of Montana and federal regulations and permits granted have resulted in failure to avoid the mess and extensive contamination that now exists at the CFAC superfund site, what evaluation of current state and federal regulations has been done to identify where these failure can be linked to failed regulations, criteria, and laws that need to be changed to better ensure the proper and complete cleanup of the CFAC superfund site going forward? https://ncnewsline.com/2022/11/22/dishonorable-discharge-runoff-from-a-formerindustrial-site-is-contaminating-an-important-nc-lake/"

- **Comment 134K.** "10) What review of the historical and financial information make public in U.S. Judge Donald Molloy's August 2021 ruling in CFAC v. ARCO has been done to identify information that might be significant to what clean up options you considered or recommended? For example, according to Molloy's facts and findings, Anaconda and ARCO together dumped about 129,000 to 135,000 pounds of spent potliner in landfills at the plant from 1960 to 1980. Landfills were not lined during that time period, and spent potliner, a source of cyanide in groundwater, was not a designated hazardous waste. From the late 1980s through the early 1990s, CFAC transferred about 1 million gallons of leachate from a leaking landfill into unlined ponds. Molloy also noted that CFAC was aware that cyanide and fluoride in groundwater reached the Flathead River. Instead of addressing this underground problem, CFAC erected ponds along the river to contain the seeping contaminated groundwater, but the ponds were sometimes inundated by flood waters. The ponds were recently removed, but contaminated groundwater from leaking landfills and ponds continues to flow beneath the plant site toward the river."

3.12.2 EPA Response

Comments and other input from a former CFAC employee were considered throughout the RI/FS process by EPA, DEQ, and CFAC and here in preparation of the ROD. Regarding the comments to the 43-acre former Operational Area north of the plant that was sampled using the incremental sampling method, the commenter is incorrect that the sampling was designed to collect a 10-to-12-foot soil sample, but no sample was collected. The incremental sampling method sampling method uses a composited sample that consists of 32 subsamples for each acre plot. Soil samples from 0.0. to 0.5 feet (surface) and 0.5 to 2 feet (shallow) were collected from the 32 subsamples per acre to form one sample per the Phase I site characterization sampling and analysis plan. The method was designed to provide data regarding surface and shallow soil contamination, not deep. Note that at least 13 discrete subsurface soil samples were advanced to a depth of at least 12 feet and samples were collected for analyses from 10 to 12 feet in the former Operational Area. The results of this subsurface soil sampling indicate that soil contamination is limited to the upper two feet in that area.

In regard to conducting an evaluation of current state and federal regulations to determine why these regulations failed to prevent pollution at the site, the smelter began operating in 1955, before regulations were enacted in 1976 under RCRA. The first statute enacted to specifically focus on improving disposal methods was the Solid Waste Disposal Act of 1965. The West Landfill was closed in 1994 and the Center Landfill was reportedly used to dispose of SPL, solvents, sanitary waste, and scrap from 1970 until it was closed in 1980. The lined East Landfill was constructed in 1990, with multi-layer caps constructed on the West and Center Landfills shortly thereafter.

The 158-page findings of fact and conclusion of law issued by Judge Molloy (Molloy 2021) references the RI/FS and other reference materials identified in the RI and other reports. There was no new information in the ruling that was not already known in the RI/FS and that would consequently affect EPA's selection of a site remedy.

3.13 Supports the FS

3.13.1 Public Comments

Four comments were received from CFAC (#135) that described how the FS met all requirements under the NCP.

- **Comment 135I.** "<u>Comment 3c. The Feasibility Study Included Alternatives Protective of Human Health and the Environment that Were Developed and Screened Consistent with the</u>

Requirements of the National Contingency Plan. As part of the alternative development and screening process, the National Contingency Plan requires that the Feasibility Study include remedial action objectives for constituents, media of concern, exposure pathways, and remediation goals. Preliminary remediation goals that are protective of human health and the environment should initially be identified based on readily available information and ARARs and evolve as information becomes available. The Feasibility Study should also identify suitable technologies and compile those technologies into remedial alternatives. 40 CFR 300.430(e). Prior to detailed analysis, alternatives are screened based on effectiveness, implementability and cost.40 CFR 300.430(e)(7).

The Feasibility Study identified nine remedial action objectives for 22 constituents in soil, groundwater, and sediment, including pore water. Based on ARARs and other readily available information, the Feasibility Study included approximately 75 preliminary remediation goals. Starting with a total of approximately 20 suitable technologies, the Feasibility Study assembled some 24 alternatives to address conditions at the six decision units. These alternatives where then screened using effectiveness, implementability and cost to develop the alternatives that underwent more detailed analyses."

- **Comment 135J.** "Comment 3d. Screening Out the Excavation and Off-Site Disposal Alternative for Landfills DU1/Groundwater DU6 in the Feasibility Study Before Undergoing a Detailed Analysis Was Consistent With the National Contingency Plan. The National Contingency Plan states that screening out of alternatives is appropriate when the alternative is less effective or costs significantly more than alternatives that are as effective as the screened alternative. 40 CFR 300.430(e)(7)(i) and 40 CFR 300.430(e)(7)(ii). The excavation and off-site disposal alternative was both less effective and its construction cost was significantly greater than the Landfills DU1/Groundwater DU6 Alternative 4A, which became the EPA Preferred Alternative."

- **Comment 135L.** "Comment 3d(ii). The Excavation and Offsite Disposal Alternative Would Cost Significantly More to Implement Than the EPA Preferred Alternative While Being Less Effective. The National Contingency Plan states that "[t]he costs of construction and any long-term costs to operate and maintain the alternatives shall be considered. Costs that are grossly excessive compared to the overall effectiveness of alternatives may be considered as one of several factors used to eliminate alternatives." 40 CFR 300.430(e)(7)(iii) The EPA estimated the total cost of implementing its Preferred Alternative for the Landfill DU1/Groundwater DU6/River Area DU 5 at $45,642,497. The EPA estimated the total cost of excavation and on-site disposal for LDU1/GWDU6/RADU5 in Option 6 at $165,590,849. The excavation option with off-site disposal was screened out and therefore a total cost for that option was not estimated but would be much more than the cost of Option 6 because of the additional cost of transporting the material and the fees for disposing of it at an off-site location. Yet, as described above, the off- site disposal option would be much less effective than the EPA Preferred Alternative and would increase environmental impact and human health risk in the short term whereas the EPA Preferred Alternative would decrease environmental impact and would prevent an entire category of human health risk that would be created by the excavation and off-site disposal option. This cost is "grossly excessive when compared to the overall effectiveness" of the excavation and offsite disposal alternative.

- **Comment 135M.** "Comment 3e. The Detailed Analysis of the Alternatives After Screening Was Consistent with the National Contingency Plan. The National Contingency Plan requires that the remaining alternatives be subject to a detailed analysis considering nine factors (40 CFR 300.430(e)(9)(i):

  - Overall Protection of Human Health and the Environment (40 CFR 300.430(e)(9)(iii)(A));
  - Compliance with ARARs (40 CFR 300.430(e)(9)(iii)(B));
  - Long Term Effectiveness and Permanence (40 CFR 300.430(e)(9)(iii)(C));
  - Reduction in Toxicity, Mobility, or Volume Through Treatment (40 CFR 300.430(e)(9)(iii)(D));
  - Short-Term Effectiveness (40 CFR 300.430(e)(9)(iii)(E))
  - Implementability (40 CFR 300.430(e)(9)(iii)(F)); and
  - Cost (40 CFR 300.430(e)(9)(iii)(G));
  - State Acceptance (40 CFR 300.430(e)(9)(iii)(H));
  - Community Acceptance (40 CFR 300.430(e)(9)(iii)(I))

  The National Contingency Plan acknowledges that the last two criteria – State and Community Acceptance – may not be completed until comments on the EPA Proposed Plan are received. 40 CFR 300.430(e)(9)(iii)(H) and (I).

  The National Contingency Plan does not specify how alternatives should be compared according to these criteria in the Feasibility Study but it does specify how these criteria are to be used in remedy selection. For purposes of remedy selection, the criteria are categorized into three groups:

  - Threshold Criteria: These are Overall Protection of Human Health and the Environment and Compliance with ARARs. Only alternatives that meet these criteria may be selected as a final remedy;
  - Primary Balancing Criteria: These are Long-term Effectiveness and Permanence; Reduction of Toxicity, Mobility, or Volume Through Treatment; Short-Term Effectiveness; Implementability; and Cost;
  - Modifying Criteria: These are State and Community Acceptance.

  All of the alternatives retained after screening met the Threshold Criteria. The Feasibility Study then used two methods to apply the Primary Balancing Criteria: narrative descriptions of how each retained alternative met each of the Criteria in Tables 6.1-6.5 and a 100 point scale that ranked the remaining alternatives for each Decision Unit according to each of the Primary Balancing Criteria presented in Table 7.2. This numerical ranking system normalized each option within each Decision Unit according to each Primary Balancing Criteria allowed a direct comparison among alternatives that used different technologies, timelines and had different costs to achieve ARARs and reduce identified human health and ecological risk. The use of this numerical scale was consistent with EPA "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" October 1998 ("RI/FS Guidance") which states in section 6.2.6 regarding presentation of detailed analyses in Feasibility Studies "[a]n effective way of organization this section is, under each individual criterion, to discuss the alternative(s) that performs the best overall in that category, with other alternatives discussed in the relative order in which they perform." The presentation of alternatives using the numerical ranking system is a very effective method of presenting, in one table, the relative rank of each alternative with regard to each Balancing Criteria. In addition, the cumulative numerical score allows rankings to be summed across each alternative in each decision unit to determine the best performing alternative in that decision unit. The application of numerical ranking system to remedial alternatives in each decision unit is further supported and explained by the narrative provided in Section 7, Comparative Analysis of Remedial Action Alternatives."

3.13.2 EPA Response

EPA agrees that the FS was conducted in accordance with agency guidance documents designed to meet the requirements of the NCP. The final FS report was reviewed and approved by EPA, with DEQ concurrence.

3.14 Supports the RI

Three comments were received from CFAC (#135) that describe how the RI met all requirements under the NCP.

- **Comment 135F.** "Comment 3: The Information in the Remedial Investigation and Analysis in the Feasibility Study are Consistent with the National Contingency Plan and Sufficient to Support the Proposed Plan; No Additional Sampling is Required under the National Contingency Plan to Support the Selection of the Preferred Alternatives as the Remedy in the Record of Decision. The Requirements of the National Contingency Plan Applicable to Remedial Investigations and Feasibility Studies. Title 40, Section 300.430(d) lays out the requirements for a remedial investigation under the National Contingency Plan and Section 300.430(e) provides the requirements for feasibility studies.

  The Requirements of the National Contingency Plan Applicable to Remedial Investigations. The purpose of a remedial investigation under the National Contingency Plan is to "collect data necessary to adequately characterize the site for the purpose of developing and evaluating effective remedial alternatives." To achieve this end, the entity performing the remedial investigation must, as appropriate, conduct field investigations and a baseline risk assessment. The remedial investigation should provide information to assess site risks to human health and the environment and to support the evaluation of appropriate alternatives to address such risks. Remedial investigations may be done in phases. 40 CFR 300.430(d)(1)."

- **Comment 135G.** "Comment 3a. The Remedial Investigation Characterized the Nature of the Threat from Hazardous Materials at the Site and the Extent to Which Releases at the Site Pose a Risk to Human Health and the Environment pursuant to NCP Section 300.430(d)(2). Title

40 Section 300.430(d)(2) requires that remedial investigations characterize the nature of and threat posed by the hazardous substances and materials to human health and the environment by conducting, as appropriate, field investigations to assess:

- Physical characteristics of the site, including important surface features, soils, geology hydrogeology, meteorology, and ecology; 40 CFR 300.430(d)(2)(i)
- Characteristics of air, ground water and surface water; 40 CFR 300.430(d)(2)(ii)
- General characteristics of the waste; 40 CFR 300.430(d)(2)(iii)
- Identification and characterization of the source of potential site impact to human health and the environment; 40 CFR 300.420(d)(2)(iv) and
- Actual and potential exposure pathways through environmental media and exposure routes; 40 CFR 300.420(d)(2)(v) and (vi);

The assessment of the site in the Remedial Investigation was built on 45 years of previous site assessments consisting of over 16 separate investigations (RI p.18) reviewed. as part of the development of the RI Workplan. These reports consisted of investigations conducted by the US EPA, the Montana Department of Environmental Quality ("MDEQ") and various independent consultants. The investigations included surveys and subsurface investigations, reviews of employee allegations of improper waste disposal that were reported to the MDEQ, two EPA preliminary site assessments for purposes of evaluating the site for placement on the National Priorities List, and four years of semi-annual drinking water well sampling in Aluminum City. In addition, the RI built on extensive background information development based on the Background Sampling and Analysis Plan approved by the EPA with MDEQ input. This background information included a site photogrammetric survey, years of meteorological data from a nearby weather station and extensive local geological and hydrogeological data (RI Section 1.3.3) and some 13 aerial photos spanning a period of approximately 60 years of activities at the site, including before construction of the aluminum smelter. The photos included at least one photo from every decade beginning in the 1940s and three from the 1980s, two from the 1990s and four from the 2000's. (RI Appendix F). The investigation also reviewed years of operating records to understand the site production processes and related contaminants of concern and emissions. The investigation reviewed as built drawings for the East and West landfills, the latter being the single largest contributor of contaminants to groundwater. (RI Appendix G)

Beginning with the development of the RI workplan in 2015, the RI itself took five years to complete. The extensive historical and background sampling was used to develop sampling and analysis plans for two phases of site sampling designed to determine the nature and extent of contamination, fully characterize key site characteristics, such as ground water flow and direction, site habitats and ecosystems, and the potential for off-site impacts from the site. Both of these sampling and analysis plans were extensively reviewed by EPA and their contractors and the MDEQ. The government reviewers provided more than 800 comments through 13 comment rounds during the development of the RI. Ultimately, all comments were resolved to the satisfaction of EPA, their contractors and MDEQ. Furthermore, in developing the sampling and analysis plans, the EPA, CFAC and CFAC's contractor walked the site with a former employee who had alleged mismanagement of site materials. Using a map marked up by the former employee, CFAC's contractor assigned every area identified by the former employee with a geolocation tag and included the allegations in the development of the sampling and analysis plan. Also, during the period of the development of the sampling and analysis plans, CFAC held 14 Community Liaison Panel meetings and expressly requested community input on the site, including from former site employees, to inform the sampling and analysis plans.

Overall, the Remedial Investigation included over 1,000 soil samples, 400 ground water samples from 77 separate wells that assessed the full range of depth to groundwater and seasonal flow conditions, 200 surface water samples, 70 sediment samples, and 40 pore water samples. In addition to sampling throughout the site, the investigation included 100 off-site samples which established background conditions. From this information, the RI includes sitewide and operational area soil thematic maps for 13 separate constituents to characterize the full extent of on-site soil impact. The RI also includes thematic maps for groundwater impact for 12 constituents in two distinct vertical groundwater zones. Through the placement and sampling of 77 monitoring wells the RI provides a complete depiction of the plume of impacted ground water both vertically and horizontally. This includes approximately 30 perimeter wells outside the defined limits of the plume, 14 of which are located between the defined plume and western boundary of the Site. These data clearly show that impacted ground water has not migrated off the site and is not migrating toward adjacent communities nor can it impact in any way the drinking water of the City of Columbia Falls.

The Remedial Investigation also included approximately 40 soil sample locations along the perimeter of the Site. The concentrations of constituents in these samples were either non-detect or at trace levels that pose no risk to human health or ecological risk above applicable risk standards. In addition, the trace concentrations of key constituents, such as cyanide and polycyclic aromatic hydrocarbons ("PAHs"), in soil along the western site perimeter were similar to the concentrations detected in samples collected from background areas unaffected by the site. These areas were assessed for residential exposure and the de minimis constituent concentrations pose no human health or ecological risk to area residents or plants and animals. Concentrations of constituents in site perimeter groundwater and surface water samples were typically non-detect and/or well below standards. These findings indicate there is no offsite migration of site constituents."

- **Comment 135H.** "Comment 3b. The Remedial Investigation Included a Site-Specific Baseline Risk Assessment as Required by NCP Section 300.430(d)(4). The Remedial Investigation includes baseline risk assessments for both human health and ecological receptors. Both risk assessments were developed by expert risk assessors from the consulting firm EHS Support under the supervision and approval of EPA expert risk assessors. The Baseline Human Health Risk Assessment ("BHHRA") was developed according to the procedures and using the methods delineated in the "Risk Assessment Guidance for Superfund Parts A-F", the overall guidance document that EPA developed for the preparation of human health risk assessments at CERCLA sites beginning in 1989. In addition, the risk assessors relied on and their analysis was consistent with guidance in over 20 other relevant EPA guidance documents as well as applicable guidance from the Agency for Toxic Substances and Disease Registry and reports by a national laboratory and academic studies.

Building on the comprehensive environmental assessment data developed for the Remedial Investigation and consistent with applicable guidance, the risk assessors used similar structures to identify and characterize baseline human health and ecological risk. With respect to human health risk, the risk assessors identified areas of the site where humans might be exposed to contaminants of concern and the pathways – such as inhalation and ingestion – through which they might be exposed. The assessors then identified the hazards at the site using the data developed for the Remedial Investigation. Using the extensive site data base, they identified the contaminants of concern, their concentrations in the environment, the pathways through which people might be exposed, and the extent of such potential exposure. The assessors then used that information to develop estimates of theoretical cancer and non-cancer risks associated with site constituents for various exposure scenarios approved by EPA and MDEQ.

To identify decision units where health risks exceeded standards, the assessors developed cumulative cancer risks and non-cancer risks for all constituents for each decision unit. For constituents with multiple versions, called congeners, such as PAHs (cPAHs), in order to account for the toxicity of all the members of the chemical group, assessors applied the relative potency factor (RPF) for each cPAH to the toxicity values used for the cPAHs to calculate cumulative cancer risks. This methodology of applying the RPF to the toxicity value is consistent with USEPA guidance (USEPA, 2023b Regional Screening Levels – User's Guide) which states: "that computationally it makes little difference whether the RPFs are applied to the concentrations of cPAHs found in environmental samples or to the toxicity values as long as the RPFs are not applied to both. However, if the adjusted toxicity values are used, the user will need to sum the risks from all cPAHs as part of the risk assessment to derive a total risk from all cPAHs". Cumulative cancer risks were summed across all cPAHs and other carcinogens for each exposure pathway and receptor in the BHHRA. Of the cPAHs in soil, exposure to only five at site concentrations resulted in theoretical cancer risks exceeding the de minimis screening threshold of 1 x 10-6 and were identified as primary risk drivers: benzo(a)anthracene (soils only), benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-c,d)pyrene.

Human health PRGs for soil were developed for these five PAHs and other human health PRGs were developed for other constituents in other media that would achieve target risk levels.5 Using this cumulative risk approach, assessors determined that the other site constituents of concern when taken together, including other cPAHs, did not pose human health risks above acceptable levels. The assessors determined that most of the site did not pose theoretical health risks above applicable risk standards. The assessment did show that site constituents in four areas of the site – the North Percolation Ponds, the Main Plant Area, the Central Landfills Area and Industrial Landfills Area – posed enough of a theoretical health risk to industrial workers or trespassers under applicable exposure scenarios to such constituents that those risks needed to be addressed in a feasibility study. All of those areas are posted with no trespassing signs, protected by fencing and the public is not allowed access. Furthermore, the assessment did conclude that consumption of impacted groundwater over a lifetime could also pose a theoretical risk to human health in a hypothetical residential scenario but there are no operating drinking water wells accessing that ground water The assessment also showed that the site contaminants do not pose a human health risk off-site. Along with the existing measures that reduce or eliminate exposure in the areas of elevated theoretical human health risk mentioned above, the EPA Preferred Alternatives are designed to address the theoretical human health risks identified in the BHHRA. The EPA Preferred Alternative for the Landfills DU1/Groundwater DU6/River Area DU5 if implemented fully will address the theoretical human health risk in the Central Landfills Area and the groundwater through the construction of improved caps over the Wet Scrubber Sludge Pond and Center Landfill that will greatly reduce infiltration; and cap maintenance, engineering and institutional controls that will reduce or eliminate the potential for direct exposure to site constituents.

Further reduction of cyanide and fluoride migration into groundwater will be accomplished through the construction of a slurry wall around the West Landfill and Wet Scrubber Sludge Pond. The placement of institutional controls prohibiting groundwater use will also address the theoretical human health risk associated with impacted groundwater. The EPA Preferred Remedy for the Soils DU3 will address any direct exposure risk associated with the Main Plant Area by excavating and removing impacted soil and isolating that soil by placing it in the Wet Scrubber Sludge Pond. As described above, the Wet Scrubber Sludge Pond will be capped and the material in the Pond, including impacted soil, will be surrounded by the impermeable slurry wall minimizing the risk that they can impact groundwater. The EPA Preferred Alternative for the Landfills DU2 area will address any theoretical human health risk in the Industrial Landfill Area. The EPA Preferred Remedy for the North Percolation Ponds of excavating impacted materials is designed to address any theoretical human health risk associated with site constituents in that area.

The Baseline Ecological Risk Assessment (“BERA”) was developed in accordance with the 1997 USEPA guidance “Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments” as well as some 34 other applicable EPA guidance documents, MDEQ permits and information sources and papers from U.S. national laboratories and academic research. Building on a Screening Level Ecological Risk Assessment that could not rule out potential adverse ecological impacts from constituents at the site, the ecological risk assessors examined potential ecological exposure areas, representative species that might be in those areas, the pathways through which those species might be exposed to site constituents, the bioavailability of those constituents to representative species and the extent to which constituents bioaccumulate or biomagnify. Exposure areas consisted of terrestrial areas that are dry upland areas, transitional exposure areas that are inundated with water on a seasonal or intermittent basis, and aquatic exposure areas that are always or almost always inundated with water. Impacted media in these exposure areas included soil, surface water, and sediment. The assessors used ecological screening values and representative species to conservatively assess potential contaminants of concern. The assessors refined the list of contaminants of concern by identifying the contaminants most likely to drive risk management decisions for the site. Using receptor-specific benchmark toxicity reference values that represented no adverse effect levels and exposure estimates from the information gathered for the RI, the assessors estimated the likely risk from site constituents to the representative species in each of the exposure areas.

Like the Baseline Human Health Risk Assessment, the Baseline Ecological Risk Assessment found no risk to representative species from site constituents in the undeveloped areas, the Flathead River Riparian and River areas (excluding the Backwater Seep Sampling Area), Cedar Creek, the Cedar Creek Reservoir Overflow Ditch and the Northern Surface Water Feature. The areas that did pose some level of ecological risk from site constituents were the industrial areas of the site including the Main Plant Area, the Central Landfills, the area sampled for soil impacts, the Industrial Landfill Area, the North Percolation Ponds, the South Percolation Ponds, and the Flathead River Riparian Area Channel and Backwater Seep Sampling Area. The potential ecological risks in all of these areas will be effectively addressed by either remedial actions that have already been completed or the implementation of the EPA Preferred Alternatives in the Proposed Plan. The South Ponds were fully remediated in an early action completed in 2021. The EPA's preferred alternative for the Landfills DU1/Groundwater DU6/River Area 5 is designed to effectively address the cyanide and fluoride in groundwater that is the source of potential risk in the Flathead River Riparian Channel and Backwater Seep Sampling Area as well as the sources of potential ecological risk in the Central Landfills Area.

The EPA Preferred Alternative for the Soils DU3 area is designed to address the potential ecological risks from exposure to impacted soils in the Main Plant Area, the historical operational area north of the Main Plant Area, and the Central Landfills Area. Potential ecological risks at the Industrial Landfill will be addressed through the capping remedy in the EPA Preferred Alternative for the Landfills DU2 and the EPA Preferred Alternative for the North Percolation Pond DU4 is designed to address potential ecological risks associated with the North Percolation Ponds. The Requirements of the National Contingency Plan Applicable to Feasibility Studies The objective of the feasibility study is to ensure that appropriate remedial alternatives are developed and evaluated so that decision makers can review relevant information about the remedial action options to select a remedy consistent with the National Contingency Plan. Remedial options must reflect the scope and complexity of the remedial action under consideration and the potential site impacts. The development of alternatives is to be integrated with the site assessment in the Remedial Investigation and the Feasibility Study must include an alternatives screening step, if appropriate. 40 CFR 300.430(e)(1)."

3.14.2 EPA Response

EPA agrees that the RI was conducted in accordance with agency guidance documents designed to meet the requirements of the NCP and included an exhaustive sampling effort that spanned two phases of investigation and took local input into account. Workplans were reviewed and approved by EPA, with DEQ concurrence. Data were validated and evaluated. The human health and ecological risk assessments were part of the RI and were thorough, followed accepted guidance, and made conclusions that are defensible and were used to drive the FS. The final RI report was reviewed and approved by EPA, DEQ concurrence.

3.15 Unknown Wastes

3.15.1 Public Comments

Twenty-one comments were received from 13 individuals, the TASC (#1), and CBF (#134) expressing concerns about the presence of unknown wastes on the site that may eventually show up in the groundwater.

- **Comment 1F.** "2. A member of the community has expressed concern that unknown wastes have been disposed improperly within the site. There is fear that the remedial investigation sampling efforts may have missed buried wastes that may cause potential harm to human health and the environment. It is possible that some of these concerns may be addressed with an encompassing slurry wall capturing the three most significant sources of groundwater contamination (refer to Comment #1). The community may want to communicate their concerns regarding possible additional waste source areas and their location in relation to alternative design features."

- **Comment 4B.** "The thing that's bothered me from day one is that no one knows what is in what dumps where. And I think Nino will tell you. In the middle of the night, stuff got taken out of the plant and just -- the rule was, with the union guys, Get rid of it. When we had our 25th anniversary, Bob said -- the plant manager -- Clean the plant. You should have seen the stuff that was buried. For years when the engineers made a mistake, the material that they ordered was never returned; it was buried. I put a stop to it, and Bob Smollack hated my butt from that day forward. He and I always went loggerheads. You can't tell me that the paste plant, when it was running, stopped at the North Fork. No one has ever -- that was one of the first questions I asked. And I never got asked to be on the liaison panel, by the way, because I guess I asked a sensitive question; they didn't want me on there. But the things that have been buried, unless you start probing to know what is in some of those landfills, even the safe landfills, you don't have an idea. As Larry Kraft told me here when we were walking on Memorial Day, You remember when the dump caught on fire? I said, Well, I gotta think about it. I said, Yeah. They called him out; he moved material for seven hours, left, and about a day later, they fired right back up because of the sodium that was there. Shouldn't have been sodium in that particular landfill."

- **Comment 5B.** "And I'm very concerned, especially when I hear from -- firsthand -- people who worked at that plant for many, many years, like Mr. Shepherd, Mr. Berube, that there is things that are out there that neither the State nor the EPA have really properly determined where they are, what they are, and what potential ramifications they may have if they're not included within these slurry walls. It makes me very nervous. Not for myself, but for our future, the kids of our communities."

- **Comment 6D.** "In particular, I would like to see the comments reflect, or your response reflect, how did you gather information about where material was buried on the site, and why were the plant managers and people in the community that really have a lot of knowledge, why were they not brought in and made part of this discovery process. And I would like to see them brought in and made part of the discovery process."

- **Comment 7G.** "Okay, my question would be -- and here's actually a question finally -- can the EPA project engineer just ignore anything he really doesn't want to find and call the finished RI work a quality professional product? Obviously it got reviewed somehow; it got approved. I don't know that anybody in here reviewed it. I read 7,000 pages. And the only way I could have any input -- and I never knew if they looked at it or not -- I had to write them a letter. And, you know, I was never asked to participate with any kind of review, nor was anybody on the Columbia Falls aluminum -- the Columbia Falls liaison panel. This has all been done totally nontransparent, okay. The letter also gives him -- okay, we're talking about this letter now, okay, and in that letter I also gave him five information sources that would be necessary to have professionally reviewed by a technically competent project manager from EPA that included, okay, and you'll -- In fact, I'm gonna ask you point blank. Will you put this -- there's about 40 pages between these two letters -- will you put them in the comments from this public meeting? : I'll hand them to you tonight, okay. I've read 7,000 pages for these guys. They can put this out there so you can read 40 from me that make as much sense or more than what they've done. The areas that I put in that they needed to look at, Summary Findings from 1990 PM-10 study for the CFAC and the town of Columbia Falls. It was a federally or state-government mandated, okay, and it provides an immense amount of information about that airshed around that aluminum plant, what it contained, where it was, why it didn't move. I mean, it's totally -- if you're looking at cleaning up something, you would want to know that."

- **Comment 7I.** "Aerial photos of the plant from 1952 to 2009 -- you're gonna love this -- Glencore found six total photos, okay. They used that to develop a work program or a work -- what is the first document they put in? It's a work plan of some kind. They had to submit it to EPA to get their approval. They used six pictures. Four of them came off the wall when you walk in the plant's administrative office. And I don't know where they found the other two. It was amazing, okay. In 2003, when I was the engineering superintendent, I had a wooden box in my office that had 200 or more aerial photos from 1952 to 2002 at that time. Okay, that box is out there. Somehow they never found it, all right. Those aerial photos could be fairly valuable if you're looking for problem areas, okay, like, What's in that dump? There were visible in there. How deep are the dumps? Is there water in the bottom of them? What else would you want to know? Where did they bury the two rectifiers in the mid-'60s that are full of mercury? You know, these are serious problems. Did anybody read anything about mercury in that document that's come out? Well, I'm gonna tell you a little secret. There's two rectifiers out there, pieces of equipment that are about 20 feet tall, 100 feet long, and about 30 feet deep. They are made up of thousands of little glass ampoules with mercury in them. And that's how they used to go from AC to DC power. These things would jiggle back and forth. As the power came in, they'd cut the electricity wave off and go from AC to DC. Well, in 1960 -- and mercury is a great actor in the environment, okay. Most of you probably have read or heard things about it. They're buried out there. These guys didn't even look for them. Now, that's a quality job of a remedial investigation."

- **Comment 7K.** "In fact, I'll give you a personal comment from the EPA engineer. He told me that he didn't give a damn if they were out there; he would -- if I could tell them exactly where they were, he'd go look for them. And then he prefaced that and said, Hell, no, if they're in a dump, there's no way I'm gonna open up any one of the nine dumps out there. Now that's a guy that's truly interested in finding about something that you guys are gonna live with the rest of your lives, and your kids and your kids after them, if that gets loose. It's out there; they can't find it because they don't know where to look; I don't know where to look. I told them, you know, Why don't you go find the last environmental manager? He was -- in the 1970s – he was the operator crew chief; he was in charge of the whole thing; he might remember what the people told them where they buried it. But I don't think they did that even. What I'm after is not the comments that, you know, speak specific to anything, but I want you to know as a community that you had a remedial investigation that was done by people that had no business doing it. They are technically educated, but they know nothing about this plant, this area, and they did a horrible job of providing data that should be available before you make a decision that's permanent on everybody around. That's my message to you, okay, in total. So somebody else want to come up?-- in the 1970s -- he was the operator crew chief; he was in charge of the whole thing; he might remember what the people told them where they buried it. But I don't think they did that even. All right. So we got all those things."

- **Comment 11K.** "11. CARBON infiltration property wide, including Columbia Falls City needs verified, and addressed."

- **Comment 16B.** "2. There is concern about possible additional waste source areas and location in relation to alternative design features."

- **Comment 47C.** "On Page 6 of the EPA's Proposed Plan for Cleanup, Exhibit 4, there is a list of "Contaminants of Concern." I have always asked why only two of these are being monitored and why are they only monitored in the surface water and groundwater. Your own chart shows that they are present in soil and sediment also. EPA has drawn an arbitrary red line around the main portion of the plant site for testing, but has there been any testing in the area to the west of this red line? And what has been the result of that testing? And will soil testing be continued in those areas? Since my home and property are adjacent to the CFAC property, I consider this issue paramount to my safety and well being."

- **Comment 54AQ.** "30. Metals and PAHs aren't just present in shallow soils in select areas; but are found across the entire superfund site as deep as 22 feet below the surface."

- **Comment 54AY.** "38. Exterior of main plant building soil PAH exceeded industrial RSL's. These values are hundreds of times higher than DEQ-7 drinking water standards and extend down at least to 17 feet below the ground surface. Readings from under the potlines are generally lower with fewer residential RSL violations."

- **Comment 54AZ.** "39. Soil samples from bore holes #285 and #287 were an issue for EPA that wasn't defined in Phase 2. Sample #287 had a finding from about 8 feet down to 20 feet down where a set of sample cores were defined as high odor, sheen and high odor, followed by high odor, sheen, wet. The wet was with half a dozen organic compounds. Where did they come from and what are they? This sample was an outlier from between rooms 8 and 9. Its location was very shallow and does not appear to be from an underground tank because of the multiple different compounds it contains. Is it from the storage tanks around the waste burner oil building? Is it possibly the path of oil from the barrels in the west land fill? Did you ever zero in your study to identify what and where all these different chemicals came from and how they all were found as a liquid in a very shallow layer underneath a huge potline building?"

- **Comment 54BA.** "40. Use of weather station - Throughout phase 1 and 2 you cite plant conditions based on Kalispell Airport data. A poor choice. The plant had its own weather station and kept daily records for several decades. They do not match the airport in significant ways. The siting choice for the aluminum plant was horrific based on its large volume of air-born pollution. Being up against the Swan Mountain Range with a north/south orientation, a broad Flathead Valley to its west, and a river passage through a narrow canyon that gathers air from a large river drainage system creates its own unique weather. Precipitation - Historically, the site gets 1.33 times the airport readings. Inversions - Besides a historic winter season that sees the Flathead Valley getting roughly 60 days each winter, the plant location compounds this because the east/west airflow is blocked not only by the Swan Mountain front, but this is further compounded by the narrow river canyon that separates the Flathead Valley from the three drainages of the Flathead River. This narrow canyon forms an air block to movement between the main Flathead Valley and the river drainages. The air pressure differential stagnates air at the plant on a daily basis, based on daylight and dark conditions. The winds from the Rose chart at the airport flow primarily from the west, southwest up to 25 mph and a secondary smaller contingent from the north, north/west at a lower velocity. From midday till dusk the plant generally agrees with this Rose; but as darkness increases, the cold air flow blocks the narrow canyon at Berne Park and stops the air movement on the plant site. This creates a local inversion and holds the polluted air from the potlines over a narrow band along the mountain front. This lasts until the air pressure behind the air dam starts forcing its way into the valley by moving the cold, dense air from the three forks of the Flathead River into the valley. The valley air density pushes under the warmer main valley air along the river bottom. This creates a very strong east wind 25 to 40 mps winter and summer flowing out into the valley. These winds stay below the high bank along the north side of the river and they move off to the southwest. The Columbia Heights area routinely has early morning ground blizzards in winter and cold winds in the summer while the town of Columbia Falls and the airport are quiet. In the fall this phenomena can be witnessed by a fog bank that forms in the river canyon and does not come into the valley until late in the morning. At this time, you can witness clouds of fog streaming over Teakettle Mountain like a fast moving waterfall. It doesn't matter what the airport is reporting. This is a cold east wind that can and has crushed the large truck doors on the east and north side of the potlines. Winds can exceed 60 to 80 mph and higher while the town of Columbia Falls experiences only a light wind. This mini-inversion at the mountain face forms a potato shaped mass of polluted air, that can be seen from out in the valley, that rolls above the plant. It extends north to the saddle where the North Fork Road goes through the mountains. To the south it goes down the mountain front to the Creston area. I have had employees tell me they could smell the Paste Plant at night at their homes in the Creston area. This potato-shaped cloud doesn't dissipate because it is caught between two competing air pressures. It generally breaks down late morning unless it occurs during a valley-wide inversion, then it just gets more polluted day after day."

- **Comment 54BB.** "The reason I told you about the PM-10 study in the 1990s time frame was that there were pictures in the document that clearly showed the potato-shaped cloud in place above the plant. The air shed polluted everything north and south of the plant for 55 years. That is why you have found every pollutant in all of the plant's soil, sediment, and surface water samples down to at least 17 feet below the ground surface. While I'm at it, that means most of the samples you took for background values are questionable. The air shed around this plant poisoned the soil and you picked your background plots underneath this potato-shaped cloud. Subtracting background values you found in the formulas used for the BERA documents may not be correct. Your finals answers should all turn out lower than what you actually should have found. The constant use of the statement, "the metals being found are naturally occurring," is more spin. Some of the metals exist on the site naturally; but the vast majority came to us in the aluminum oxide we used, cryolite, spar, and the coal tar pitch and at least a dozen different petroleum cokes used at the plant. These raw material sources amounted to over 50,000,000,000 pounds (yes, 50 billion pounds) that were processed with all of their contained heavy metal loads. Unlike smelters in Anaconda and East Helena we didn't create slag piles filled with heavy metals, they left the plant as air pollutants into the air shed around the plant. Another large metal source came from the ball mill balls we consumed in the Paste Plant. They were highly alloyed for hardness and contained large quantities of chrome, manganese, copper and vanadium. We consumed tens of thousands of balls per year and this is the source of these metals in our soil. Using the field 300 yards northwest of the Paste Plant for your background samples and asking the State of Montana to subtract their elevated metal values from the on-site samples is a tactic ARCO Metals and CFAC tried to use to get under pollution standards for the operating plant. Its time to stop the games and remediate what you are finding. Recognize the local air shed for what it did to the local plant vicinity and don't use a weather station 8 miles away that has completely different weather than the plant site."

- **Comment 87B.** "Question I have is will the EPA take into serious consideration public comments from previous engineers and employees at CFAC concerning missed burial sites that will cause future harm to human health and the environment? It was discovered that many public comments and information was not included in all phases of the investigation. Including photo's of other well sites."

- **Comment 102B.** "It appears more soil sampling is needed throughout the site to more accurately identify all of the contaminates that may be present. It also seems prudent for the monitoring samples be examined for a larger range of contaminates."

- **Comment 120C.** "3 – they have areas that are not the "major" contaminated areas that need to be studied. They are not going to be in the current slurry wall and can still be deadly to our river and people."

- **Comments 106A, 123G, and 134AP.** "7. Can EPA prove that known and unknown wastes buried outside of the designated areas will be detected and remediated? Why was the entire industrial area not explored for contaminants including outside of the designated treatment areas? Are there other contaminants dangerous to human health and the environment that are not being addressed, i.e. mercury? A citizen of Columbia Falls and former long-time employee has expressed concern that known and unknown wastes were disposed of

> improperly within the site in now unknown areas in a haphazard manner outside of the established waste dumps."

3.15.2 EPA Response

EPA requires that RIs use current science and due diligence to develop a site conceptual model specific to each site that pinpoints source areas and directs the sampling needed to characterize the nature and extent of contamination. The RI at the site started with a review of operations and prior investigations to identify potential source areas. EPA sought input from members of the community regarding potential source areas and evaluated all information from residents and former plant employees. Extensive sitewide sampling was used to investigate all identified potential source areas. The results of that sampling are presented in the RI and the descriptions of the nature and extent of contamination were used to develop the cleanup alternatives that were evaluated in the FS and to choose the Preferred Alternative that was presented in the Proposed Plan (EPA 2023a). The RI (Roux 2020a) and FS (Roux 2021a) followed established EPA guidance (EPA 1988a) and were each approved by EPA with concurrence from DEQ. *Section 3- Public Comments Related the RI and FS* contains a variety of responses relevant to how the site was characterized, including how input was gathered from previous employees (*Section 3.10 – Input from Others*).

Surface and subsurface soil contamination was adequately characterized in the RI for use in the conceptual model and risk assessments. Contamination that may or may not be found at depth in other locations does not impact the primary pathways for risk from soil samples (air blown dust and direct contact).

Background soil sampling locations targeted reference areas upwind of the site that had similar chemical and physical properties to the site. These background reference area sampling results were compared to other background soil datasets for perspective on how the site-specific background dataset compares to the range of the regional background datasets. Regional datasets reviewed and used for comparison to the site-specific background dataset include the *Background Concentrations of Inorganic Constituents in Montana Surface Soils* (Hydrometrics 2013), and Montana native soil data for metals from the 0 to 15 cm interval (equivalent to 0-0.5 foot interval) presented in Appendix 3a of the *USGS Geochemical and Mineralogical Data for Soils of the Conterminous United States* (Smith et al. 2013) and the *Montana Dioxin Background Investigation Report* (DEQ 2011). A comparison of the mean concentration for metals in site-specific background surface soil indicates that in general, the mean site-specific background concentrations are less than Montana and USGS mean concentrations. These data indicate that the reference areas selected for background during the RI were appropriate and were not adversely impacted by historic smelter emissions fallout from the site.

COCs are site-related contaminants that EPA has determined, at the conclusion of BERA, to pose an unacceptable risk to human health and/or the environment. COCs are identified through sampling and are used to help determine cleanup actions. At any Superfund site, initial sampling and analysis is structured to confirm or rule out as many analytes as possible so that future sampling becomes more targeted. Long-term groundwater monitoring currently includes all groundwater COCs. Long-term monitoring does not typically include soils once they are characterized at a closed facility because the source of the contamination (such as aerial emissions, spills, etc.) is no longer present.

Sediments have also been characterized and are unlikely to change, although the final decision on additional sediment sampling will be made in the remedial design.

Landfill sites by nature have unknowns, as the wastes they contain are buried beneath the ground surface. However, the three years of groundwater monitoring conducted during the RI provide a level of confidence that the understanding of site contaminant sources is correct. New contamination from unknown sources that were not detected during RI sampling is unlikely, especially after the additional capping and slurry wall construction reduces the exposure of wastes to surface water and groundwater. Long-term groundwater monitoring associated with the Selected Remedy in this ROD will ensure that the remedy remains protective and effective. Should they be needed, additional actions identified in the ROD will ensure that the remedy adapts to changing site conditions. During the design phase, EPA will evaluate the list of analytical parameters for future sampling to see if there is value in occasional analysis of a more robust list of parameters, to rule out the possibility of impacts from unknown contaminants.

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