FIFTH FIVE-YEAR REVIEW REPORT FOR THE BUNKER HILL MINING AND METALLURGICAL COMPLEX SUPERFUND FACILITY (BUNKER HILL SUPERFUND SITE) SHOSHONE, KOOTENAI, AND BENEWAH COUNTIES in IDAHO SPOKANE COUNTY in WASHINGTON

Prepared by:

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Abbreviations and Acronyms

Alta	Alta Science and Engineering, Inc.
AMD	acid mine drainage
ARAR	applicable or relevant and appropriate requirement
ATV	all-terrain vehicle
AWQC	ambient water quality criteria
BEMP	Basin Environmental Monitoring Plan
BHMC	Bunker Hill Mining Corporation
BLM	U.S. Bureau of Land Management
BMP	best management practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFP	community fill policy
CIA	Central Impoundment Area
COC	contaminant of concern
CTP	Central Treatment Plant
cy	cubic yard(s)
EFNM	East Fork Ninemile
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Difference
FYR	Five-Year Review
gpm	gallons per minute
GWCS	groundwater collection system
I-90	Interstate 90
ICP	Institutional Controls Program
IDAPA	Idaho Administrative Procedures Act
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDHW	Idaho Department of Health and Welfare
IDWR	Idaho Drinking Water Regulations
IEUBK	Integrated Exposure Uptake Biokinetic
LHIP	Lead Health Intervention Program
LUR	limited use repository
MFA	Maul Foster Alongi, Inc.
mg/kg	milligrams per kilogram
NCP	National Oil and Hazardous Substances Contingency Plan
NPL	National Priority List (list of Superfund sites)
O&M	operation and maintenance
OU	Operable Unit
PHD	Panhandle Health District
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
ROD	Record of Decision
ROW	right-of-way
SFCDR	South Fork of the Coeur d'Alene River

SSI	sludge storage impoundments
µg/dL	micrograms per deciliter of blood
UU/UE	unlimited use and unrestricted exposure
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WCA	Waste Consolidation Area
WENI	West End Natural Infiltration
WY	Water Year
XRF	X-ray fluorescence

1 Introduction

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 Code of Federal Regulations [CFR] Section 300.430(f)(4)(ii)) and considering EPA policy.

This is the fifth FYR for the Bunker Hill Mining and Metallurgical Complex Superfund Facility (the Bunker Hill Superfund site or site). The site consists of three Operable Units (OUs) all of which were reviewed in this FYR. The triggering action for this statutory review is November 16, 2015, the completion date of the previous FYR. This FYR has been prepared because hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Bunker Hill Superfund site FYR was led by EPA Region 10 and their contractor, Jacobs LLC. Participants included the Idaho Department of Environmental Quality (IDEQ) and their contractor, Alta Science and Engineering, Inc. (Alta); and the Coeur d'Alene Work Trust (Coeur d'Alene Trust) and their contractor, Maul Foster Alongi, Inc. (MFA). Sections of this report were contributed by the Panhandle Health District (PHD), Coeur d'Alene Tribe, Washington State Department of Ecology (Ecology), U.S. Fish and Wildlife Service (USFWS), U.S. Geological Survey (USGS), and U.S. Bureau of Land Management (BLM). The review began on December 16, 2019 and concluded on January 11, 2021.

1.1 Site Background

The Bunker Hill Superfund site is located in northern Idaho, sections of the Coeur d'Alene Reservation, and in northeastern Washington along the Spokane River (Figure 1-1). The site includes mining-contaminated areas in the Coeur d'Alene River corridor, adjacent floodplains, downstream waterbodies, tributaries, and fill areas, as well as the 21-square- mile Bunker Hill "Box" where historical ore-processing and smelting operations occurred. The site was listed on the National Priorities List (NPL) in 1983.

The site is divided into three OUs:

- The populated areas of the Bunker Hill Box (OU 1).
- The non-populated areas of the Bunker Hill Box (OU 2).
- Mining-related contamination in the broader Coeur d'Alene Basin (OU 3 or the Basin).

A description of the three OUs is summarized below in Table 1-1.

Table 1-1. Bunker Hill Superfund Site Operable Units

OU	Description
OU 1 (Box)	OU 1 is located within the 21-square-mile area surrounding the former smelter complex, commonly referred to as the Bunker Hill Box. The Box is located in a steep mountain valley in Shoshone County, Idaho, east of the city of Coeur d'Alene. Interstate 90 (I-90) bisects the Box and parallels the South Fork of the Coeur d'Alene River (SFCDR). OU 1 is often referred to as the populated areas of the Bunker Hill Box and is home to more than 7,000 people in the Cities of Kellogg, Wardner, Smelterville, and Pinehurst, as well as the unincorporated communities of Page, Ross Ranch, Elizabeth Park, and Montgomery Gulch. The populated areas include residential and commercial properties, street rights-of-way (ROWs), and public use areas. Most of the residential neighborhoods and the former smelter complex are located on the valley floor, side gulches, or adjacent hillside areas. Cleanup activities first began in OU 1 because this area was of the greatest concern for human health exposure from mine waste.
OU 2 (Box)	OU 2 comprises the non-populated areas of the Bunker Hill Box. Areas within the city of Kellogg include the former industrial complex and Mine Operations Area (MOA), Central Impoundment Area (CIA), and the Central Treatment Plant (CTP), which treats acid mine drainage (AMD); the city of Smelterville's Government Gulch; Smelterville Flats (the floodplain of the SFCDR in the western half of OU 2); and hillsides, various creeks, and gulches. The SFCDR within OU 2 and the non-populated areas of the Pine Creek drainage are both addressed as part of OU 3.
OU 3 (Basin)	OU 3 includes all areas of the Coeur d'Alene Basin outside the Bunker Hill Box where mining-related contamination is located. OU 3 extends from the Idaho-Montana border into Washington State and contains floodplains, populated areas, lakes, rivers, and tributaries. OU 3 includes areas surrounding and including the SFCDR and its tributaries, and areas surrounding and including the main stem of the Coeur d'Alene River down to the depositional areas of the Spokane River, which flows from Coeur d'Alene Lake* into Washington State. OU 3 also includes areas where mine wastes have come to be located as a result of their use for road building or for fill and construction of residential or commercial properties. Spillage from railroad operations also contributed to contamination across OU 3.

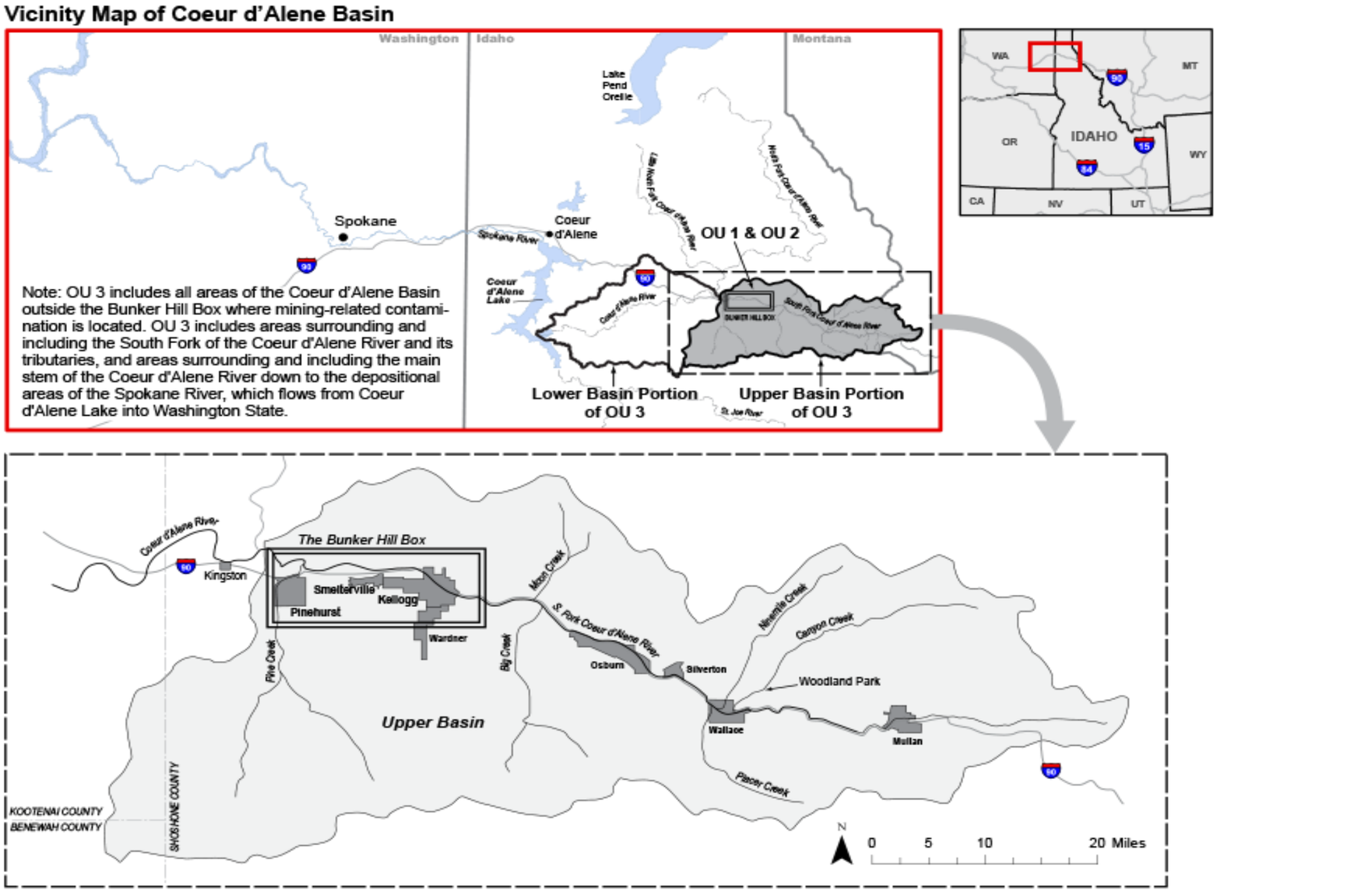
* Coeur d'Alene Lake is being managed by state, Tribal, federal, and local governments outside of the Superfund process through the Coeur d'Alene Lake Management Plan. See Appendix B.

Operable Unit 3 is also divided into two areas with common sources of contamination: The Upper Basin and the Lower Basin. The Upper Basin, however, also contains OUs 1 and 2 when referring to certain water quality remedy components. A description of these two areas is summarized in Table 1-2 on the following page.

Table 1-2. Upper Basin and Lower Basin

Portion of Site	Description
Upper Basin *(Eastern portion of OU 3 when referring to Human Health remedies; and includes the Box when referring to certain water quality remedies)*	The Upper Basin is located in Shoshone County, Idaho, and contains the portion of OU 3 east of OUs 1 and 2 (the Box). The 300-square-mile Upper Basin and Bunker Hill Box includes the main areas of historical mining and industrial activities of the SFCDR and its tributaries downstream to the confluence of the South and North Forks of the Coeur d'Alene River. Consequently, these areas are the primary source of downstream metals contamination and the 2012 Upper Basin Interim ROD Amendment considered the Box as part of the Upper Basin for the purpose of the selected actions expected to improve water quality and reduce movement of contaminated sediments downstream in the Lower Basin.
Lower Basin *(Western Portion of OU 3)*	The Lower Basin is located west of the Upper Basin and the Box. The Lower Basin includes the main stem of the Coeur d'Alene River, adjacent lateral lakes, floodplains, and associated wetlands down to the depositional areas of the Spokane River, which flows from Coeur d'Alene Lake into Washington State. The primary source of metals contamination in the Lower Basin is from the Upper Basin (including the Box).

Figure 1-1. Location Map: Bunker Hill Mining and Metallurgical Complex Superfund Site



OU = Operable Unit

Note:
The river corridor portions of the South Fork of the Coeur d'Alene River and Pine Creek located within the Bunker Hill Box are considered to be part of OU 3.

Figure 1-1
Location Map
Record of Decision (ROD) Amendment
Upper Basin of the Coeur d'Alene River
Bunker Hill Superfund Site

382081.TA.07.01.01.04_BunkerHill_ES031812185638SEA . Fig 1-1 Location Map v6 29jun12.ai . gr

EPA

1.2 Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Bunker Hill Mining and Metallurgical Complex Superfund Facility (Site)		
EPA ID: IDD048340921		
Region: 10	**State: ID and WA**	**City/County: Shoshone, Kootenai, Benewah Counties in Idaho, and Spokane County in Washington**
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion? No**	
REVIEW STATUS		
Lead agency: EPA		
Author name (Federal or State Project Manager): Tamara Langton, EPA Project Manager		
Author affiliation: EPA Region 10		
Review period: 12/16/2019 - 1/11/2021		
Dates of last site inspections: 7/22/2019 – 10/11/2019; 9/20/2020 – 10/18/2020		
Type of review: Statutory		
Review number: 5		
Triggering action date: 11/16/2015		
Due date *(five years after triggering action date)*: 09/30/2021		

* ***Inspections were conducted over multiple days during this timeframe.***

2 Five-Year Review Process

This section summarizes the process taken to notify the public about the 2020 Bunker Hill site FYR, obtain information about the completed and ongoing remedial actions across the site, and how and where to get the results of this FYR and report.

2.1 Community Notification, Involvement & Site Interviews

EPA first announced the upcoming fifth FYR of the Bunker Hill site at the August 2019 Coeur d'Alene Basin Environmental Improvement Project Commission (BEIPC) public meeting. In November 2019, EPA officially notified community members, organizations, and other interested parties about its launch. This notification was publicized via local newspaper advertisements, the Basin Bulletin newsletter[1], emails to over 3,000 addresses, and internet sites including EPA's Bunker Hill project website and the Coeur d'Alene Basin and EPA Region 10 Facebook pages. This notification also invited interested parties to share information about the site that EPA could consider during the FYR process. EPA initially set February 12, 2020 as the deadline to share information, but in response to several public requests extended the deadline to April 30, 2020.

As of the beginning of May 2020, EPA received over 400 emails, letters, and phone calls regarding the site. Topics ranged from timber health and restoration efforts at and around Upper Basin mine and mill sites, to abandoned tires and lead contaminated soils and sediments along the streambanks of the Coeur d'Alene River. The vast majority of input, however, focused on concerns with Lake Coeur d'Alene water quality, with most requesting EPA to conduct a full remedial investigation of and develop a cleanup plan for the lake.

EPA has not selected a remedy for Lake Coeur d'Alene, and, as such, an evaluation of the lake was not included as part of this FYR. EPA has deferred remedy selection pending successful implementation of the 2009 Coeur d'Alene Lake Management Plan (LMP) by the state of Idaho, the Coeur d'Alene Tribe, local governments, and other federal agencies using separate regulatory authorities (IDEQ and Coeur d'Alene Tribe, 2009). In 2019, the Coeur d'Alene Tribe retracted support for the LMP, though they continue to support and advocate for activities regarding lake health and water quality. IDEQ continues to implement elements of the LMP which are discussed in Appendix B.

Questions were also asked whether OU 1 or portions of OU 1 should be deleted from the NPL. The National Contingency Plan (NCP) allows for portions of NPL sites to be deleted once these portions have achieved and documented completion milestones and have met certain requirements (EPA, 2011). Deletion or partial deletion may occur when no further response action is needed and the risk to public health or the environment has been mitigated.

Although the property remediation program is essentially complete in OU 1 and the original 1991 Populated Areas Record of Decision (ROD) blood lead remedial action objectives (RAOs) have been achieved based on the Integrated Exposure Uptake Biokinetic Model for Lead in Children IEUBK model predictions using environmental exposure data, other factors indicate the risk to public health may not yet be fully mitigated for those living in and recreating around OU 1.

For example, the use of environmental exposure data is the recommended approach when determining cleanup levels and measuring achievement of RAOs; however, when a substantial amount of childhood blood lead data exists (e.g., nearly half of the children living at a site participate in blood draws) as in the

[1] The Basin Bulletin is a newsletter published three times a year by EPA Region 10 to provide updates about Site activities.

case of OU 1, these data may be considered when assessing remaining risk to resident children (EPA, 2016a). As discussed in the OU 1 section of this report, 2017 through 2019 mean blood lead levels fluctuated with two OU 1 communities exhibiting more than five percent of screened children with a blood lead level of 10 micrograms per deciliter of blood (µg/dL) or greater. In these years, approximately one-third to half of the estimated OU 1 childhood population participated. Additionally, recent scientific literature on lead toxicology and epidemiology supports adverse health effects associated with blood lead levels less than 10 µg/dL and may have no safe level (National Toxicology Program, 2012; EPA, 2013a; ATSDR, 2020).

Another factor to consider is information that was obtained during Lead Health Intervention Program (LHIP) follow-up services with families whose children exceeded target blood levels and/or homes that had elevated levels of lead in house dust. As discussed later in this report, alternative approaches to identify and mitigate the risks from multiple potential exposure sources within and surrounding OU 1 that may be contributing to these exceedances have only just started. Additional time beyond this FYR period to monitor and evaluate these and other alternative approaches to effectively reduce individual house dust levels to the ROD-specified interior house dust performance standard and to maintain or reduce blood lead levels to at least the 1991 ROD-specified RAOs is required.

And lastly, many remediated properties in OU 1 have heavy metals-contaminated soil and waste rock underneath six- or 12-inches of clean soil, gravel and vegetation at levels classified a hazardous substance. Ensuring the integrity of these clean barriers in perpetuity is the hallmark of success for the OU 1 selected remedy. To date, the Institutional Controls Program (ICP) has been effective at managing these barriers and it is assumed this vital program will continue to do so into the future given adequate funding. The recently completed Remedy Protection stormwater and drainage projects designed to protect these barriers are assumed to be effective. These projects, however, will take years of substantial rain and runoff events to evaluate their long-term effectiveness and future response actions may be needed to address remaining contamination that poses residual risk to public health.

Given consideration of the above factors, EPA and IDEQ do not recommend that OU 1 or portions of OU 1 be deleted from the NPL at this time.

2.2 Site Inspections

Information to conduct this FYR was also obtained from ongoing remedial action and routine operation and maintenance (O&M) inspections conducted on various dates throughout the FYR period. Some scheduled O&M inspections occurred semi-annually while unscheduled inspections occurred due to unforeseen events, such as heavy rainfall or flooding. No inspections were done for the sole purpose of this FYR.

Inspections were conducted by FYR partner agencies and their contractors including EPA, IDEQ, Coeur d'Alene Trust, Ecology, PHD as part of administering the ICP, and also other property owners and local entities implementing remedial actions. The results of site inspections and issues impacting current and/or future protectiveness are summarized within each of the sections for OU 1, OU 2, and OU 3.

2.3 Five-Year Review and Report Availability

The results of this FYR and report are available via the following:

- Visiting the EPA Region 10 website[2]
- Calling EPA at 1-800-424-4372, extension 8561
- Visiting one of the site's seven information repositories listed as follows:

Kellogg Public Library
16 West Market Avenue
Kellogg, ID 83827
208-786-7231

Coeur d'Alene Field Office, EPA
1910 Northwest Boulevard, Suite 208
Coeur d'Alene, ID 83814
208-664-4588

St. Maries Library
822 W. College Avenue
St. Maries, Idaho 83861
208-245-3732

Wallace Public Library
415 River Street
Wallace, ID 83873
208-752-4571

Spokane Public Library
906 West Main Avenue
Spokane, WA 99201-0976
509-444-5336 (reference desk; ask for Dana Dalrymple)

Molstead Library (North Idaho College) Library
1000 Garden Avenue
Coeur d'Alene, ID 83814
208-769-3355

[2] The EPA Region 10 Website: https://www.epa.gov/aboutepa/epa-region-10-pacific-northwest

3 Sitewide Response Action Summary

This section summarizes the history and nature and extent of contamination at the Bunker Hill Superfund site that led to its listing on the NPL. This section also summarizes response actions conducted prior to EPA decision documents and remedies selected within EPA decision documents.

3.1 Basis for Taking Action

The Bunker Hill Superfund site is within one of the largest historical mining districts in the world. Commercial mining for lead, zinc, silver, and other metals began in what is called the "Silver Valley" in 1883. Metals related to mining, milling, and smelting activities have contaminated soil, sediment, surface water, and groundwater across the site. As a result of past mining, milling, and smelting practices, substantial portions of the site contain elevated concentrations of lead, zinc, cadmium, arsenic, and other metals that are hazardous to human health and the environment.

The principal sources of metal contamination were from waste rock piles from mining, tailings generated from the milling of ore which were discharged to the South Fork Coeur d'Alene River (SFCDR) and its tributaries or confined in large onsite waste piles, and from air emissions from smelting operations in Kellogg and Smelterville depositing significant metals and sulfur dioxide across the site.[3] Spillage from railroads and other modes of transportation also contributed to contamination.

Tailings discharged to the SFCDR and its tributaries were transported downstream, particularly during high-flow events, and deposited as lenses of tailings or as tailings/sediment mixtures in the bed, banks, floodplains, and lateral lakes of the main stem of the Coeur d'Alene River, and into Coeur d'Alene Lake. Some fine-grained material washed through the lake and was deposited as sediment within the Spokane River flood channel. The estimated total mass and extent of impacted materials (primarily sediments) exceeds 100 million tons dispersed over thousands of acres (EPA, 2001).

3.2 Site Receptors and Pathways

Contaminants across the site have impacted both human health and ecological receptors. The primary contaminants and media of concern, and the primary pathways for exposure for human and ecological receptors are summarized in Table 3-1 and Table 3-2 on the following page.

[3] Smelter operations ceased in 1981, but limited mining and milling operations continued onsite from 1988 to 1991, and small-scale mining operations continue to this day.

Table 3-1. Contaminants Impacting Human Health

Contaminants of Concern	Media of Concern	Primary Exposure Pathways
Lead and Arsenic	Contaminated soil where it occurs in residential yards, ROWs, commercial and undeveloped properties, and common areas, and airborne dust generated at these locations. Contaminated floodplain soil, sediments, and vegetation.	Ingestion and Inhalation
Lead and Arsenic	Contaminated house dust, originating primarily from contaminated soil and interior house paint.	Ingestion
Lead, Arsenic, and Cadmium	Private drinking water wells or from surface water.	Ingestion

Although fish and vegetables were not screened for contaminants of concern (COCs), indicator metals were selected for these based on toxicity and presence in the Basin. The selected indicator metals for humans consuming fish were cadmium, lead, and mercury, and for vegetable consumption were arsenic, cadmium, and lead.

Table 3-2. Contaminants Impacting Ecological Receptors

Contaminants of Concern	Media of Concern	Primary Exposure Pathways
Arsenic, cadmium, copper, lead, and zinc	Soil	Ingestion and Direct Contact; Root uptake
Arsenic, cadmium, copper, lead, mercury, silver, and zinc	Sediment	Ingestion and Direct Contact; Root uptake
Cadmium, copper, lead, and zinc	Surface water	Ingestion and Direct Contact; Root uptake

Cadmium, lead, and zinc are pervasive in all environmental media and at the concentrations found across the site, generally present higher risks to ecological receptors than arsenic, copper, mercury, and silver. In addition, groundwater is important as a pathway for migration of metals to surface water.

3.3 Response Actions

As noted in Section 1, the Bunker Hill Superfund site was placed on the NPL in 1983. Following initial investigation of OU 1 and OU 2, cleanup actions began in the 1980s. Cleanup actions have been conducted by numerous parties in addition to EPA including mining companies, the Coeur d'Alene Tribe, IDEQ, Ecology, BLM, USFWS, the U.S. Forest Service (USFS), the Silver Valley Natural Resource Trustees (SVNRT), and the federal Coeur d'Alene Basin Natural Resource Trustees. Some of these actions were implemented prior to release of EPA decision documents. Many additional cleanup actions have been implemented since release of EPA decision documents and continue today.

3.3.1 Pre-EPA Decision Documents

Numerous investigations and response actions across each of the three OUs were conducted prior to release of EPA decisions documents. Each of these "early" response actions were either overseen by EPA or the state of Idaho to ensure compatibility with applicable or relevant and appropriate requirements (ARARs) and other criteria or were re-evaluated and included in subsequent EPA RODs, if necessary, to achieve cleanup goals. Appendix C lists the pre-ROD response actions by operable unit.

3.3.2 EPA Decision Documents

EPA-selected remedies are documented in various decision documents. Table 3-3 lists each of the Bunker Hill Superfund site decision documents by OU and the RAOs, major remedy components, and the cleanup goals for each.

Table 3-3. EPA Decision Documents by Operable Unit, Remedial Action Objectives, Major Remedy Components, and Cleanup Goals

Decision Documents	Remedial Action Objectives (RAOs)	Major Remedy Components	Cleanup Goals
Operable Unit 1 (Populated Areas/Residential Soils)			
August 1991 **Residential Soils/Populated Areas Record of Decision (ROD)** **September 1992** **Non-populated Areas ROD** *(Included aspects of the Populated Areas that were not addressed in the 1991 ROD [ROWs, commercial buildings, and lots; Residential interiors; public water supply considerations)* **April 1998 ESD** *(Change to1992 Non-populated ROD to add well refusal remedy component)* **August 2012** **Upper Basin Interim ROD Amendment** *(Amended both the Populated Areas and the Non-populated Areas RODs. Added first drinking water RAO for OU 2; and, added protection of OU 1 human health barrier protections.)* **October 2015 ESD** *(Change to 2012 Upper Basin Interim ROD to add 2 new Remedy Protection Projects.)*	Human Health • Blood Lead: Decrease exposure to lead-contaminated residential soils such that: ▪ No more than 5 percent of children in the community have a blood lead level of 10 µg/dL or greater. ▪ Less than 1 percent of children have a blood lead level exceeding 15 µg/dL. • Restore surface water designated as beneficial use for drinking water to meet drinking water and water quality standards. • Prevent ingestion of surface water used as drinking water and containing COCs exceeding drinking water standards and associated risk- based levels for drinking water. • Minimize the potential for recontamination of previously remediated residential yards.	Human Health • Removal of residential contaminated surficial soil greater than or equal to (≥) 1,000 micrograms per kilogram (mg/kg) lead, replacement with clean soil, and revegetation of yards. • Control of fugitive dust. • Disposal of contaminated materials in site repository. • Adoption of the Lead Health Intervention Program (LHIP) to include blood screening and vacuum loan program. • Establish an Institutional Controls Program (ICP) to maintain protective barriers to underlying contamination over time. • Removal of contaminated surficial soils in gravel rights-of-ways (ROWs), commercial buildings and lots (includes public buildings parks, churches) commensurate with 1991 Populated Areas ROD remedy components and cleanup goals. • Residential Interiors: Develop and implement interior dust monitoring program and clean all homes ≥ 1,000 mg/kg lead house dust after OU 1 remedial actions are completed. • Public Water Supply Considerations: Abandon and close contaminated wells in main valley aquifer (upper and lower aquifers) and other potentially contaminated wells. Provide an alternate source of water for any well used for drinking water. • Property owners who refuse closure of contaminated groundwater wells will be tracked by the ICP until property owner changes mind or property is sold to new owner. • Stormwater control actions to protect the existing human health barriers to underlying contamination (aka Remedy Protection Projects). • Fix paved roads as barriers for protection of human health collaboratively with local and county entities responsible for providing and maintaining roadways in their communities.	Human Health • Residential Soil Lead (Primary COC) ▪ Action Level: ≥ 1,000 mg/kg ▪ Performance Standard: Achieve geometric mean yard soil concentration of less than (<) 350 mg/kg for each residential community in OU 1. • Clean Replacement Soil Performance Standards *(on average)*: ▪ Arsenic: ≤ 100 mg/kg ▪ Cadmium: ≤ 5 mg/kg ▪ Lead: ≤ 100 mg/kg *(no individual sample greater than (>) 150 mg/kg lead)* ▪ House Dust Lead ▪ Action Level: ≥ 1,000 mg/kg ▪ Performance Standard: Achieve geometric mean of interior house dust lead levels for each community of less than or equal to (≤) 500 mg/kg, with no individual house dust level ≥ 1,000 mg/kg. • Groundwater Wells as Drinking Water: ▪ Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs) for arsenic, cadmium, lead, manganese, and zinc.

Decision Documents	Remedial Action Objectives (RAOs)	Major Remedy Components	Cleanup Goals
Operable Unit 2 (Non-populated Areas)			
September 1992 Non-populated Areas ROD **September 1996 Non-populated Areas ROD Amendment** *(Change to Principal Threat Materials [PTM] treatment and disposal specified in 1992 Non-populated Areas ROD)* **January 1996 ESD** *(Change to 3 area remedies in 1992 Non-populated Areas ROD)* **April 1998 ESD** *(Change to 11 area remedies in the 1992 Non-populated Areas ROD)* **December 2001 Non-populated Areas ROD Amendment** *(Also called "Minewater" ROD Amendment. Focused on AMD management from Bunker Hill Mine.)* **August 2012 Upper Basin Interim ROD Amendment** *(Added protection of barriers from stormwater and an OU 2 riparian songbird cleanup level; and clarified and modified Phase II Water Collection and Treatment.)* **February 2018 ESD** *(Change to 2012 Upper Basin Interim ROD Amendment to change groundwater collection system to a soil bentonite cut-off wall and pumping system rather than a drain system.)*	<u>Human Health and Environmental</u> Specific RAOs were established for each of the nonpopulated, nonresidential areas and subareas. RAOs for each area included a subset of the following: • Minimize risk of direct contact with contaminants. • Minimize erosion and wind dispersion of contaminants in soil. • Minimize surface water infiltration into contaminated materials. • Reduce contamination of surface water and groundwater. • Reduce suspended sediment and/or contaminant loading in surface runoff to South Fork Coeur d'Alene River (SFCDR). • Maximize efficient interception of contaminated groundwater from the CIA seeps. • Minimize habitat destruction. • Prevent the release of untreated AMD into Bunker Creek and the SFCDR. • Reduce the concentrations and mass per day of metals discharged into Bunker Creek and SFCDR. • Upgrade the CTP to meet current water quality standards. • Reduce the volume of sludge generated at the CTP in order to maximize existing sludge storage capacity. • Provide for long-term sludge storage needs. • Reduce the quantity of AMD generated by the mine. • Reduce the long-term AMD management costs. • Minimize the potential for recontamination of previously remediated areas.	<u>Human Health and Environmental</u> • Demolition of abandoned milling and processing facilities. • Source material removals. • Capping of surface material. • Revegetation. • Stabilization of creek channels. • Disposal of contaminated materials in repositories. • ICP that focuses on future development in OU 2. • AMD Source Control: Construction of West Fork Milo Creek Diversion, rehabilitating the Phil Sheridan Rise, and plugging in-mine drill holes. • AMD Collection: Collection of AMD within the Bunker Hill Mine. • AMD Storage: AMD storage required when the CTP is shut down for maintenance or repairs, or when mine water flow exceeds treatment capacity. • AMD Conveyance: Conveyance of mine water from the Kellogg Tunnel to the CTP. • Sludge Management: Disposal of sludge in current lined pond on top of CIA to capacity and the close. Construct new lined pond on top of CIA. • Stormwater control actions to protect the existing human health barriers to underlying contamination (aka Remedy Protection Projects). • Fix paved roads as barriers for protection of human health collaboratively with local and county entities responsible for providing and maintaining roadways in their communities. • Phase II water collection and treatment clarifications and modifications: ▪ Install groundwater cutoff walls at the top of Government Creek to divert clean groundwater to the lined surface water stream. Contaminated groundwater at the base of Government Gulch will be collected for treatment at the CTP. ▪ Line Government Creek and divert CTP effluent away from Bunker Creek to minimize infiltration through contaminated materials. ▪ Groundwater collection near the CIA with a soil bentonite cut-off wall and multi-well pumping system. Change from original design as a drain system. Contaminated groundwater will be collected and piped to the CTP. ▪ Collection and treatment of groundwater and water management actions to reduce the flow of contaminated discharges near the Reed and Russell Adits. ▪ Expansion and upgrade of the CTP to provide treatment of collected water and AMD from OU 2, consistently achieve discharge requirements, allow for operation in high-density sludge mode, and reduce the volume of waste sludge generated. ▪ Conveyance of effluent from the CTP (i.e., clean, treated water) directly to the SFCDR in a pipeline.	<u>Human Health and Environmental</u> • Soil Lead: ▪ Action Level: ≥ 1,000 mg/kg • Clean Replacement Soil Performance Standards *(on average)*: ▪ Arsenic: ≤ 100 mg/kg ▪ Cadmium: ≤ 5 mg/kg ▪ Lead: ≤ 100 mg/kg *(no individual sample >150 mg/kg lead)* • PTM Action Levels: ▪ Antimony: 127,000 mg/kg (12.7%) ▪ Arsenic: 15,000 mg/kg (1.5%) ▪ Cadmium: 71,000 mg/kg (7.1%) ▪ Lead: 84,600 mg/kg (8.5%) ▪ Mercury: 33,000 mg/kg (3.3%) • Magnet and Government Gulch Upland Action Levels: ▪ Antimony, Arsenic, Cadmium, Mercury: ≥ 850 ppm ▪ Lead: ≥ 10,000 mg/kg ▪ Zinc: ≥ 9,000 mg/kg • Magnet and Government Gulch Streambed Action Levels: ▪ Antimony, Arsenic, Cadmium, Mercury:≥850 mg/kg ▪ Lead, Zinc: ≥1,000 mg/kg • Effluent Discharge Limits: Discharge limits for the upgraded CTP are based on Idaho water quality standards and national recommended water quality criteria for the contaminants of concern (aluminum, arsenic, cadmium, copper, iron, lead, mercury, manganese, selenium, thallium, silver, and zinc), as well as the CTP Total Maximum Daily Load (TMDL) units for cadmium, lead, and zinc. Discharge limits expected to be met where the CTP discharges into Bunker Creek are based on the expected hardness of the effluent. <u>Ecological Receptors</u> • Soil/sediment (Protection of riparian songbirds): ▪ Lead: 530 mg/kg

Decision Documents	Remedial Action Objectives (RAOs)	Major Remedy Components	Cleanup Goals
Operable Unit 3 (Coeur d'Alene Basin)			

September 2002
Operable Unit 3 Interim ROD
(The human health selected remedy is based on the risk assessment for OU 3 residential and community areas only and does not include the Box.)
 	
August 2012
Upper Basin Interim ROD Amendment
(For human health actions in OU 3, this decision document amends the 2002 OU 3 Interim ROD RAOs and adds new major remedy components. "Upper Basin" in this case does not include the Box.)
 	
October 2015 ESD
(Change to 2012 Upper Basin Interim ROD Amendment to add three OU 3 Remedy Protection Projects.)
 	
July 2017 ESD
(Change to 2012 Upper Basin Interim ROD Amendment to add one new OU 3 Remedy Protection Projects.)
	<u>Human Health</u>
	• Reduce mechanical transportation of soil and sediments containing unacceptable levels of contaminants into residential areas and structures.
	• Reduce human exposure to lead in house dust via tracking from areas outside the home and air pathways exceeding health risk goals.
	• Reduce ingestion by humans of groundwater or surface water withdrawn or diverted from a private, unregulated source, used as drinking water, and containing contaminants of concern exceeding drinking water standards and risk-based levels for drinking water.
	• Reduce human exposure to unacceptable levels of contaminants of concern via ingestion of aquatic food sources (e.g., fish and water potatoes).
	• Soil, sediments, and source materials: Reduce human exposure to soil, sediments, and source materials, including residential yard soil, that have concentrations of COCs greater than selected risk-based levels for soil.
	• Surface water: Restore surface water designated as beneficial use for drinking water to meet drinking water and water quality standards.
	• Surface water: Prevent ingestion of surface water used as drinking water and containing COCs exceeding drinking water standards and associated risk-based levels for drinking water.
	• Surface water: Prevent discharge of seeps, springs, and leachate that would cause surface water to exceed drinking water and water quality standards.
		<u>Human Health</u>
		• Partial removal and replacement of residential soils with lead concentrations ≥ 1,000 mg/kg; a barrier such as a vegetative barrier to control or limit migration of soils with lead concentrations between 700 and 1,000 mg/kg; and a combination of removals, barriers, and access restrictions at commercial and undeveloped properties.
		• Removal and/or capping of formal recreational areas identified in the ROD (boat ramps, picnic areas, and campgrounds) with surface soil/sediment lead concentrations ≥ 700 mg/kg. Areas with soil arsenic concentrations ≥ 100 mg/kg levels will be prioritized for cleanup based on use.
		• Lead health information and intervention program similar to the Box LHIP to include free blood lead screenings, a vacuum loan program, education and outreach services, and monitoring of house dust lead levels (loading rates) and concentrations. Remediation of interior house dust at end of property remediation program, if necessary.
		• Multiple alternative drinking water sources (wellhead or point-of-use treatment, connection to the public drinking water system, or a new well) for residences using groundwater having metals at concentrations exceeding SDWA MCLs.
		• Dust suppression during remedial activities.
		• Disposal of contaminated materials.
		• Expansion of Box ICP to include OU 3 for protection of human health barriers to underlying contamination.
		• Fish tissue sampling and education and outreach regarding risks of eating fish and other aquatic food sources, e.g., fish advisories.
		• Stormwater control actions to protect the existing human health barriers to underlying contamination (aka Remedy Protection Projects).
		• Fix paved roads as barriers for protection of human health collaboratively with local and county entities responsible for providing and maintaining roadways in their communities.
		• Remedial actions for 15 mine and mill sites that pose unacceptable risks to human health.
		• Spokane River Recreational Areas:
		  ○ The selected remedy consists of a combination of access controls, capping, removals, and performance monitoring. for shoreline sediment depositional areas along that reach of the Spokane River within the state of Washington upstream of the Spokane Indian Reservation.
		  ○ It also includes remediation of contaminated sediments stored behind Upriver Dam and performance
			<u>Human Health</u>
			• Blood Lead: OU 3 soil, sediment, and house dust remedial actions are expected to reduce lead exposures such that there is a 5 percent or less probability of a typical child having a blood lead level > 10 µg/dL and a 1 percent or less probability of a typical child having a blood lead level > 15 µg/dL.
			• Residential Soil Lead Action Levels:
			  ▪ Arsenic: ≥ 100 mg/kg
			  ▪ Lead: ≥ 700 and ≥ 1,000 mg/kg
			• Clean Replacement Material *(Soil or Crushed Aggregate/Gravel)* Performance Standards (on average):
			  ▪ Arsenic: < 35 mg/kg *(no single sample > 45 mg/kg)*
			  ▪ Cadmium: < 5 mg/kg
			  ▪ Lead: < 100 mg/kg *(no individual sample >150 mg/kg lead)*
			• Recreational Area Surface Soil/Sediment Action Levels:
			  ▪ Arsenic: ≥100 mg/kg *(prioritized based on use)*
			  ▪ Lead: ≥ 700 mg/kg (capping of boat ramps, picnic areas and campgrounds) and ≥ 1,000 mg/kg (removal).
			• House Dust Lead:
			  ▪ Low enough to achieve lead health risk goals *(stated above in the first bullet)*
			  ▪ Intervention when dust levels ≥ 1,500 mg/kg
			• Drinking Water Action Levels:
			  ▪ Arsenic: ≥ 10 µg/L
			  ▪ Cadmium: ≥ 5 µg/L
			  ▪ Lead: ≥ 15 µg/L
			• Surface Water *(Table 8-1 and notes in the 2012 Upper Basin IRODA)*:
			  • Arsenic: 10 µg/L
			  ▪ Cadmium: 0.62[a] µg/L
			  ▪ Copper: 6.3[b] µg/L
			  ▪ Lead: 14.7[c] µg/L
			  ▪ Mercury: 0.012[d] µg/L
			  ▪ Zinc: 123[e] µg/L
			• Groundwater cleanup levels for protection as a drinking water source *(Table 8-2 in the 2012 Upper Basin IRODA)*:
			  ▪ Arsenic: 10 µg/L
			  ▪ Cadmium: 5 µg/L
			  ▪ Copper: 1,300 µg/L
			  ▪ Lead: 15 µg/L
			  ▪ Zinc: 5,000 µg/L

Decision Documents	Remedial Action Objectives (RAOs)	Major Remedy Components	Cleanup Goals
Operable Unit 3 (Coeur d'Alene Basin) Continued			
	Ecological Receptors • Ecosystem: Remediate soil, sediment, and water quality and mitigate mining impacts in habitat areas to be capable of supporting a functional ecosystem for the aquatic and terrestrial plant and animal populations in the Coeur d'Alene Basin. • Ecosystem: Maintain (or provide) soil, sediment, and water quality and mitigate mining impacts in habitat areas to be supportive of individuals of special-status biota that are protected under the Endangered Species Act and the Migratory Bird Treaty Act. • Soil, Sediment, Source Materials: Prevent ingestion of arsenic, cadmium, copper, lead, mercury, silver, and zinc by ecological receptors at concentrations that results in unacceptable risks. • Soil, Sediment, Source Materials: Reduce loadings of cadmium, copper, lead, and zinc from soil and sediments to surface water so that exceedances do not cause potential surface water quality applicable or relevant and appropriate requirements (ARARs). • Soil, Sediment, Source Materials: Prevent transport of cadmium, copper, lead, and zinc from soil and sediments to groundwater at concentrations that exceed potential surface water quality ARARs. • Soil, Sediment, Source Materials: Prevent dermal contact with arsenic, cadmium, copper, lead, mercury, silver, and zinc by ecological receptors at concentrations that result in unacceptable risks. • Mine water: Prevent discharge of cadmium, copper, lead, and zinc in mine water, including adits, seeps, springs, and leachate to surface water at concentrations that exceed potential surface water quality ARARs. • Groundwater: Prevent discharge of groundwater to surface water at concentrations of cadmium, copper, lead, and zinc that exceed potential surface water quality ARARs.	Ecological Receptors • Upper Basin: ▪ Excavation and Secure Placement of Materials: Excavation of waste rock, tailings, and floodplain sediments and placement of excavated materials in waste consolidation area or repository. ▪ Source Stabilization: Low-permeability capping or regrading, consolidation, and revegetation of exiting tailings impoundments and waste rock areas. ▪ Groundwater Treatment: Hydraulic isolation of contaminated groundwater in the Woodland Park area of Canyon Creek and in the SFCDR near Osburn will prevent the contaminated groundwater from reaching the surface streams. ▪ Collection and Treatment of Contaminated Surface Water: Collection of contaminated adit discharges and seeps, and active treatment at the CTP or passive treatment at the site. ▪ Stream and Riparian Cleanup: Improvement of bank and stream stability, thereby reducing erosion and sediment loading, by installation of current deflectors, vegetative bank stabilization, and sediment traps. • Lower Basin Floodplains: ▪ Combination of capping and excavation in high-priority floodplain areas (areas with high use by waterfowl, high levels of lead in sediments, availability of site access, and relatively low potential for recontamination during flood events). ▪ Soil treatment to reduce lead bioavailability may be applied in selected areas if effective treatment technologies are identified. ▪ Identify agricultural and other areas (subject to landowner approval and further sampling) with lower levels of lead for cleanup to provide additional clean feeding areas. ▪ Contaminated materials in lakes and marshes would be excavated from some areas and transported to an upland repository or consolidated within the lateral lake being cleaned up. ▪ Other areas would be capped with a layer of clean soil to prevent feeding birds from becoming exposed to metals. ▪ Lower Basin Beds and Banks**:** ▪ Excavation of contaminated bank sediment and bank stabilization for riverbanks that are highly susceptible to erosion.	Ecological Receptors • Soil/sediment (Protection of riparian songbirds): ▪ Lead: 530 mg/kg • Water Quality Standards and Criteria for Protection of Aquatic Life in the Lower Basin, Coeur d'Alene Lake, and Spokane River Within Idaho (See Table 8.2-3 in 2002 OU 3 Interim ROD). • SFCDR-specific Ambient Water Quality Criteria: The SFCDR-specific criteria were developed using EPA's "resident species" approach that involved testing the toxicity of cadmium, lead, and zinc in actual site water near the headwaters of the SFCDR (upstream of pollution from mining activities) using native species that occur in the subbasin. The studies included toxicity tests with 14 species, including westslope cutthroat trout, shorthead sculpin, mayflies, stoneflies, caddisflies, other insects, and snails. The SFCDR-specific criteria were developed by the state of Idaho and reviewed and approved by EPA in 2002 after the 2002 OU 3 Interim ROD was published. • Surface Water Cleanup Levels (Table 8-1 and notes in the 2012 Upper Basin IRODA): ▪ Arsenic: 10 µg/L ▪ Cadmium: 0.62[a] µg/L ▪ Copper: 6.3[b] µg/L ▪ Lead: 14.7[c] µg/L ▪ Mercury: 0.012[d] µg/L ▪ Zinc: 123[e] µg/L

Decision Documents	Remedial Action Objectives (RAOs)	Major Remedy Components	Cleanup Goals
	• Ecosystem: Reduce COCs in soil, sediments, and surface water to support a functional ecosystem for aquatic and terrestrial plant and animal populations (including, but not limited to, waterfowl, riparian songbirds, and other species protected under the Endangered Species Act, the Fish and Wildlife Conservation Act, and the Migratory Bird Treaty Act) in the Upper Basin.	▪ Pilot riverbed sediment removal program in the Coeur d'Alene River near Dudley. Implement periodic removal of riverbed sediments in Dudley Reach or other natural depositional areas ▪ Construct and operate sediments traps at splay areas where the river overflows its banks during high flow conditions after evaluation though pilot studies. ▪ Hydraulic controls (floodgates) and levees could be used to limit recontamination of treated areas.	
Operable Unit 3 (Coeur d'Alene Basin) Continued			
	<u>Ecological Receptors Continued</u> • Soil, sediment, and source materials: Reduce risks from COCs in soil, sediments, and source materials to acceptable exposure levels that are protective of ecological receptors. • Soil, sediment, and source materials: Reduce transport and deposition of COCs from soil, sediments, and source materials into surface water and groundwater at concentrations above levels that are protective of ecological receptors. • Mine Water: Reduce discharge of mine water, including adits, seeps, springs and leachate, containing COCs to surface water at concentrations that cause surface water to exceed levels protective of ecological receptors. • Groundwater: Reduce discharge of groundwater containing COCs to surface water at concentrations that cause surface water to exceed levels that are protective of ecological receptors. • Surface Water: Reduce risks from COCs in surface water to acceptable exposure levels that are protective of ecological receptors.	<u>Ecological Receptors Continued</u> • Spokane River: ▪ The remedy for the contaminated sediments behind Upriver Dam will be established following further study and engineering evaluation. Dredging or capping are the options anticipated for sediments behind the dam.	

3.3.3 Institutional Controls Program

In addition to the general remedy components found in Table 3-3, the Bunker Hill Superfund site's ICP is common to all 3 operable units and is integral to the achievement of site RAOs.

The PHD implements the ICP following the requirements described in the Idaho Administrative Procedures Act (IDAPA) 41.01.01.500 through 41.01.01.543 and 41.01.01.900 through 41.01.01.902. Its purpose is to 1) protect public health by controlling human exposure to contaminated soil, 2) ensure that barriers to underlying contamination remain protective, are adequately maintained, and are appropriately installed in new developments and during redevelopment activities, and 3) ensure clean materials are used and provide appropriate disposal options for local communities.

The program regulates construction and land use changes, including providing information for interior construction and renovation projects that involve ceiling or insulation removal, as well as dirt basements and crawl spaces. The ICP's permitting process is linked to existing local building departments and land use planning activities. Educational materials are made available primarily through permitting, contractor training, and property disclosures to owners, lenders, and realtors.

The ICP also provides several services free to residents, including education, sampling assistance, clean soils for small projects (less than 1 cubic yard of material), collection of soil removed in small projects, and a permanent disposal site for contaminated soils generated within the ICP administrative area.

Discussions about ICP activities since the last FYR are provided in the OU-specific sections of this report.

3.3.4 Basin Environmental Monitoring Program

The Coeur d'Alene Basin Environmental Monitoring Program (BEMP) supports the OU 2 and OU 3 decision documents by establishing a sitewide environmental monitoring plan for the following:

- **Surface Water**: Dissolved and total metals concentrations, and hardness (calcium and magnesium). The surface water monitoring design emphasizes dissolved zinc, cadmium, and lead under a range of flow conditions, and total lead under high-flow conditions.
- **Sediments**: Metal concentrations in sediments in river, stream, and riparian environments in the Upper Basin (particularly Ninemile Creek, Canyon Creek, Pine Creek, and the South Fork Coeur d'Alene River); metals concentrations in sediments within river, stream, riparian, lake, and wetland environments in the Lower Basin; and metals concentrations in sediments within depositional areas of the Spokane River. The BEMP aims to monitor sediments for long-term trends while soil in source areas may be targeted for action-specific testing and monitoring as appropriate.
- **Groundwater**: Dissolved metals concentrations of the primary COCs including arsenic, cadmium, copper, lead, mercury, and zinc.
- **Biological resources**, which generally include:
  - Fish, macroinvertebrates, periphyton, and aquatic habitat in river and stream environments.
  - Songbirds, small mammals, and vegetation in riparian environments.
  - Waterfowl in wetland environments; and
  - Waterfowl and fish in lake environments.

The goal of the BEMP is to provide a framework for collection, analysis, and interpretation of environmental monitoring data that will support management goals, guide, and prioritize remedial

actions, and document progress toward RAOs. The BEMP focuses on data collection pertaining to the following monitoring goals:

- Assess long-term status and trends of contaminants in site media.
- Evaluate the performance and effectiveness of pilot projects, interim and final remedial actions.
- Provide data for CERCLA-required five-year reviews of the progress on remedy implementation.
- Evaluate progress toward meeting RAOs.
- Improve the understanding of the Coeur d'Alene Basin environmental processes and variability to optimize subsequent remedial action implementation.

The BEMP also supports a variety of non-CERCLA and state monitoring efforts, including the Coeur d'Alene LMP (Appendix B).

BEMP data used to evaluate OU 2 and OU 3 remedial actions since the 2015 FYR are discussed in the OU-specific sections of this report.

4 Operable Unit 1

4.1 Status of Implementation

This section describes the status of remedial actions implemented in OU 1 since the 2015 FYR.

4.1.1 Residential and Community Areas

Response activities in OU 1 residential and community areas[4] as described in site decision documents began in 1985. Since that time many of these actions have been completed and have transitioned into O&M. Human health remedial actions conducted since the 2015 FYR are discussed below. These actions were conducted to limit exposures to contaminated soil, house dust, and drinking water.

4.1.1.1 Lead Health Intervention Program (1985 - present)

The LHIP was initiated in 1985 by the Idaho Department of Health and Welfare (IDHW) to minimize blood lead levels in children through education and awareness about the risks associated with lead contamination and voluntary blood lead screening. The 1991 Populated Areas ROD included the LHIP as a major remedy component.

The PHD implements the LHIP which continues to provide voluntary blood lead screenings, outreach materials and education opportunities, and the loan of a high-efficiency particulate air filter (HEPA) vacuum. Additionally, as part of the LHIP, the PHD conducts house dust lead monitoring follow-up and intervention services discussed in Section 4.1.1.3 below.

Blood Lead Screening

Annual voluntary blood lead screening of children and follow-up with those exhibiting elevated lead levels have been offered since 1985. Fixed-site blood lead screening events were held each year between 2015 and 2019. Screenings were offered free of charge to people who live or recreate within the site.

To increase participation rates, a monetary incentive was reinstituted in 2016 for each child 6 months to 6 years of age living within site boundaries. Starting in 2017, the events were advertised more broadly utilizing a variety of social media platforms, and events were moved from July to August for multiple reasons including increasing participation rates (Alta, 2019a).

The PHD offered follow-up services to the parents of children with blood lead levels of ≥ 5 µg/dL, based on recommendations from the Centers for Disease Control and Prevention (CDC, 2012). Since the 2015 FYR, follow-up services were offered to the families of 55 children who participated in the blood screening events as well as families of children who were referred by a doctor. Twelve (12) families (a total of 22 children, including children with a blood lead level of ≥ 5 µg/dL and their siblings) accepted in-home consultations (three in 2016, three in 2017, two in 2018, and four in 2019).

The observed increase in participation and the results of blood lead screenings are discussed in the *Data Review* section.

[4] Residential areas refer to privately owned or occupied homes and property. Community areas refer to public places, such as recreational areas, parks, town centers, and businesses.

Outreach and Education

PHD staff continued to work with IDEQ and EPA to provide outreach and education services to raise awareness about the risks associated with lead exposure and protective measures that can be taken to reduce those risks. A detailed list of activities can be found in BEIPC annual reports (BEIPC, 2016, 2017, 2018, 2019, 2020). A summary of activities is provided below.

- Outreach at local community events, including organizing and hosting multiple events.
- Classes for students in kindergarten through third grade conducted at 7 to 9 schools each year.
- Updated signs posted at public recreation sites, including along the Trail of the Coeur d'Alenes.
- Updated newsletters, brochures, and posters including articles in the tri-annual Basin Bulletin newsletter and the "Healthy Living in the Silver Valley and Coeur d'Alene Basin" brochure.
- Public service announcements run throughout the peak summer season.
- Childrens' activity books disseminated to an average of 900 children per year in kindergarten through third grade.
- Presentations at schools including one middle school and two high schools where simplified blood lead modeling, recreation, lead health education, and Superfund site history topics were discussed.

Vacuum Loan Program

The HEPA vacuum loan program continued to be offered as part of the LHIP during this FYR period. From 2015 through 2019, HEPA vacuums were checked out an average of 59 times each year for use in homes within the site.[5] An average of 50 people checked out the vacuums each year from an average of 50 addresses, indicating this service is still useful to residents.

4.1.1.2 Property Remediation Program (1986 - 2008)

Remediation of OU 1 residential and commercial properties, common-use areas, and rights-of-ways (ROWs) began in 1986 when EPA and IDHW conducted time-critical removals on areas with the highest soil lead concentrations. In 1994, EPA and the state of Idaho entered into a Consent Decree (CD) with the potentially responsible parties (PRPs) to take over and conduct remedial actions selected in the 1991 Populated Areas ROD. In 2008, EPA and the IDEQ certified the PRPs' CD work complete. As part of certification, the PRPs provided a cash-out payment to the state of Idaho which was deposited into a State-held trust fund to cover future remediation of refusal properties.

Property refusals are tracked under the site's ICP managed by the PHD. If a property owner changes their mind or the property is acquired by a new owner, remediation is conducted as part of O&M.

4.1.1.3 House Dust Monitoring and Intervention Services (1988 - present)

IDEQ and PHD sampled house dust from vacuum bags annually from 1988 through 2005 (and dust mats from 1996 through 2005), and periodically thereafter in 2008 and 2013. In 2018, vacuum and/or dust mat samples were collected from 258 homes in OU 1. Approximately 7 to 10 percent of homes in all communities except Wardner (4 percent) were sampled. Additionally, petri dish sampling was conducted in 33 of the 258 homes to evaluate use of this method (Alta, 2019b).

[5] The PHD does not track loan of the HEPA vacuum by Operable Unit.

PHD provided result letters to all participants. PHD attempted by phone or letter to schedule follow-up and intervention services at 12 homes with dust lead levels ≥ 1,000 mg/kg (Alta, 2019b). PHD used a portable XRF analyzer and conducted targeted sampling at a few homes with elevated dust levels.

One-Time Interior House Cleaning

The 1992 Non-populated Areas ROD selected remedy included a one-time cleaning of OU 1 residential interiors with house dust lead concentrations ≥ 1,000 mg/kg after completion of remedial actions. To date, no interior cleanings have been implemented outside of pilot projects. Instead, periodic monitoring of house dust lead has continued, and additional activities have focused on outreach, education, and intervention services at residences with elevated house dust lead concentrations. See the *Progress Since the Last Five-Year Review* section for a discussion on why these and other alternatives to the one-time interior house cleaning remedy component are now recommended by EPA and IDEQ.

4.1.1.4 Institutional Controls Program (1995 to present)

A discussion of the purpose and components of the ICP is included in Section 3.3.3. The PHD completed the following ICP activities in the last five years:

- Issued 1,395 permits in OU 1, most of which were for large exterior excavation projects > 1 cubic yard (cy) (Table 4-1). Photographs are taken for every permitted project. Development of a secured web-based application occurred in 2019, and since then, the ICP has been issuing and tracking permits electronically.
- Issued 650 licenses to contracting companies and 88 licenses to government entities and utility companies for all OUs6. Development of a secured web-based application occurred in 2019, and since then, the ICP has been issuing and tracking contractor licenses electronically.
- Provided 1,154 property disclosures in OU 1 and OU 2.
- Recorded and followed-up with 3,473 One-Call system calls in OU 1 and OU 2.
- Scanned all current and historical permits and records of compliance into electronic files that are stored securely in the ICP database and backed up following information technology procedures. All permits and records of compliance are maintained in hard copy and/or electronic form. PHD also maintains contractor licenses, logs of samples collected and results, logs of disposal volumes and counts, and logs of clean soil and gravel provided to homeowners.

Table 4-1. Number of ICP Permits Issued in OU 1, 2015 - 2019

Permit Type	Calendar Year					Cumulative 5-Year Total	Annual Average
	2015	2016	2017	2018	2019		
Large Excavations	335	146	190	178	211	1,060	212
Large Exterior Projects - Demolition	15	8	4	11	4	42	8
Interiors	26	22	10	5	9	72	14
Records of Compliance	70	53	31	32	35	221	44
Totals	**446**	**229**	**235**	**226**	**259**	**1,395**	**279**

Notes:

Data provided by PHD (PHD, 2016; 2017; 2018a; 2019; 2020).

No new subdivisions or planned unit developments were proposed in OU 1 since the 2015 FYR.

[6] The PHD does not track licenses by Operable Unit.

In addition, the PHD delivered a total of 468 cy of clean soil/gravel to Box residents and a total of 24 vouchers were issued for homeowners to pick up clean soil and gravel (Table 4-2).

Table 4-2. OU 1 and OU 2 (Box) ICP Clean Material Volumes, 2015 - 2019

Delivery Method	Units	Calendar Year					Cumulative 5-year Total	Annual Average
		2015	2016	2017	2018	2019		
Clean soil/gravel delivery	cy	38	64	47	128	191	**468**	94
Soil/gravel voucher issued (homeowner pickup)	# of vouchers	3	2	7	9	3	**24**	5

Source: Data provided by PHD (PHD, 2016; 2017; 2018a; 2019; 2020).

The ICP also collected opportunistic samples of soil and sediment after major snow events. Data from these events is discussed in the *Data Review* section.

4.1.1.5 Remedy Protection Projects (2013 - 2015)

The IDEQ initiated remedy protection projects in 2013 to protect existing human health remedies against stormwater runoff, tributary flooding, and heavy rain. Construction of all remedy protection projects identified for OU 1 in the 2012 Upper Basin Interim ROD Amendment (EPA, 2012a) have since been completed, with the last four projects completed in the summer of 2015: Little Pine Creek, Slaughterhouse Gulch, Jackass Creek, and Silver Creek (TerraGraphics, 2016b; and TerraGraphics, 2016c).

4.1.1.6 Paved Roadway Surface Remediation Program (2013 - present)

The Box Paved Roadway Surface Remediation (Paved Roads) program, administered by EPA and IDEQ through assistance from a local jurisdiction Roads Board, began in 2013 to ensure the long-term effectiveness of barriers installed in OU 1 ROWs and to repair damage to roads that occurred during property remediations.[7]

From 2015 through 2020, approximately 26 additional miles of Box roads that were underlain by contaminated soils were rebuilt, patched, or chip sealed. Most of the 26 miles of road work completed in the last five years lie within OU 1; however, a small portion of those roads also extend into OU 2.

This program is anticipated to be completed in 2021. Future maintenance of paved roadways will be the responsibility of the applicable government jurisdiction.

4.2 Operation and Maintenance

This section summarizes routine, and O&M activities conducted in OU 1 since the 2015 FYR.

[7] The Paved Roads program was not intended to address all problems with all paved roads in the Box. It was limited in scope to roadways that were previously rated and assigned a remaining service life less than 10 years (SVTP; Silver Valley Transportation Team, 2017). Roads not addressed include alleys, roadways not listed in the SVTP, and roadways that had deteriorated to a remaining service life of less than 10 years.

4.2.1 Residential and Community Areas

O&M activities that were completed in residential and community areas are discussed below. These actions were conducted to limit exposures to contaminated soil, house dust, and drinking water.

4.2.1.1 Property Remediation Program (1986 - 2008)

The PHD remediated five refusal properties as part of O&M since the 2015 FYR (one each year from 2016 to 2018 and two in 2019). As of the end of 2019, a total of nine refusal properties are not yet remediated. These properties are located throughout the Box: five properties in Pinehurst, two in Wardner, and two in Elizabeth Park.

Private residential and commercial property owners are responsible for maintenance of their remediated property. If their property is disturbed, they must comply with ICP permitting requirements for repairs.

New property development and future modifications to existing properties will create barriers following the ICP as described in IDAPA 41.01.01.500 – 41.01.01.902. Table 4-1 in Section 4.1.1.4 includes Box ICP permits issued and material provided as part of the ICP since the 2015 FYR.

4.2.1.2 Drinking Water Program (1994 - 2008)

PRPs began water well closures in 1994 and were completed by 2008 (MFG, 1997). Since then, IDEQ identified a total of 16 properties in OU 1 with residential domestic irrigation wells whose owners had previously refused closure pursuant to Idaho Drinking Water Regulations (IDWR). See the *Progress Since the Last Five-Year Review* section for a discussion on the evaluation of these properties.

In addition, water samples collected in 2017 from a creek near Kellogg and a downstream residence that collects and uses the creek water were analyzed to determine whether heavy metals from a nearby abandoned mine waste pile were present in the water. Results of this sampling is discussed in the *Data Review* section.

4.2.1.3 Remedy Protection Projects (2013 - 2015)

Local government jurisdictions are responsible for funding and implementing O&M of the completed projects as defined by Interagency Cooperative Agreements (ICAs) with the exception of the Jackass Creek and Silver Creek projects where the landowner on whose property a drainage structure was constructed is responsible for O&M.

Table 4-3 summarizes each OU 1 remedy protection project, the date of the respective O&M manual, the party responsible for O&M, and the maintenance completed since the 2015 FYR. Scheduled inspections are to occur semi-annually, typically in May and September per the O&M manuals. Unscheduled maintenance because of unforeseen events, such as heavy rainfall or flooding, triggers additional inspections. IDEQ has conducted semi-annual inspections as part of O&M oversight. Maintenance needs, if identified, are referred to the individual maintenance jurisdictions.

Table 4-3. O&M at OU 1 Remedy Protection Projects, 2015 - 2019

Project	Community	Year Construction Completed	O&M Manual Citation	Party Responsible for Inspections and Maintenance[a]	Maintenance since 2014[a]
Grouse Creek	Smelterville	2013	TerraGraphics, 2014c	Smelterville	Brush removal
Sierra Nevada Road	Wardner	2013	TerraGraphics, 2014b	Wardner	Required (as discussed in text)
Portland Avenue	Kellogg	2014	TerraGraphics, 2016d	Kellogg	None
Little Pine Creek	Pinehurst	2014 to 2015	TerraGraphics, 2016b	Pinehurst	Required (as discussed in text)
Slaughterhouse Gulch	Wardner	2015	TerraGraphics, 2016c	Wardner	None
Jackass Creek	Kellogg	2015	TerraGraphics, 2016c	Kellogg & Shoshone Medical Center	None (see discussion in text)
Silver Creek	Page	2015	TerraGraphics, 2016c	Property owner under Environmental Covenant in accordance with ICA (EPA et al., 2015)	None

[a] The property owner and maintenance personnel at the cities of Pinehurst, Smelterville, Kellogg, and Wardner were contacted in March 2020 to provide feedback on the project performance and to summarize any maintenance activities.

Note: Findings from IDEQ's inspections are documented in inspection reports (IDEQ, 2016a; 2016b; 2017a; 2017b; 2018c; 2018d; 2018e; 2020b; 2020c)

Sierra Nevada Road: In 2019, the City maintenance personnel modified the original rock armoring around the inlet, included as part of the design, by cementing it to try to prevent the rock from shifting and blocking the intake. Recommended O&M treatment for rock armor is to replace the missing pieces of rock. Instead, the City took additional measures by cementing the rock in place to make it more secure and prevent erosion.

Little Pine Creek: In 2017, an above average rain-on-snow flooding event in Little Pine Creek damaged approximately 60 feet of bank armoring near the Maple Street crossing. The City applied for and received grants from the Federal Emergency Management Agency (FEMA) to repair the damage. In 2018, the City performed maintenance on the channel near D Street by removing built up sediment, as recommended in the O&M manual.

Jackass Creek: No O&M has been required for the Jackass Creek overflow pipe installed as part of the Jackass Creek Remedy Protection Project. Shoshone Medical Center lined the multi-sized corrugated metal pipe under their property. The rehabilitation of the Shoshone Medical Center pipe provides additional conveyance capacity for Jackass Creek, and now functions along with the overflow pipe installed as part of the Remedy Protection Project to convey high flows from Jackass Creek to the South Fork Coeur d'Alene River.

4.2.2 Waste Disposal Areas

Waste disposal sites and activities for the Box are discussed in the Section 5.2 (*Operable Unit 2; Operation and Maintenance).*

4.3 Progress Since the Last Review

This section includes the 2015 protectiveness determination and statement, and the status on issues and recommendations that were identified in the 2015 FYR report that directly affect protectiveness of the OU 1 remedial actions.

4.3.1 2015 FYR Report Protectiveness Determination

Table 4-4. Protectiveness Determination and Statements from 2015 Five-year Review Report

OU 1 Protectiveness Statement
Protectiveness Determination: Will be protective
Protectiveness Statement: The selected remedy at Operable Unit 1 (OU 1) is expected to be protective of human health and the environment upon completion. In the interim, where remedial activities have been completed to date, they have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Although the selected remedy has not been fully implemented, it is nearly complete, and data indicate that the remedy is functioning as intended by EPA decision documents. As remediation nears completion, soil and house dust lead concentrations have declined, lead intake rates have been substantially reduced, blood lead levels have achieved their remedial action objectives (RAOs), and the Institutional Controls Program (ICP) has been established and is operating. Continued operation of a robust ICP is essential to the long-term performance of the installed human health barriers. House dust lead levels have declined to below the 500 mg/kg sitewide average RAO. However, further evaluation is necessary to inform ongoing implementation of the interior cleaning remedy. Private groundwater wells used for drinking were closed during the years that yard soil remedial actions were ongoing. Owners of 13 wells that exceeded federal drinking water standards refused closure. None of these 13 wells were used for drinking water purposes at the time; however, the current potable or non-potable status of 13 wells whose owners refused closure is currently unknown.

4.3.2 Status of Recommendations from the 2015 Five-year Review Report

Table 4-5 provides the status of OU 1 issues and recommendations that directly affect remedy protectiveness identified in the 2015 FYR report.

Table 4-5. Status of OU 1 Recommendations from the 2015 FYR

Title	Issue	Recommendations	Current Status	Current Implementation Status Description*	Completion Date (if applicable)
Alternatives to One-Time Interior House Dust Cleaning Remedy Component	Results of two pilot studies indicate that house dust lead concentrations return to precleaning levels within one year of cleaning, regardless of the cleaning method. Recent data confirm that house dust lead concentrations have achieved the community mean of ≤ 500 mg/kg and the number of homes ≥ 1,000 mg/kg lead in house dust is declining.	Evaluate the need for implementation of the interior cleaning component of the remedy based in part on information on alternative dust lead sources. Determine additional data and monitoring needs to support one-time cleaning evaluation.	Completed	See discussion below.	3/30/2020
Drinking Water Remediation Refusals	Owners of 13 wells that exceeded federal drinking water standards refused closure. At the time of refusal, all wells were dedicated to non-potable uses.	Review current use of the 13 wells whose owners refused closure to identify those being used for potable purposes, if any.	Completed	See description below.	2/6/2020

4.3.2.1 Alternatives to One-Time Interior House Dust Cleaning Remedy Component

In 2015 and 2016, the PHD, IDEQ, and EPA held a series of brainstorming sessions to discuss alternatives to implementing the one-time interior house dust cleaning remedy component selected in the 1992 Non-populated Area ROD. This resulted in the adoption of additional outreach and education activities through the LHIP including the following:

- Hiring of a full-time outreach coordinator in 2018.
- Increasing the use of social media to reach more people.
- Hosting booths at local family-oriented events (e.g., Annual Health Fair at the Shoshone Medical Center, Silver Mountain Halloween Trunk or Treat event).
- Starting an Occupational Safety Outreach Program with mining companies.
- Increasing outreach to recreational users through new health and safety signs and attending events to provide recreation safety information to target recreational users (e.g., North Idaho Fair, Coeur Fest, Our GEM Symposium)

- Outreach to community groups to increase education for all ages (e.g., presentations at local libraries, hosting a booth at the Silver Valley Economic Development Council's Veteran's Career Fair, Leadership Coeur d'Alene Environment Day, BEIPC presentations).

Additionally, PHD enhanced home follow-ups with the use of a portable XRF analyzer, conducting targeted sampling at a few homes with elevated dust levels. This has provided supplementary information about sources of lead in these homes as presented in the *Data Review* section. Based on information from these follow-up services and the results from the 1990 and 2000 pilot cleaning studies where lead in homes returned to pre-cleaning levels within one year (CH2M Hill, 1991a; TerraGraphics 2002), EPA and IDEQ no longer recommend a one-time interior house cleaning. Instead, alternative approaches to increase participation in blood lead screening events and follow-up services, new methods of sampling such as continued use of the XRF to supplement vacuum bag and dust mat sampling, continued outreach and education efforts, and installation and maintenance of signage and access controls at unremediated areas adjacent to residential and community areas will be pursued to reduce house dust levels to performance standard levels identified in the 1992 Non-populated Areas ROD (EPA, 1992). To document this decision, EPA will prepare and publish an Explanation of Significant Difference (ESD) in 2022.

4.3.2.2 Drinking Water Program Well Closure Refusals

IDEQ investigated a total of 16 properties (three more than initially identified) whose owners refused to close private wells that exceeded federal drinking water standards. This entailed reviewing remedial action certification reports to:

- Identify/confirm current (potable/non-potable) status and number of residential domestic irrigation wells.
- Determine if the well sites have been abandoned/decommissioned or only used for irrigation, and
- Confirm if the property is currently being served by a local community water system (IDEQ, 2020d).

Of the 16 properties, four wells were no longer functional (two were capped and two were dry), three were no longer in use, four were being used exclusively for irrigation, and one owner reported that no well was on the property. The status of the remaining four wells is unknown because the owner could not be contacted, did not respond, or had no knowledge of a well on the property, or the property appeared to be abandoned. IDEQ, however, confirmed with the Central Shoshone County Water District that residential domestic water service exists at 15 of the 16 properties reviewed. The owners of the remaining property installed two new domestic water wells in 2005 in compliance with IDWR "area of drilling concern" guidelines.

This 2015 recommendation is deemed complete, as IDEQ confirmed that residential drinking water at the 16 OU 1 properties is sourced from the community water system or from domestic water wells drilled in compliance with IDWR guidelines. The area of drilling concern continues to protect residents from developing private drinking water wells in the main valley aquifer (IDEQ, 2020d).

4.4 Data Review

This FYR included a review of relevant site-related documents and recent inspection and monitoring data reports. A complete list of the documents reviewed can be found in Appendix A (*References)*. This section provides an overview of data collected and evaluated since the 2015 FYR.

4.4.1 Soil and Dust

4.4.1.1 Property Remediation Program Soil Data

Soil lead concentrations in OU 1 communities are assumed to be similar to the community soil means presented in the 2010 and 2015 FYRs which were < 350 mg/kg. This assumption is based on the following:

- The community mean soil performance standard of < 350 mg/kg lead was achieved in all communities as of 2008 (EPA, 2010).
- Only five refusal properties were remediated in the last five years, and those clean soil values would only slightly reduce overall community means.
- The PHD continues to permit and monitor projects throughout the Box as part of the ICP, directing disturbed soils with lead concentrations > 350 mg/kg to the designated OU 1 repository or to be placed under a cap. Under established criteria, clean replacement material shall not have lead levels greater than 100 mg/kg.

The nine remaining refusal properties will be tracked by IDEQ and remediated using the state of Idaho's trust fund should property owners change their minds or properties change ownership.

4.4.1.2 House Dust Lead Monitoring Data

House dust samples obtained in 2018 from targeted vacuum and dust mat sampling were evaluated to ascertain current lead concentrations, loading rates and trends, and whether performance standards continue to be achieved. Data results indicated that in 2018, as was seen in 2002, the community geometric mean house dust lead concentrations remain well below the < 500 mg/kg performance standard and the assumed community mean soil lead performance standard of < 350 mg/kg (Alta, 2019b). Although geometric mean dust loading rates have generally remained similar over time, the amount of lead in that dust has decreased, indicating residents are tracking similar amounts of dust into their homes but the lead concentrations in dust are lower (Alta, 2019b).

Results based on individual homes, however, continue to demonstrate exceedances with 12 (or 5 percent) of the sampled OU 1 homes exhibiting vacuum bag and/or dust mat lead concentrations ≥ 1,000 mg/kg (Alta, 2019b). Extrapolating to the entire estimated housing population of OU 1, this equates to approximately 145 individual homes in the Box that may have elevated dust lead concentrations. Follow-up with the few residents that accepted intervention services indicated several likely sources including soils in areas not previously remediated (e.g., under decks) and other factors such as antique jewelry, lead-based paint (in older homes as well as through furniture restoration), parents' clothing worn during work (house painters and mine workers), and clothing and items used during recreational activities in unremediated areas (Alta, 2019a).

4.4.2 Modeled Lead Health Risks

IEUBK modeling for lead in children was also evaluated as part of this FYR (Table 4-6).[8] Based on current and available environmental exposure data, predicted blood lead levels for children living in OU 1

[8] IEUBKwin version 1.1, build 11, using the 40:30:30 dust/property soil/community soil partition, community-specific bioavailability, and soil/dust ingestion rates from von Lindern et al. (2016). The modeling used observed house dust lead concentrations from vacuum samples collected in 2018 (most recent year of dust sampling), in combination with community geometric mean and yard soil lead concentrations (assuming a concentration of 100 mg/kg lead for soil at remediated properties). In May 2021 IEUBK version 2.0 was released–after this modeling effort was completed. Future efforts will utilize the most current version.

indicate continued achievement of the blood lead RAOs established at the time of the 1991 Populated Areas ROD.

Table 4-6. IEUBK Model Results for OU 1 RAO Evaluation

Metric	Kellogg	Page	Pinehurst	Smelterville	Wardner
Predicted Geometric Mean Blood Lead (µg/dL)	2.5	1.8	2.6	2.6	2.9
Percentage of Children[a] Predicted to Exceed 10 µg/dL	0.8%	0%	0%	0.5%	0%
Percentage of Children[a] Predicted to Exceed 15 µg/dL	0%	0%	0%	0%	0%
Number of Homes with Current House Dust and Soil Data[b]	97	3	54	26	5
Percentage of Those Homes with Vacuum Dust ≥ 1,000 mg/kg	5%	0%	6%	15%	0%

[a] Children 6 months through 6 years of age (6 through 83 months)

[b] Vacuum dust data collected in 2018, results used in the IEUBK modeling

4.4.3 Blood Lead Monitoring Data

Data collected through LHIP's annual blood lead screening events were evaluated as part of this FYR, including participation rates and blood lead trends.

Annual participation rates substantially increased from those in 2015:

- In 2015, six children participated (2 percent of the OU 1 resident child population).
- From 2016 through 2019, more than 100 children in OU 1 participated each year (35 to 50 percent of the OU 1 resident child population) (Alta,2019a).

The increase in participation in 2016 through 2019 is attributable to increased use of social media platforms to advertise blood screening events, expanded delivery of outreach and educational materials, and reinstituting a monetary incentive.

Blood lead levels observed from 2015 through 2019 were generally comparable to 2002 levels, although they did fluctuate as shown in Table 4-7 and in Appendix D *(Supporting Tables and Figures)*. Blood lead screening results in 2017 showed a notably higher percentage of children exhibiting elevated blood lead levels (> five or > 10 µg/dL) compared to prior years. In some communities, more than five percent of screened children had a blood lead level of ≥ 10 µg/dL (Wardner in 2017 and Smelterville in 2018, and in 2019 one child living in Wardner had a blood lead level > 15 ug/dL). However, the overall number of children with blood lead levels > 10 µg/dL remained low (less than four children in each community (Alta, 2019a).

Table 4-7. Summary of Blood Lead Levels of Children Participating in the LHIP by Geographic Area in OU 1, 2015 - 2019

Year	Geographic Area	No. of Children	Blood Lead Level Range (µg/dL)		Blood Lead Level (µg/dL)		No. (%) Children with Blood Lead Levels			
			Minimum	Maximum	Arithmetic Mean	Geometric Mean	Below Detection Limits[a]	≥ 5 µg/dL	≥ 10 µg/dL	≥ 15 µg/dL
2015	Box-wide	6	1.8	3.5	2.4	2.4	0 (0%)	0 (0%)	0 (0%)	0 (0%)
2016	Kellogg	61	< 1.4	8.0	3.2	2.9	8 (13%)	4 (7%)	0 (0%)	0 (0%)
	Page	6	2.6	9.0	4.9	4.3	0 (0%)	2 (33%)	0 (0%)	0 (0%)
	Pinehurst	19	< 1.4	6.0	3.4	3.2	1 (5%)	2 (11%)	0 (0%)	0 (0%)
	Smelterville	28	< 1.4	5.0	2.9	2.7	5 (18%)	1 (4%)	0 (0%)	0 (0%)
	Wardner	0	-	-	-	-	-	-	-	-
	Box-wide	114	< 1.4	9.0	3.2	3.0	14 (12%)	9 (8%)	0 (0%)	0 (0%)
2017	Kellogg	62	< 1.4	13	3.6	3.0	13 (21%)	9 (15%)	3 (5%)	0 (0%)
	Page	2	-	-	-	-	-	-	-	-
	Pinehurst	26	< 1.4	10	3.6	3.1	3 (12%)	5 (19%)	1 (4%)	0 (0%)
	Smelterville	24	< 1.4	6.0	3.3	3.1	12 (50%)	2 (8%)	0 (0%)	0 (0%)
	Wardner	10	< 1.4	10.2	3.4	2.9	5 (50%)	1 (10%)	1 (10%)	0 (0%)
	Box-wide	124	< 1.4	13	3.5	3.0	20 (16%)	17 (14%)	5 (4%)	0 (0%)
2018	Kellogg	71	< 1.9	9.0	2.7	2.3	30 (42%)	6 (8%)	0 (0%)	0 (0%)
	Page	2	-	-	-	-	-	-	-	-
	Pinehurst	34	< 1.9	10	2	1.8	23 (68%)	1 (3%)	1 (3%)	0 (0%)
	Smelterville	29	< 1.9	10	3.3	2.6	12 (41%)	6 (21%)	2 (7%)	0 (0%)

Year	Geographic Area	No. of Children	Blood Lead Level Range (µg/dL)		Blood Lead Level (µg/dL)		No. (%) Children with Blood Lead Levels			
			Minimum	Maximum	Arithmetic Mean	Geometric Mean	Below Detection Limits[a]	≥ 5 µg/dL	≥ 10 µg/dL	≥ 15 µg/dL
	Wardner	5	< 1.9	< 1.9	NA	NA	5 (100%)	0 (0%)	0 (0%)	0 (0%)
	Box-wide	141	< 1.9	10	2.6	2.2	70 (50%)	13 (9%)	3 (2%)	0 (0%)
2019	Kellogg	93	1.0	11	2.5	2.1	50 (54%)	5 (5%)	2 (2%)	0 (0%)
	Page	4	< 1.9	2.4	1.7	1.6	3 (75%)	0 (0%)	0 (0%)	0 (0%)
	Pinehurst	43	< 1.9	12	3.1	2.5	17 (40%)	7 (16%)	1 (2%)	0 (0%)
	Smelterville	22	1.0	5.0	2.0	1.8	13 (59%)	1 (5%)	0 (0%)	0 (0%)
	Wardner	7	< 1.9	29	9.3	5.4	2 (29%)	3 (43%)	3 (43%)	1 (14%)
	Box-wide	169	1.0	29	2.8	2.2	85 (50%)	16 (9%)	6 (4%)	1 (1%)

[a] Detection limit was 1.4 µg/dL prior to 2018 and 1.9µg/dL in 2018 and 2019.

Note: For confidentiality, data are not displayed if the number of observations is less than three.

To identify potential factors that could impact blood lead levels, a systematic, exploratory review and evaluation of information gathered by the LHIP in 2017 and 2018 along with environmental data from participants' homes was conducted. Participant questionnaires provided at 2017 blood screening events indicated a somewhat higher incidence of certain hobbies, occupations, and recreational activities that year, and information reviewed from the few LHIP follow-up services suggests that multiple reasons could have contributed to the elevated blood lead levels observed in 2017. This evaluation resulted in recommendations for future screenings and blood lead data evaluations (Alta, 2019a).

4.4.4 Institutional Controls Program Data

Review of ICP permits, records, and reports, and discussions with PHD personnel were conducted as part of this FYR to determine compliance with IDAPA 41.01.01.

Based on this review, the PHD is implementing the ICP per IDAPA 41.01.01 and continues to direct lead soil contamination > 350 mg/kg to a designated repository, enforce the use of clean import soils that are ≤ 100 mg/kg lead, and permit and inspect new property development. Community compliance is high and no enforcement actions for noncompliance were issued in the last five years. Clean barriers that were disrupted through excavation have been repaired in response to ICP permitting and inspection activities. In addition, over the last five years, all barriers on properties identified as being re-contaminated from fire, flooding, or runoff (which pose challenges to the ICP as identified in the last Five-Year Review) have been repaired.

Opportunistic soil, regrinds, and snow melt sediment samples collected from 2015 through 2019 by the ICP were also reviewed. Lead concentrations from snow melt sediment samples average 257 to 780 mg/kg, and most samples had lead concentrations ≥ 350 mg/kg. Approximately one third of the "regrinds" and "other soil" samples collected since 2014 for ICP monitoring and permitting purposes show lead concentrations > 350 mg/kg, reinforcing the need for an ICP to protect public health by managing contaminants left in place. Appendix D includes a table of lead concentrations in ICP snow melt samples collected in the Box from 2015 through 2019.

4.4.5 Remedy Protection Project Data

A qualitative evaluation of the completed Remedy Protection Projects was conducted as part of this FYR. This was accomplished by reviewing O&M plans and inspection reports and having discussions with local jurisdictions.[9]

To date, all systems have performed as designed during storms, according to discussion with those responsible for maintenance. In the short time that these projects have been in place, the drainage systems including pipes and open channels have required some basic O&M with Little Pine Creek being the only project to require more significant O&M. Although the 2017 storm event damaged approximately 60 feet of Little Pine Creek bank armoring, no flooding occurred. Channel side slopes and channel inverts have remained stable. Based on these observations, the remedy protection projects appear to be functioning as designed to protect current remediated properties against stormwater runoff, tributary flooding, and heavy rain.

[9] Remedy protection actions in the Box do not include protection against flooding of the SFCDR and Pine Creek; however, EPA and IDEQ are committed to taking part in efforts to understand the SFCDR system more fully, including Pine Creek, and ways in which various entities can contribute to the management of flooding problems.

4.4.6 Surface Water and Groundwater

4.4.6.1 Drinking Water Program Data

Evaluation of properties with wells where owners had refused closure is discussed in the *Progress Since the Last Five-Year Review* section.

Evaluation of 2017 surface water samples from a creek near Kellogg used by a downstream residence indicated no exceedances of federal drinking water action levels for the metals tested (arsenic, cadmium, copper, lead, and mercury; Alta, 2018a). It is possible, however, that metal concentrations in the creek may change seasonally under different hydrological conditions. PHD cautioned residents about drinking or cooking with the water.

4.5 Technical Assessment

4.5.1 Question A: Is the Remedy Functioning as Intended by the Decisions?

The OU 1 human health remedy selected in the 1991 Populated Areas ROD, the 1992 Non-populated Areas ROD, and the 2012 Upper Basin Interim ROD Amendment where completed is functioning as intended. Successful implementation of the comprehensive remedial strategy outlined in these documents has reduced soil and dust lead exposures and subsequent blood lead levels, as well as the use of contaminated surface water and groundwater as drinking water sources.

The property remediation program is essentially complete. The geometric mean soil lead performance standard of < 350 mg/kg for each OU 1 residential community, first achieved in 2008, is expected to be status quo as of publication of this FYR report. This assumption is primarily based on the continued effective implementation of the ICP which ensured clean barriers to underlying contamination remained intact in the Box through its permitting, licensing, inspection, and oversight activities. Other factors supporting this assumption include the remediation of five more refusal properties; repair and paving of an additional 26 miles of roads and ROWs; installation of stormwater controls to enhance long-term protection of existing remedies against recontamination from stormwater runoff, flooding, and other high-precipitation events; and containment of contaminated soils in engineered waste disposal areas. Given these additional remedial actions, and with only nine refusal properties left to remediate, it is expected the < 350 mg/kg community mean soil performance standard continues to be achieved at this time.

Interior house dust lead concentrations decreased over time as soil remediation progressed. Geometric mean house dust levels remain below the 1992 Non-populated Areas ROD performance standard of ≤ 500 mg/kg lead in all OU 1 communities; however, individual homes continue to exceed the ≥ 1,000 mg/kg performance standard. Based on 2018 monitoring data, approximately five percent of homes sampled ≥ 1,000 mg/kg lead. This equates to an estimated 145 individual homes in the Box that may have elevated dust lead levels even though the soil remediation program is complete but for nine refusal properties. Information obtained during the few house dust follow-up services appear to indicate multiple sources are likely causing these elevated dust lead levels including parents' occupation and hobbies, antique jewelry, lead-based paint (from existing paint in older homes as well as via furniture restoration), family recreational activities in areas not previously remediated, and legacy contamination.

Participation in annual blood lead screening events increased in 2016 through 2019, which is attributed in part to reinstitution of a monetary incentive and broader use of social media platforms to advertise events. Recent observed blood lead results indicate childrens' blood lead levels have remained below targeted levels as a whole; however, a few exceedances were observed in the past five years. Information gathered from LHIP follow-up services indicate these exceedances may be due to a variety of exposure sources

similar to those identified during house dust follow-up services. Based on current and available environmental exposure data, IEUBK predicted blood lead levels for children residing in OU 1 indicate continued achievement of the blood lead RAOs established at the time of the 1991 Populated Areas ROD as shown earlier in Table 4-7.

As stipulated in the 1992 Non-populated Areas ROD, if any individual home ≥ 1,000 mg/kg lead in house dust at the time property remediations are deemed complete, those residences are to receive a one-time interior cleaning. EPA and IDEQ, however, no longer recommend implementation of this remedy component. This is based on identification of the aforementioned sources of exposure obtained from LHIP follow-up services that may be contributing to elevated lead in house dust and blood lead levels, and results from two pilot studies which indicated that lead in house dust returned to pre-cleaning levels within one year after cleaning, Instead of a one-time cleaning, alternative approaches to identify, monitor, and reduce potential exposures have been explored, with several implemented within the past five years: increasing participation in blood lead screenings and follow-up services and expanding educational opportunities as described earlier; using new methods of sampling lead sources and exposures during LHIP follow-up services (e.g., XRF analyses); expanding outreach and educational opportunities so that more community members can learn about the risks of lead exposure, where sources of exposures exist, and ways to mitigate those exposures; and, installing and maintaining signage and access controls at unremediated areas especially those adjacent to residential and community areas and recreational areas across the Bunker Hill Superfund site where legacy contamination still exists.

To document the recommendation to not conduct the one-time interior cleaning, EPA will prepare and publish an ESD in 2022. Alternative approaches to identify and mitigate potential exposure sources and reduce elevated house dust and blood lead levels will continue to be implemented and expanded upon so that achievement of blood lead RAOs is maintained.

4.5.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of the Remedy Selection Still Valid?

Certain exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selected in EPA decision documents have changed such as soil and dust bioavailability and children's ingestion rates and are discussed in previous Five-Year Reviews. No changes have occurred, however, in the past five years.

4.5.2.1 Changes in Standards and To-Be-Considered Criteria

EPA reviewed the federal, state, and Tribal requirements that are ARARs and the "To Be Considered" (TBC) criteria selected in RODs as part of this FYR. There were no changes that called into question the validity or protectiveness of the OU 1 selected remedy.

4.5.2.2 Changes in Toxicity and Other Contaminant Characteristic

Recent scientific literature on lead toxicology and epidemiology provides evidence that adverse health effects are associated with blood lead levels < 10 µg/dL (National Toxicology Program, 2012; EPA, 2013a; Agency for Toxic Substances and Disease Registry (ATSDR), 2020). EPA recognizes that a target blood lead level of 10 µg/dL may not be adequately protective for children and adults; however, no changes to EPA's lead health risk policy occurred since the 2015 FYR.

4.5.2.3 Changes in Risk Assessment Methods

EPA released updates to the IEUBK Model in May 2021 (Version 2). This latest version was based largely on evaluation of data from OU 1 of the Bunker Hill Superfund site (von Lindern et al., 2016; Vandenberg, 2020). The IEUBK version 1.1 was used for this FYR (see Section 4.4.3 for further details).

EPA is also considering a change in its national lead policy. Although no policy changes have yet occurred, if a lower blood lead target level was adopted and applied to the Box, additional residences may not achieve the updated target. For example, for a target where an individual child has an estimated risk of no more than five percent chance of exceeding a five µg/dL blood lead level, approximately one-third of OU 1 residences would not achieve the updated target based on IEUBK modeling. However, no determination of the impacts can be made until a revised national lead policy is final and current risk assessment methodologies and models are used to assess the cleanup.

4.5.2.4 Changes in Exposure Pathways

There have been no changes in land use that would call into question the protectiveness of the OU 1 selected remedy, nor were there changes in human health or ecological routes of exposure or newly identified receptors that would affect protectiveness.

Properties continued to change owners in the past five years and new commercial and residential developments are being planned, but these were anticipated in ROD cleanup levels decisions for protection of human health. In addition, these new developments will require permits and oversight from the ICP to ensure that contaminated soils and backfill requirements for clean soil and barriers to underlying contamination are maintained, and drinking water sources are protective.

Recreational usage over the past five years has appeared to increase per observations of the Recreational Sites Team and other IDEQ and PHD staff.

4.5.2.5 Expected Progress Towards Meeting RAOs

The human health RAOs selected in the 1991 Populated Areas ROD are:

- No more than 5 percent of children in the community have a blood lead level of 10 µg/dL or greater.
- Less than 1 percent of children have a blood lead level exceeding 15 µg/dL.

Based on current and available environmental exposure data, IEUBK predicted blood lead levels for children residing in OU 1 indicate continued achievement of the blood lead RAOs established at the time of the 1991 Populated Areas ROD as shown earlier in Table 4-6. There were exceedances of observed blood lead levels (> 5, 10, and 15 µg/dL) since the 2015 FYR as discussed in the *Data Review* section; however, the overall number of children with observed blood lead levels > 10 µg/dL was low (less than four children in each community) and only one child had a blood lead level > 15 µg/L. Implementation and evaluation of alternative approaches to identify and mitigate potential exposure sources that may be contributing to these exceedances as discussed in Question A are anticipated to continue achievement of the blood lead RAOs.

4.5.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has become available since the last FYR that would call into question the protectiveness of the OU 1 selected remedy.

4.6 Issues and Recommendations

Table 4-8. Issues and Recommendations in Operable Unit 2

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
Operable Unit 1

4.6.1 Other Findings

Issues that do not directly affect protectiveness are included in the *Other Findings* table located in Appendix E.

4.7 Protectiveness Statement

Table 4-9. 2020 FYR Protectiveness Determination and Statements

OU 1 Protectiveness Determination and Statements	
Operable Unit:	***Protectiveness Determination:***
1	**Will be Protective**
Protectiveness Statement:	
The selected remedy at Operable Unit 1 (OU 1) is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have addressed direct exposure pathways in these areas. The residential property remediation program is essentially complete with only nine "refusal properties" left to sample and remediate. Soil and interior house dust lead concentrations and blood lead levels are below target levels in most OU 1 residential communities. Participation in free blood lead screenings has increased over the last five years attributable to reinstitution of a monetary incentive and advertising using social media platforms to reach more residents. The continued operation of the Institutional Controls Program (ICP) to maintain clean barriers to underlying metals contamination, and the recently completed stormwater projects designed to protect these barriers from erosion caused by high water events are expected to limit potential exposures in the future. Remedial actions to eliminate the use of contaminated groundwater as a drinking water source have further reduced exposures to lead, arsenic, and cadmium. Modeling results using current, available environmental exposure data to predict blood lead levels indicate the continued achievement of the blood lead remedial action objectives (RAOs) selected in the 1991 Populated Areas Record of Decision (ROD). However, elevated blood lead levels observed in a few OU 1 communities and exceedance of the house dust performance standard at individual residences necessitates implementation of alternative remedial approaches to identify at-risk populations and mitigate exposures from multiple sources contributing to these exceedances in order to meet all cleanup goals. Based on the results of this Five-Year Review (FYR) and implementation of alternative approaches to further reduce exposure risks, EPA and IDEQ no longer recommend implementation of the one-time cleaning of homes that exceed the individual house dust lead performance standard. This decision will be documented in an Explanation of Significant Differences (ESD) in 2022.	

5 Operable Unit 2

5.1 Status of Implementation

This section describes the remedial actions that were implemented in OU 2 since the 2015 FYR.

5.1.1 Phase I Remedy Implementation

In 1995, implementation of the 1992 Non-populated Areas ROD selected remedy was divided into two phases after the 1994 bankruptcy of Gulf Resources, the Bunker Hill site's major PRP. Phase I included extensive removal, stabilization and containment of contaminated soil and other waste materials; implementation of the ICP; and interim control and treatment of contaminated water and AMD at the CTP. Also included was the evaluation of Phase I removal and source control actions on improving water quality primarily through reduced loadings to the South Fork Coeur d'Alene River SFCDR and Bunker Creek. Most Phase I removal and source control remedial actions have been completed and O&M activities associated with these remedies are described in the *Operation and Maintenance* section below.

5.1.1.1 Institutional Controls Program (1995 - present)

A discussion of the purpose and components of the sitewide ICP is included in Section 3.3.3 of this report. The ICP has issued a total of 163 permits in OU 2, mostly for large excavation projects since the 2015 FYR. Table 5-1 lists the type of permit by each year.

Table 5-1. Number of ICP Permits Issued in OU 2, 2015 - 2019

Permit Type	Calendar Year					Cumulative 5-Year Total	Annual Average
	2015	2016	2017	2018	2019		
Large Exterior Projects – Excavation Total	27	36	36	26	27	**152**	30
Large Exterior Projects - Demolition Total	0	0	0	2	1	**3**	1
Interiors Total	1	2	0	0	0	**3**	1
Records of Compliance Total	0	1	2	0	2	**5**	1
Totals	**28**	**39**	**38**	**28**	**30**	**163**	**33**

Notes:

Data provided by PHD (PHD, 2016; 2017; 2018a; 2019; 2020).

No new subdivisions or planned unit developments were proposed in OU 1 since the last Five-Year Review.

Other ICP activities and functions, such as contractor licensing, property disclosures, disposal, and clean fill material handling, are tracked with OU 1 activities as presented in Section 4.1.1.4 of this report.

5.1.2 Phase II Remedy Implementation

Phase II of the OU 2 remedy implementation addresses long-term water quality, and ecological and environmental issues. Remedial actions to address these issues are identified in the 2001 Non-populated Areas (Minewater) ROD Amendment and the 2012 Upper Basin Interim ROD Amendment.

5.1.2.1 Central Treatment Plant and Groundwater Collection System (2016 - present)

Phase II remedial actions began in 2016 with construction of an upgraded and expanded CTP and a new Groundwater Collection System (GWCS). Construction was substantially completed on October 26, 2020, and both the CTP and GWCS will be transferred to the state of Idaho on October 21, 2021 for long-term O&M.

5.1.2.2 Central Treatment Plant

The upgraded and expanded CTP included replacement of the facility components that had reached their useful life, installation of new components to allow operation in high-density sludge (HDS) mode and meet upgraded effluent discharge limits to the SFCDR, as well as an expansion needed to treat OU 2 groundwater collected by the newly installed GWCS. Upgrades and expansion of the CTP included:

- Pumps, piping, and controls to increase treatment capacity to 8,000 gallons per minute (gpm).
- Replacement of the aeration basin with two concrete mixed and aerated reactors (Reactor B1 and B2) piped to operate either in series or singularly.
- Refurbishment of the existing clarifier and increasing its hydraulic capacity.
- Addition of a pressure dual-media filtration system consisting of six pressure vessels sized for filtering a total flow of 5,000 gpm with integrated backwash system and bypass pipes for flows exceeding 5,000 gpm.
- Effluent pumping system and pipeline routed over the east end of the CIA to the SFCDR which included a flow diffuser in the river.
- New sludge thickener for thickening solids settled in the clarifier including pumps for recirculating or wasting sludge.
- New sludge recirculation system from the thickener to a new lime/sludge mix tank (Reactor A) and new lime slurry piping from the lime slurry tank to Reactor A.
- Electrical upgrades and additions, control system and computerized maintenance and management system, including an updated, electronic O&M Manual.
- System layout and reserved space to accommodate future Phase 2 expansion for waters collected in Operable Unit 3 and conveyed to the CTP.

Sludge Storage Impoundments

Three new double-lined sludge storage impoundments (SSIs) were constructed on top of the east end of the CIA above the CTP. Each cell is sized to store 10 years of sludge, yielding a total of 30 years of capacity. The new SSIs also include:

- A primary liner constructed of linear low-density polyethylene (LLDPE), and an underlying LLDPE liner with leak detection grid and leak detection piping. The SSI liner system is tied into the LLDPE liner, which covers the CIA, providing contiguous coverage.
- Multiple sludge discharge locations into each SSI, and piping to gravity drain filtrate back to the CTP for treatment.
- Filtrate collection system to collect water which drains from the sludge as it consolidates as well as rainfall and snowmelt in the SSI.

It is expected that the remaining capacity in the unlined sludge impoundment on the CIA will be used to maximize sludge disposal capacity.

5.1.2.3 Groundwater Collection System

The new GWCS is intended to collect metals-contaminated groundwater from the areas around the CIA and convey it to the CTP thereby reducing contaminant loading to nearby surface water (SFCDR, Bunker Creek). Construction consisted of the following:

- An approximately 8,000-foot long, 30-feet deep, soil-bentonite groundwater cutoff wall along the north side of the CIA between the CIA slope and Interstate 90 (I-90), and around the west end of the former slag pile area. The wall is keyed into the top of a leaky confining unit between the upper and lower aquifers.
- Nine extraction wells just south of the slurry bentonite groundwater cutoff wall sized to provide water level control behind the wall and collection of between 1,500 and 2,500 gpm, and groundwater level control and monitoring wells between the extraction wells.
- Two parallel force mains (one operational and one spare) around and over the east end of the CIA to convey groundwater to the CTP for treatment, and Pig launch and retrieval stations along the force mains for periodic pipeline cleaning.
- Piping and valving to allow temporary storage of groundwater in the Lined Pond and the three lined sludge storage impoundments.
- Backup electrical generators to provide continuous power to the groundwater extraction well pumps.
- Control and telecommunication system for remote monitoring and operation at the CTP.

Additional information on the CTP upgrades, GWCS, and the SSIs can be found in the draft O&M manual (Wood, 2020).

2019 Emergency Action

In December 2018, following partial construction of the GWCS groundwater cutoff wall, a turbid seep was identified in the SFCDR within the eastern portion of OU 2, and settlement of all lanes of Interstate 90 (I-90) in two locations was observed starting in early February 2019. EPA mobilized an emergency response team to the site in February 2019 to explore and define the causes of the turbid seeps and settlement. Turbid seeps in the SFCDR were last observed in March 2020 before the sporadic startup of the GWCS extraction wells and no further subsidence of I-90 has occurred (CH2M, 2021). Monitoring in this area will continue as part of the BEMP.

5.2 Operation and Maintenance

This section summarizes the routine, and Phase I remedy O&M activities conducted in OU 2 since the 2015 FYR.

5.2.1 Interim Control and Treatment of Contaminated Groundwater (1995 - present)

Interim control and treatment of contaminated groundwater and AMD consisted of repairs and maintenance at the Bunker Hill Mine and routine O&M of the CTP.

5.2.1.1 Bunker Hill Mine

The current owner of the Bunker Hill Mine, the Bunker Hill Mining Corporation or BHMC, has not actively mined in several years. Regular inspections of the interior of the mine over the past five years by EPA, IDEQ and CTP contractors indicated that BHMC completed required maintenance activities including shoring up portions of the Kellogg Tunnel, rail replacement, and pump maintenance and replacement. Regular inspections of mine water infrastructure components external to the Bunker Hill Mine also occurred over the past five years including the mine water line intake flume and AMD flows from the Kellogg Tunnel. No issues were discovered.

Reed and Russell Tunnels

In 2018, the BHMC installed a simple pump back system to address the release of AMD from the Reed and Russel Tunnel adits which drain into Milo Gulch pursuant to the 2012 Upper Basin Interim ROD Amendment. This system consisted of an electric pump that pumped the tunnel water back into the mine so that it would be treated with other AMD. After this system failed in early 2019, BHMC designed and installed a two-stage reservoir and pump with float switch so that the system would pump only when water was in the reservoir and the second reservoir is a contingency measure that also has a pump and float switch. IDEQ inspected the system in spring of 2021 and found it to be working as intended and saw no indication of AMD being released to surface waters.

5.2.1.2 Central Treatment Plant

The CTP was constructed in 1974 to treat metals-laden AMD from the Bunker Hill Mine and contaminated process water from various OU 2 industrial facilities. Routine O&M of the CTP over the past five years was conducted under a contract administered by the United States Army Corps of Engineers (USACE) via an Interagency Agreement (IA) with EPA pursuant to the long-term O&M manual (CH2M Hill, 2004). Activities primarily consisted of continued treatment of AMD from the Bunker Hill Mine and other de minimus site sources, maintenance of all mechanical and electrical plant equipment, regular pigging and inspections of the direct feed and lined pond pipelines, and emergency repairs to equipment that fails. No issues were discovered. Discussion of CTP effluent discharge is discussed in the *Data Review* section.

5.2.2 Removal and Source Control Remedial Actions (1995 - 2010)

All but one Phase I removal and source control remedial action was completed in 2010[10]. These actions are now in the O&M phase and are routinely inspected by IDEQ, and maintained by IDEQ and/or individual property owners.

Table 5-2 lists the Phase I remedial action areas and subareas that were inspected, the date of the respective O&M manual, the party responsible for maintenance, the maintenance required, and observations made over the five years.

Results of water quality monitoring and songbird blood collection in Smelterville Flats are discussed in the *Data Review* section.

[10] Area 14 remediation was postponed pending development by the property owner.

Table 5-2. Phase I Removal and Source Control Remedial Actions O&M Activities, 2015 – 2019

Remedial Action Area/Subarea		O&M Manual Citation	Party Responsible for Maintenance	Maintenance Since 2014
Hillsides		TerraGraphics, 2010a	O&M is conducted by Galena Ridge LLC or other private property owners for areas altered by development, and by IDEQ for areas unmodified since the remedy.	No maintenance required[a]. Observation of new logging roads that may destabilize hillsides will continue to be monitored.
Gulches	Deadwood Gulch	TerraGraphics, 2010c	O&M is conducted by private owners for areas altered by development, and by IDEQ for areas unmodified since the remedy.	Routine maintenance required[a.] Entry gate repaired and new "No Trespassing" signs were posted in 2019. Observation of logging on west slope and construction on the old Pintlar wetland test plots will continue to be monitored.
	Government Gulch [a]	TerraGraphics, 2010b	O&M is conducted by private owners for areas altered by development, and by IDEQ for areas unmodified since the remedy.	Bank erosion was repaired as part of O&M. Several drainage features changed as a result of LUR and CFP activity, and IDEQ recently identified a concrete-lined drainage ditch on the west side of the road in poor condition and releasing sediment from under the concrete. The City is planning future road repairs in this area that will likely address this issue. Observation of mining exploration on upper west slope and erosion caused by all-terrain vehicles (ATVs) will continue to be monitored. USGS monitored water quality at the mouth of Government Gulch.
	Grouse Gulch[a]	No formal plan	O&M is conducted by private owners for areas altered by development, and by IDEQ for areas unmodified since the remedy	No maintenance of gabion dams and sediment basins were required. Mining exploration company rerouted adit drainage in 2017 to flow directly into Grouse Creek instead of overflowing down dirt road. Frequent camping observed at edge of stream bank that may impact clean soil barriers and stream channels will continue to be monitored.

Remedial Action Area/Subarea		O&M Manual Citation	Party Responsible for Maintenance	Maintenance Since 2014
	Magnet Gulch[a]	TerraGraphics, 2010c	O&M is conducted by Galena Ridge LLC for areas altered by development, and by IDEQ for areas unmodified since the remedy.	No maintenance was required[a]. Observation of a small sinkhole in the channel below Gabion Dam #2 will continue to be monitored.
	Railroad Gulch	TerraGraphics, 2010c	IDEQ	No maintenance was required[a].
	Portal Gulch	Part of CTP O&M Manual (CH2M Hill, 2004)	Bunker Hill Mining Corporation	Maintenance for Portal Gulch focuses on mine water treatment from the Bunker Hill Mine.
Milo Gulch	Upper Milo Creek Watershed	TerraGraphics, 2001 (Milo Creek)	Milo Creek Watershed District (upper portions & lower Milo Creek piping system) [a,b]	Maintenance activity during this review period has been limited to regular sediment and debris removal. See discussion below table for additional information. Surface water monitoring continued to be conducted.
	Lower Milo Creek Piping System	USACE, 2000	EPA until March 2020 when EPA transferred responsibility to the BHMC.	See discussion below table for additional information on Reed Landing.
Smelterville Flats		TerraGraphics, 2010d	O&M is conducted by private owners for areas altered by development, and by IDEQ for areas unmodified since the remedy Shoshone County owns and maintains the county airport.	Routine maintenance including hand-spraying of weeds was conducted. See discussion below table for more information. Surface water monitoring and collection of songbird blood was also conducted.

Remedial Action Area/Subarea		O&M Manual Citation	Party Responsible for Maintenance	Maintenance Since 2014
Central Impoundment Area (CIA)		TerraGraphics, 2009	IDEQ	Routine maintenance of the cap included hand spraying of weeds and replacing missing drainpipe caps[a]. See discussion below table for additional information. No O&M inspections occurred during construction of the three new SSIs on the east end of the CIA. Baseline groundwater monitoring was conducted.
Industrial Complex	Smelter Closure Area and PTM Cell	TerraGraphics, 2008	O&M is conducted by property owner for areas altered by development, e.g., drainage areas altered by Silver Mountain, and by IDEQ for areas unmodified since the remedy.	Routine maintenance was required including fence repair, weed and woody vegetation spraying, and clearing of plugged drainage pipes[a]. Animal burrowing in the cap material resulting in exposed slag will continue to be monitored. Sediment recently observed in perimeter runoff channels clogging the strip drainpipe outlets will be removed as necessary.
	Borrow Area Landfill	CH2M HILL, 2007	O&M is conducted by Galena Ridge LLC for areas altered by development and by PHD for the soil cover barrier.	Routine maintenance was completed by Galena Ridge LLC.
	Mine Operations & Boulevard Areas	TerraGraphics, 2010f	O&M is conducted by private owners for areas altered by development, and by IDEQ for areas unmodified since the remedy.	No maintenance was required[a].

Remedial Action Area/Subarea	O&M Manual Citation	Party Responsible for Maintenance	Maintenance Since 2014
Bunker Creek	TerraGraphics, 2010e	IDEQ	Routine maintenance was required including fence repairs and weed spraying[a]. IDEQ trapped three beavers and removed one beaver dam; continued monitoring and removal of beavers will be required. Surface water monitoring was conducted. Infiltration of water through the in-situ soil liner and through underlying contaminated materials is occurring (EPA, 2015a) and will be evaluated after the CTP upgrades are completed because it is anticipated to change discharge to the creek.
Page Pond	IDEQ and NWCS, 2020	IDEQ	Routine maintenance is conducted in parallel with Page Repository. See discussion below table for more information. Fugitive dust and stormwater controls as part of expansion efforts were required during the past five years.
A-4 Gypsum Pond	MFG, 2004	Stauffer Management Company, LLC	Routine maintenance was required. Surface water and groundwater were monitored from 2015 thru 2019; Stauffer discontinued groundwater monitoring in early 2019 [c].

[a] Inspections were primarily conducted by IDEQ; PHD also inspected remedial actions as necessary while administering the ICP. Notes on semi-annual O&M inspections are documented in IDEQ reports (IDEQ, 2015b, 2015c, 2016a, 2016b, 2017c, 2018a, 2018b, 2018c, 2018d, 2018e, 2019, 2020a, 2020b, 2020c).

[b] Source: Guardipee, 2020, personal communication.

[c] Inspection details, records of repair work, and water quality results from the semiannual inspections and water quality monitoring are documented in the O&M and annual water quality reports (MFA, 2015a, 2015b, 2016a, 2016b, 2016c, 2016d, 2017a, 2017b, 2017c, 2017d, 2018a, 2018b, 2018c, 2018d, 2019a, 2019b, 2019c, 2019d, 2019e; Arcadis 2018b, 2018c, 2018d, 2019b, 2019c, 2019d, 2019e, 2019f, 2019g, 2020).

Note: ATV = all-terrain vehicle

Milo Gulch

Upper Milo Creek Watershed

No maintenance was required in the upper Milo Creek segment since the 2015 FYR.

Lower Milo Creek Piping System

The Milo Watershed District conducted semiannual inspections of the lower Milo Creek piping system, and almost daily inspections of the intake structures during high flow events to prevent excessive sediment and debris buildup. A hole in the bottom of the Wardner Structure was repaired in 2015 (IDEQ, 2015a), debris that clogged the Milo Creek intake during the May 2018 flood event was cleared in July 2018 (Guardipee, 2020, personal communication), and sediment was removed from sediment basins by American Zinc Corporation as part of their work for the property owner.

Reed Landing

EPA and IDEQ conducted a joint inspection of Reed Landing in 2016 in preparation for transferring O&M responsibility to the BHMC. Several concerns were identified including two loose or missing concrete joint seals and AMD etching into the concrete channel that could result in significant damage to the structure (IDEQ, 2016c). EPA agreed to a one-time repair of the joint seals, and on June 21, 2017 EPA, IDEQ, and BHMC entered into an Environmental Covenant obligating BHMC and future property owners to abide by access, activity, and use limitations. This was followed by a Settlement Agreement and Order on Consent with BHMC in 2018 that included a Work-to-be-Performed section addressing management of AMD and other O&M responsibilities.

Smelterville Flats

Inspections were conducted between 2015 and 2019 to determine condition of the vegetative cover and the reconstructed SFCDR bank. In 2018, sampling was conducted to assess the integrity of the barrier and identify whether potential human health risks exist. Noxious weeds were hand sprayed. Bio-control weevils were released in July 2015 in an ongoing attempt to control noxious weeds that have not been controlled by hand spraying due to the expanse of infestation (IDEQ, 2015b). Phragmites have become a major weed problem in the wetland areas of the Smelterville Flats. Control methods are currently being researched by IDEQ and the Idaho Department of Fish and Game (IDFG) through a study initiated in the Lane area by IDFG in 2019.

Central Impoundment Area

Inspections were conducted between 2015 and 2019 to determine the condition of the cap and vegetative cover. IDEQ entered a concessioner's agreement in 2016 to improve soil conditions and establish a healthy grass crop for potential haying on top of the CIA (IDEQ, 2016a). In 2017, however, the concessioner requested, and IDEQ approved, they be released from the agreement due to poor soil and grass growth conditions.

Page Pond

Completion and certification of the Upstream Mining Group (UMG) remedial actions associated with the Page Pond area occurred in 2011. The active Page Ponds Wastewater Treatment Plant, the Page Repository/Page Westward Expansion Repository, and the West Page Swamp cover most of the Page Pond area footprint. O&M is being conducted as part of the Page Repository /Page Westward Expansion discussed below in Section 5.2.4.1.

A-4 Gypsum Pond

Routine maintenance was required between 2015 and 2019. The property owner fixed depressions in the cap due to gypsum subsidence, monitoring wells, and damage to fencing related to wildlife activity (presumably elk). The channel wall on the western bank of Magnet Creek required repair again in 2017 (IDEQ, 2020b). This appeared to be caused by entrapment of groundwater behind the heavy filter fabric overlaying the rock and gypsum in the channel's side walls beneath the rip rap cover, which dissolved the gypsum and caused failure. Subsidence has continued in this area including observations in the most recent inspections in 2020.

Results of semi-annual groundwater and surface water monitoring are discussed in the *Data Review* section.

5.2.3 Union Pacific Railroad Right-of-Way Trail (Completed in 1998)

The Idaho Department of Parks and Recreation (IDPR) manages the 7.75-mile-long Union Pacific Railroad (UPRR) ROW trail within the Box. The UPRR is responsible for maintenance of the ROW under oversight by IDEQ and PHD. Routine monitoring of the trail is conducted pursuant to the 2001 O&M manual (MFG, 2001) and maintenance and repair followed ICP requirements. Inspections, maintenance, and repairs are documented in annual reports (Arcadis, 2015a, 2016a, 2017a, 2018a, 2019b). The following summary of actions occurred since the 2015 FYR:

- Transect surveys spaced 1,000 feet apart were conducted yearly between 2015 and 2018 to determine if any barrier settlement or loss had occurred.[11]
- Additional data collection to verify barrier integrity using XRF was completed along portions of the ROW from Pinehurst to the old railroad depot in Kellogg.
- Additional and updated signage was installed to warn the public of health hazards associated with contaminated soils and accessing areas not covered by the remedial barrier.
- Fences damaged by wildlife were repaired along the corridor between the A-4 Gypsum Pond and the CTP.
- The asphalt trail was removed and partially replaced in the Kellogg Greenbelt as part of the Kellogg sewer and water line replacement project. The asphalt trail and shoulder gravel were partially removed and replaced by Idaho Department of Transportation (IDOT) near the Pine Creek trailhead as part of the Pine Creek overpass project in 2014 and 2015.
- A small additional remedial barrier was installed near the Pine Creek bridge to address potential exposure to heavy metals by people leaving the asphalt trail.
- Reclaimed jersey barriers and fencing was installed in Smelterville along the edge of the trail ROW from Airport Road to K Street.
- Additional access controls were installed and or modified to stop unauthorized user access in Pinehurst, Smelterville, and Kellogg.
- Grading of the gravel road barrier adjacent to the trail from Pinehurst to Smelterville was completed.
- Missing or damaged station markers were replaced throughout the trail corridor.

[11] Transect measurements frequency requirement in 2019 changed from yearly to once every 5 years based on the recommendations provided by Arcadis to EPA, IDEQ, and Tribe (Arcadis, 2019a). The O&M Manual will be updated to reflect this change.

5.2.4 Waste Disposal Areas

Activities conducted at waste disposal areas in the Box since the 2015 FYR are discussed below.

5.2.4.1 Page Repository and Expansion Efforts (Operating since 1987)

Several upgrades and operational changes have been completed at the Page Repository to allow for greater efficiencies and increased capacity including continuing construction on the phased westward expansion. From 2015 through 2016, the Cell 2 foundation, originally consisting of coarse durable, cobble-sized material designed to segregate contaminated waste from West Page Swamp surface water and riprap side-slope armoring to prevent scour, was supplemented with additional material. Construction of Cell 3 was also initiated during this period.

In 2017 and again in 2019, Cells 3, 4 and 5 began receiving foundation and starter berm material consisting of concrete wastes. Waste was strategically placed over the newly constructed cells based on the *Page Westward Expansion Final Design* (TerraGraphics, 2013) and updates to the *Waste Management and Planning Strategy* (TerraGraphics, 2016e; Alta, 2019c). These expansion efforts increased the capacity estimate from 665,300 cy to 715,300 cy of waste soil (TerraGraphics, 2013, 2016e).

In addition to expansion construction activities, annual topographic surveys were completed over the past five years. Starting in 2017, drone light detection and ranging (LIDAR) was incorporated to improve estimates of waste placement volumes. Table 5-3 presents estimated volumes placed in the Page Repository Westward Expansion area based on in-place, compacted cubic yards of Box Remedial Action and ICP-permitted project wastes.

Table 5-3. Estimated OU 1 and OU 2 (Box) Remedial Action and ICP-Permitted Project Waste Volumes Placed at Page Repository, 2015 – 2019

Year	Foundation (cy)	Total Waste Soil Volume Placed, excluding Foundation (cy)	Total Volume Placed (cy)
2015	2,800	11,300	14,100
2016	390	12,500	12,890
2017	4,127	11,876	16,003
2018	3,144	20,993	24,137
2019	3,048	33,989	37,037
Totals	**13,509**	**90,658**	**104,167**

Note: NWCS, 2016a, 2017a, 2018a, 2019a, and 2019b.

5.2.4.2 Government Gulch Disposal Sites (Closed in 2019)

To reserve capacity at Page Repository for more contaminated Remedial Action and ICP-generated wastes, lower-level wastes from the Box Paved Roads Program began to be placed in the Limited Use Repository (LUR) in 2015 (LUR; IDEQ and EPA, 2015). The LUR was located in Government Gulch, just south of Smelterville. In the same year, lower level ICP-generated wastes began to be placed in Community Fill Program (CFP) designated areas in Government Gulch.

Temporary erosion and sediment control measures were installed and adjusted as needed during site preparation and waste placement. Appropriate Best Management Practices (BMPs) and stormwater management were maintained throughout construction. Permanent surface and groundwater controls were installed as designed to direct water away from the LUR. A groundwater cutoff drain system was installed along the southernmost section of the CFP south expansion.

The Government Gulch LUR and CFP disposal sites received lower-level wastes until reaching capacity in May 2019, after which they were closed and capped and made ready for redevelopment pursuant to ICP requirements. Table 5-4 presents the estimated volumes of wastes placed in Government Gulch LUR and CFP disposal sites based on in-place, compacted cubic yards of waste.

Table 5-4. Estimated Waste Volumes Placed at Government Gulch LUR and CFP Disposal Sites, 2015 - 2019

Year	LUR Cell 1)	LUR Cell 2	CFP 1	CFP 2	Total Volume Placed
2015	20,600	0	1,800	0	22,400
2016	40,700	0	14,000	0	54,700
2017	35,322	0	17,866	0	53,188
2018	19,710	27,325	7,978	37,399	92,412
2019	2,286	8,936	612	3,977	15,811
Total Volume[a]	118,618	36,261	42,256	41,376	238,511
6-inch Cover Volume	6,072	1,640	1,818	3,753	13,283
Total Waste Volume	**112,546**	**34,621**	**40,438**	**37,623**	**225,228**

[a] Total Volume equals Total Waste Volume plus 6-inch Cover Volume.

Notes:

Additional details can be found in the *Government Gulch LUR Construction Completion Report* (Alta, 2020a)

All units are in cubic yards (cy).

Materials from Box ICP-permitted projects directed to the Page Repository and to the Government Gulch CFP areas over the past five years are provided below in Table 5-5.

Table 5-5. Box ICP-Permitted Project Estimated Waste Volumes, 2015 - 2019

Waste Category	Disposal Site	Materials Disposed or Source of Materials	Units	Calendar Year					Cumulative 5-year Total	Annual Average
				2015	2016	2017	2018	2019		
Building Demolition[a]	Page Repository	Demolition Debris	cy	24	10	300	0	40	**374**	75
		Insulation	Bags	195	0	20	0	0	**215**	43
		Carpets and Pads[b]	sy	5,472	2,154	467	0	0	**8,093**	1,619

Waste Category	Disposal Site	Materials Disposed or Source of Materials	Units	Calendar Year					Cumulative 5-year Total	Annual Average
				2015	2016	2017	2018	2019		
Soil Disposal[c]	Page Repository	Soil	cy	9,500	9,015	8,856	15,230	14,048	**56,649**	11,330
	Government Gulch Community Fill Program	Soil	cy	0	15,120	15,540	33,543	0	**64,203**	12,841

[a] Data provided by PHD (PHD, 2016; 2017; 2018a; 2019; 2020).

[b] An estimated total of 374 cy of building demolition debris (including insulation), 215 bags of insulation, and 8,093 square yards of carpets and padding were directed to the Page Repository between 2015 and 2019. As of the end of 2017, carpets and pads are no longer accepted at Site repositories (IDEQ et al., 2017a).

[c] Data from Annual Box Repository Reports and Weekly Truck Counts (NWCS, 2016a; 2017a; 2018a; 2019a; 2019b). The reported waste volumes from these reports are estimates based on truck counts and will not match those presented in Table 4-4 which are based on year-end engineering surveys for all remedial action and ICP waste volumes placed and compacted.

sy = square yards

5.2.4.3 Smelterville Flats Disposal Site (Operating since 2009)

An extensive gravel apron adjacent to the Shoshone Airport tarmac was previously used as an ICP disposal site beginning in 2009. It is estimated to be at capacity and will be capped and closed in the coming years when the County expands the runway.

5.3 Progress Since the Last Review

This section includes the 2015 protectiveness determination and statements. There were no issues identified in the 2015 FYR report that directly affect protectiveness of the OU 2 remedial actions.

5.3.1 2015 FYR Report Protectiveness Determination

Table 5-6. Protectiveness Determination and Statement from 2015 Five-year Review Report

OU 2 Protectiveness Statement
Protectiveness Determination: Will be protective
Protectiveness Statement: The remedy at OU 2 is expected to be protective of human health and the environment upon completion. In the interim, where remedial activities have been completed to date, they have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Implementation of Phase I of remedy as selected in the 1992 ROD, ROD Amendments (1996, 2001, and 2012), and ESDs (1996 and 1998) includes extensive source removal and stabilization efforts, demolition activities, development, and implementation of the ICP, land use development support, and public health response actions.

OU 2 Protectiveness Statement

Phase I includes monitoring and evaluation of the success of source control efforts. Interim control and treatment of contaminated water and AMD were also included in Phase I of remedy implementation.

Phase I remedies have removed and consolidated over 2.8 million cy of contaminated waste onsite in engineered closure areas (the Smelter and CIA closures; see Table 12). The use of geomembrane cover systems on these closure areas effectively removes these contaminated wastes from direct contact by humans and biological receptors. Consolidating these wastes in engineered closures also substantially reduces the exposure pathway to the surface water and groundwater environment in comparison to pre-remediation Site conditions.

Over 800 acres of property within OU 2 have been capped to eliminate direct contact with residual contamination that remains in place within some areas of OU 2. In addition, the revegetation work conducted as part of the Phase I remedial actions has substantially controlled erosion and has significantly improved the visual aesthetics of OU 2. The success of the Phase I revegetation efforts is providing improved habitat for wildlife that was largely absent for decades in many areas of the hillsides and Smelterville Flats.

All of these efforts have reduced or eliminated the potential for humans to have direct contact with soil/source contaminants, have reduced opportunities for transport of contaminants by surface water and air, and are expected to provide surface and groundwater quality improvements over time throughout the Site. Responsibility for O&M of OU 2 Phase I remedial actions has been transferred to the state of Idaho upon completion of the remedies.

5.4 Data Review

This FYR included a review of relevant site-related documents and recent inspection and monitoring data reports. A complete list of the documents reviewed can be found in Appendix A (*References)*. This section provides an overview of data collected and evaluated since the 2015 FYR.

5.4.1 Soil and Dust

5.4.1.1 Phase I Remedial Action Barrier Data

Evaluation of Phase I remedial action barriers to underlying contamination were conducted as part of this FYR during routine O&M inspections.

Routine inspections of Smelterville Flats and results from a 2018 sampling event indicate a mostly intact vegetative cover with the exception of some discrete areas of erosion and exposed tailings that remain in two forested areas (IDEQ, 2019). Vegetation is self-regenerating and little maintenance is required beyond noxious weed control.

The capped area of the CIA, closure runoff control berms and swales, and rock-lined surface water discharge channels are stable, although some evidence of rock displacement from surface water discharge channels was observed. The density and quality of the vegetative cover, however, appears to be degrading with desirable plants being replaced by noxious weeds.

Animal burrowing in the cap material in the Smelter Complex area resulted is exposed slag, and the holes may provide a preferential pathway for water penetration into and through the underlying material.

Vegetation in undisturbed hillside and gulch areas is thriving; however, installation of new dirt and gravel roads for private logging and mining exploration purposes have resulted in an increase of ATV use, likely resulting in exposures to contaminated soils and dust, and the potential for slope destabilization and

erosion. Frequent camping observed in Grouse Gulch near the stream bed may have compromised the integrity of the remediated soil barrier exposing campers to underlying contaminated soil and erosion of that soil into Grouse Creek. These areas will continue to be monitored.

5.4.1.2 Union Pacific Railroad Right-of-Way Trail Data

Evaluation of the integrity of the UPRR ROW within the Box was conducted as part of this FYR.

Transect surveys showed no significant barrier loss problems (Arcadis, 2015a, 2016a, 2017a, 2018a). Results of additional XRF data collected along portions of the ROW from Pinehurst to the old railroad depot in Kellogg indicated the gravel barrier was intact.

Although transect surveys and XRF readings indicated no significant barrier loss, annual maintenance and monitoring activities show damage caused by illegal ATV access outside of transect locations. The installation of additional access controls and signage to re-direct ATV users was marginally successful. In addition, people continue to access the SFCDR and Pine Creek from the trail despite signs posted warning of hazardous wastes. These issues and recommendations to mitigate damage and exposures continue to be discussed by the Recreational Sites Team.

5.4.1.3 Page Repository Data

Reports on Page Repository operations and expansion effort were evaluated as part of this FYR.

The permanent decontamination facility at the Page Repository was in full operation each construction season which reduced the potential for tracking contaminated materials off-site. ICP users use designated hardened roads to dispose of wastes on top of the repository and to exit the facility. Because the hardened roadways are easy to clean and have proven to be an asset in controlling contaminant tracking, all roadways, off-loading aprons, equipment, and material stockpile areas that are underlain by asphalt regrinds are routinely inspected, washed clean of dirt and litter, and rebuilt to optimize their use as a clean barrier in work areas.

Dust suppression efforts and other best management practices during expansion efforts continued to be applied and revegetation efforts kept pace with earthwork to minimize fugitive dust and movement of contaminated soils. Partial closure of portions of the expansion that have reached final grade have also been effective interim measures to reduce contact with contaminated soils and underlying wastes, and to reduce erosion of soil and sediment.

5.4.1.4 Institutional Controls Program Data

Box ICP data that was reviewed and evaluated as part of this FYR is discussed in Sections 4.1.1.4 and 4.4.4. Evaluation of Government Gulch LUR and CFP waste disposal areas recently closed pursuant to ICP requirements will be evaluated in the next FYR.

5.4.1.5 Human Health Mine and Mill Sites Data

To begin to address potential recontamination from mine dumps, 105 mine and mill sites throughout the Site were characterized in 2016 and prioritized for action based on human health risks and recontamination potential (TerraGraphics, 2017a). The prioritization effort did not include properties with active mining, and PHD personnel continue to observe recreational off-highway vehicle use at a few mine dump areas above Wardner, where there are restricted areas and active mining sites.

5.4.1.6 Recreational Sites Data

Eight recreation sites in the Box were evaluated in 2018 and 2019 and prioritized for action based on human health risks (Alta, 2019d). A portion of the Smelterville Flats has been used as a walking trail and people occasionally attempted to camp at the site, although signs were posted to deter them. As a result of this activity, Smelterville Flats was sampled in 2018 and 2019 to assess the integrity of the barrier and identify whether potential human health risks exist. Sampling results are summarized in technical memoranda (Alta 2019d, 2020b) and remedial actions are in the planning stages. EPA and IDEQ will continue to evaluate and prioritize actions at recreational sites in the Box, as described in the Coeur d'Alene Basin Recreational Sites Strategy Plan (EPA et al., 2016).

5.4.2 Surface Water and Groundwater

5.4.2.1 Central Treatment Plant Effluent Data

The CTP has operated under discharge limitations established by National Pollution Discharge Elimination System (NPDES) permits. The 2012 Upper Basin Interim ROD Amendment selected the discharge point of the upgraded CTP to be the SFCDR (whereas it previously discharged into Bunker Creek). In February 2015, EPA established new surface water quality discharge requirements consistent with the substantive requirements of the NPDES permit program. The statutory and regulatory basis for the technology and water quality-based effluent limits and a list of the current and future CTP effluent discharge limits, are provided in the *CTP Discharge Requirements Technical Memorandum* (EPA, 2015b).

Monitoring of the CTP influent and effluent streams are conducted approximately three times per week to assure compliance with discharge standards and determine if operations need to be adjusted. Over the past five years, effluent water quality has generally been in compliance with the expired NPDES discharge permit requirements with few exceptions. Removal efficiencies are typically 90 percent for zinc. The average percent removal of lead and zinc for the years 2015 through 2019 was greater than 99 percent while manganese averaged about 75 percent. Metals removed from the Bunker Hill Mine water and other de minimus influent streams averaged approximately 480,000 lbs of zinc, 320,000 lbs of manganese, and 3,300 lbs of lead per year. For part of this reporting period, the CTP was operating on a temporary treatment system while the upgrades were being constructed.

The upgraded CTP came on-line in mid-2020. Preliminary assessments of the data collected indicate zinc and other heavy metals removal efficiency is greater than 99 percent from the influent streams. This results in less than 2 lbs/day average zinc discharged to the SFCDR. Although not a hazardous substance under CERCLA, phosphorus is also monitored in the CTP influent streams and the effluent streams. Preliminary assessments indicate total phophorous removal is greater than 98 percent resulting in 10 lbs/day discharged to the SFCDR.

5.4.2.2 A-4 Gypsum Pond

Semi-annual surface water and groundwater monitoring data were evaluated as part of this FYR.

Surface water monitoring data were collected between 2015 and 2019[12]. Groundwater monitoring data were collected between 2015 and 2019; however, the PRP, Stauffer Management Company, ceased groundwater monitoring after 2019 despite direction given by EPA and IDEQ in a 2020 letter to continue

[12] Thomas, Mike, IDEQ. Letter to Carol Dickerson, Project Manager, Zeneca, Inc., 23 Oct. 1998

groundwater monitoring during O&M (IDEQ and EPA, 2020). This issue will continue to be discussed with the PRP in 2022.

Concentrations of cadmium, zinc, fluoride, phosphate, and sulfate between 2015 and 2019 in surface water samples from south (MC-1) to north (MC-2) along Magnet Gulch Channel appear to show an increasing trend (MFA, 2019d). This increase may be caused by observed ponding of spring snow melt which slowly drains into the closure causing gypsum dissolution and elevated groundwaters.

Recent groundwater samples showed elevated concentrations of cadmium, zinc, fluoride, phosphate and sulfate in monitoring wells A4-2 and A4-12. These wells are located downgradient of the gypsum closure with respect to groundwater flow. Fluoride is found in notable concentrations in these wells which is indicative of gypsum dissolution. Elevated water levels in monitoring wells A4-2, A4-4, and A4-12 appear to have come in contact with gypsum and waste rock at the bottom of the unlined closure approximately 24 percent of the time. There is also concern that the Magnet Creek Gulch fabric liner may have become impregnated with silt and is potentially damming water on the A-4 Gypsum Pond's western slope.

5.4.2.3 Page Repository Data

Surface water and groundwater monitoring data from Page were evaluated as part of this FYR.

Quarterly water quality monitoring events were conducted through 2017 and biannual monitoring events were conducted from May 2017 to fall 2019[13]. Potential impacts to water quality from repository expansion efforts are visually inspected at least weekly and after major stormwater events, and BMPs are maintained or modified based on the results of those inspections. Partial closure with vegetative covers has effectively reduced soil and sediment erosion, and no unauthorized releases through the stormwater management system have been observed since the 2015 FYR.

A prediction limit (PL) approach to groundwater monitoring was implemented beginning in May 2017 to detect potential water quality impacts from repository expansion efforts (TerraGraphics, 2017b).[14] PLs developed in 2017 were updated in 2019 based on exceedance of some 2017 limits (Alta, 2019c). In both the 2019 and 2019 statistical analyses, potentially decreasing trends were identified in groundwater, including post-waste placement dissolved cadmium data at cross-gradient site PZ-03, and both pre- and post-waste placement dissolved lead data at downgradient site PZ-07. Potentially increasing trends were identified for post-waste placement dissolved arsenic data at downgradient site PZ-07, and post-waste placement dissolved zinc data at three downgradient sites (PZ-06, PZ-07, and 0118-U in 2017 only) and at the cross-gradient site PZ-03 (in 2019 only).

Although PL exceedances have occurred for various analytes/sites in groundwater, a statistically significant increase (declared when all three samples—initial plus both retesting samples—show an increase) was identified for dissolved zinc at cross-gradient site PZ-03 in fall 2018 and fall 2019. The statistically significant increases are not thought to be connected to waste added to the repository due to the cross-gradient site location. Potential reasons for the increasing dissolved zinc trend and statistically significant increases at PZ-03 are being investigated and will be documented in a forthcoming technical memorandum.

[13] Surface water sites in the WENI area were removed from the water monitoring program in 2018 given that sufficient baseline data had been collected for the WENI wetland project, and these sites were not monitored for evaluation of the Page Repository Westward Expansion.
[14] The prediction limit approach was not implemented for surface waters given the limited sample size (TerraGraphics, 2017b).

No trends were identified for analytes at the downgradient surface water site (WP-0001), although AWQC ratios above 1 continue to be observed for total and dissolved zinc for each event, and total and dissolved cadmium in select events over the past 5 years. Upgradient surface water sites also exceeded AWQC.

5.4.2.4 BEMP Surface Water Monitoring Data

BEMP OU 2 surface water monitoring during this FYR period was primarily conducted to provide a baseline dataset prior to construction and operation of the Phase II GWCS remedial action.

In Water Year (WY) 2014 to 2018, the USGS collected samples and took instantaneous discharge measurements two times per year at four sites in OU 2 (Bunker Creek, Government Gulch, Milo Creek, and seeps north of the CIA tailings). The USGS collected only limited samples at these sites prior to WY 2014; however, other entities have collected samples from these sites from WY 1990 to 2013 and these data were downloaded from the National Water Quality Portal (National Water Quality Monitoring Council, 2020) and used for analysis. The combined water-quality data were used to calculate site- and event-specific dissolved cadmium, lead, and zinc AWQC ratios over the period of record for which data were available for each site. Where event-specific hardness values were not available, site-specific average hardness values were used. The AWQC ratios were based on the SFCDR-specific criteria for chronic aquatic exposure.

Generally, dissolved cadmium, lead, and zinc median and range AWQC ratios have declined at Bunker Creek, Government Gulch, and Milo Creek since WY 1990. However, the median and range dissolved zinc AWQC ratios increased somewhat at Bunker Creek in WY 2014 to 2018. Overall, dissolved cadmium and zinc AWQC ratios remain above one for most samples at all sites. Dissolved lead AWQC ratios were below one for most sites and most samples, but Milo Creek was a notable exception with all samples above chronic criteria. This suggests that for OU 2, the CIA and proximal tributaries remained major sources of dissolved cadmium and zinc, whereas Milo Creek was a major source for lead.

During baseflow conditions in WY 2017, the USGS conducted a seepage study to quantify groundwater loading of trace metals from the CIA to the SFCDR between Kellogg and Smelterville. The 2017 seepage study results found that most of the dissolved metal load added to the SFCDR between Kellogg and Smelterville was from groundwater rather than from discrete surface water sources. Results at the seeps north of the CIA tailings also showed dissolved zinc concentrations did not increase over the past five years (Zinsser, 2019).

The lack of improvement in AWQC ratios for the seeps north of the tailings, along with results from the 2017 seepage study, indicate that groundwater from the CIA has persisted as a major source of dissolved cadmium and zinc loading to the SFCDR. This source should be addressed with the current construction of the Phase II GWCS. Following optimization of the new GWCS, the USGS will conduct a second seepage study in 2022 between Kellogg and Smelterville to evaluate this remedy's efficacy on reducing dissolved metal loading from groundwater to the SFCDR.

5.4.2.5 BEMP Groundwater Monitoring Data

In 2015, EPA completed an optimization review of its site-wide groundwater monitoring program that led to development of the *2016 BEMP Quality Assurance Project Plan (QAPP) for Groundwater (*TerraGraphics 2015a, 2015b and TerraGraphics, 2016a). The initial focus of the optimized BEMP in OU 2 was to develop a baseline groundwater monitoring dataset at 11 sites with insufficient data prior to implementation of the CTP/GWCS remedial actions (CH2M, 2018). The 11 groundwater sites were located north and west of the CIA. Three of the sites are screened in the lower aquifer, and eight sites are

screened in the upper aquifer. IDEQ's contractor continued to monitor these 11 sites from fall 2015 to fall 2018.

Baseline data from the 11 groundwater sites indicated that ARARs for select COCs continued to be exceeded over the past five years at most sites. In the lower aquifer wells, conditions were stable or improving for dissolved cadmium and zinc (Alta and IDEQ, 2021). Upper aquifer sites show only one site is stable for dissolved cadmium and zinc (no sites improving). The remainder of the sites are not improving, with one of the 11 sites showing increasing cadmium trends. In addition, the median concentrations exceed ARARs for cadmium and zinc at all but one upper aquifer site, and cadmium at one lower aquifer site.

In 2021, a seasonal evaluation and a Mann-Kendall trend analysis was conducted on dissolved zinc data sets for 38 groundwater monitoring sites spanning from 2002 to 2018 (Alta and IDEQ, 2021). Twelve of the thirty-eight sites evaluated showed statistically significant dissolved zinc trends, all other sites showed nonsignificant trends. All significant trends were decreasing except at two upper aquifer sites, which were increasing.

5.4.3 Ecological Monitoring Data

5.4.3.1 Wetland Mitigation Project Data

To meet EPA and IDEQ obligations for mitigating wetland losses due to westward expansion efforts at Page Repository, the following two mitigation projects were constructed:

- A 45-acre wetland mitigation project at Robinson Creek in the Lower Basin began in 2014. A summary discussion of the Robinson Creek project is in Sections 6.2.4.2 and 6.4.8.2 of this report.
- A 14-acre wetland constructed in 2012 in the 18-acre West End Natural Infiltration (WENI) area located north of West Page Swamp.

Monitoring of the wetlands in the WENI area continued through 2018, at which time the wetlands showed efficacy (Alta, 2018b). The assessed potential credits from the WENI area wetland indicate a 14.3 acres of 1-to-1 credit; however, 0.58 acres (or credits) has been applied to the Canyon Creek Repository project constructed by the Coeur d'Alene Trust (MFA, 2019f). This leaves approximately 13.7 acres of mitigation credit remaining. These plus anticipated excess credits from the Robinson Creek will be banked to offset other site-wide remedial actions requiring mitigation under Section 404 of the Clean Water Act (CWA).

5.4.3.2 Songbird Monitoring Data

Biological monitoring of two species of songbirds conducted by the USFWS in 2015 at Smelterville Flats was evaluated as part of this FYR (USFWS, 2019). This data was used to assess performance of remedial actions on reducing ecological exposures to lead in riparian area soils.

The American robin (*Turdus migratorius*) and song sparrow (*Melospiza melodia*) were selected as representative receptors within OU 2 because of their relative abundance and risks from lead contaminated soil in the Basin, small home ranges of two to 12 acres, and because they frequent riparian areas. Songbirds were captured and sampled for lead exposure at the two Monitoring Avian Productivity and Survivorship (MAPS; 2010-2014) stations: Smelterville Flats and the Reference Site along the North Fork Coeur d'Alene River (NFCDR).

Lead concentrations were elevated in both soil and songbird blood compared to reference conditions. Median soil lead concentrations were 36 times higher at Smelterville Flats than at the Reference Site.

Songbird mean blood lead concentrations at Smelterville Flats were seven times higher in American robin and eight times higher in song sparrow as compared to the Reference Site.

American robins and song sparrows sampled from the Reference Site all had background blood lead levels, whereas Smelterville Flats exhibited blood lead concentrations at toxic levels. As shown in Table 5-7, American robins sampled from Smelterville Flats showed 27 percent subclinical, and 45 percent severe clinical levels.

Table 5-7. Percentage of Songbirds by Blood Lead Toxicity Category in OU 2 and the Reference Site, 2015

Location	Species	N	< 1.04[a]	1.04 to < 2.6[b]	2.6 to < 5.2[c]	> 5.2[d]
Smelterville Flats	American Robin	11		27%	27%	45%
	Song Sparrow	28	32%	64%	4%	
Reference Site	American Robin	7	100%			
	Song Sparrow	29	100%			

[a] Suggested background criteria.

[b] Suggested subclinical toxicity criteria

[c] Suggested clinical toxicity criteria.

[d] Suggested severe clinical toxicity criteria (Franson and Pain, 2011).

Results indicate that despite previous remedial activities at Smelterville Flats, representative songbirds using this riparian habitat are exposed to and accumulate lead at concentrations above toxicological thresholds (Franson and Pain, 2011) and Reference Site conditions.

5.5 Technical Assessment

5.5.1 Question A: Is the Remedy Functioning as Intended by the Decision Documents?

The OU 2 remedy selected in EPA decision documents where completed is functioning as intended.

5.5.1.1 Human Health Selected Remedy

The OU 2 human health remedy selected in the 1992 Non-populated Areas ROD, 1996 Non-populated Areas ROD Amendment, and the 2012 Upper Basin Interim ROD Amendment where completed is functioning as intended.

Successful implementation of the comprehensive phased remedial strategy has substantially reduced the potential for direct contact with soil and source contaminants, opportunities for contaminants to be transported by air and surface water, and are expected to provide surface and groundwater quality improvements over time throughout the site.

Phase I human health remedial actions, which focused on removal and containment of waste materials and stabilization of contaminated hillsides, are nearly complete. To date, more than 2.8 million cubic yards of contaminated soil and other source materials have been removed and consolidated into engineered waste disposal areas, and more than 800 acres of property within OU 2 have been capped with a variety of material acting as barriers to underlying contamination.

Overall, Phase I barriers are performing as intended and limiting direct contact exposures. The PHD continued to effectively manage the ICP through its permitting, oversight and inspection activities to ensure that clean barriers to underlying contamination remain intact to maintain achievement of the 350 mg/kg residential community-wide lead performance standard. Discrete areas in some caps, however, have eroded and are showing bare patches that could potentially increase exposures to contaminated soil and other waste materials. The capped area of the Smelter Closure Area, for example, is generally functioning as designed; however, animal burrowing observed in cap material has resulted in exposed slag necessitating more frequent monitoring and repair. Another example is the vegetative cap on Smelterville Flats which is still intact as evidenced by sampling in 2018; however, discrete areas of erosion and exposed tailings were observed in two forested areas (Alta, 2019e). These areas on Smelterville Flats will continue to be monitored and additional remedial actions may be considered should these areas become developed as a public recreational area. Current study on and applications of biological noxious weed controls on various OU 2 vegetative caps are expected to allow beneficial plants to take hold and provide for more adequate cover material.

As in other areas of the Bunker Hill Superfund site, increases in recreational pursuits in nonrecreational areas have been observed over the past five years. Although vegetation in undisturbed hillside and gulch areas is thriving, installation of new dirt and gravel roads for private logging and mining exploration purposes has resulted in increased ATV use, likely resulting in exposures to contaminated soils and dust, and the potential for slope destabilization and erosion. Frequent camping observed in Grouse Gulch near the stream bed may have compromised the integrity of the remediated soil barrier exposing campers to underlying contaminated soil and erosion of that soil into Grouse Creek. Transect surveys and additional XRF data collected along the UPRR ROW trail within the Box indicated no significant gravel or asphalt barrier loss; however, annual O&M inspections show damage caused by illegal ATV access outside of transect areas. In addition, people continue to access unremediated areas along the SFCDR and Pine Creek from the trail despite signs warning of the risks. These issues and remedial alternatives to reduce exposure risks will continue to be evaluated by the multi-agency Recreational Sites Team.

The permanent decontamination facility at the Page Repository was in full operation each construction season which reduced the potential for tracking contaminated materials offsite. Dust suppression efforts and other best management practices conducted during expansion efforts continued to be applied and revegetation efforts kept pace with earthwork to minimize fugitive dust and movement of contaminated soils. Partial closure of portions of the expansion that have reached final grade have also been effective in reducing potential exposures and limiting offsite erosion of soil and sediment.

Evaluation of the impacts of Phase I removal and source control remedial actions on groundwater protection as a drinking water source identified in the 1992 Non-populated Areas ROD indicate that SDWA MCLs have not been met within the Box. Given the pervasive nature of the subsurface contamination under Box communities, roadways, and infrastructure (and elsewhere in the Upper Basin), achievement of SDWA MCLs will more than likely never be realized. Instead, and when appropriate, EPA will evaluate monitoring data after completion of Phase I and Phase II remedial actions to determine whether a technical impracticability waiver may be warranted at locations where achievement of drinking water standards in groundwater cannot be achieved. In the meantime, as discussed in Section 4.3.2.2, all residential drinking water in the Box is sourced from the community water system or from domestic water wells drilled in compliance with IDWR area of drilling concern guidelines (IDEQ, 2020d).

5.5.1.2 Environmental/Ecological Selected Remedy

The OU 2 environmental/ecological remedy selected in the 1992 Non-populated Areas ROD, 1996 Non-populated Areas ROD Amendment, 2001 Non-populated Areas (Minewater) ROD Amendment, and the 2012 Upper Basin Interim ROD Amendment where completed is functioning as intended.

For most of this reporting period, the CTP was operating on a temporary treatment system while the upgrades were being constructed. Monitoring of the CTP influent streams, including those from the Bunker Hill Mine, and the effluent stream from the CTP prior to implementation of Phase II remedial action per the 2001 Non-populated Areas (Minewater) ROD Amendment and the 2012 Upper Basin Interim ROD Amendment indicate an average of 99 percent of lead and zinc were removed between 2015 and 2019, while manganese averaged about 75 percent. The upgraded and expanded CTP is anticipated to be even more effective.

Surface water monitoring at the A-4 Gypsum Pond between 2015 and 2019 appeared to show an increasing trend of cadmium, zinc, fluoride, phosphate, and sulfate from south to north along the Magnet Gulch Channel. Observed ponding of spring snow melt slowly draining into underlying gypsum was assumed to be the cause of increased dissolution of gypsum. Groundwater samples during this time period showed elevated concentrations of cadmium, zinc, fluoride, phosphate, and sulfate in wells downgradient of the gypsum closure with respect to groundwater flow. Fluoride is also found in notable concentrations in these wells which is indicative of gypsum dissolution. Elevated water levels in three groundwater monitoring wells appear to have come in contact with gypsum and waste rock at the bottom of the unlined closure.

Page Repository surface water monitoring data and observations indicated no unauthorized releases of soil and sediment through the stormwater management system since the 2015 FYR. Groundwater PLs were developed in 2017 and revised in 2019 to detect potential water quality impacts from expansion efforts. Although PL limit exceedances have occurred for various analytes/sites in groundwater, a statistically significant increase was identified for dissolved zinc at a cross-gradient site in fall 2018 and fall 2019. This increase was not thought to be connected to waste added to the Repository, however, due to its cross-gradient site location.

BEMP surface water and groundwater monitoring in OU 2 during this FYR period was primarily conducted to providing a baseline dataset prior to construction and operation of the Phase II GWCS remedial action. Results of baseline surface water monitoring suggests that the CIA and proximal tributaries remained major sources of dissolved cadmium and zinc to the SFCDR, whereas Milo Creek was a major source for lead. Results of a 2017 seepage study, however, suggest that most of the dissolved metal load added to the SFCDR between Kellogg and Smelterville was from groundwater rather than from discrete surface water sources. The lack of improvement in AWQC ratios for seeps north of the CIA tailings, along with results from the 2017 seepage study, indicate that groundwater from the CIA has persisted as a major source of dissolved cadmium and zinc loading to the SFCDR. The Phase II GWCS remedial action, once completed, is expected to intercept metals-contaminated groundwater and reduce loading to the SFCDR from groundwater by over 60 percent. However, the efficacy of this remedial action will not be observed in surface water and groundwater data until the system is optimized in 2022. Following optimization, the USGS will conduct a second seepage study in 2022 between Kellogg and Smelterville to evaluate this remedy's efficacy on reducing dissolved metal loading from groundwater to the SFCDR.

Results of biological monitoring in Smelterville Flats indicate that despite previous remedial activities, representative songbirds using this riparian habitat are exposed to and accumulate lead at concentrations above toxicological thresholds (Franson and Pain, 2011) and Reference Site conditions.

5.5.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of the Remedy Selection Still Valid?

Certain exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selected in OU 2 decision documents have changed. There were no changes, however, since the 2015 FYR.

5.5.2.1 Changes in Standards and TBCs

EPA reviewed the federal, state, and Tribal requirements that are ARARs, and the TBC criteria selected in the EPA RODs as part of this FYR. There were no changes that called into question the validity or protectiveness of the Selected Remedy.

5.5.2.2 Changes in Toxicity and Other Contaminant Characteristic

Recent scientific literature on lead toxicology and epidemiology provides evidence that adverse health effects are associated with blood lead levels < 10 µg/dL (National Toxicology Program, 2012; EPA, 2013a; ATSDR, 2020). EPA recognizes that a target blood lead level of 10 µg/dL may not be adequately protective for children and adults. However, to-date, EPA has not yet changed their national lead health risk policy.

5.5.2.3 Changes in Risk Assessment Methods

As discussed in the 2015 FYR report, the recreational scenario evaluated in the original OU 2 risk assessment suggested that soil lead concentrations of approximately 1,200 to 3,500 mg/kg could be considered acceptable for short-term exposures involving children 6 years of age and older (SAIC, 1992). Several factors and assumptions were used to estimate these short-term soil lead concentrations, including projected post-remediation blood lead levels for children residing in OU 1 coupled with a 20 percent bioavailability estimate. Limited new bioavailability data obtained in 2018 from four OU 2 recreational sites may indicate that the original assumption of 20 percent is low and recreational risks likely underestimated (Alta 2018c, 2019d). EPA and IDEQ will continue to discuss impacts from observed increases in recreational activities in the Box.

5.5.2.4 Changes in Exposure Pathways

There have been no changes in land use that would call into question the protectiveness of the OU 2 selected remedy, nor were there changes in human health or ecological routes of exposure or newly identified receptors that would affect protectiveness.

New commercial and residential developments are being planned but these were anticipated in ROD cleanup level decisions for protection of human health. In addition, these new developments will require permits and oversight from the ICP to ensure that contaminated soils and backfill requirements for clean soil and barriers to underlying contamination are maintained, and drinking water sources are protective.

As discussed in other areas of this report, recreational exposures are likely a more predominant exposure pathway across the entire site than originally assumed. Recreationalists in OU 2 typically use the Trail of the Coeur d'Alenes, the SFCDR, and hillsides; however, the frequency of access in localized areas is greater than originally anticipated according to observations made by the Recreational Sites Team and IDEQ and PHD staff. Development of Upper Magnet Gulch, Deadwood Gulch, and Grouse Gulch has increased hillsides accessibility. Along the Trail of the Coeur d'Alenes, new, informal pedestrian paths

leading down the riverbank continue to be created and likely result in erosion and increased exposure. Observance of families with young children recreating in unremediated areas dispersed across the Box and Basin has increased over the past five years.

5.5.2.5 Expected Progress Towards Meeting RAOs

The RAOs outlined in EPA decision documents plans are intended to reduce or eliminate human and ecological exposures to COCs and reduce impacts to surface water and groundwater quality over time. Additional risk-reduction measures to limit access to and exposures from recreating in remediated and unremediated areas in OU 2 will be required to achieve all human health RAOs.

Overall decreases in dissolved cadmium, lead, and zinc AWQC ratios in most OU 2 surface water sites since WY 1990 suggest that Phase I remedial actions are effectively reducing dissolved cadmium, lead, and zinc concentrations in OU 2, but the persistence of AWQC ratios above chronic criteria and smaller improvements in the last 10 years suggest the need for continued progress.

5.5.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has become available since the last FYR that would call into question the protectiveness of the OU 2 selected remedy.

5.6 Issues and Recommendations

No additional information has become available since the last FYR that would call into question the protectiveness of the OU 2 selected remedy.

Table 5-8. Issues and Recommendations in Operable Unit 2

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
Operable Unit 2

5.6.1 Other Findings

Issues that do not directly affect protectiveness are included in the *Other Findings* table located in Appendix E.

5.7 Protectiveness Statement

Table 5-9. 2020 FYR Protectiveness Determination and Statements

OU 2 Protectiveness Determination and Statements	
Operable Unit:	***Protectiveness Determination:***
2	**Will be Protective**

Protectiveness Statement:

The selected remedy at Operable Unit 2 (OU 2) is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have addressed direct exposure pathways in these areas.

Human Health Selected Remedy

Phase I of the two-phased OU 2 remedial strategy is nearly complete. Removal and containment of hazardous materials have reduced soil and dust lead and other heavy metal concentrations to below target levels. Clean barriers to underlying contamination are performing as intended and limiting direct contact and fugitive dust exposures. Effective management of the Institutional Controls Program (ICP) through its permitting, oversight, and inspection activities ensures barriers remain intact, contributing to the continued achievement of the Box community-wide residential soil lead performance standard. The observance of increased private development in remediated hillside areas and recreational activities in these and unremediated areas across OU 2, however, increases the potential for exposures to contaminated soil and dust, and the potential for slope destabilization and erosion. These issues and remedial alternatives to reduce exposure risks will continue to be evaluated by the multi-agency Recreational Sites Team.

Environmental/Ecological Remedy

Phase I remedial actions to stabilize hillsides and creek channels, manage stormwater runoff from capped waste disposal and other remediated areas, and control and treat contaminated water and Acid Mine Drainage (AMD) at the Central Treatment Plant (CTP) has limited lead and zinc-contaminated soils, sediment, surface water and groundwater from entering downgradient surface water bodies. Preliminary evaluation of the effectiveness of Phase I removal and source control actions on improving surface water and groundwater quality, however, suggest that sources of contamination in OU 2 continue to exist. In addition, biological monitoring in Smelterville Flats riparian areas indicates that despite Phase I remedial actions, songbirds are exposed to and accumulate lead at concentrations above toxicological thresholds. Phase II remedial actions to address these environmental and ecological issues will be evaluated in future FYRs.

6 Operable Unit 3

6.1 Status of Implementation

This section describes the remedial actions that were implemented in OU 2 since the 2015 FYR.

6.1.1 Residential and Community Areas

Response activities in OU 3 residential and community areas[15] as described in site decision documents began in 1989. Since that time several of these actions have been completed and have transitioned into O&M. Human health remedial actions conducted since the 2015 FYR are discussed below. These actions were conducted to limit exposures to contaminated soil, house dust, and drinking water.

6.1.1.1 Property Remediation Program (1989 - present)

Removal actions were initiated in 1989 by mining companies and government agencies to address immediate threats and/or obvious sources of contamination in or along streams (Appendix C). After release of the 2002 OU 3 Interim ROD, remediation of OU 3 residential and commercial properties, common-use areas, and ROWs continued under the Basin Property Remediation Program (BPRP). IDEQ managed the BPRP through 2015. Since 2016, the Coeur d'Alene Trust has managed the BPRP with oversight from EPA and IDEQ.

Since the 2015 FYR, an additional 288 properties have been remediated, including 8 that were considered high risk. An estimated 83,910 cy of contaminated soil were removed from these properties and placed in designated repositories (Table 6-1).

Table 6-1. Summary of OU 3 Property Remediation, 2015 - 2019

Year	2015	2016	2017	2018	2019	Totals
Remediated Properties[a,b]	82	74	48	54	30	**288**
Remediated High Risk Properties with Resident Young Children (less than 7 years of age) or Pregnant Women, Licensed Day Care Center, or Children that Have a High Blood Lead Level	3	3	0	1	1	**8**
Cubic Yards of Soil Removed[c]	25,229	25,373	9,460	12,595	11,253	**83,910**

[a] Remediation of Schools/Daycares and Recreational and Common Use Areas have not been tracked separately from other properties since 2005.

[b] Data provided by Coeur d'Alene Trust and IDEQ. A property may have discrete areas, such as a ROW, driveway, or play area, in addition to a yard. If discrete areas of a property were remediated (but not the yard), that property is included in this count. City or County ROWs and private gravel roads are also included in this count.

[c] Data in 2015 from (DG&S, 2016; NWCS, 2016b). Data from 2016 through 2019 from annual construction completion reports (McGillivray Environmental, LLC, 2016, 2017, 2018; Pioneer, 2020a).

Based on 2020 estimates of eligible parcels, 97 percent have been sampled and remediation is 93 percent complete to date with an estimated 904,000 cy of contaminated soil removed and placed in designated

[15] Residential areas refer to privately owned or occupied homes and property. Community areas refer to public places, such as recreational areas, parks, town centers, and businesses.

repositories. Property owners are responsible for O&M of their remediated properties and must comply with ICP permitting requirements.

Approximately 3 percent of the eligible parcels have owners that have refused or not responded to requests for sampling (personal communication between J. Crawford and A. Helkey, February 2021). These "refusals" will continue to be tracked via the BPRP should the current property owner change their minds or the property changes ownership.

6.1.1.2 House Dust Monitoring and Intervention Services (1996 - present)

House dust monitoring began in 1996 and has occurred most years since 2004. IDEQ managed the OU 3 house dust monitoring and intervention services through 2015. The Coeur d'Alene Trust took over this work in 2016 with oversight from EPA and IDEQ.

The majority of OU 3 house dust lead and arsenic data were obtained through "targeted surveys." This type of survey focuses solicitation on remediated properties, and on homes where children under 7 years of age and/or pregnant women reside regardless of remediation status. Opportunistic house dust samples were also collected through the BPRP (accounting for a minor portion of the dust data set).

Targeted surveys were conducted in 2015, 2017, and 2018 and consisted of taking samples from personal household vacuum cleaners and from specialized dust mats placed just inside the main entry of participating homes. Dust monitoring conducted in 2015 and 2017 targeted homes in the upper Basin[16], except for a few homes with young children in the lower Basin. Sampling in 2018 targeted homes in the lower Basin, except for a few homes with young children in the upper Basin. Vacuum sample results were obtained from 430 homes and mat sample results were obtained from 811 homes over the last 5 years.

If dust lead concentrations were ≥ 1,500 mg/kg, the PHD conducted follow-up and intervention services as part of the LHIP. Between 2015 and 2018, PHD contacted residents at 42 homes by phone or letter recommending participants call to discuss their results; only 12 families completed a follow-up with PHD (Alta, 2020c).

In addition to dust monitoring, PHD, IDEQ, and EPA worked toward addressing recommendations in the 2015 FYR to develop alternative approaches to identify at-risk children in addition to the current dust intervention protocol. See the *Progress Since Last Five-Year Review* section for more information.

6.1.1.3 Lead Health Intervention Program (1996 - present)

See Section 4.1.1.1 for a description of the sitewide LHIP services offered by the PHD.

Blood Lead Screening

Annual voluntary blood lead screening of children and follow-up with those with elevated lead levels have been offered since 1996 in OU 3. Approaches to increase participation rates at blood screening events for OU 1 residents and recreators were the same for those in OU 3, except the monetary incentive for each child 6 months to 6 years of age living or recreating in OU 3 was offered as early as 2015.

[16] The Human Health Risk Assessment supporting the 2002 OU 3 Interim ROD did not include the Box in the definition of the Upper Basin. Rather, it defined this area as east of the Box containing 6 of 8 geographic subareas: Burke/Ninemile Basin, the cities of Mullan, Osburn, Silverton, and Wallace and side gulches. The lower Basin is west of the Box containing the other 2 geographic subareas of Kingston and the Lower Basin (west of Kingston down to depositional areas of the Spokane River).

The PHD offered follow-up services to families of children with blood lead levels of ≥ 5 µg/dL or greater who participated in the screening events, based on CDC recommendations (CDC, 2012). The PHD also offered follow-up services to families of children who were referred by a doctor outside of these events. Twenty-two (22) families (a total of 41 children, including children with a blood lead level of ≥ 5 µg/dL and their siblings) accepted in-home or phone consultations (five each year in 2015 and 2016, two in 2017, four in 2018, and six in 2019).

Participation rates and results of the annual 2015 through 2019 blood screenings are discussed in the *Data Review* section.

Outreach and Education

Outreach and education efforts in OU 3 reached over 100 elementary school children each in 2015 and 2016 and over 500 elementary school children each year from 2017 to 2019.

Vacuum Loan Program

The HEPA vacuum loan program offered thru the LHIP continued to be used by residents of OU 3.

6.1.1.4 Drinking Water Program (1999 - present)

The EPA conducted time-critical removal actions (TCRAs) in OU 3 residential and common-use areas from 1997 to 2001. In 2002, the IDEQ conducted TCRAs in the OU 3 residential areas. This included provision of an alternate water supply for residences on contaminated private drinking water wells, such as connection to a nearby community water supply or end-of-tap water filters. Actions to address drinking water continued after the 2002 OU 3 Interim ROD. Since 2016, the Coeur d'Alene Trust has managed the drinking water program as part of the BPRP.

From 2015 through 2019, water samples were collected from 54 homes with private drinking water sources. Approximately 85 percent of these homes were in the Lower Basin and Kingston areas. In addition, the Coeur d'Alene Trust attempted to follow up with 34 properties identified in the 2015 FYR that had purged drinking water results above SDWA MCL action levels for lead, arsenic, and cadmium. Table 6-2 summarizes the actions taken at these 34 properties.

Table 6-2. Actions Taken at Properties with Elevated Purged Drinking Water Results, 2015 – 2019

Number of Properties	Actions Taken Since Last Five-Year Review[a]
12	Sampled again to determine action. Based on those results:
	2 Required remediation and received drinking water filtration systems in 2017.
	1[b] Requires remediation; however, the owner refused remediation.
	1[b] Had high purged results; however, the well is currently not connected to a residence and is not used for drinking water at this time. In the event the well is re-connected to a residential structure, remedial action will be taken at that time.
	8 Had purged sample results below drinking water action levels; no remedial action was taken.
6	Not sampled again because the residence was no longer on the property, or the property had already been connected to municipal water supply (some wells may be used for irrigation purposes).
9[b]	Property owners were contacted for additional sampling but have not been responsive to consent attempts.

Number of Properties	Actions Taken Since Last Five-Year Review[a]
2[b]	Property owners were contacted for additional sampling and refused sampling.
5[b]	Remediation on-hold as the Coeur d'Alene Trust evaluates whether the elevated arsenic concentrations are from naturally occurring sources not associated with mining contamination.
34	**Total Follow-Ups**

Source: Data provided by Coeur d'Alene Trust.

[a] Properties require alternative drinking water sources if lead ≥ 15 µg/L, arsenic ≥ 10 µg/L, or cadmium ≥ 5 µg/L.

[b] The identified properties are included in the list of remaining properties with high purged drinking water results that require an alternative drinking water supply or filtration system. As indicated in the table, not all properties have been responsive to consent, sampling, or remediation. As of 2020 there are 7 properties with installed and maintained drinking water systems.

Note: The Coeur d'Alene Trust also assumed maintenance of five previously installed drinking water filtration systems and two new systems installed in 2017.

6.1.1.5 Institutional Controls Program (1995 - present)

A discussion of the purpose and components of the ICP is included in Section 3.3.3. The PHD completed the following ICP activities in the last five years:

- Issued 1,930 permits most of which were for large exterior excavation projects (> 1 cy) (Table 6-3). Development of a secured web-based application occurred in 2019, and since then, the ICP has been issuing and tracking permits electronically.
- Issued 650 licenses to contracting companies and 88 licenses to government entities and utility companies for all OUs (licenses are not tracked by OU). Development of a secured web-based application occurred in 2019, and since then, the ICP has been issuing and tracking contractor licenses electronically.
- Provided 1,162 property disclosures.
- Recorded and followed up on 5,199 One-Call system (intent to excavate–locate utilities) calls.
- Scanned all current and historical permits and records of compliance into electronic files that are stored securely in the ICP database and backed-up following information technology procedures.

Table 6-3. Number of ICP Permits Issued in OU 3, 2015 - 2019

Permit Type	Calendar Year					Cumulative 5-year Total	Annual Average
	2015	2016	2017	2018	2019		
Large Exterior Projects – Excavation Total	410	273	360	333	270	1,646	329
Large Exterior Projects – Demolition Total	5	4	7	6	8	30	6
Interiors Total	17	12	12	2	8	51	10
Records of Compliance Total	70	16	28	47	42	203	41
Totals	**502**	**305**	**407**	**388**	**328**	**1,930**	**386**

Notes:

Sources: PHD, 2016, 2017, 2018a, 2019, 2020.

Five new subdivisions were constructed since the last Five-Year Review.

In addition to issuing permits, PHD delivered a total of 490 cy and 10 buckets of clean soil/gravel to OU 3 properties, and a total of 44 vouchers were issued for homeowners to pick up clean soil or gravel (Table 6-4).

Table 6-4. OU 3 ICP-Provided Clean Material Volumes, 2015 - 2019

Delivery Method	Units	Calendar Year					Cumulative 5-year Total	Annual Average
		2015	2016	2017	2018	2019		
Clean soil/gravel delivery	cy	21	72	54	118	225	490	98
Clean soil/gravel delivery	Buckets	3	0	3	0	4	10	2
Soil/gravel voucher issued (homeowner pickup)	No. of vouchers	12	3	17	9	3	44	9

Notes:

Data provided by PHD. (PHD, 2016, 2017, 2018a, 2019, 2020)

6.1.1.6 Idaho Recreational Sites Program (1999 - present)

Remediation of recreational areas in OU 3 began in 1999 (see *O&M* section). The Idaho Recreational Sites Program is currently managed by the Coeur d'Alene Trust under EPA and IDEQ oversight. Table 6-5 on the following page summarizes the remedial actions that were completed at OU 3 recreational sites in Idaho since the 2015 FYR.

Table 6-5. Remedial Actions at OU 3 Recreation Sites in Idaho, 2015 - 2019

Recreation Site (CUA No. when applicable)	Year(s) Remedial Actions Completed	Management Agency or Owner	Remedial Actions Since the 2015 Five-Year Review
Kahnderosa Campground Pilot Project	2014 and 2015	Private	In 2015, completed remediation of this pilot project under the BPRP which included installation of asphalt at camping pads and roads at the site so that they can be easily cleaned of contaminated sediments. In addition, trees were re-planted due to unsuccessful establishment during initial planting efforts as part of the 2014 riverbank bio-stabilization demonstration project of a 300-foot section of riverbank used to access the river and beach (MFA, 2016e).
Cataldo Mission (CUA 068)	2018	Coeur d'Alene Tribe and IDPR	In 2018, EPA completed remediation including installing clean soil and gravel barriers in areas where contaminants exceeded action levels. Additionally, a portion of the lower parking area near Mission Road, which is monitored by PHD following flood events, was paved with asphalt. Areas which received clean soil barriers were revegetated with sod or seed, as coordinated with the property owner (McGillivray Environmental, 2018).
Coeur d'Alene River Road Pullouts 2 & 3, Near Enaville	2018	Shoshone County	In 2018, EPA completed remediation including removal of contaminated materials to a depth of 12 inches and installing clean gravel backfill materials to a depth of 12 inches. Remediation of the parking area provides a clean parking area for recreational users accessing the Coeur d'Alene River (Pioneer, 2019).
Avista Substation Parking Area	2018	Private	In 2018, EPA completed remediation including removal of contaminated materials to a depth of up to 12 inches and installing clean gravel backfill materials. Remediation of the parking area provides a clean parking area for recreational users accessing areas within the Canyon Creek basin (Pioneer, 2019)

Recreation Site (CUA No. when applicable)	Year(s) Remedial Actions Completed	Management Agency or Owner	Remedial Actions Since the 2015 Five-Year Review
Ninemile & Larson Road Fishing Ponds	2018-2019	Private	In 2018 and 2019, EPA completed remediation of areas around the perimeter of the pond and corresponding parking areas. Remediation included removal of contaminated materials to a depth of up to 12 inches and installing clean gravel, riprap, or soil backfill materials. Remediation of the site provides clean access to a publicly used fishing pond (Pioneer, 2019; Pioneer, 2020b).
Coeur d'Alene River Road Pullout 4, Near Kingston	2019	Shoshone County	In 2019, EPA completed remediation including removal of contaminated materials to a depth of 6 inches and installing clean gravel backfill materials to a depth of 6 inches. Remediation of the parking area provides a clean parking area for recreational users accessing the Coeur d'Alene River (Pioneer, 2019).
Gray's Bridge Road	2019	Private	In 2019, EPA completed remediation including removal of contaminated materials to a depth of up to 12 inches and backfilled with clean gravel or riprap materials to a depth of 12 inches. Remediation of the area mitigates potential exposures during informal recreational use (Pioneer, 2020b).

CUA = common use area

IDPR = Idaho Department of Parks and Recreation

In addition to the above, EPA, IDEQ, and PHD increased public outreach and education over the past five years including installation of updated signs at 20 Upper and Lower Basin locations in 2018 and 2019 which suggest ways for recreators to decrease potential exposures to contaminated soil and sediment. Many of these signs include historical mining information to increase interest. In addition, signs were developed and posted by PHD along the Trail of the Coeur d'Alenes.

As part of the increased education and public outreach efforts, temporary handwash stations were placed at frequently used recreational sites in the Lower Basin during the summer months 2018 and 2019. Signage was placed with the temporary handwash stations to encourage hand washing before and after eating or drinking.

6.1.1.7 Paved Roads Program (2013 - present)

The Basin Paved Roads Program was initiated in 2013. Work was implemented by local government jurisdictions with oversight by EPA, IDEQ, and a Roads Board.

From 2015 through 2019, approximately 39.5 miles of Basin roads were rebuilt, overlaid, patched, or chip sealed pursuant to ICP requirements. This program is anticipated to be completed in 2021. Future maintenance of paved roadways will be the responsibility of the applicable government jurisdiction.

6.1.2 Aquatic Food Sources

6.1.2.1 Fish Advisories

Fish from the Coeur d'Alene Basin were tested for mercury, arsenic, cadmium, and lead. High mercury levels were found in some fish species, including bass, bullhead, northern pike, panfish, and kokanee. For waterbodies in Idaho, mercury has been the main contaminant of concern for generating consumption advisories. Sources of mercury in Idaho water bodies have been attributed to regional atmospheric deposition of mercury from industrial sources or coal burning. In response, the IDHW and the

Coeur d'Alene Tribe, in coordination with the Idaho Fish Consumption Advisory Program, updated its fish advisory and educational outreach materials (IDHW, 2019, and 2020).

The Washington State Department of Health and Spokane Regional Health District also have a fish consumption advisory for the Spokane River with a warning to not eat fish caught between the Idaho border and Upriver Dam (WDOH, 2009a, 2009b).

6.1.3 Mine and Mill Sites

Mine and mill sites in the Upper Basin were prioritized first based on human health exposures to contaminated soil and waste rock and second on impacts to surface water and groundwater and ecological receptors. Below are the two OU 3 mine and mill sites that were completed since the 2015 FYR; both are in the Ninemile Watershed.

6.1.3.1 Success Complex (2016 - 2019)

The Success Complex area is comprised of four sites in the Ninemile Watershed: Success Mine Rock Dump, Success Mine, American Mine, Alameda Mine. Previous early removal actions by EPA and the Silver Valley Natural Resource Trustees failed to substantially reduce metals loading from the Success Complex; therefore, a fuller remedial action commenced in 2016 and was completed in the fall of 2019 (Pioneer, 2020c). Remedial action, managed by the Coeur d'Alene Trust, included the following activities:

- Excavating, loading, hauling, and disposing of approximately 387,000 bank cubic yards of mine waste material at the East Fork Ninemile (EFNM) Waste Consolidation Area (WCA).
- Stream reconstruction of the Alameda Tributary and EFNM Creek.
- Installation of a bat-friendly adit closure at the American Mine.
- Installation of stormwater run-on and runoff control channels.
- Placement of amended cover soil, soil stabilization and vegetative cover.
- Abandonment of groundwater monitoring wells not needed for post-remedial water quality monitoring.

The Success Complex is privately owned by the Success Mining Company (Magnuson) and Patricia Payne. Access agreements are in place with the property owners to allow the Coeur d'Alene Trust to conduct O&M. An Environmental Covenant is not yet finalized for the Success Complex as it will be included with a portion of another EFNM Creek remedial action that was initiated after this FYR. This creek portion has the same property owners as the Success Complex. The Environmental Covenant will limit the use of both properties by the property owners or future owners. Additionally, any redevelopment of the site will be subject to the ICP.

The Coeur d'Alene Trust will conduct O&M starting in 2021 (Pioneer, 2020c). The Coeur d'Alene Trust will also conduct post-remedial action water quality effectiveness monitoring as part of O&M (MFA, 2020a).

6.1.3.2 Interstate Millsite (2019 - 2020)

Remedial action construction activities began at the Interstate Millsite in the summer of 2019 and were completed in the fall of 2020 (Pioneer, 2021). Activities were similar to those of the Success Complex consisting of the following:

- Excavating, loading, hauling, and disposing of over 100,000 cy of mine waste at the EFNM WCA.

- Reconstruction of the EFNM Creek.
- Installation of stormwater run-on and runoff control channels.
- Placement of amended cover soil, soil stabilization and vegetative cover.

The Interstate Millsite property is privately owned by the Hecla Mining Company. An access agreement is in place with Hecla which will allow the Coeur d'Alene Trust to perform O&M activities. Preparation and filing of an environment covenant to limit use of the property by Hecla or future owners was not necessary as the Consent Decree with Hecla covers the same items. Additionally, any redevelopment of the site will be subject to the ICP.

O&M of the completed Interstate Millsite remedial action will be conducted by the Coeur d'Alene Trust. In addition, the Coeur d'Alene Trust will conduct post-remedial action water quality effectiveness monitoring as part of O&M (MFA, 2020a).

6.2 Operation and Maintenance

This section summarizes routine, and O&M activities conducted in OU 3 since the 2015 FYR.

6.2.1 Residential and Community Areas

O&M activities that were completed in residential and community areas are discussed below. These actions were conducted to limit exposures to contaminated soil, house dust, and drinking water.

6.2.1.1 BPRP Gravel Roads (2011 - 2014)

Remediation of public gravel roads was completed by the end of 2014. Little maintenance other than re-grading has been completed on these remediated public gravel roads according to staff from the East Side Highway District, Shoshone County, and the cities of Osburn, Mullan, and Wallace in April 2020.

Remediation of private gravel roads through the BPRP is complete, except for roads where owners have refused requests for sampling or remediation. The BPRP will continue to track these refusals should current property owners change their minds or properties change ownership. Property owners are responsible for O&M of their remediated gravel roads and must comply with ICP permitting requirements if gravel roads need repair.

6.2.1.2 Idaho Recreational Sites Program (1999 – present)

The PHD inspects remediated and frequently used OU 3 recreational sites in Idaho on an annual basis or after significant flooding events as part of the ICP. The PHD then submits recommendations to the "Management Agency or Owner" responsible for maintenance. Table 6-6 lists recreational sites remediated prior to 2015 where routine O&M activities were completed in the past 5 years.

Table 6-6. O&M at OU 3 Recreational Sites, 2015 - 2019

Recreation Site (CUA No. when applicable)	Year(s) Remedial Action(s) Completed	Management Agency or Owner
Medimont Boat Launch (CUA045)	1999 and 2013	USFS
Rainy Hill Boat Launch (CUA046&47)	1999 and 2006	USFS
Thompson Lake Boat Ramp (CUA038)	1999-2000	IDFG
Anderson Lake Boat Ramp (CUA033)	1999 and 2008	IDFG

Recreation Site (CUA No. when applicable)	Year(s) Remedial Action(s) Completed	Management Agency or Owner
Black Rock Slough Trailhead/ Highway 3	2001-2002, 2004, and 2005	IDPR
Bull Run Boat Launch (CUA059&60)	2004	USFS and IDPR

CUA = common use area

6.2.1.3 Trail of the Coeur d'Alenes Removal Action (2000 - 2004)

Over the past 5 years, IDPR and UPRR continued to maintain the Trail of the Coeur d'Alenes with oversight by IDEQ as prescribed by the Response Action Maintenance Plan (Coeur d'Alene Tribe et al., 2008) and other approved documents (Arcadis, 2012, 2019a). Routine monitoring and maintenance of the trail is documented in detail in annual reports (Arcadis, 2015a, 2016a, 2017a, 2018a, 2019b; Coeur d'Alene Tribe and State of Idaho, 2015, 2016, 2017, 2018, 2019) and is summarized below:

- Sediment accumulating in ditches and drainage structures near Plummer, Harrison, Wallace, and Medimont was cleaned out. A drainage ditch in Willow Acres was repaired, requiring removal of vegetation and several trees. The ditch area was then regraded to promote drainage.
- The sand at the beach in Harrison was sampled for lead annually in compliance with ICP protocols.
- Regular Asphaltic concrete pavement (ACP) monitoring tests and assessments were conducted to determine the integrity of the asphalt. The ACP was sawcut and replaced and/or rolled to smooth the surface and sealed to repair cracks caused by roots and heaving of ACP. Damage to the ACP due to the overpass construction in Pinehurst was replaced by the contractor as requested by the state agencies. Longitudinal cracking is beginning to be observed in sections of the trail and does not appear caused by roots. These areas were sealed and will be monitored. Bridge deck transitions and approaches were replaced near Plummer and repaired in other areas where the expansion and contraction of the bridge structures has cracked the ACP of the approaches over time.
- Damaged access controls were replaced or removed in Cataldo, Bull Run, Golconda, Pine Creek, and Gold Creek. Additional access controls or modification to existing access controls in Mullan, Golconda, Silverton, Elizabeth Park, Kellogg, Smelterville, Pinehurst, Dudley, Lane, Springston, and Harrison was conducted as directed by the IDEQ.
- Major flood repair due to a high water/runoff event in 2017 was conducted at Kahnderosa, Schlepps, Black Lake, and Plummer. Flash flooding and a rockslide plugged a culvert and undermined the trail near Milepost 2 in Plummer resulting in required repairs.
- Replacement and installation of new and updated signage throughout the trail corridor as signs fade or need to be updated with new information.
- Noxious and invasive weed control was performed throughout the trail corridor.

6.2.1.4 Washington Recreation Areas along the Spokane River (2007 - 2013)

Ecology is responsible for conducting O&M of eight remediated shoreline recreational areas per the 2013 Monitoring, Sampling and Analysis Plan (Ecology, 2013).

In 2018, Ecology inspected all eight remediated areas. The remedies were generally intact; however, gravel cap erosion, including geotextile fabric exposure, was observed at several areas. Depositional sediment accumulation observed at seven of the eight remediated areas was sampled and evaluated (Starr Road, Island Complex, Murray Road, Harvard Road, Barker Road North Shore, Myrtle Point, and Islands Lagoon; the Flora area had no observed depositional sediment). Lead concentrations were below the 700 mg/kg lead cleanup level except for three samples collected at the Island Complex and two samples

collected at Murray Road. Inspection notes and analytical results are provided in the *Spokane River Shoreline Sediment Sites Monitoring, Sampling and Analysis Report* (Ecology, 2019). Repair and maintenance of areas identified during 2018 inspections is ongoing.

6.2.1.1 Remedy Protection Projects (2013 - 2019)

Implementation of remedy protection projects in OU 3 began in 2013 under EPA oversight. Construction of all projects identified in the 2012 Upper Basin Interim ROD Amendment are now complete (EPA, 2012a).

Scheduled O&M inspections with oversight by IDEQ are to occur semi-annually, typically in May and September. Unscheduled maintenance includes inspections and/or repairs that occur in anticipation of or because of heavy rainfall or flooding. Table 6-7 lists each completed OU 3 remedy protection project, the date of the respective O&M manual, the party responsible for O&M, and the maintenance completed since the 2015 FYR.

Table 6-7. O&M at OU 3 Remedy Protection Projects, 2015 - 2019

Project	Community	Year Construction Completed	Operations and Maintenance Manual Citation[a]	Responsible Entity	O&M Activities Since 2014[b]
Dewey Street	Mullan	2013	MFA, 2020b	Mullan	Debris removal.
Third Street	Mullan	2013	MFA, 2020b	Mullan	Debris removal.
Mill Road	Mullan	2015	MFA, 2020b	Mullan	Debris removal.
South 2nd Street	Mullan	2015	MFA, 2020b	Mullan	Debris removal.
Unnamed Gulch	Silverton	2013	MFA, 2017e	Shoshone County	Annual springtime cleaning.
Shields Gulch	Osburn	2014	MFA, 2019g	Osburn	None
Meyer Creek	Osburn	2015	MFA, 2019g	Osburn	None
McCarthy Creek	Ninemile Watershed	2015	MFA, 2020c	Shoshone County	Annual springtime cleaning.
Revenue Gulch	Silverton	2015 and 2019	MFA, 2017e	Shoshone County	Annual springtime cleaning. See further discussion below table.
Mill Creek	Mullan	2017	MFA, 2020b	Mullan	Leaking culvert coupling and sink hole repaired in 2018. Debris was removed from around inlet.
Copper Street/ Boulder Creek	Mullan	2017	MFA, 2020b	Mullan	Debris removal.
Hunt Gulch[d]	Kingston	2017	MFA, 2020c	Shoshone County	Annual springtime cleaning.
Rosebud Gulch	Osburn	2018	MFA, 2019g	Shoshone County	Annual springtime cleaning.

Project	Community	Year Construction Completed	Operations and Maintenance Manual Citation[a]	Responsible Entity	O&M Activities Since 2014[b]
Printer's Creek	Wallace	2018	MFA, 2019h	Wallace	None
Tiger Creek	Mullan	2019	MFA, 2020b	Mullan, Joseph L. Haferman[c]	Debris removal.
Blackcloud Creek	Ninemile Watershed	2019	MFA, 2020c	Shoshone County	None
Gem Drainage[e]	Gem, Burke Canyon	2019	MFA, 2020c	Shoshone County	None
Star Parking Area[e]	Burke	2019	MFA, 2020c	Shoshone County	None

[a] O&M plans are included as appendices in the cited Remedial Action Reports.

[b] As noted in IDEQ, 2017a, 2017b, 2018a, 2018b, 2018c, 2020a, and 2020b and IDEQ checklists from 2016 (not formally recorded in report format). No inspections were performed in 2015. In addition, the property owner (Joseph L. Haferman) and maintenance personnel at Shoshone County and the Cities of Mullan, Osburn, and Wallace were contacted in April 2020 to provide feedback on the project performance and to summarize any maintenance activities. IDEQ reports of remedy protection inspections are only available for 2017-2019.

[c] Two O&M plans were produced for Tiger Creek, one for the City of Mullan and one for Joseph L. Haferman. The intake structure and some associated piping of the Tiger Creek project lists Joseph L. Haferman as the property owner under Environmental Covenant. The rest of the system lists the City of Mullan as the property owner.

[d] Project identified in EPA, 2017.

[e] Project identified in EPA, 2019.

Revenue Gulch: Observations indicated pavement settling and cracking around utility covers and catch basins that were constructed during the project on 7th Street. The Coeur d'Alene Trust coordinated with Shoshone County to discuss the issue and investigation of the cause of this issue. Investigations found that the settlement was not a result of the workmanship of the Remedy Protection project but was a result of a leaking water line in the area. East Shoshone Water District repaired their line in 2020 and replaced asphalt in the area following the repairs.

6.2.2 Mine and Mill Sites

O&M activities at mine and mill sites that were remediated prior to 2015 to reduce human exposures to contaminated soil and waste rock are summarized below.

6.2.2.1 Canyon Creek Watershed: Sisters Mine (2004 - 2005)

As no formal O&M plan exists for the Sisters Mine, IDEQ conducted site inspections in 2015 and 2016 pursuant to the *Prioritization of Upper Coeur d'Alene Basin Mine and Mill Sites* characterization program (TerraGraphics, 2017a), and from 2017 through 2019 as part of the Environmental Covenant and Remedy Protection Program (IDEQ, 2017a; 2017b; 2018d; 2019; 2020a; 2020b). No problems were identified during these inspections and no public use of this area was observed.

6.2.2.2 Pine Creek Watershed: Constitution Mine and Mill Site (2005 - 2006)

The Constitution Mine and Mill site was separated into two projects: The Upper Constitution and the Lower Constitution. The BLM has responsibility for O&M of Upper Constitution which consists of visual inspections for vandalism and illegal dumping, and integrity of the tailing's repository cap. No vandalism or illegal dumping was observed. Several groundwater monitoring wells that had been vandalized prior to 2015 were decommissioned in 2018.The tailings repository cap was inspected and there were no signs of surface erosion or stream scour. A real-time USGS gage located downstream near Nabob Creek continuously measures specific conductance and turbidity would likely detect any significant failure of the Constitution tailings repository. Weeds were observed on top of the cap and were treated.

At Lower Constitution, EPA installed a gravel cap in September 2020 after evidence of recent human activity was observed in a level contaminated area. The area (approximately 15,000 square feet) was capped with 6 inches of 3-inch minus gravel underlain by a visual barrier fabric.

6.2.2.3 South Fork Coeur d'Alene River

Golconda (2006 - 2007)

Hecla Silver Valley (SV) performed site inspections annually from 2015 to 2019 (Hecla SV, 2015, 2016, 2017, 2018, 2019) in accordance with the Golconda O&M Plan (EPA, 2012b). These inspections indicated there was no disturbance of reclamation features, re-vegetation areas were in good condition with only sparse occurrences of noxious weeds, and no threats or adverse impacts to public safety. A visual inspection of the adit water control system noted seepage from an overflow port; however, it did not appear to reach the SFCDR. Surface water and groundwater monitoring was discontinued in July 2012 as discussed in previous Five-Year Review reports (EPA, 2010, 2015a).

In addition to the site inspections, PHD indicated that no ICP permits have been issued for this section of Golconda, and ICP staff was not aware of any development plans.

Osburn U.S. Bureau of Mines Impoundment Site (2010 - 2011)

The Coeur d'Alene Trust is responsible for O&M in accordance with site O&M plans (MFA, 2014a; Parametrix, 2011). Inspections were completed annually between 2012 and 2019, with results documented in annual reports. Additional visual inspections are completed periodically throughout the year and following SFCDR high-flow events.

Recent inspections indicate no soil erosion; steel barrier fence, monitoring well, or ecology block tampering; quarry spall windrow deterioration; or flood damage has been observed. The Coeur d'Alene Trust has replaced exterior barrier boulders that had been moved or removed to allow recreational vehicle access to the site (MFA, 2019g). Evidence of continuing erosion and wear of the gravel cap at the apex of an active roadway was observed in 2018 and 2019, including tire ruts deeper than 3 inches (50 percent of gravel cap depth) (MFA, 2019g). Monitoring will continue; if additional degradation is observed, action to repair the area may be necessary.

Wallace Yard Removal (2010 - 2014)

The Wallace Yard Removal Action, which included the Hercules Mill and Canyon and Ninemile Creek Spur Lines, was completed in 2014. UPRR and Burlington Northern Santa Fe (BNSF) conducted

quarterly inspections in accordance with the Maintenance and Repair (M&R) Plan[17] (Arcadis 2013) and results reported results to EPA and IDEQ (Arcadis, 2015b, 2015c, 2015d, 2016b; 2016c; 2016d; 2016e; 2017b; 2017c; 2017d; 2017e; 2017f; 2018b; 2018c; 2018d; 2019c; 2019d; 2019e; 2019f; 2020). Barrier disturbances were observed in the following locations:

- Around an IDOT electrical box, which was also disturbed
- At the north end of the trail where a vehicle or ATV was accessing Spunstrand Corporation
- By the bridge construction crew entrance
- On the road shoulder due to snow plowing
- In a drainage channel by the eastbound I-90 on-ramp

All barrier disturbances were repaired prior to publication of this report.

6.2.2.4 Ninemile Watershed

Rex Mine and Mill No. 2/Sixteen-to-One (2007 - 2010)

The Coeur d'Alene Trust is responsible for O&M of the Rex Mine and Mill No. 2/Sixteen-to-One remedial action consistent with the O&M plan (CDM Smith, 2015a).[18] Semiannual (spring and fall) inspections were completed between 2016 and 2019, with results documented in inspection reports (MFA, 2019i). Site maintenance activities included the following:

- Repair of areas where erosion was observed.
- Reinstallation of displaced riprap along the Rex Creek channel.
- Construction of a berm along the perimeter of the Rex Creek channel to contain flow.
- Reseeding of sparsely vegetated areas.

Remedial action effectiveness surface water monitoring was also conducted in the past 5 years. A summary discussion is provided in the *Data Review* section of this report.

Interstate-Callahan Rock Dumps (2014 - 2015)

The Coeur d'Alene Trust is responsible for O&M in accordance with the O&M Plan (Pioneer, 2016). Inspections were conducted at least annually and evaluated vegetation, noxious weeds, cover soil and erosion, reconstructed stream and tributary channels, and stormwater controls. Site maintenance activities included the following:

- Vegetation maintenance and herbicide applications to noxious weeds.
- Monitoring of areas where minor erosion had been observed.
- Some minor stabilization of EFNM Creek.
- Reseeding of areas with minimal vegetative coverage.
- Planting of additional alders to begin regrowth of the green line where erosion had been observed.

[17] The spur lines are not subject to the M&R Plan because the railroads abandoned them in 2014, and ownership is now subject to real estate ownership regulations. It is anticipated that the railroad ROW along the spur lines will or has been adopted by adjacent landowners and therefore subject to the ICP.
[18] The Rex No. 1 area was characterized by the Coeur d'Alene and determined that remedial action was not warranted.

Remedial action effectiveness surface water monitoring was also conducted in the past five years. A summary discussion is provided in the *Data Review* section of this report.

6.2.3 Waste Disposal Areas

Placement of ICP-derived wastes and O&M of waste disposal areas in OU 3 are summarized below:

6.2.3.1 Institutional Controls Program Waste Placement

An estimated 85,649 cy of OU 3 ICP wastes were directed to Basin Repositories since the last FYR including an estimated total of 43 cy of building demolition debris, 113 bags of insulation, and 4,915 square yards of carpets and padding directed to the Big Creek Repository (Table 6-8).

Table 6-8. OU 3 ICP Waste Disposal Volumes, 2015 - 2019

Waste Category	Disposal Site	Materials Disposed or Source of Materials	Units	Calendar Year					Cumulative 5-year Total	Annual Average
				2015	2016	2017	2018	2019		
Building Demolition	Big Creek Repository	Demolition Debris	cy	13	0	30	0	0	43	9
		Insulation	Bags	73	0	40	0	0	113	23
		Carpets and Pads*	sy	4,520	0	395	0	0	4,915	983
Soil Disposal	Big Creek Repository and Big Creek Repository Annex	Soil	cy	4,204	3,065	4,371	10,114	2,451	24,204	4,841
	East Mission Flats	Soil	cy	3,078	4,189	2,821	29,309	2,497	41,894	8,379
	Lower Burke Canyon Repository	Soil	cy	0	0	10,263	6,572	2,715	19,551	6,517

Notes:

* The amount of carpets and pads disposed is reported in square feet in the 2017 ICP activity report, and as square yards in this table. As of the end of 2017, carpets and pads are no longer accepted at repositories (IDEQ et al, 2017b).

Building demolition data provided by PHD (2016, 2017, 2018a, 2019, 2020).

Soil Disposal data from Annual Basin Repository Reports (CDM Smith, 2019, 2020a; DG&S, 2018; NWCS, 2016b, 2017b).

sy = square yards

6.2.3.2 Big Creek Repository (Operating since 2002)/Big Creek Repository Annex (Operating since 2015)

The Big Creek Repository (BCR) has operated since 2002 and accepts waste materials from the BPRP, ICP, Remedy Protection Program and the Paved Roads Program, as well as wood waste material and oversize concrete debris. In December of 2016, the *Big Creek Repository East Expansion and Final Cover Design* was completed. This expansion will provide an estimated 127,000 cy in additional waste placement capacity (CDM Smith, 2016).

In 2019, part of the final cover system was installed on portions of the northern, western, and southern slopes of the BCR. The final cover placement and current operation activities are discussed in detail in the *2019 Annual Operation Report* (CDM Smith, 2020a). Typical best management practice activities have been sufficient to maintain the repository. Long-term O&M activities will begin after the closure of the BCR anticipated to be in 2026.

In 2015, construction of the Big Creek Repository Annex (BCRA) was completed providing an estimated 190,000 cy in additional waste capacity. The BCRA is anticipated to reach full capacity in 2033 (MFA, 2021).

Water levels, surface water and ground water quality are monitored at the BCR and BCRA. Results of monitoring efforts is provided in the *Data Review* section.

6.2.3.3 East Mission Flats Repository (Operating since 2009)

The East Mission Flats Repository (EMFR) accepts waste materials from the ICP, BPRP, Remedy Protection Program, and Paved Roads Program. Typical waste placement operations continued through 2019. The most recent annual operation activities are summarized in the Annual Operation Report (CDM Smith, 2020a). Typical best management practice activities have been sufficient to maintain the repository. Long-term O&M activities will begin after the closure of the repository.

Water levels and groundwater wells were also monitored at the EMFR. A summary discussion is provided in the *Data Review* section of this report.

6.2.3.4 EFNM Waste Consolidation Area (Operating since 2014)

The EFNM WCA has been operational since July 2014 and has received waste from the Interstate-Callahan Rock Dumps (2014 to 2015), the Success Complex (2016 to 2019), and the Interstate Millsite (2019 to 2020). An expansion of the EFNM WCA and the first phase of final cover installation began in 2019, coinciding with the start of waste consolidation from the Interstate Millsite (CDM Smith, 2020b). The EFNM WCA will continue to accept waste from Ninemile Watershed remedial actions until all are completed.

Monitoring through 2019 included surface water, groundwater, underdrain pipes, seep pipes and drainage ditches. A summary of the results is provided in the *Data Review* section of this report. Actions to encourage runoff from the site and reduce impacts to surface water over the past 5 years are summarized below:

- A channel and dewatering trench were added to the expansion footprint to maintain separation between groundwater and consolidated waste. Perforated pipe at the bottom of the trench will capture groundwater and will discharge collected drainage away from the EFNM WCA.
- Waste surface was graded at an average slope of 7 to 9 percent, greater than the initial design's 5 percent.
- One-inch minus screened material was used for the waste cushion layer that is placed over the waste at the end of each construction season to reduce infiltration.
- A copolymer was applied over the active waste surface during winterization to reduce infiltration.
- The final cover system was installed on a portion of the EFNM WCA.

6.2.3.5 Lower Burke Canyon Repository (Operating since 2015)

Initial construction of the Lower Burke Canyon Repository (LBCR) began in 2014 and was completed in 2015. Waste placement at the LBCR began in 2015 and continued through 2019. The LBCR will provide

space for up to 1,150,000 cy of mine waste materials, including mine waste rock and tailings from sites throughout the Canyon Creek Watershed and waste from the BPRP, ICP, Remedy Protection, and Paved Roads Program. The most recent annual operation activities are summarized in the *2019 Annual Repository Operation Report* (CDM Smith, 2020a).

Periodic inspections and monitoring of the LBCR are necessary to evaluate the effectiveness of the repository and identify required maintenance. The following activities were conducted in the past 5 years:

- Semiannual inspection of landscape, drainage, erosion, and integrity of access-control structures, gates, and the Hecla-Star mine portal discharge pipeline.
- Embankment stability monitoring.

Long-term O&M activities will begin after the closure of the repository.

6.2.3.6 Limited Use Repositories (2015 – present)

Limited use repositories (LURs) were used in the Upper Basin between 2015 and 2018 to minimize ICP material disposal at OU 3 repositories. Osborn, Shoshone County Transfer Station, and East Zanetti Yard LURs received lower-level wastes from the Paved Roads Program and road-related waste from Remedy Protection Projects. These LURs were sited and developed in accordance with the LUR policy memorandum (IDEQ and EPA, 2015) and contain a total of approximately 72,000 cy of waste (Table 6-9).

Table 6-9. OU 3 Limited Use Repositories, 2015 - 2019

Year	Osburn LUR	Shoshone County Transfer Station LUR	East Zanetti Yard LUR	Total Volume Placed
2015	29,510	0	0	**29,510**
2016	0	6,225	4,148	**10,373**
2017	0	8,320	7,155	**15,475**
2018	0	5,975	10,855	**16,830**
Total Waste Volume	**29,510**	**20,520**	**22,158**	**72,188**

In 2017, the Mullan ICP Transfer Station, designed to temporarily collect ICP waste from local ICP users, was constructed. Accumulated waste is transferred to the LBCR on an as needed basis.

6.2.4 Wetland Restoration

The following two wetland restoration projects have been constructed in the Lower Basin.

6.2.4.1 Clean Waterfowl Habitat (Agriculture-to-Wetland Conversion Project; 2006 - 2018)

The clean waterfowl habitat pilot study project in the Lower Basin near Medimont was completed in 2011. The overall intent of the project was to establish 396 acres of clean feeding habitat for migratory and resident swans, ducks, and other wetland bird species to reduce their exposure to lead-contaminated sediment. The project area includes the East Field remedy (completed in 2008) and the West Field

remedy (completed in 2011). O&M is the responsibility of the US Fish and Wildlife Service (USFWS) per the draft 2018 long-term O&M Plan (USFWS, 2018) and proceeding documents.[19]

In 2018, O&M activities included hydraulic control, the removal of undesirable plants, levee protection, and other activities. Periodic site visits of the East Field indicate that the wetland surface water elevation has been maintained as designed and Robinson Creek remains a clean source of water to the site.

Annual waterfowl surveys were conducted in the spring of 2015 through 2019. As indicated in Table 6-10, both fields indicated high waterfowl use in 2015 and 2016 followed by decreases in 2018 and 2019. Waterfowl use in the West Field was at its lowest in 2017, assumed to be caused from: poor establishment and growth of vegetation requiring additional soil treatment; freezing that caused a pervasive ice cover; and an early spring flood that damaged the large outlet which drains the west field under the Trail of the Coeur d'Alenes. The outlet was repaired in late summer 2017 but water levels remained too high which prompted waterfowl to not stopover. Further monitoring will be required to determine whether the West Field will more frequently attract high waterfowl usage or if additional restoration efforts may be necessary.

Table 6-10. Total Waterfowl Observations at Agriculture-to-Wetland Project, 2015 - 2019

Wetland	2015	2016	2017	2018	2019
East Field	28105	21113	25072	15548	7423
West Field	11300	7962	1858	3552	2473

Additional observations on weather and hydraulic impacts on waterfowl usage and mortality rates in Lower Basin wetlands is provided in the *Data Review* section.

6.2.4.2 Robinson Creek Wetlands Restoration Project (2014 - 2017)

The Robinson Creek Wetlands Restoration Project, a mitigation project engendered from the Page Repository Westward Expansion in OU 2, is located in Kootenai County in the Lower Basin. Construction was scheduled to be completed in 2015; however, construction continued through 2017 with the planting of herbaceous and woody plants, constructing a parking lot, and monitoring and controlling noxious weeds and reed canary grass.

6.3 Progress Since the Last Five-Year Review

This section includes the 2015 protectiveness determination and statement, and the status on issues and recommendations that were identified in the 2015 FYR report that directly affect protectiveness of the OU 3 remedial actions.

[19] Preceding documents relevant to the management of the conservation easement area referenced includes the Preliminary Restoration Plan (USFWS, 2007), Draft Schlepp Easement Management Guidance (USFWS, 2010), and Draft West Field Interim Restoration Plan (USFWS, 2010).

6.3.1 2015 FYR Report Protectiveness Determination

Table 6-11. OU 3 Protectiveness Determination and Statement from 2015 Five-year Review Report

OU 3 Protectiveness Statement
Protectiveness Determination: Will be protective
Protectiveness Statement: The remedy at OU 3 is expected to be protective of human health and the environment upon completion. In the interim, where remedial activities have been completed to date, they have adequately addressed exposure pathways that could result in unacceptable risks in these areas. However, the ecological remedy included in the OU 3 ROD (EPA, 2002) and ROD Amendment (EPA, 2012a) is an interim remedy and therefore a final remedy will need to be selected to fully address groundwater and surface water contamination. Implementation of cleanup activities is presented in the Superfund Cleanup Implementation Plan (EPA, 2013b). Although the Implementation Plan focuses on cleanup actions selected in the ROD Amendment, it also identifies additional actions identified in other decision documents and additional studies that EPA plans to conduct at the site, including the Lower Basin. EPA continues to pursue data collection efforts in the Lower Basin to support the evaluation of remedial alternatives for subsequent decision documents. The Selected Remedy is designed to provide significant improvements to soil, sediments, surface water, and groundwater, and to greatly reduce the risks posed to human health and the environment within the Upper and Lower Basin. It is also expected to reduce the movement of contaminated sediments downstream in the Lower Basin. Although the remedial action in Basin residential and community areas has not been fully implemented, environmental data indicate that the remedy is, in general, functioning as intended by the 2002 OU 3 ROD. As property remediation progresses, soil and house dust lead concentrations are declining, lead intake rates have been substantially reduced, and blood lead levels have declined to levels that meet the RAOs. The low level of participation in the annual Basin blood lead monitoring program remains a concern because it limits the identification of children who might benefit from intervention. In addition to cleanup work in the residential and community areas of OU 3, remedial work has also been completed at a number of mine and mill sites in the Upper Basin as well as at recreational sites along the Coeur d'Alene and Spokane rivers. In addition to consolidating mine waste to reduce contaminant loading to surface water and groundwater, the remedial actions at the mine and mill sites have included barriers or deterrents to all-terrain vehicle and motorcycle use, which have reduced exposures and are functioning as designed. Remedial work at the recreational sites along the Coeur d'Alene River have largely involved grading and capping contaminated materials, installation of site access controls, and stabilization of adjacent eroded riverbank. Remedial actions at the Spokane River sites have involved a combination of removing contaminated materials, capping, and installing deterrents to recreational users. The remedies constructed at recreational sites along both the Coeur d'Alene and Spokane Rivers are, in general, functioning as designed. A number of additional privately owned recreational sites and informal, undeveloped sites have been identified that may present a heavy metal exposure risk to recreationalists. Three repositories have been designed, constructed, and operated pursuant to the 2002 OU 3 ROD to safely contain waste material and prevent the release of contaminants to surface water, groundwater, or air in concentrations that would exceed state and/or federal standards. Based on monitoring results in the last 5 years, the operation of these repositories has prevented the release of contaminants to surface water, groundwater, or air in concentrations that would exceed state and/or federal standards. In addition to the three repositories, the EFNM WCA, which is located in the upper reach of the EFNM Creek Watershed, was constructed approximately 250 feet above EFNM Creek outside of the alluvial valley and in an area that is relatively isolated from groundwater. The WCA was completed in 2014 and began receiving

OU 3 Protectiveness Statement

waste from the Interstate Callahan Rock Dump. It is expected to be operational for approximately 10 years and expanded to accommodate all the waste from cleanup in EFNM.

EPA, working with the USFWS and Ducks Unlimited, completed a cleanup and pilot study project establishing nearly 400 acres of clean feeding habitat for migratory and resident swans, ducks, and other wetland bird species in the Lower Basin. The agriculture to wetland conversion project has demonstrated high waterfowl usage on the East Field and an increasing activity in the West Field as a result of restoration activities conducted by the Natural Resource Trustees.

The 2002 OU 3 ROD did not identify any remedial actions for Coeur d'Alene Lake, where large quantities of contaminated mining wastes have been deposited in lakebed sediments. The ROD indicated that a management plan for the lake would be developed by the State of Idaho and the Coeur d'Alene Tribe, with input from local, other state, and federal agencies to focus on controlling riverine inputs of metals and nutrients that continue to contribute to contamination of the Lake and Spokane River. An important milestone was achieved in March 2009 when the State of Idaho and the Coeur d'Alene Tribe completed a significant revision to the Lake Management Plan (LMP; IDEQ and Coeur d'Alene Tribe, 2009). Implementation of initial LMP actions has begun and lake monitoring efforts are underway.

6.3.2 Status of Recommendations from the 2015 Five-year Review Report

Table 6-12 provides the status of OU 3 issues and recommendations that directly affect remedy protectiveness identified in the 2015 FYR report.

Table 6-12. Status of OU 3 Issues and Recommendations that Affect Protectiveness from 2015 FYR Report

Title	Issue	Recommendations	Current Status	Current Implementation Status Description*	Completion Date (if applicable)
Consider Alternative Approaches to Identify At-Risk Children.	House dust monitoring currently only occurs every other year while remediation is ongoing. Therefore, other strategies are needed to help identify at-risk children annually.	Consider additional alternative approaches to the 2002 OU 3 Interim ROD's dust intervention protocol to identify at-risk children.	Addressed in Next FYR	See discussion below.	N/A
Reduce Recreational Exposures	There are numerous contaminated sites used for recreation throughout the Basin that span the spectrum from informally used to fairly highly developed. These sites don't fit into established cleanup programs such as the BPRP. Many have recontamination potential	Identify and evaluate Basin recreational sites for possible exposure reduction or educational outreach measures. Identify and evaluate cost effective exposure reduction and educational outreach measures (where appropriate) geared	Completed	See discussion below.	06/24/2020

	from recurring flood deposition.	towards various types of recreational sites.			

6.3.2.1 Consider Alternative Approaches to Identify At-Risk Children

As recommended in the 2015 FYR report, alternative approaches to identify at-risk children in years when targeted house dust monitoring does not occur were developed in collaboration with EPA, IDEQ, the Coeur d'Alene Trust and PHD. These approaches are presented in the draft 2020 House Dust Evaluation report (Alta, 2020c) and are summarized below.

- Collect dust samples through other active programs (e.g., when residents obtain clean soil or gravel through the ICP).
- Identify homes where a combination of soil and dust lead concentrations indicate risk and offer intervention activities to those families with children.
- Provide intervention based on soil concentrations alone.
- Increase the participation rate in the annual blood lead screenings.
- Enhance public education programs.

Implementation of these and other alternatives will be initiated over the next four years and evaluated in the next FYR. See the *OU 3 Issues and Recommendations* table.

6.3.2.2 Reduce Recreational Exposures

Based on the recommendation from the 2015 FYR, a formal mechanism was developed by EPA, IDEQ, and PHD in October 2016 to identify, evaluate and prioritize implementation of risk reduction measures at recreational sites in the Upper and Lower Basins (EPA et al., 2016). Based on this mechanism, recreational sites in more populated areas of the Upper Basin were first identified and prioritized for remediation to reduce exposure risks. In late 2019, EPA, DEQ and the PHD completed visits to multiple recreational areas along the Coeur d'Alene River in the Lower Basin. Areas visited ranged from publicly used boat launches that had undergone previous remediations to camp sites on privately-owned land to informal beach areas dispersed across the Lower Basin. These visits allowed for direct review of each area to aid in identifying priority sites and determine feasible remedial alternatives given the ongoing recontamination concerns from deposition of contaminated sediments during flood events. As was done in the Upper Basin, signage was replaced or installed where needed and temporary handwashing stations were installed during summer months in Lower Basin areas to reduce exposures.

The identification, evaluation, and prioritization of recreational sites for implementation of feasible remedial alternatives to reduce exposure risks was documented in *the Bunker Hill Mining and Metallurgical Complex Superfund Site Operable Unit 3 Final 2018 Recreational Sites Plan* dated August 22, 2018 (Pioneer, 2018) and the *Final 2020 Recreational Sites Plan Revision 2* dated June 24, 2020 (Pioneer, 2020d). These reports, paired with the formal mechanism developed by EPA, IDEQ, and PHD for identifying, evaluating, and prioritizing risk reduction measures at recreational sites (EPA et al., 2016), provide the framework for on-going remedy implementation and completes the 2015 recommendation.

6.4 Data Review

This FYR included review of relevant site-related documents including recent inspection and monitoring data reports. A complete list of the documents reviewed can be found in Appendix A (*References*). The following sections provide an overview of data collected and evaluated since the 2015 FYR.

6.4.1 Soil and Dust

6.4.1.1 Property Remediation Program Soil Data

Surface soil data from residential and commercial properties, common-use areas, and ROW obtained from the BPRP were used to estimate current and projected post-remedial lead concentrations for OU 3 geographic areas. Projected post-remedial lead concentrations assume that remediation is complete at all properties that will eventually require remedial action and is used as an estimate of potentially achievable community means if current remedial actions continue as specified.

Current community geometric mean soil lead concentrations (the primary COC) continue to be near or below 200 mg/kg for all OU 3 geographic areas, ranging from 55 mg/kg in the Lower Basin to 211 mg/kg in Osburn located in the Upper Basin (Alta, 2020b). These concentrations are well below the property-specific remedial action levels of $\geq$ 700 mg/kg and $\geq$ 1,000 mg/kg lead, the Basin ICP soil disposal action level of > 350 mg/kg lead, and the Basin ICP clean replacement material performance standard of < 100 mg/kg lead. Projected post-remedial community geometric mean lead concentrations are slightly less but similar because few properties remain to be remediated.

Current and projected post-remedial community mean soil arsenic concentrations are estimated to remain stable (less than 30 mg/kg) and below the property-specific remedial action level of $\geq$ 100 mg/kg arsenic and the Basin ICP clean replacement material performance standard of < 35 mg/kg arsenic (Alta, 2020b).

Remediation of public and private gravel roads as part of the BPRP was completed prior to 2015. No sampling was conducted as part of this Five-Year Review; however, local jurisdictions responsible for maintaining public gravel roads reported that little maintenance was required. No data on remediated private gravel roads were available.

6.4.1.2 House Dust Lead Monitoring Data

Lead data obtained from vacuum and dust mats were evaluated to ascertain current lead concentrations, loading rates and trends (Alta, 2020c).

Recent dust data (2017 and 2018) indicate geometric mean vacuum and dust mat lead concentrations are < 300 mg/kg in all communities, except in Wallace and Osburn where community means are < 500 mg/kg (Alta, 2020c). Overall, current community mean vacuum lead concentrations are near the community soil mean concentrations. However, community mean dust mat lead concentrations, used to quantify lead and dust entering into homes, have not yet decreased to community soil mean lead levels, suggesting lead continues to be tracked into homes. Available information suggests several attributable factors, including possible residual soil lead concentrations from areas of a property that did not require soil removal/replacement or other sources not related to property remediation such as parental occupation (e.g., miner, house painter) or recreational activities in unremediated areas of the site (e.g., ATV use on mine dumps, picnicking and swimming along banks of the SFCDR).

Although community mean dust lead concentrations are low, current estimates show 11 percent of Upper Basin homes and 3 percent of lower Basin homes have elevated dust lead levels > 1,000 mg/kg (Alta, 2020c). The contingency for the interior house cleaning remedial action identified in the 2002 OU 3

Interim ROD for these homes with elevated dust lead levels is to be evaluated when residential and community area property remediations are completed.

6.4.2 Modeled Lead Health Risks

IEUBK modeling for lead in children was conducted as part of this FYR (Alta, 2020c). Based on current and available environmental exposure data, estimates of lead health risks indicate that approximately 6 percent of homes in the Basin (8 percent of Upper Basin homes and 2 percent of lower Basin homes) do not meet current EPA risk policy. These exceedances for a typical (or hypothetical) child between the ages of 6 months and 6 years are due to elevated soil or dust lead concentrations, or a combination thereof, with the large majority due to elevated dust lead concentrations.

6.4.3 Blood Lead Monitoring Data

Data collected through LHIP's annual blood lead screening events were evaluated as part of this FYR, including participation rates and blood lead trends.

Participation rates were similar to previous years and continued to be lower than those seen for OU 1, with less than a quarter of the estimated OU 3 child population participating in the annual blood screening events as shown in Table 6-13 below.

Table 6-13. Summary of OU 3 Participation Rates in Annual Blood Screening Events, 2015 - 2019

Year	Estimated Eligible Population	Total Eligible Population Providing Samples	Percentage of Population Providing Samples
2015	483[a]	94	19%
2016	483[a]	70	14%
2017	493[b]	105	21%
2018	493[b]	88	18%
2019	493[b]	84	17%

[a] Estimated population based on 2014 enrollment data for School District 391 (TerraGraphics, 2015c)

[b] Estimated population based on 2018 enrollment data for School Districts 274, 391, 393, and 392 (Alta, 2019a).

Table 6-14 presents blood lead levels over the past five years by geographic area obtained from annual fixed-site blood screening events. In general, mean blood lead levels have fluctuated in all OU 3 geographic areas since the 2015 FYR although evaluating trends in observed blood levels is difficult because of the small sample sizes in certain age groups and communities. Appendix D contains two figures depicting blood lead level trends from 1996 through 2019.

Table 6-14. Summary of Blood Lead Levels for Children Participating in the LHIP by Geographic Area in OU 3, 2015 - 2019

Year	Geographic Area	Number of Children	Blood Lead Level Range (µg/dL)		Blood Lead Level (µg/dL)		Number (%) Children with Blood Lead Levels			
			Minimum	Maximum	Arithmetic Mean	Geometric Mean	Below Detection Limits[a]	≥ 5 µg/dL	≥ 10 µg/dL	≥ 15 µg/dL
2015	Lower Basin	2	-	-	-	-	-	-	-	-
	Kingston	23	< 1.4	6.0	3.5	3.3	0 (0%)	1 (4%)	0 (0%)	0 (0%)
	Side Gulches	14	< 1.4	10	2.6	2.1	3 (21%)	1 (7%)	1 (7%)	0 (0%)
	Osburn	23	< 1.4	4.6	2.9	2.6	2 (9%)	0 (0%)	0 (0%)	0 (0%)
	Silverton	10	< 1.4	4.6	2.6	2.4	1 (10%)	0 (0%)	0 (0%)	0 (0%)
	Wallace	10	< 1.4	13	3.9	2.9	0 (0%)	2 (20%)	1 (10%)	0 (0%)
	Burke/Ninemile	12	< 1.4	6.0	3.6	3.3	0 (0%)	2 (17%)	0 (0%)	0 (0%)
	Mullan	0	NA	NA	NA	NA	NA	NA	NA	NA
	Basin-wide	94	< 1.4	13	3.2	2.8	6 (6%)	6 (6%)	2 (2%)	0 (0%)
2016	Lower Basin	8	< 1.4	8.0	4.5	3.9	1 (13%)	3 (38%)	0 (0%)	0 (0%)
	Kingston	18	< 1.4	9.0	3.3	2.8	4 (22%)	3 (17%)	0 (0%)	0 (0%)
	Side Gulches	15	< 1.4	5.0	3.0	2.7	3 (20%)	2 (13%)	0 (0%)	0 (0%)
	Osburn	16	2.0	4.7	3.0	2.9	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Silverton	4	< 1.4	3.2	2.1	1.9	2 (50%)	0 (0%)	0 (0%)	0 (0%)
	Wallace	6	2.0	4.5	3.3	3.1	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Burke/Ninemile	3	< 1.4	3.0	2.3	2.2	1 (33%)	0 (0%)	0 (0%)	0 (0%)
	Mullan	0	NA	NA	NA	NA	NA	NA	NA	NA
	Basin-wide	70	< 1.4	9.0	3.2	2.9	11 (16%)	8 (11%)	0 (0%)	0 (0%)

Year	Geographic Area	Number of Children	Blood Lead Level Range (µg/dL)		Blood Lead Level (µg/dL)		Number (%) Children with Blood Lead Levels			
			Minimum	Maximum	Arithmetic Mean	Geometric Mean	Below Detection Limits[a]	≥ 5 µg/dL	≥ 10 µg/dL	≥ 15 µg/dL
2017	Lower Basin	3	2.3	4.2	3.1	3.0	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Kingston	26	< 1.9	14	4.8	3.8	2 (8%)	8 (31%)	3 (12%)	0 (0%)
	Side Gulches	17	< 1.9	20	6.3	4.3	4 (24%)	8 (47%)	4 (24%)	1 (6%)
	Osburn	25	< 1.9	8.0	3.4	3.1	2 (8%)	3 (12%)	0 (0%)	0 (0%)
	Silverton	8	< 1.9	4.8	2.3	2.1	3 (38%)	0 (0%)	0 (0%)	0 (0%)
	Wallace	7	2.9	14	5.7	5.0	0 (0%)	2 (29%)	1 (14%)	0 (0%)
	Burke/Ninemile	8	< 1.9	9.0	4.3	3.6	1 (13%)	2 (25%)	0 (0%)	0 (0%)
	Mullan	11	2.3	4.9	3.4	3.3	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Basin-wide	105	< 1.9	20	4.3	3.5	12 (11%)	23 (22%)	8 (8%)	1 (1%)
2018	Lower Basin	5	< 1.9	< 1.9	NA	NA	5 (100%)	0 (0%)	0 (0%)	0 (0%)
	Kingston	14	< 1.9	9.0	2.8	2.2	8 (57%)	2 (14%)	0 (0%)	0 (0%)
	Side Gulches	15	< 1.9	8.0	2.5	2.0	10 (67%)	2 (13%)	0 (0%)	0 (0%)
	Osburn	24	< 1.9	6.0	2.3	2.0	14 (58%)	1 (4%)	0 (0%)	0 (0%)
	Silverton	11	< 1.9	4.9	2.0	1.8	7 (64%)	0 (0%)	0 (0%)	0 (0%)
	Wallace	6	< 1.9	4.8	2.5	2.2	3 (50%)	0 (0%)	0 (0%)	0 (0%)
	Burke/Ninemile	5	< 1.9	6.0	2.6	2.2	2 (40%)	1 (20%)	0 (0%)	0 (0%)
	Mullan	8	< 1.9	4.3	2.3	2.0	4 (50%)	0 (0%)	0 (0%)	0 (0%)
	Basin-wide	88	< 1.9	9	2.4	2.0	53 (60%)	6 (7%)	0 (0%)	0 (0%)

Year	Geographic Area	Number of Children	Blood Lead Level Range (µg/dL)		Blood Lead Level (µg/dL)		Number (%) Children with Blood Lead Levels			
			Minimum	Maximum	Arithmetic Mean	Geometric Mean	Below Detection Limits[a]	≥ 5 µg/dL	≥ 10 µg/dL	≥ 15 µg/dL
2019	Lower Basin	5	< 1.9	8.0	3.4	2.5	3 (60%)	1 (20%)	0 (0%)	0 (0%)
	Kingston	15	< 1.9	3.4	1.7	1.6	12 (80%)	0 (0%)	0 (0%)	0 (0%)
	Side Gulches	25	< 1.9	14.0	3.8	2.7	12 (48%)	4 (16%)	3 (12%)	0 (0%)
	Osburn	17	< 1.9	3.8	1.7	1.6	15 (88%)	0 (0%)	0 (0%)	0 (0%)
	Silverton	3	< 1.9	< 1.9	NA	NA	3 (100%)	0 (0%)	0 (0%)	0 (0%)
	Wallace	7	< 1.9	2.9	1.6	1.6	6 (85%)	0 (0%)	0 (0%)	0 (0%)
	Burke/Ninemile	7	< 1.9	8.0	2.3	1.8	6 (85%)	1 (14%)	0 (0%)	0 (0%)
	Mullan	5	< 1.9	4.2	2.3	2.1	3 (60%)	0 (0%)	0 (0%)	0 (0%)
	Basin-wide	84	< 1.9	14	2.5	1.9	60 (71%)	6 (7%)	3 (4%)	0 (0%)

[a] Detection limit was 1.4 µg/dL prior to 2017 and 1.9 µg/dL in 2017 and 2018.

Note: For confidentiality, data not displayed if number of observations is less than three.

< indicates the result is below the detection limit.

NA = Not Applicable

In 2017, participant questionnaires provided at blood screening events indicated a somewhat higher incidence of risk factors such as occupation, hobbies and/or recreational pursuits that may have influenced elevated blood lead levels observed in that year. Information gathered from LHIP follow-up discussions with families of children with either elevated blood lead levels or elevated house dust lead concentrations confirmed that exposures may be occurring from a variety of sources including lead in house paint, remodeling activities, hobbies and/or recreational activities, and parents who work in mining (Alta, 2019a).

6.4.4 Institutional Controls Program Data

ICP records and reports were evaluated as part of this FYR. The PHD continues to implement the ICP according to its rule (IDAPA 41.01.01) and to maintain < 350 mg/kg residential community-wide lead average in soils by directing contaminated soils to designated waste disposal areas, enforcing the use of clean import soils, and permitting and inspecting new property development. Clean barriers that were disrupted through excavation have been repaired in response to ICP permitting and inspection activities. ICP inspectors are continually in the field to ensure that barriers are installed consistent with remedial actions identified in EPA RODs, and in compliance with the ICP rule. Compliance is high and no enforcement actions for noncompliance were issued in the last five years.

Opportunistic soil, regrinds, and snow melt sediment samples collected from 2015 through 2019 by the ICP were also evaluated. Lead concentrations from snow melt sediment samples average 158 to 521 mg/kg. Fifty (50) percent of the "regrinds" and more than 10 percent of the "other soil" samples collected since 2014 show lead concentrations > 350 mg/kg, and 8 percent of the "other soil" samples show arsenic concentrations > 100 mg/kg, reinforcing the need for an ICP to protect public health by managing contaminants left in place (Alta, 2020c).

6.4.5 Remedy Protection Project Data

A qualitative evaluation of the completed Remedy Protection Projects was conducted as part of this FYR by reviewing O&M plans and inspection reports and through discussions with local jurisdictions. Except for Revenue Gulch, as discussed in the *O&M* section of this report, no major issues or unexpected O&M activities occurred.

6.4.6 Soil and Sediment

Soil and sediment data from recreational areas and from the BEMP were evaluated as part of this FYR.

6.4.6.1 Idaho Recreational Sites Program Data

Soil data from the eight, publicly owned and remediated sites along the South Fork and the mainstem of the Coeur d'Alene River were collected and evaluated. Results indicate that, in general, removal of contaminated soil (≥ 1,000 mg/kg lead or ≥ 100 mg/kg arsenic) and capping of boat ramps, picnic areas, and campgrounds (≥ 700 mg/kg lead) continues to reduce public exposures to lead, arsenic and other heavy metals.

Sediment accumulation after high-flow events continues to be an issue at sites along the Coeur d'Alene River especially in the Lower Basin. Lead concentrations ranging from 1,000 to 5,000 mg/kg and arsenic concentrations ranging from 40 to 130 mg/kg have been observed. Sediment data collected at the Killarney Peninsula volleyball area in 2020 showed 6,360 mg/kg lead. Boat launch areas are inspected by PHD shortly after high-flow events, and if sediment deposition is observed, the applicable maintenance

jurisdiction is notified per agreed upon guidelines (PHD, 2018b). The maintenance jurisdiction then temporarily closes the impacted area until the area can be restored.

In addition, absolute bioavailability data obtained in 2018 from 13 Upper and Lower Basin recreation sites and 2 sediment samples from the Coeur d'Alene River had an average of 26 percent, ranging from 2.5 to 39 percent (Alta, 2018c).

6.4.6.2 Trail of the Coeur d'Alenes Data

Soil and sediment data were evaluated as part of O&M activities. Annual lead sampling at the beach in Harrison showed no exceedances above EPA's lead soil target level. Sediment observed to be accumulating in ditches and drainage structures near Plummer, Harrison, Wallace, and Medimont was removed and placed in an ICP repository. A qualitative evaluation of other components of the remedy was also completed via onsite inspections and review of O&M reports.

6.4.6.3 Washington Recreational Areas Along Spokane River Data

Sediment data collected in 2018 that had accumulated at seven remediated areas were evaluated. Lead concentrations were below the 700 mg/kg remedial action level at all areas except for three samples collected at the Island Complex (which was observed to have the most sediment accumulation) and two samples collected at Murray Road. These exceedances suggest recontamination is occurring; however, samples were analyzed with an XRF. Future sampling will include a subset of samples analyzed by an analytical laboratory to confirm XRF instrument accuracy (Ecology, 2019).

6.4.6.4 BEMP Sediment Data

Suspended and depositional sediment data collected through the BEMP were evaluated as part of this FYR.

Suspended Sediment

In mid-March 2017, CH2M and the USGS conducted intensive sampling during a 10-year peak flood event in the Lower Basin. The results of this sampling event are summarized in *Flood Stage Sampling Report Lower Basin of the Coeur d'Alene River* (CH2M, 2017). Key findings are summarized below:

- Lead concentrations in suspended sediment at the Cataldo Dredge Pool were consistently about 1,000 mg/kg, reflecting the dilution of sediment from the SFCDR with the lower concentrations from the North Fork Coeur d'Alene River.
- Suspended sediment concentrations were highest during peak flow conditions. Suspended sediment concentrations increased rapidly from the Cataldo Dredge Pool at river mile 160 and peaked at about river mile 155 with over 300 milligrams per liter (mg/L) on March 16. Suspended sediment concentrations decreased through the middle (Killarney) reach then increased to even higher values (350 mg/L) near the mouth of the river.
- Lead concentration values at peak flow increased sharply immediately downstream of the Cataldo Dredge Pool, increasing about a factor of four over 5 miles. Unlike suspended sediment concentration, lead concentrations remained high (up to 5,000 mg/kg) to the Springston Bridge before dropping slightly at the mouth of the river.

Data from the 2017 high flow sampling event corroborates the conceptual site model (CSM) for the Lower Basin and the importance of the Dudley Reach (river mile 152 to 160) as a significant and mobile source of lead to the rest of the Lower Basin.

Depositional Sediment

Variation in flood magnitude and duration from year to year can impact where sediments are deposited and the nature (thickness, grain size, lead concentration) of sediments. Consequently, only large-scale trends can be readily discerned from recent sample collection. Additionally, lead concentrations measured at the same BEMP depositional stations show a high degree of year-to-year variability, particularly at off-channel locations, complicating the assessment of long-term trends.

For most years, low flows resulted in lack of inundation and deposition at many off-channel locations. In WY 2017, the 10-year peak flood event resulted in extensive flooding of the Coeur d'Alene River floodplain and inundation and sediment deposition at most of the off-channel sampling stations. Lead concentrations in the deposited sediment during this elevated flood event were consistent with elevated flood events in past water years.

Large scale trends for depositional sediment consistently observed include:

- Lead concentrations increase rapidly downstream from Cataldo, indicating that lead is being mobilized from the channel bed
- Lead concentrations generally increase with decreasing particle size; the highest concentrations are typically found in the silt/clay fraction
- The highest lead concentrations from supplemental sampling stations were measured near the Strobl splay area, near Swan Lake, and near Killarney Lake.

In years where the Coeur d'Alene River flow did not exceed the bank full stage, most observed deposition occurred at locations within, or adjacent to Swan Lake and within the Killarney/Campbell/Hidden/Moffit Complex. In general, greater deposition is observed closer to the channel.

The depositional sampling plan has been optimized to collect samples in locations most likely to exhibit change in both depth of deposition and lead concentration of deposited sediments. For suspended sediments, there is a need to evaluate and compare different sampling methods (US D-96, grab sampler, laser in-situ scattering and transmissometry [LISST]) to optimize sampling accuracy and frequency. However high flow conditions (events with greater than 20,000 cfs) did not occur beyond the 2017 flood event to allow additional opportunistic suspended sediment sampling.

6.4.7 Surface Water and Groundwater

Surface water and groundwater data from residential areas, mine and mill sites, repositories, waste consolidation areas, and from BEMP sampling were evaluated as part of this FYR.

6.4.7.1 Drinking Water Data

Data from private drinking water samples collected through the BPRP were evaluated to determine concentrations of lead, arsenic, and cadmium.

As of December 2019, an estimated 19 OU 3 residences have been identified that have high purged drinking water results that require an alternative drinking water supply or filtration system. As sampling continues in the Lower Basin, where many homes use private drinking water systems, additional homes may be identified that require alternative drinking water sources or treatment. IDEQ, the Coeur d'Alene Trust, and EPA will continue to evaluate, track, and remediate private drinking water sources at residential properties as part of the BPRP completion plan process (IDEQ and TerraGraphics, 2012).

6.4.7.2 Rex Mine and Mill No. 2/Sixteen-to-One Data

The Coeur d'Alene Trust conducted remedial action effectiveness monitoring, including surface water monitoring above and below the remediated area. Samples collected upstream of the site continue to exceed AWQC for zinc and cadmium. Total and dissolved cadmium, lead, and zinc concentrations have remained generally consistent since 2014.

Peak flow total and dissolved lead concentrations from the Rex No. 2 Adit have continued to fluctuate over time, whereas concentrations from baseflow events have remained generally consistent. Zinc and cadmium results from the adit sample also fluctuate seasonally, with the greatest concentrations observed during the peak flow events.

No apparent increase or decrease in total and dissolved cadmium and lead concentrations has been observed in samples collected at the downstream surface water location.

6.4.7.3 Interstate-Callahan Rock Dumps Data

The Coeur d'Alene Trust conducted remedial action effectiveness monitoring, including surface water monitoring in EFNM Creek above and below the completed remedy. Recently, increasing trends of total and dissolved cadmium and zinc have been observed in post-remedial data. This follows a period of significant decrease in concentrations that was observed in 2016 and 2017 after completion of the remedial action. Post-remedial dissolved-lead concentrations appear relatively stable and have decreased by an order of magnitude from baseline conditions. It appears that total lead has been decreasing, in general, since the remediation was completed. The highest and lowest post-remedial concentrations are generally lower than the highest and lowest baseline concentrations.

Other sources of potential impacts present in the IC Rock Dumps include surface water runoff from the EFNM WCA, which has had increasing concentrations of metals. Nonetheless, seasonal average concentrations downstream from the IC Rock Dumps continue to show significant reductions between baseline and post-remedial datasets (MFA, 2020a).

Per the remedial action effectiveness framework (MFA, 2017), concentration trends will be quantitatively assessed after collection of 2020 data, as that will be five years after the remedial action A was completed.

6.4.7.4 Big Creek Repository Data

Water level elevations are monitored in one piezometer installed within the BCR footprint. Water level elevations are continuously monitored in groundwater monitoring wells outside the waste footprint at the BCR and BCRA. The transducers at the BCR and BCRA are downloaded semiannually during the first and third quarters, as described in the *2019 Big Creek Repository and Big Creek Repository Annex Water Monitoring Report* (MFA, 2020d).

Monitoring wells at the BCR and BCRA are also monitored to evaluate the performance of the repositories. Groundwater and surface water monitoring at the BCR and BCRA indicate that metals concentrations are either stable or trending downward (MFA, 2020d). Background threshold values were developed for groundwater and surface water, per the Optimization Review Report (EPA, 2016b). Total and dissolved metals and water chemistry parameters were evaluated to support analysis during the five-year review. The comparison of analytical results shows that the BCR and BCRA repository wastes are not impacting downgradient groundwater or surface water (MFA, 2020d).

6.4.7.5 East Mission Flats Repository Data

Water levels are continuously monitored in waste at two piezometers, and floodwater is monitored in the nearby lowlands with pressure transducers. Porewater is generally observed in piezometers installed in the waste when floodwater levels reach the toe of the repository. Transducer data are downloaded semiannually, i.e., during the second and fourth quarters. Groundwater monitoring also continues semiannually. Details on both efforts are described in the *2019 EMFR Water Monitoring Report* (MFA, 2020e).

Background threshold values were developed for total and dissolved metals, and water chemistry parameters were evaluated to support analysis during the Five-Year Review, per the *Optimization Review Report* (EPA, 2016b). Two additional monitoring wells were installed in 2018 to refine the conceptual site model. Elevated cadmium and zinc concentrations were identified in one of the offsite wells. Recent results are summarized below:

- Cleanup level and prediction limit exceedances were observed during the 2019 monitoring events.
- Monitoring results from 2019 indicate increasing trends for both cadmium and zinc in multiple downgradient and cross-gradient monitoring wells (MFA, 2020e).
- Geochemical conditions vary throughout the monitoring network.
- The 2019 source investigation identified offsite sources of metals to groundwater downgradient and cross-gradient of EMFR.

Complex hydrogeology and geochemical conditions at the repository preclude definitive identification of impacts associated with EMFR. The high degree of variability in the geochemistry of the upper alluvial groundwater, combined with the complex hydrogeology of the area and the spatial distribution of the zinc and cadmium results, makes it difficult to determine if EMFR is a source of these metals observed in groundwater. The Coeur d'Alene Trust will continue to monitor groundwater at EMFR to evaluate trends and adjust site management including stormwater controls that could improve groundwater.

6.4.7.6 Lower Burke Canyon Repository Data

Three Vibrating Wire Piezometers (VWPs) were installed at the LBCR in 2014 to monitor pore water pressure at the interface of the native alluvium and the tailings beneath the repository in Star Tailings Impoundment Pond 4, as documented in the Vibrating Wire Piezometer Installation Memorandum (CDM Smith, 2015a). The VWP data are collected and reviewed annually. The pore water pressure measurements are compared to an action-level threshold established by the design engineer.

Exceedances of the action-level threshold occurred in one VWP in early 2017 and 2018. As a result, CDM Smith revisited the geotechnical stability model, both in 2017 and in 2018. The stability of the repository was assessed, and no signs of erosion, settlement, cracks or fissures, sluffing soils, or seepage from the side slopes were observed. The drainage system was also observed to be functioning as designed. Exceedances of the VWP action level threshold did not occur at the LBCR in 2019 (CDM Smith, 2020a).

6.4.7.7 EFNM Waste Consolidated Area Data

Construction of the first expansion of the EFNM WCA was completed in 2016, and construction of the second expansion and first phase of final cover began in 2019. Increasing trends in metals were observed in surface water downgradient of the EFNM WCA from 2017 to 2019. This interim surface water impact was anticipated in the design and is expected to decrease after installation of the final cover system. There were no exceedances of CULs in groundwater through 2019, indicating that there were no significant

releases to groundwater. Future monitoring results will help inform the extent to which these controls mitigate the degradation of surface water quality. It is currently planned that the final cover will be placed on the EFNM WCA in 2025.

6.4.7.8 BEMP Surface Water Data

BEMP surface water quality data and discharge measurements were evaluated as part of this Five-Year Review. The concentration, load, and trend analyses over the last 5 years is summarized below. Specific monitoring efforts and calculations, and long-term trends are published in *Trends in Concentrations, Loads and Mass Balance of Trace Metals and Nutrients in the Coeur d'Alene River Basin, Northern Idaho, Water Years 1990-2018* (Zinsser, 2020).

AWQC exceedance ratios for dissolved cadmium, lead, and zinc have consistently declined across mining-affected sites in OU 3 over the past 5 years and from WY 2009 to 2018; however, concentrations remain above chronic criteria in most locations. Flow-normalized metal concentrations and loads decreased with high statistical likelihood over the past 5 years and over WY 2009 to 2018 throughout OU 3 at mining-affected sites. Specifically, total, and dissolved zinc and cadmium concentrations and loads, are likely decreasing about 25 to 75 percent over the past 5 years, and likely decreasing trends of about 10 to 30 percent over WY 2009 to 2018.

Total and dissolved lead concentrations and loads are likely decreasing about 25 to 85 percent over the past 5 years, and likely decreasing about 10 to 50 percent over WY 2009 to 2018. One exception was total lead load in the Coeur d'Alene River near Harrison, which had a marginally increasing trend. Association between trends in zinc and cadmium concentrations and loads show that the pervasiveness of contamination and the broad impacts of numerous remedial actions have imparted a "nonpoint source" signature to the metals wherein improvements are accrued during both runoff and baseflow conditions.

Mass balance analyses of annual total load estimates illustrate major patterns of metal transfers in the Basin and indicate some key locations for focusing future remedial efforts. Substantial loads of total zinc, cadmium, and lead in the SFCDR above Elizabeth Park are likely related to tailings still located in the Osburn Flats area and represent an opportunity for further remedial actions (Zinnser, 2020). The SFCDR remains the source of most of the dissolved zinc and cadmium loads into Coeur d'Alene Lake, and the mainstem Coeur d'Alene River remains the source of the majority of total and dissolved lead loads into Coeur d'Alene Lake. The mainstem Coeur d'Alene River is also an important source of particulate cadmium and zinc, particularly during high flow years. These results are unsurprising but nonetheless important because remedial actions have not yet directly addressed widespread particulate contaminants in the mainstem Coeur d'Alene River. The presence of these particulate contaminants, in conjunction with geochemical processes in deep riverbends, lateral lakes, and wetlands, are a sustained source of dissolved lead, zinc, and cadmium in the mainstem Coeur d'Alene River and may become more important as dissolved metal loads from the SFCDR continue to decline.

6.4.8 Ecological Resources

6.4.8.1 Waterfowl Surveys/Tundra Swan Mortality Data

Biological monitoring of waterfowl usage and tundra swan mortality data collected by the USFWS in OU 3 Lacustrine/Palustrine Habitats were evaluated as part of this FYR.

Waterfowl survey data collected each spring from 2015 through 2019 is used to evaluate performance and usage of the Agriculture-to-Wetland project near Medimont and to observe how local weather conditions such as air temperature, ice cover, snowpack, and rain-on-snow events are the primary factors controlling

hydrologic conditions and in turn wetland-specific waterfowl use and tundra swan (*Cygnus columbianus*) mortality within the Lower Basin.

Detailed information on these influences and impacts on usage and mortality, as well as tundra swan mortality prevention measures implemented at Harrison Slough in 2019 can be found in USFWS, 2020a; 2020b.

6.4.8.2 Robinson Creek Wetlands Restoration Project Data

The objectives of the 45-acre Robinson Creek Wetlands Restoration Project, a mitigation project engendered from the Page Repository Westward Expansion in OU 2, were evaluated in 2016. All objectives were determined met and the wetland is expected to take at least 4 years to reach efficacy (IDFG, 2017).

6.5 Technical Assessment

6.5.1 Question A: Is the Remedy Functioning as Intended by the Decisions?

The OU 3 remedy selected in EPA decision documents where completed is functioning as intended.

6.5.1.1 Human Health Selected Remedy

The OU 3 human health remedy selected in the 2002 OU 3 Interim ROD and the 2012 Upper Basin Interim ROD Amendment where completed is functioning as intended. Successful implementation of the comprehensive remedial strategy outlined in these documents has reduced soil and dust lead exposures and subsequent blood lead levels, as well as the use of contaminated surface water and groundwater as drinking water sources.

Substantial reductions in community mean soil lead concentrations have been achieved through large-scale remediation of residential and commercial properties, common-use areas, and ROWs. To date, 97 percent of eligible parcels have been sampled and remediation is 93 percent complete. The 3 percent of parcels where owners have refused or have been nonresponsive to access requests to sample are being tracked by the Coeur d'Alene Trust as part of the BPRP. If owners change their minds or if the parcel changes ownership, the properties will be sampled and remediated under established cleanup criteria where warranted.

Current estimated community geometric mean soil lead concentrations continue to be near or below 200 mg/kg for all OU 3 geographic areas. These concentrations are well below the property-specific remedial action levels of $\geq$ 700 mg/kg and $\geq$ 1,000 mg/kg lead, the Basin ICP soil disposal action level of > 350 mg/kg lead, and the Basin ICP clean replacement material performance standard of < 100 mg/kg lead. Current and projected post-remedial community mean soil arsenic concentrations are estimated to remain stable (less than 30 mg/kg) and below the property-specific remedial action level of $\geq$ 100 mg/kg arsenic and the Basin ICP clean replacement material performance standard of < 35 mg/kg arsenic (Alta, 2020b). Estimated current and post-remedial community mean soil lead and arsenic concentrations are assumed to remain near these estimated levels.

Recent dust data (2017 and 2018) indicate geometric mean vacuum and dust mat lead concentrations are < 300 mg/kg in all communities, except in Wallace and Osburn where dust mat community means are < 500 mg/kg (Alta, 2020c). Overall, current community mean vacuum lead concentrations are near the community soil mean concentrations. However, community mean dust mat concentrations, used to quantify lead and dust entering into homes, have not yet decreased to community soil mean lead levels,

suggesting lead continues to be tracked into homes. Available information suggests several attributable factors, including possible residual soil lead concentrations in areas of a property not requiring complete soil removal/replacement or other sources not related to property remediation such as parental occupation (e.g., miner, house painter) or recreational activities in unremediated areas of the site (e.g., ATV use on mine dumps, picnicking and swimming along banks of the SFCDR).

Although property remediations are near complete and overall community geometric mean soil led concentrations and house dust lead concentrations are low, current data show 11 percent of Upper Basin homes and 3 percent of Lower Basin homes have elevated dust lead levels ≥ 1,000 mg/kg (Alta, 2020c). It is at these homes where lead health risk typically does not meet the house dust RAO. Current estimates of lead health risks indicate that approximately 6 percent of homes in the Basin do not meet the current EPA risk goal due to elevated soil or dust lead concentrations, or a combination thereof. (Alta, 2020c).

Participation rates in free blood screening events was similar to previous years with less than a quarter of the estimated OU 3 child population participating. Mean blood lead levels have fluctuated in all OU 3 geographic areas since the 2015 FYR although evaluating trends in these observed blood levels is difficult because of the small sample sizes in certain age groups and communities. Participant questionnaires provided at blood screening events in 2017 indicated a somewhat higher incidence of risk factors such as occupation, hobbies and/or recreational pursuits that may have influenced elevated blood lead levels observed that year. Information gathered from questionnaires provided at blood screening events and LHIP follow-up discussions with families of children with elevated blood lead levels indicated that exposures may be occurring from a variety of sources similar to those attributable to elevated house dust lead concentrations.

House dust sampling will continue as property remediations are completed to determine whether overall community-wide trends will decline to expected levels, and to monitor occurrences of homes with elevated dust lead levels. Alternative approaches to identify at-risk children in years when targeted house dust surveys do not occur will also continue to be implemented as well as ways to increase participation in blood lead screenings. In the meantime, the LHIP will continue to offer follow-up and intervention services for families living in homes with elevated dust lead levels and where children with elevated blood lead levels reside.

Long-term performance of remediated properties in residential and commercial areas is dependent on several factors including private property owners maintaining soil, gravel, and vegetated barriers in compliance with cleanup criteria and ICP requirements, and government jurisdictions maintaining public roads remediated under the Paved Roads Program and stormwater projects completed under the Remedy Protection Projects program. The paved roads are expected to provide effective barriers to underlying contamination, and combined with the remedy protection projects, are expected to protect completed residential and commercial property, and ROW remediations from future recontamination from stormwater runoff, tributary flooding, and high-precipitation events in the Upper Basin. Evaluation of these two recently completed infrastructure programs will be provided in future five-year reviews.

Many common-use areas where people recreate are near residential areas. The remediated Washington Recreational Areas along the Spokane River, Trail of the Coeur d'Alenes, and the Idaho Recreational Sites are frequently used especially those along the Coeur d'Alene River and lateral lakes in the Lower Basin. Education and outreach, access controls and signage, placement of temporary handwashing stations during busy summer months, and timely monitoring and maintenance of sites help to reduce exposure risks and preserve protective barriers from erosion and slope destabilization. There are continuing issues, however, with recontamination of remediated areas after high-flow events and frequent use of unremediated areas where only signage exists. Increases in the number of families with young children recreating in unremediated areas where signs warning of the risks are visibly posted and in numerous informal areas dispersed across the site have been observed over the past five years. In

addition, as was noted in the 2015 FYR report, private property owners continue to establish campgrounds and recreational areas for their personal use in contaminated portions of the Coeur d'Alene River floodplain. These issues and remedial alternatives to reduce exposure risks will continue to be evaluated by the multi-agency Recreational Sites Team with a focus over the next four years on publicly owned recreational sites previously identified in the Lower Basin.

Remediation of nearby OU 3 mine and mill sites has reduced area residents' and recreational users' direct contact with contaminated soils and waste rock, and contaminated sediment along creek channels. O&M inspections of surface areas and stream channels indicated only routine repairs were required including reinstalling riprap along creek channels, reseeding of sparsely vegetated areas, replanting of trees, replacing access controls, and noxious weed treatment. Many additional mine and mill sites, and hillside and flood plain areas, however, require access controls and/or remediation to further reduce exposures to contaminated soils and sediments across OU 3.

Remedial actions have also been conducted to provide point-of-service treatment or alternate sources of drinking water to Basin residents with SDWA MCL exceedances of certain metals, and advisories and outreach materials have been made available on the risks of eating fish from the rivers and lakes of the Coeur d'Alene watershed. These actions help to further reduce peoples' exposure risks across OU 3.

6.5.1.2 Environmental/Ecological Selected Remedy

The environmental/ecological remedy selected in the 2003 OU 3 Interim ROD and the 2012 Upper Basin Interim ROD Amendment where completed is functioning as intended.

In general, post-remedial surface water monitoring results at Upper Basin remediated mine and mill sites have shown improvements in total and dissolved metals concentrations at downgradient surface water monitoring locations. Fluctuations do occur, as was recently observed downgradient of the Interstate-Callahan Rock Dumps site in the East Fork Ninemile watershed, although overall metal concentrations and loadings to downgradient surface water bodies have declined.

The three engineered repositories are safely containing waste material and preventing the release of contaminants to surface water and groundwater that would exceed state and/or federal standards as indicated by monitoring results. The increasing trend in metals observed in surface water downgradient of the EFNM WCA were anticipated during expansion of the footprint but are expected to decrease after installation of the final cover system. There were no exceedances of cleanup levels in groundwater through 2019 at the EFNM WCA, indicating that there were no significant releases to groundwater.

Remedial actions to remove, install barriers to and contain contaminated soil and sediment, control of surface water runoff, and point source treatment of groundwater in the Upper Basin have impacted positive changes on zinc, cadmium, and lead concentrations and loadings to surface and groundwater. Sediment contamination from unremediated Upper Basin mine wastes, however, continues to be transported throughout the SFCDR and its tributaries, and the mainstem of the Coeur d'Alene River. Although remediation of these upgradient sources remains a priority, the significant and pervasive source of metals in the Lower Basin necessitates planning for and implementing remedial actions in the Lower Basin in order to achieve cleanup goals. The framework for remedial actions in the Lower Basin consists of pilot project planning and design beginning in the Dudley Reach of the Coeur d'Alene River. Using the adaptive management process, EPA will use the Dudley pilot project to inform future Lower Basin pilot project and remedial action implementation. It is only when Lower Basin remedial actions are implemented will significant and measurable reductions in metals concentrations and loadings be observed in groundwater and surface water monitoring data.

For waterfowl, providing sufficient clean feeding acreage is fundamental to achieving cleanup goals. The Agriculture-to-Wetland project near Medimont in the Lower Basin has provided approximately 400 acres of clean feeding habitat. Ecological success of wetland remediation and restoration is ultimately contingent on shifting waterfowl use from contaminated wetlands to newly established clean wetland habitats. Waterfowl exposure and mortality will continue if there is continued exposure to lead-contaminated sediment and until sufficient clean feeding habitat is provided.

Continued coordination between EPA and the Natural Resource Trustees on wetland remediation and restoration is an efficient and cost-effective strategy for providing additional clean feeding habitat in the Lower Basin. Recent coordination efforts have prioritized several potential wetland projects for remedial/restoration actions including Gray's Meadow, Gleason's Marsh, and Canyon Marsh. Remediation and restoration of these properties could provide approximately 1,400 additional acres of clean wetland habitat.

6.5.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of the Remedy Selection Still Valid?

Certain exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selected in the OU 3 Interim RODs have changed such as soil and dust bioavailability and children's ingestion rates. No changes have occurred, however, in the past five years.

6.5.2.1 Changes in Standards and To-Be-Considered Criteria

EPA reviewed the federal, state, and Tribal requirements that are ARARs, and the TBC criteria selected in the EPA RODs as part of this FYR. There were no changes that called into question the validity or protectiveness of the OU 3 Selected Remedy.

Significant improvements in surface water quality are also expected in the Upper Basin and AWQC ARARs under the Clean Water Act may be achieved at many locations; however, achievement of AWQC at all locations was not envisioned in either OU 3 interim ROD. The same is true for providing safe habitat for special-status species. Achievement of ARARs under the Migratory Bird Treaty Act and the Endangered Species Act may be achieved at certain locations where remedial actions are taken, but these are not expected to be achieved at all locations.

6.5.2.2 Changes in Toxicity and Other Contaminant Characteristic

Recent scientific literature on lead toxicology and epidemiology provides evidence that adverse health effects are associated with blood lead levels < 10 µg/dL (National Toxicology Program 2012, EPA, 2013a; ATSDR, 2020). EPA recognizes that a target blood lead level of 10 µg/dL may not be adequately protective for children and adults. However, to-date, EPA has not yet changed their national lead health risk policy.

In addition, bioavailability data obtained in 2018 discussed in the *Data Review* section indicate that the original bioavailability assumption of 18 percent may have been low and potentially underestimated incremental recreational risk. EPA and IDEQ will continue to discuss the need for collecting additional bioavailability data.

6.5.2.3 Changes in Risk Assessment Methods

EPA released updates to the IEUBK Model in May 2021 (Version 2). This latest version was based largely on evaluation of data from OU 1 of the Bunker Hill Superfund site (von Lindern et al., 2016; Vandenberg, 2020). The IEUBK version 1.1 was used for this FYR (see Alta 2020c for further details).

EPA is also considering a change in its national lead policy. Although no policy changes have yet occurred, if a lower blood lead target level was adopted and applied to the Basin, additional residences may not achieve the updated target. For example, for a target where an individual child has an estimated risk of no more than five percent chance of exceeding a five µg/dL blood lead level, then approximately two-thirds of Upper Basin residences and 15 percent of lower Basin residences would not achieve the updated target based on IEUBK modeling. However, no determination of the impacts can be made until a revised national lead policy is final and current risk assessment methodologies and models are used to assess the cleanup.

6.5.2.4 Changes in Exposure Pathways

There have been no changes in land use that would call into question the protectiveness of the OU 3 Selected Remedy, nor were there changes in human health or ecological routes of exposure or newly identified receptors that would affect protectiveness.

New commercial and residential developments are being planned but these were anticipated in ROD cleanup level decisions for protection of human health. In addition, these new developments will require permits and oversight from the ICP to ensure that contaminated soils are appropriately handled, backfill requirements for clean soil are followed, and barriers to underlying contamination are established if required.

As discussed earlier in the report, recreational exposures are likely a more predominant exposure pathway than originally assumed. This will require additional risk-reduction measures in order to achieve RAOs.

6.5.2.5 Expected Progress Towards Meeting RAOs

The selected remedies are progressing towards meeting the RAOs as stated in the OU 3 interim RODs, and no new site conditions have been discovered that would negatively impact their achievement or remedy protectiveness when all remedial actions are complete.

6.5.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has come to light to call into question the protectiveness of the OU 3 Selected Remedy.

6.6 Issues and Recommendations

Issues that directly affect the protectiveness of the OU 3 Selected Remedy and recommendations to resolve these issues are provided below in Table 6-15.

Table 6-15. Issues and Recommendations Identified in the 2020 Five-Year Review

<table>
<tr><td rowspan="4">OU 3</td><td colspan="4">Issue Category: Remedy Performance</td></tr>
<tr><td colspan="4">Issue: This is a continuation of the 2015 Issue “ Consider Alternative Approaches to Identify At-Risk Children.”

Individual homes continue to demonstrate elevated dust lead concentrations above 1,000 mg/kg. It is at these homes where lead health risk exceedances typically do not meet the house dust RAO. Current estimates of lead health risks indicate that approximately 6 percent of homes in the Basin do not meet the current EPA risk goal due to elevated soil or dust lead concentrations, or a combination thereof, with the large majority due to elevated dust lead concentrations.

House dust monitoring occurs after the following: After a property is remediated through the BPRP; every other year targeted surveys; and after annual blood screening events. The BPRP is nearing completion and participation in blood lead screenings remains low. Therefore, other strategies are needed to help identify at-risk children.</td></tr>
<tr><td colspan="4">Recommendations:

1) Continue house dust monitoring focusing on the Upper Basin using current approaches and applying a targeted investigation approach at homes that do not meet the Basin health risk goal to identify lead sources in and outside these homes.

2) Implement alternative approaches to obtain house dust and blood lead data and measures to reduce exposures.</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Party Responsible</td><td>Oversight Party</td><td>Milestone Date</td></tr>
<tr><td>No</td><td>Yes</td><td>EPA/State</td><td>EPA/State</td><td>11/16/2025</td></tr>
</table>

6.6.1 Other Findings

Issues that do not directly affect protectiveness are included in the *Other Findings* table located in Appendix E.

6.7 Protectiveness Statement

Table 6-16. 2020 FYR Protectiveness Determination and Statement

OU 3 Protectiveness Determination and Statement	
Operable Unit:	***Protectiveness Determination:***
3	**Will be Protective**

Protectiveness Statement:

The selected remedy at Operable Unit 3 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have addressed direct exposure pathways in these areas.

Human Health Selected Remedy

The residential and community area property remediation program is 93 percent complete. Soil and interior house dust lead concentrations and observed blood lead results are below target levels in most OU 3 geographic areas. The continued operation of the Institutional Controls Program (ICP) to maintain clean barriers to underlying metals contamination and the recently completed stormwater projects designed to protect these barriers from erosion caused by high water events are expected to limit potential exposures in the future. Remediation of nearby mine and mill sites and recreational areas have further limited exposures to lead contaminated soils and sediments. And remedial actions to limit the use of contaminated surface water and groundwater as drinking water sources have reduced exposures to lead, arsenic, and cadmium. As remediation continues, however, implementation of alternative remedial approaches to identify at-risk populations, increasing participation in free blood lead screenings, and mitigating exposures from multiple sources will be required to meet all human health remedial action objectives (RAOs). This is especially true for families with young children living in homes with elevated house dust lead levels and those observed recreating in unremediated areas across the site.

Environmental/Ecological Selected Remedy

Remedial actions to remove, install clean barriers, contain contaminated soil and sediment, and control of surface water runoff in the Upper Basin have impacted positive changes on lead, zinc, and cadmium concentrations and loadings to surface water and groundwater. Pilot projects conducted in the Lower Basin to reduce erosion of streambanks and to provide clean feeding acreage for waterfowl show promise. Sediment contamination from the many unremediated Upper Basin mine sites, however, continues to be transported downstream. Exposure to these contaminated sediments poses health risks to people recreating in the Lower Basin as well as waterfowl feeding in Lower Basin wetlands and lakes. Remediation of upgradient sources remains a priority because of these continuing risks.

There are also risks associated with the significant and pervasive source of metals contamination already in the Lower Basin which necessitates planning for and implementing additional pilot projects such as the one planned at Dudley Reach. Lessons from this riverbed and bank sediment project will inform future Lower Basin remedial actions. It is only when Lower Basin remedial actions are implemented will significant and measurable reductions in metals concentrations and loadings be observed in surface water groundwater monitoring data, and waterfowl exposure to contaminated sediment and mortality rates decline.

7 Next Review

The next FYR Report for the Bunker Hill Superfund site is required five years from the completion date of this review.

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Appendix B. Coeur d'Alene Lake Management Plan

Introduction

Although Coeur d'Alene Lake is within the Bunker Hill Mining and Metallurgical Complex Superfund Site (Bunker Hill Superfund Site), remedial actions for the lake were not selected in the 2002 Operable Unit 3 Interim Record of Decision (ROD). The U.S. Environmental Protection Agency (USEPA) deferred a decision on whether to select remedial actions for the lake pending the development and effective implementation of a revised Coeur d'Alene Lake Management Plan (LMP), which was to be a revision of the 1996 LMP. USEPA concluded that "…an effective LMP created outside of the CERCLA defined process, using separate regulatory authorities, would reduce riverine inputs of nutrients and metals that continue to contribute to contamination of the lake and the Spokane River" (Idaho Department of Environmental Quality [IDEQ] and Coeur d'Alene Tribe, 2009). The ROD also addressed the possibility of future actions. One effect of USEPA's decision was to limit its use of funds from the Superfund accounts created under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to address mining related water quality conditions in the lake.

The Coeur d'Alene Tribe (Tribe) and the Idaho Department of Environmental Quality (IDEQ) share responsibility for water quality in Coeur d'Alene Lake under Clean Water Act (CWA) authority. The Tribe and IDEQ collaboratively developed the 2009 LMP with the goal "to protect and improve lake water quality by limiting Basin-wide nutrient inputs that impair lake water quality conditions, which in turn influence the solubility of mining-related metals contamination contained in lake sediments" (IDEQ and Coeur d'Alene Tribe, 2009) USEPA assisted the Tribe and IDEQ by convening and participating in an Alternative Dispute Resolution (ADR) process. USEPA includes lake management in its regular Five-Year Reviews of ROD implementation progress, most recently in 2015. The 2015 Five Year Review includes a detailed description of the LMP Objectives.

The LMP identifies objectives and strategies to accomplish the overall goal through ongoing science, coordination with Coeur d'Alene River Basin (Basin) stakeholders, public outreach and education, project implementation, and identification of potential funding sources.

In 2019, the Coeur d'Alene Tribe notified the EPA that they would no longer be able to support the Lake Management Plan, citing it as being ineffective in protecting lake water quality. The Coeur d'Alene Tribe's letter to EPA was accompanied by a Critical Review of the 2009 Lake Management Plan.

The IDEQ continues to operate under the framework of the LMP. Both the Coeur d'Alene Tribe and IDEQ continue to collaborate on issues regarding monitoring and improving the health of the lake and water quality.

In 2019, the EPA Region 10 requested an internal independent review from the Office of Land and Emergency Management's Optimization Program. The Optimization Review focused on the status and effectiveness of actions at the Superfund site as related to Coeur d'Alene Lake. The Optimization Review Report was finalized in June 2020. DEQ and the Tribe voiced concerns that the data set reviewed by the optimization team was incomplete, considering the fact recommendations were based on that data set. In 2020, the State of Idaho commissioned the National Academies of Sciences (NAS) to analyze available data and information about Coeur d'Alene Lake water quality and provide recommendations to address issues of concern. The NAS review is also being supported by Kootenai County and the U.S. Environmental Protection Agency , with endorsement from the Coeur d'Alene Tribe. The NAS assembled a 12-member, multi-disciplinary committee to conduct the study. The committee plans to meet approximately five times in 2021-2022.

Summary of Lake Management Plan Objectives

The 2009 Lake Management Plan includes the following goal and objectives:

The goal of the 2009 LMP is to protect and improve lake water quality by limiting basin-wide nutrient inputs that impair lake water quality conditions, which in turn influence the solubility of mining-related metals contamination contained in lake sediments. The nutrients of concern are phosphorus and nitrogen. Increased loads of these nutrients into the lake increase algae and rooted aquatic plant growth through a process known as eutrophication. When this organic material decomposes, the process consumes oxygen dissolved in the water. Acceleration of this process, due to land use and development activities, is termed: cultural eutrophication. Depletion of dissolved oxygen (anoxia) concentrations in lake bottom waters will promote geochemical processes that release certain mining-related hazardous substances from lakebed sediments. Anoxia will also lead to the release of additional nutrients that stimulate production of algae and rooted aquatic plants that can lead to a cycle that is difficult or impossible to interrupt and that has harmful effects on water quality. Management objectives to achieve this water quality goal are listed below.

1) Improve scientific understanding of lake conditions through monitoring, modeling, and special studies
2) Establish and strengthen partnerships to maximize benefits of actions under existing regulatory frameworks
3) Develop and implement a nutrient reduction action plan
4) Increase public awareness of lake conditions and influences on water quality
5) Establish funding mechanisms to support the LMP goal, objectives, and strategies

Actions Completed since 2015

Staff with IDEQ and the Tribe have continued to implement activities aimed at addressing the objectives in the LMP. The annual progress reports developed by the BEIPC at the end of each calendar year provide a summary of activities accomplished through EPA's remedial efforts. These reports also include a summary of Coeur d'Alene Lake Management Plan accomplishments. These progress reports are available on the BEIPC website. Below is an abbreviated summary of activities from 2016 through 2020.

Objective 1: Science

- Regular lake water quality monitoring (since 2008)
- Reported lake trends from 2008-2014 as well as an update report summarizing data 2015- 2018. Some parameters are trending in the wrong direction, approaching or exceeding water quality triggers outlined in the LMP. See the latest trends report here: (https://www.deq.idaho.gov/water-quality/surface-water/coeur-dalene-lake-management/).
- Reports compiled from previous data collected for special studies (phytoplankton, benthic macroinvertebrates, and rooted aquatic plants in bays)
- Periphyton study in northern bays with the University of Idaho
- Annual rooted aquatic plant surveys to identify aquatic invasive species infestations
- Coordination with ISDA and Avista to address invasive species infestations
- Third-party review initiated to address water quality trends and triggers concerns

Objective 2: Partnerships

- LMP staff have participated regularly in Watershed Advisory Group around the basin, including the St. Joe, St. Maries Rivers, Coeur d'Alene Lake Tributaries, and the Coeur d'Alene River. WAGs are key in identifying potential nutrient reduction opportunities.
- LMP staff have continued to coordinate with the Technical Leadership Group, the Citizen's Coordinating Council, and the BEIPC during regular meetings and for written reports.

- LMP staff coordinated with the Kootenai, Shoshone, and Benewah Counties; Avista Corp; the City of Coeur d'Alene; the Coeur d'Alene Regional Chamber of Commerce, CDA 2030; the University of Idaho; and others on a variety of partnership efforts aimed at reducing nutrient loading to Coeur d'Alene Lake

Objective 3: Nutrient Reduction Action Plan

- LMP staff completed a nutrient (phosphorus) source inventory report, which identified nutrient loading data gaps in the basin.
- Tributary monitoring has been ongoing since 2016 to fill data gaps in nutrient loading estimates.
- LMP staff continue to coordinate on nutrient reduction projects such as riverbank stabilization, road drainage improvement, riparian vegetation establishment, and stream restoration with road districts, soil and water conservation districts, and other basin partners.

Objective 4: Public Awareness

- LakeASyst materials developed and distributed to homeowners since 2013 (provides management tools to help reduce water quality impacts on private land)
- Panhandle Stormwater and Erosion Education Program (SEEP) ongoing (provides tools for development/construction community to reduce water quality impacts)
- Our Gem Coeur d'Alene Lake Symposia and the Our Gem Collaborative disseminate water quality information to stakeholders basin-wide
- The Confluence Project reaches high-schoolers throughout the Idaho Panhandle with water quality education in a hands-on, place-based approach

Objective 5: Funding Mechanisms

- State of Idaho funds a 4-person team to perform LMP activities
- CWA Section 319, Restoration Partnership, LMP, State Revolving Fund, and other sources of funding are utilized to implement nutrient-reduction projects
- Avista funds are utilized to further LMP objectives under FERC license requirements
- EPA supports LMP efforts through analysis of metals at the Manchester Lab

Effectiveness of the LMP

The efforts of the Coeur d'Alene Tribe and IDEQ have made progress in many areas, as summarized above. Progress and momentum have been generated toward achieving the overall goal. The LMP established water quality triggers, which if approached or exceeded would prompt a comprehensive review to identify the causes of the trend and guide development of a corrective management response. A comprehensive review is in progress by the NAS, with a report expected in mid-2021. The report will provide recommendations for lake management moving forward.

Conclusions

Lake Management Plan Effectiveness

The LMP continues to be implemented by the State of Idaho. The LMP is a good framework for improving lake health and water quality and provides for the opportunity for collaboration with stakeholders.

The 2020 EPA Optimization Review identified data gaps and uncertainties as well as a number of recommendations.

Ongoing review of the status of lake water quality and the activities to protect the lake by IDEQ and the EPA continues. At the time of this Five-Year Review, the National Academy of Sciences was beginning

their examination of the Lake with a report expected in 2022. This thorough review will provide a much-needed holistic assessment of the lake and be an important perspective to determine future actions.

References

Idaho Department of Environmental Quality (IDEQ) and Coeur d'Alene Tribe. 2009. *Lake Management Plan*. March.

U. S. Environmental Protection Agency (EPA). 2020. *Optimization Review Report, Remedial Process Optimization Study, Lake Coeur d'Alene, Bunker Hill Mining and Metallurgical Site, Operable Unit 03, Coeur d'Alene, Kootenai County, Idaho, EPA Region 10.* June.

Appendix C. Pre-EPA Record of Decision Response Actions

OU	Dates of Action	Action	Responsible Agency/Party
1	1974 to 1975	CDC emergency response to epidemic lead poisoning, including a lead health study.	CDC and Idaho Department of Health and Welfare
1	1986	Time-critical removal actions. 16 public properties (parks, playgrounds, road shoulders).	EPA
1	1989	Time-critical removal Actions. 81 homes and 2 apartment complexes.	EPA and Idaho Department of Health and Welfare (IDHW)
1	1990	Removal Action. Continue residential soils/additional 130 yards.	8 mining companies paid EPA to conduct removals
1	1991	Removal Action. Take over residential soil removal program.	9 mining companies (Universal Mining Group [UMG])
2	1989 to 1993	Smelter Complex Stabilization.	3 mining companies
2	1990 to 1994	Hillside Stabilization and Revegetation; Fugitive Dust Control.	Gulf and Hecla mining companies
2	1991	Cleanup within Bunker Hill Complex.	3 mining companies
3	1989 and 2000	Upper South Fork Coeur d'Alene River - Morning Mine No. 6: Adit drainage directed to subsurface flow, rock-bed filter treatment system. Slaughterhouse Gulch was lined to reduce infiltration through the waste rock pile.	Hecla
3	1991 to 1998	Lower Coeur d'Alene River - Killarney Lake Boat Launch: Covered contaminated shoreline with geotextile fabric overlain with 12-inch rock. Paved the floodplain area and road, covered edge areas with topsoil and sodded grass, and rebuilt concrete plank boat launch. Provided drinking well and vaulted toilets at the site.	BLM
3	1992 to 1993	Ninemile Creek - Interstate Tailings Removal: Removal of tailings adjacent to EFNMC with consolidation to a nearby uphill area. Installation of straw bales along perimeter of tailings for erosion control.	Hecla

OU	Dates of Action	Action	Responsible Agency/Party
3	1993	Ninemile Creek - Success Mine/Mill Tailings and Waste Rock: Time-critical removal action included relocation and riprap armoring for about 1,600 feet of EFNMC channel; relocation of streamside tailings; placement of in-stream structures for energy dissipation; capping of tailings pile with 1-foot-thick overburden rock; installation of upgradient groundwater and surface water diversions.	EPA, IDEQ
3	1994	EFNMC Floodplain: Time-critical removal of about 50,000 cy of flood plain tailings and contaminated sediments with disposal at the Day Rock Repository. Stream reconstruction, riparian stabilization, and revegetation.	IDEQ, Hecla
3	1994	Ninemile Creek Floodplain near Blackcloud: Time-critical removal of about 44,000 cy of flood plain tailings and contaminated sediments with disposal at the Day Rock Repository. Stream reconstruction, riparian stabilization, and revegetation.	Hecla, IDEQ, SVNRT
3	1994	Ninemile Creek - Day Rock Repository: about 94,000 cy of materials from the floodplain removals were placed on top of the existing Day Rock repository and capped with native soils and growth media.	SVNRT, IDEQ, and Hecla
3	1994	Lower Coeur d'Alene River - Medimont Bank Stabilization: Placement of four types of bank erosion control, two with hay bales, two with riprap. Subsequent monitoring indicated that the hay-bale methods were not effective in this portion of the river.	IDEQ/Soil Conservation Service
3	1994 to 1995 and 1999	South Fork Coeur d'Alene River - Elizabeth Park Stream Bank Stabilization: The project removed 13,585 cy of tailings from the river and used the material to construct a compacted levee over 2,100 feet long on the south river bank. Additionally, 8,027 tons of riprap was placed on the riverbanks to protect them from further erosion. The project also installed in-channel stabilization, aquatic habitat features, and riparian zone enhancements. Work on the project was initiated in September 1994, and completed in May 1995. In 1999, additional river barbs were installed to enhance aquatic life.	SVNRT
3	1994 and 2000	Elk Creek Pond at Mouth of Moon Creek: Limited tailings removal in 1994. Clean sand was imported for a recreational beach at this swimming hole. Time-critical removal of 28,000 cy of contaminated sediments and tailings in 2000 (Liverman, 2004).	SVNRT, U.S. Army Corps of Engineers (USACE), EPA

OU	Dates of Action	Action	Responsible Agency/Party
3	1994 - 2000	Pine Creek - Nabob Mine/Mill Site: Soil cover over the tailings pile and a portion of mill area; fence to limit access to the mill site and tailings; channel improvements along Nabob Creek to stabilize the channel and prevent erosion of the tailings pile embankment. In 1995, the mine operator seeded and placed soil cover materials over the tailings, but success of the revegetation is limited. In 2000, the BLM started an investigation at the site drilling 20 wells around the pile and mill. Also, in 2000, the BLM installed a groundwater cutoff drain above and along the side of the tailings pile. In 2001, the BLM re-graded the Nabob Mid-level rock dump.	BLM
3	1995	South Fork above Elizabeth Park: Tailings removal and construction of an armored levee with rock grade-control structures to stabilize bank.	SVNRT
3	1995	Lower Coeur D'Alene River - Cataldo Mission: Removal of about 700 cy of tailings and contaminated soils from traditional campground areas in the vicinity of the Cataldo Mission.	Coeur D'Alene Tribe
3	1996 - 1997	Pine Creek - Douglas Mine and Mill Site: Time-critical removal of two existing tailings impoundments from the flood plain of the East Fork Pine Creek. 25,000 cy of contaminated materials were removed and placed into a temporary repository constructed east of Pine Creek Road near the mine.	EPA
3	1996 - 1997	Lower Coeur D'Alene River - Cataldo Boat Ramp: Placement of cabled log bank protection and brush wattling to reduce erosion and planting of bushes in the vicinity of contaminated soils to discourage human contact with the soils.	IDEQ
3	1996 - 2000	Pine Creek - Denver Creek (includes Little Pittsburg, Hilarity, Denver, and Mascot Mine): Time-critical removal of about 5,200 cy of tailings and contaminated soils associated with the Little Pittsburg Mill. No actions have been conducted on the private portion of the pile. The mouth of Denver Creek has been undergoing stabilization and revegetation by the BLM. Re-grading at the Mascot mine was done by the mine owner, Mascot Mining, in 2002.	BLM
3	1996 - 2000	Pine Creek - Amy-Matchless Mill Site: Time-critical removal of about 9,600 cy of tailings and contaminated soils in 1996 and 1997. In 1998, a non-time-critical removal action removed an additional 420 cy of residual tailings. Disturbed area covered with soil and revegetated. Mine adit was closed by backfilling. Waste rock dump regraded and revegetated.	BLM

OU	Dates of Action	Action	Responsible Agency/Party
3	1996 - 2000	Pine Creek - Liberal King Mine/Mill Site: Time-critical removal of about 9,400 cy of tailings and contaminated soils in 1998, 99 cy of mill site tailings and mill wastes were removed from the mill area. In 1999, non-time-critical removal of an additional 1,800 cy of tailings, re-grading backfill of a dry adit, import of growth medium, and revegetation. The 2000 actions included extensive grading and planting of riparian vegetation. There are continuing efforts to further revegetate and stabilize the stream reach with additional stream work and plantings of shrubs and trees.	BLM
3	1997 - 1998	Canyon Creek - Standard Mammoth Facility Removal of tailings with disposal at Woodland Park Repository. Re-graded, stabilized, capped, and revegetated waste rock pile. Removed railroad grade and crossing	American Smelting and Refining Company (ASARCO)
3	1997 - 1998	Canyon Creek from Tamarack to below Gem: Time-critical removal of about 127,000 cy of tailings and contaminated sediment with disposal at the Woodland Park Repository. Soils at removal areas were amended with organic materials, then revegetated. The stream channel of Canyon Creek was stabilized with bioengineering techniques.	SVNRT
3	1997 - 1998	Lower Canyon Creek Floodplain: Time-critical removal of 472,000 cy of tailings and contaminated materials with disposal at the Woodland Park Repository. Soils at removal areas were amended with organic materials, then revegetated. The stream channel of Canyon Creek was stabilized with bioengineering techniques.	SVNRT
3	1997 - 1998	Canyon Creek - Woodland Park Repository: Construction of an unlined repository for disposal/consolidation of removals along Canyon Creek. Repository contains approximately 600,000 cy of contaminated materials. Repository capped with native soils and revegetated.	SVNRT
3	1997 - 1998	Upper South Fork Coeur d'Alene River - Osburn Flats: Removal of 133,000 cy of tailings and contaminated soil. Project also tested the application of various in situ treatments to tie up metals.	SVNRT
3	1997 - 2001	Residential and Common-use Areas - Schools/Daycares: Partially removed lead-contaminated soils and replaced with clean soil or other protective barriers (e.g., clean gravel). Actions were completed at seven schools and daycares. The Silver Hills Middle School was started in 1997 and additional work was completed in 1998, 2001, and 2002 due to the extremely large property size.	EPA
3	1997 - 2002	Residential and Common-use Areas - Residential Yards: Partially removed lead-contaminated soils and replaced with clean soil barrier and/or other protective barriers (e.g., clean gravel). From 1997 to 2002, actions were completed at 119 residential yards.	IDEQ, EPA

OU	Dates of Action	Action	Responsible Agency/Party
3	1997 - 2002	Residential and Common-use Areas - Private Drinking Water: Provided alternate water supply to 28 residences on contaminated private wells. Alternate supplies included bottled water for11 homes, end-of-tap water treatment (water filters) for 5 homes, and municipal water hookup for 12 homes.	EPA
3	1997 - present	Pine Creek - Sidney (Red Cloud) Mine/Mill Site: Non-time-critical removal of contaminated soils around the mill foundations with disposal at the Central Impoundment Area; run-on and runoff controls; and improvements to the upstream culvert on Red Cloud Creek to control flow through the site and reduce downstream erosion. Passive treatment of adit drainage with inflow prevention at the Sidney Shaft in Denver Creek. Rock dump re-graded and hydroseeded in 2000 to minimize erosion. Additional stream channel work at the toe of the dump was performed in 2002. In 2001, the BLM started pilot water treatment efforts with the Sidney Red Cloud tunnel mine discharge. In 2003, a pilot bioreactor water treatment system was installed and is continuing to be operated and monitored.	BLM
3	1998	Ninemile Creek - Interstate Mill Site: Non time-critical removal of about 60,000 cy of tailings, mill debris, and contaminated sediments from the mill site and from EFNMC for 1,000 feet downstream. Disposal at an onsite repository. EFNMC stabilized with bioengineering structures in removal areas.	SVNRT, IDEQ, Hecla
3	1998	South Fork Floodplain Removals: Non-time-critical removals at several areas in the floodplain totaling about 128,000 cy of tailings and contaminated soils.	SVNRT
3	1998 - 2000	Moon Creek - Silver Crescent and Charles Dickens Mines: Non-time-critical removal of about 130,000 cy of tailings, waste rock, contaminated soils, and mill structures, with disposal at an onsite repository. Closure of four adits. Stream relocation and vegetative and structural rehabilitation along approximately 3,300 feet of Moon Creek, and 10 acres of riparian revegetation.	U.S. Forest Service
3	1998 - present	Pine Creek - Constitution Mine and Mill Site: Non-time-critical removal included removal of contaminated soils around the mill with disposal at the Central Impoundment Area, and realignment of East Fork Pine Creek away from the toe of the tailings pile. Most of the tailings and waste rock dump are on private land and have not been addressed to date. In 2002, at the Upper Constitution Site, the BLM installed a pilot mine water treatment bioreactor unit and a groundwater drain above the upper tailings pile. In 2003, the BLM made modification to the system and installed a ground water drain above the bioreactor.	BLM
3	1999	Time-critical removal action to address spillage of metal concentrates along the UPRR ROW.	UPRR

OU	Dates of Action	Action	Responsible Agency/Party
3	1999	Pine Creek - Highland Creek Floodplain: Time-critical removal of 8,100 cy major discrete tailings deposits along Highland Creek on public lands.	BLM
3	1999	Lower Coeur d'Alene River - Medimont and Rainy Hill Boat Launches: About 1,000 cy of clean aggregate capped contaminated parking and access areas, 3- to 6-inch rock placed in shallow areas to discourage children from playing in contaminated sediments, boulders placed to control traffic.	Asarco, Hecla, U.S. Forest Service
3	1999	Pine Creek - Highland-Surprise Mine/Mill Site (Includes Nevada Stewart Mine): Diversion of Highland Creek to reduce erosion of the lower waste rock dump. Most of the facilities at this site are on private land, thus no other actions have been taken to date. In 2001 and 2002, the BLM regarded the upper and lower rock dumps at Highland Surprise. Along with that effort in 2002 the BLM also regarded the Nevada Stewart rock dump.	BLM
3	1999	Lower Coeur D'Alene River - Dudley Bank Stabilization: Pilot bank erosion project to evaluate effectiveness of rock berms in reducing bank erosion caused by piping, or undercutting by boat wake. The project berms were constructed along 625 feet of the south bank and 720 feet of the north bank of the Lower Coeur D'Alene River upstream of the Dudley landing. The berms were constructed with large rocks placed on a geotextile fabric to prevent fine-grained soil from being washed out and undermining the berms. The berms were about 2 feet wide and were placed from 7 to 30 feet from the top of the riverbank. Monitoring in late 2000 found that very little bank erosion had occurred, and the berms have remained stable (Golder, 2001).	SVNRT
3	1999	Lower Coeur D'Alene River - Anderson Lake Boat Launch: Removal of contaminated sediments from shoreline, geotextile fabric placed against bank, and overlain with 12-inch rock. Existing unpaved parking lot rebuilt and capped with asphalt; concrete planks installed to provide boat launch.	EPA
3	1999 - 2000	Lower Coeur D'Alene River - Thompson Lake Boat Launch: Removal of contaminated sediments from shoreline, geotextile fabric placed against bank, and overlain with 12-inch rock. Existing unpaved parking lot rebuilt and capped with asphalt; concrete planks installed to provide boat launch.	EPA
3	2000	Engineering Evaluation/Cost Analysis (EE/CA) and removal action at Jack Waite Mine Site in North Fork of Coeur d'Alene River.	American Smelting and Refining Company (ASARCO)
3	2000 - 2004	Trail of the Coeur d'Alenes (UPRR Wallace-Mullan Branch ROW Removal Actions): Removal action of 72-mile UPRR Mullan-to-Wallace Branch ROW and established a recreational trail (now called the Trail of the Coeur d'Alenes).	UPRR

OU	Dates of Action	Action	Responsible Agency/Party
3	2000 - present	Canyon Creek - Gem Mill Site Pilot system: Pilot system created by Asarco (10 gallons per minute) for treatment of drainage from the Gem Portal. Continue to Evaluate Gem Portal Pilot Water Treatment System in context of Canyon Creek Water Treatment Work.	BLM , SVNRT, EPA
3	2000 - present	Ninemile Creek - Success Mine Site Passive Treatment: Contaminated groundwater diverted by a subsurface grout wall (about 1,350 feet in length) to a treatment vault. Groundwater treated using apatite.	IDEQ, SVNRT, EPA
3	2001 - 2002	Lower Coeur d'Alene River - Black Rock Slough Trailhead/Highway 3 Crossing: Graded and capped access road and parking area and a trail providing access to Trail of the Coeur d'Alenes; stabilization of 125 feet of eroding riverbank.	EPA
3	2001 - present	Grouse Creek - We Like Mine: The We Like Mine is in the upper part of Grouse Creek, just above the original Star Mine Rock Dump area. In 2001, the BLM started mine water investigations. In 2003, a pilot bioreactor tank water treatment system was installed and continues to operate.	BLM

References:

Golder Associates, Inc. 2001. *Review of Bank Stabilization Survey Data, Lower Coeur d'Alene River, Dudley, Idaho*. Prepared for the IDEQ. February 28.

Liverman, Earl, EPA. 2004. Personal communication via email regarding Elk Creek Pond. December.

BLM = U.S. Bureau of Land Management
CDC = U.S. Center for Disease Control
cy = cubic yard(s)
EFNMC = East Fork Ninemile Creek
EPA = U.S. Environmental Protection Agency
IDEQ = Idaho Department of Environmental Quality
ROW = right-of-way
SVNRT = Silver Valley Natural Resources Trustees
UPRR = Union Pacific Railroad

Appendix D. Supporting Tables and Figures

Figure D-1. OU 1 Blood Lead Levels by Geographic Area, 1988 - 2019

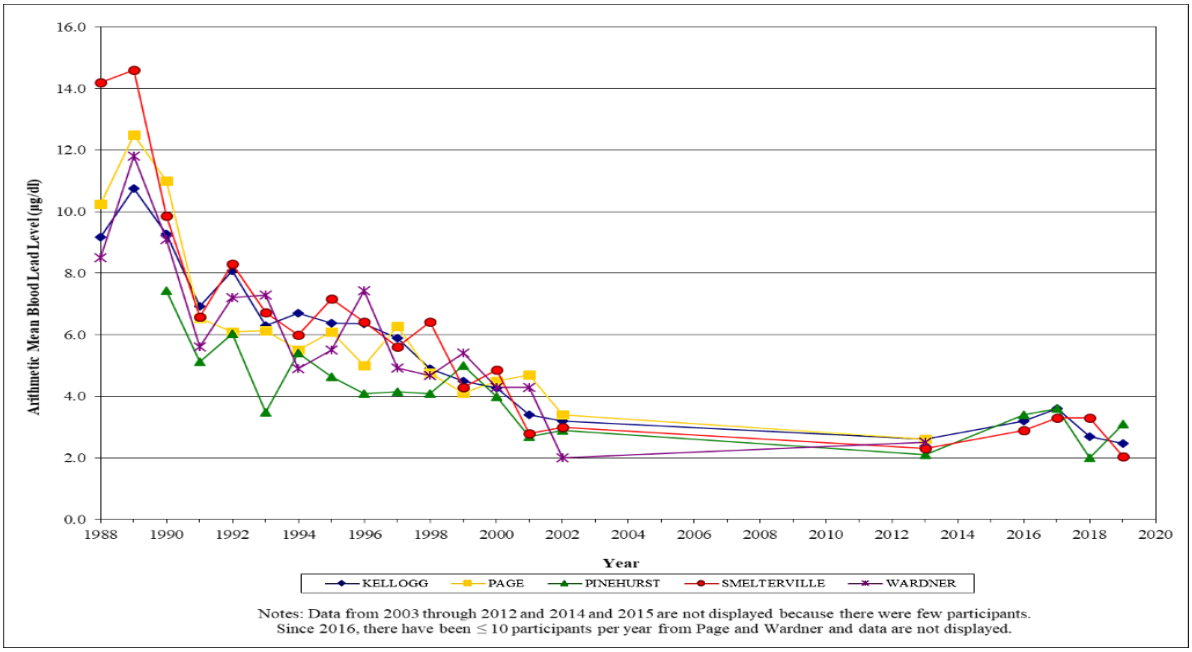

Figure D-2. OU 1 Percentage of Children with Blood Lead Levels ≥ 10 µg/dL, 1988-2019

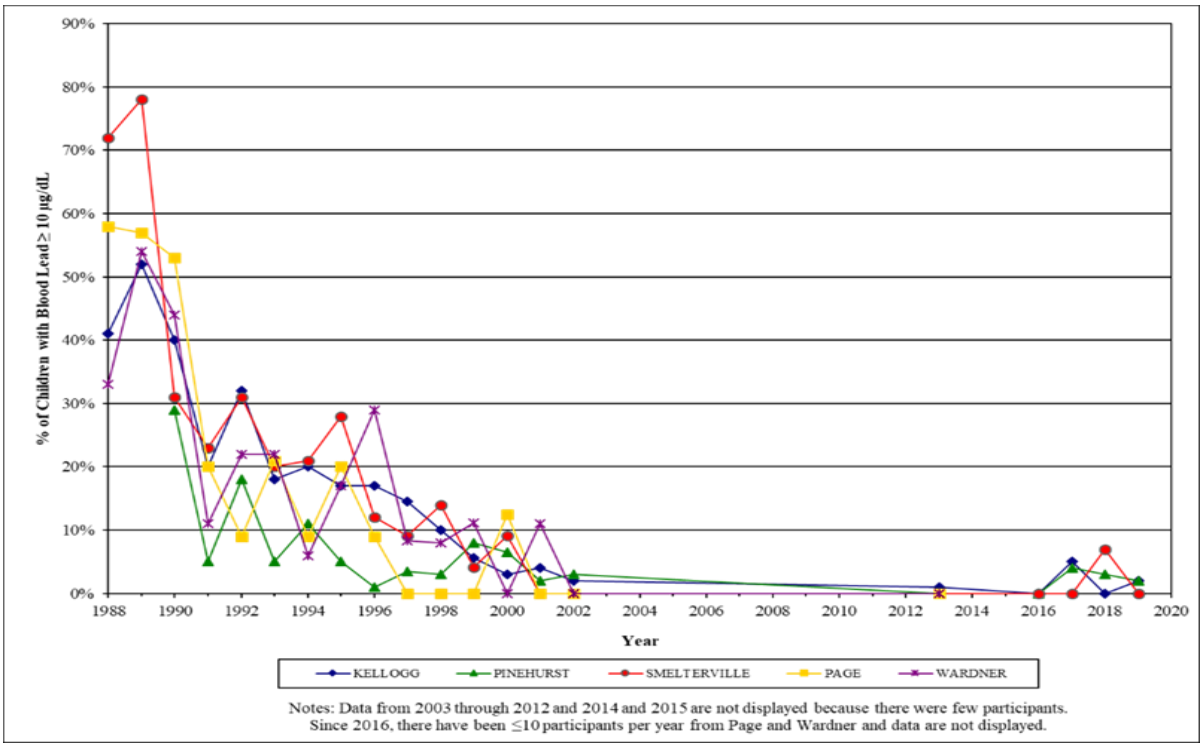

Figure D-3. OU 3 Blood Lead Levels by Geographic Area, 1996 - 2019

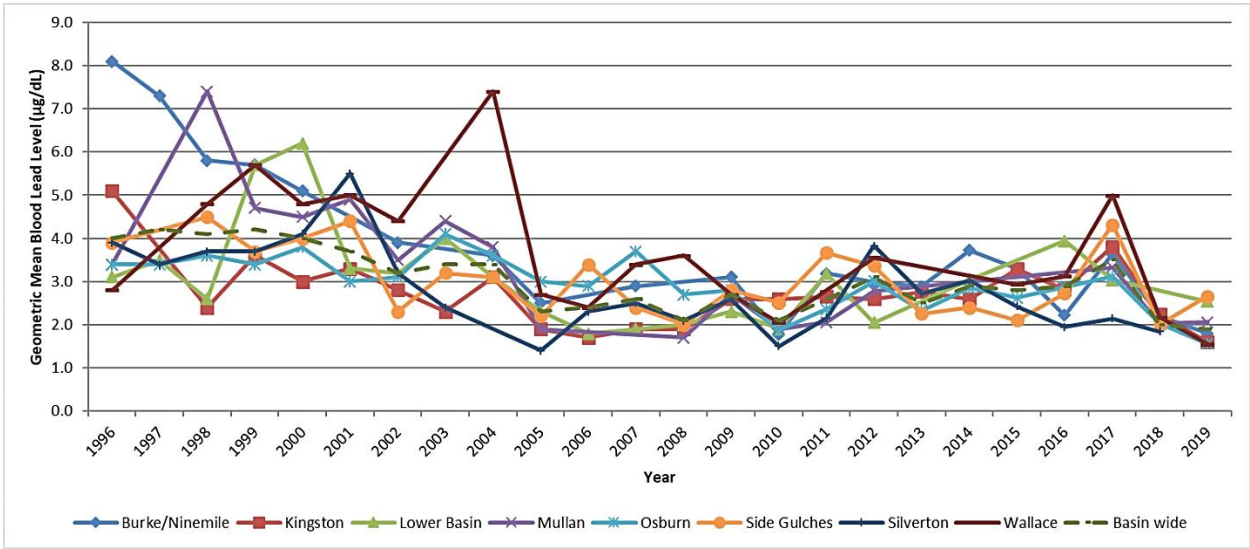

Figure D-4. OU 3 Blood Lead Levels by Age, 1996 - 2019

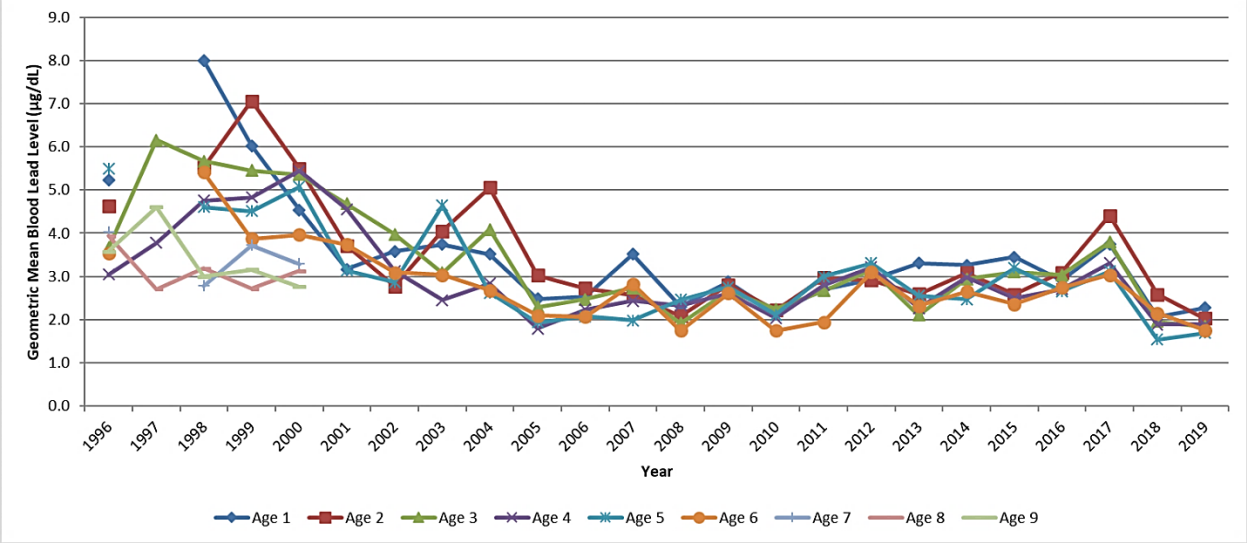

Table D-1. Summary of Lead Concentrations in ICP Samples Collected in the Box, 2015 - 2019

Type	Year	Lead Concentration (mg/kg)					Percentage of Samples ≥ 350 mg/kg
		Samples	Minimum	Maximum	Average	Standard Deviation	
Snow Pile	2015	2	528	736	632	147	100%
	2016	3	328	1,390	780	548	66%
	2017	1	574	574	574	-	100%
	2018	4	98.7	416	257	176	50%
	2019	3	238	611	385	199	33%
Regrinds	2015[a]	3	61	1,700	1,070	883	66%
	2016	0	-	-	-	-	-
	2017[b]	7	25	145	80	36	0%
	2018	0	-	-	-	-	-
	2019	0	-	-	-	-	-
Soil/Gravel[a]	2015	3	21.9	237	-	-	0%
	2016	29	37.6	69,000	-	-	48%
	2017	3	11,300	116,000	-	-	100%
	2018	0	-	-	-	-	-
	2019	2	80.0	272	-	-	0%
Soils/Gravel[a,b]	2015	0[c]	-	-	-	-	-
	2016	57	0.01	1,931	-	-	35%
	2017	362	ND	13,200	-	-	31%
	2018	283	12.0	19,918	-	-	32%
	2019	330	ND	54,116	-	-	29%

[a] These samples were collected during ICP inspections of permitted projects, projects undertaken by the utilities or government, or to monitor erosion and/or tracking. Soils that tested near or greater than 350 mg/kg lead were directed to the repositories or capped under barriers. For this reason, averages and standard deviations were not calculated.

[b] These samples were analyzed with a handheld X-ray fluorescence (XRF) analyzer.

[c] The ICP did not have access to an XRF in 2015.

Note: Data from OU 1 and OU 2 provided by PHD.

ND = non-detection

Appendix E. Status of Other Findings that Do Not Affect Remedy Protectiveness

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date
Sitewide	Long-term disposal of ICP wastes.	Regarding a long-term disposal need from ICP, establish process with community planners to identify timing and quantity of waste soils to be hauled to repositories from ICP-regulated activities.	Completed	PHD coordinates with contractors and repository managers annually for disposal of waste soils from the ICP. As waste quantities vary from year-to-year, this process has been sufficient to plan for incoming wastes and for repository capacity management (TerraGraphics, 2014; Alta 2019). IDEQ, EPA, and PHD will continue to monitor repository capacity and plan for future expansions as needed. This recommendation is complete.	September 2014
Sitewide	There needs to be a process established that outlines the entities financially responsible for repair of barriers that are damaged after small-scale floods and natural disasters.	Formalize a process to be implemented after catastrophic events occur for the purpose of evaluating barrier performance, barrier repairs, responsibility, and funding sources.	Completed	A decision process was developed by EPA, PHD, and IDEQ to determine the responsibility and financial liability for repair of barriers by small scale floods and natural disasters (EPA et al., 2018). The memorandum documents the decision process to identify whether a property owner, agencies, or local, state or federal emergency response programs are financially liable for repairing damaged barriers and includes resource options to assist with and implement barrier repairs. This recommendation is complete.	February 2018
Sitewide	Large-scale flooding and flood control not addressed by remedy protection, Infrastructure Maintenance Funding and O&M Assurances	Develop appropriate institutions and funding mechanisms to finance and oversee stewardship activities and support local governments in their efforts to identify funding for large-scale flood control. Establish infrastructure O&M cooperative involving local jurisdictions and IDEQ in order to track maintenance and repair work for flood control structures.	Ongoing	Remedy protection actions do not include protection against flooding of the South Fork Coeur d'Alene River (SFCDR) and Pine Creek. Protection against flooding of the SFCDR and Pine Creek, is a complex, system-wide problem that will require substantial involvement and investment on the part of numerous local, state, and federal entities. Regardless, Remedy Protection projects contribute to overall flood control and since the 2015 FYR, Remedy Protection projects identified in EPA decision documents have been completed. Local government jurisdictions are responsible for funding and implementing operation and maintenance (O&M) of the completed projects as defined by Interagency Cooperative Agreements (ICAs) with the exception of the Jackass Creek and Silver Creek projects where the landowner on whose property a drainage structure was constructed is responsible for O&M via Environmental Covenants. Additionally, the Idaho Department of Environmental Quality (IDEQ) has developed an inventory of flood control structures in the communities, including those that were installed as part of Remedy Protection projects. IDEQ plans to coordinate and track maintenance and repair work for the structures. To address the threat of large-scale flooding (such as flooding from the SFCDR and Pine Creek), the city of Kellogg requested assistance from the United States Army Corps of Engineers (USACE). In 2018, the Silver Valley Flood Working group was formed with initiative from the city of Kellogg and the Panhandle Health District (PHD), and in coordination with the Basin Environmental Improvement Project Commission (BEIPC et al., 2018). The Flood Working group commissioned a study by the Seattle District of the USACE Floodplain Management Services Program to re-characterize the hydrology and flooding of the SFCDR around the Kellogg vicinity and then expanded the study to include the hydrology for the SFCDR near Wallace. The BEIPC Executive Director continues to work with local flood control entities to identify sources of assistance. Supporting local governments in their efforts to identify funding for large-scale flood control and coordination with state and federal entities is ongoing.	
Sitewide	Documentation needed in a timely manner for accurate implementation of the ICP.	As required by the ICP, ensure all entities conducting earthwork and remedial actions provide documentation of these activities to PHD for inclusion in the ICP property database.	Ongoing	PHD personnel indicate that adequate documentation is a key component for the ICP to issue permits and disclose appropriately. In the past and at times, the ICP has been unable to acquire or locate documentation from entities performing work that affects properties on the site. As remediation continues, it is imperative that any entity conducting earthwork provide PHD with documentation of completed work to ensure the ICP database remains up to date. Since the 2015 FYR, the ICP has been receiving sampling reports and completion reports from the Coeur d'Alene Trust. Any documentation that IDEQ receives is also accessible to the PHD via IDEQ's electronic system. An application developed within the ICP database enables PHD to ultimately upload and access reports documenting earthwork and remedial actions throughout the site. It is expected that the Coeur d'Alene Trust will continue to provide the PHD with documentation of earthwork and remedial actions. However, all entities conducting large earthwork projects not requiring an ICP permit need to continue to send PHD associated documentation in a timely manner.	

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date
Sitewide	Recreational use in unremediated areas.	Continue to consider and implement risk management approaches to address this ongoing issue across the site.	Ongoing	There has been an observed increase of people recreating in unremediated areas across the site since the 2015 FYR. These areas include both i) those that EPA and IDEQ have placed signs warning of the risks and ways to mitigate risks, and ii) other informal areas not previously identified and dispersed across the site. In addition, there has been an observed increase in private property owners creating unauthorized recreational areas on their property. EPA, IDEQ, and PHD will implement approaches identified by the Recreational Sites Team to determine their effectiveness, and will continue to consider other approaches to mitigate this continuing issue.	
Sitewide	No Formal Snow Disposal Area	Evaluate the need for snow disposal areas. This action item applies to all three OUs.	Ongoing	Snow disposal remains a concern because as snow melts, contaminated sediment is concentrated and left behind with samples averaging more than 350 mg/kg lead and some exceeding 1,000 mg/kg lead. This likely contributes to potential recontamination because most of the snow piles are located on remediated property with only a gravel/soil barrier. Snow continues to be disposed in the same areas, as there are limited city properties that are flat enough for disposal. In the interim, the Institutional Controls Program (ICP) will continue to take opportunistic samples.	
Sitewide	O&M Assurance	IDEQ should continue to work with the different entities to ensure the appropriate O&M is conducted. Investigate development and designation of a central O&M coordinating entity for all remedy-specific O&M. Develop dedicated funding sources to ensure responsible O&M implementation.	Ongoing	IDEQ plans to create a coordination cooperative consisting of local jurisdictions, PHD, Coeur d'Alene Trust, and IDEQ that will work together to track O&M work. This effort is in the initial stages.	
OU 1	No long-term Page Repository Comprehensive O&M and Closure Plan	Continue to develop a comprehensive O&M and Site Closure Plan for the Page Repository.	Completed (See OU2)	Although closure criteria for repository soils cap and cover, use of stormwater best management practices (BMPs), and site access controls are stipulated in the final designs for the Westward Expansion, a final closure plan will not be completed until the final repository footprint has been developed. At that time, the O&M plan will be based on current operating practices, and O&M requirements for the Page Repository and Page Pond Area will be incorporated into a comprehensive plan (TerraGraphics, 2013).	September 2013
OU 1	Human Health Barrier Integrity	Develop a comprehensive approach (or program) that defines how barrier integrity for all remediated properties would be monitored over time. This issue is repeated in OU 3.	Ongoing	Widespread evaluation of property barriers has not been completed since the Potentially Responsible Party certification of activities prior to 2008, and representative sampling has been suggested to assess whether barriers are contaminated or failing. An assumed value of 100 mg/kg has been used as the clean soil lead concentration for community soil mean calculations and to estimate property soil concentrations used in Integrated Exposure Uptake Biokinetic (IEUBK) modeling to evaluate remedial action objective achievement. Opportunistic soil samples and hand-held XRF data collected through ICP inspections and Lead Health Information (and Intervention) Program (LHIP) follow-ups indicate that current property soil concentrations can substantially vary, and the value of 100 mg/kg may be low for current conditions at OU 1 properties. For example, two OU 1 property soil samples collected in 2012 varied, with lead levels about 50 mg/kg and 1,200 mg/kg. Representative soil sampling at remediated properties would provide data to evaluate barrier integrity and whether recontamination has occurred to levels that result in soil community means greater than 350 mg/kg lead. In 2019, EPA, IDEQ, and the PHD which implements the ICP, agreed to preliminary discussions on developing a strategy to review of OU 1 barrier integrity. As such, a subtask was added to the remedial response cooperative agreement (aka the "RACA") to initiate these discussions.	
OU 1	OU 2 ROD one-time interior house cleaning	Prepare an ESD to change this remedy component.	Ongoing	EPA and IDEQ no longer recommend a one-time interior cleaning based on prior pilot projects, data evaluations, published literature, and other ongoing actions by PHD. EPA and IDEQ will prepare an ESD to address the one-time interior cleaning component of the remedy prior to the next FYR.	
OU 1	Participation rates in annual blood lead screening and LHIP follow-ups.	Continue to evaluate options for increasing participation in the annual blood lead screening program and LHIP follow-ups. Repeated in OU 3.	Ongoing	Blood lead monitoring participation rates in the Box appear to be highly dependent on monetary incentives. In OU 1, few families took advantage of the annual fixed-site screenings from 2003 through 2015 (except for 2013), with a total of only 140 children tested in those 12 years. When the OU 1 monetary incentive was reinstated in 2016 and retained through 2019, participation increased significantly compared to years when the incentive was not offered. Participation rates continued to increase, and in 2019, approximately half of the eligible child population participated, which is comparable to historic door-to-door efforts. The additional LHIP education and outreach activities and increased use of social	

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date
				media have also likely contributed to the increased participation rates. Maintaining high participation in OU 1 and increasing participation in OU 3 is important to identify children who require intervention, especially when dust monitoring does not occur. In addition, the success of interventions hinges on completing follow-ups with families with children with elevated blood lead levels. PHD continues to evaluate options to maintain or build on recent success.	
OU 2	Page Pond Area O&M	Continue to develop a comprehensive O&M and Site Closure Plan for the Page Pond.	Completed	Completion and certification of the UMG remedial actions associated with the Page Pond area occurred in 2011. UMG is not conducting routine O&M because no long-term O&M plan was finalized. However, the Page Repository generally overlays the past Page Pond area footprint and repository operations, and future closure plans will incorporate any remaining Page Pond area O&M. Also see Page Repository status under OU 1 (TerraGraphics, 2013).	September 2013
OU 2	There is no permanent funding source to operate the OU 2 ICP in perpetuity.	Create irrevocable trust to provide consistent cash flow for the ICP operation in perpetuity	Completed	Since establishing this action item in the 2005 FYR, it has been determined that state of Idaho does not have the financial mechanisms to create an irrevocable trust. Instead, legislative approval led to the establishment of the Environmental Remediation Fund. This interest-bearing Fund was created under Idaho Code §39-3606c and is held by the state of Idaho's Treasurer's Office under Idaho Code §39-3605c. It is to be used to meet cost-share and O&M obligations at environmental remediation sites. The legislature approved annual transfer of funds into the Bunker Hill Box Environmental Remediation Fund from 1995 to 2005 dedicated to funding OU 2 Non-populated ICP expenses and state of Idaho match credit projects within the Box. As of November 2020, the balance of this Fund was $9.3 million. It is expected to meet ongoing cash-flow needs for OU 2 ICP operations for the next 30-years. IDEQ will continue to monitor costs and available funding and will raise this issue again should funds not be adequate. As such, this recommendation is considered complete at this time.	N/A
OU 2	Milo Gulch maintenance access	Secure permanent access for system maintenance.	Completed	Access to Milo Gulch was secured through an Environmental Covenant (EC) with Placer Mining Corporation that allows for the governmental agencies to access the property for the purpose of conducting O&M inspections. The EC states that the property owner shall be responsible for operations and maintenance of the Reed Landing Flood Control Project in accordance with the Reed Landing Flood Project Operations and Maintenance Manual (USEPA et. al., 2017). This recommendation is complete.	June 2017
OU 3	Trail of the Coeur d'Alene slope destabilization.	Continue to monitor the slow-moving slope next to the trail between Latour Creek and Cataldo and work with adjacent private landowners. The clay soil is moving at a slow rate, and trees located on private property continue to fall across the trail. Monitor trees near the trail as they help to stabilize the slope.	Completed	Partial slide occurred in approximately 2016 and was addressed and stabilized by the East Side Highway District.	December 2016
OU 3	Fish Consumption in Lower Basin (Chain of Lakes)	Planning for collection of additional fish samples within the waterbodies of the Lower Basin is underway. The sampling program will follow the fish advisory guidelines from EPA as implemented by the IFCAP. The goal of the IFCAP is to protect the public from adverse health risks associated with consuming contaminated fish from Idaho and Tribal waters.	Completed	While a fish consumption advisory has been in place for Coeur d'Alene Lake prior to 2015, the Idaho Department of Health and Welfare and Coeur d'Alene Tribe, in coordination with the IFCAP, issued a fish consumption advisory to include Coeur d'Alene Lake, Spokane River (above Post Falls Dam), the Coeur d'Alene River, and the chain lakes (IDHW, 2019, and 2020) based on fish tissue sampling conducted in 2016.	June 2020
OU 3	Human Health Barrier Integrity	Develop a comprehensive approach (or program) that defines how barrier integrity for all remediated properties would be monitored over time. This issue is repeated in OU 1.	Ongoing	See discussion under OU 1	
OU 3	Community-wide soil lead target level.	Determine whether a community-wide soil lead level is needed for the Basin. If so, determine what the appropriate level is and how it would be used. If deemed necessary, the level would be calculated	Ongoing	In 2012, IDEQ and EPA agreed to an ICP soil disposal lead level of 350 mg/kg, for consistency with the Box (EPA and IDEQ, 2012). This will assist PHD with disposal decisions that help achieve the objective of reducing exposures of young children and pregnant women to lead-contaminated soils. A Basin community-wide soil lead level has yet to be determined, because the only way to develop a health-	

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		once the Basin Property Remediation Program is completed.		protective community mean soil level in the Basin is to evaluate house dust lead levels and the distribution of soil lead levels at the completion of all property remediation.	
OU 3	Low participation rates in the annual blood screening events and LHIP follow-ups.	Continue to evaluate options for increasing participation in the annual blood lead screening program and LHIP follow-ups.	Ongoing	LHIP annual participation remains at less than a quarter of the estimated OU 3 child population. Although increased LHIP education and outreach activities including use of social media likely contributed to increased participation rates in OU 1 in 2018 and 2019, participation rates in the Basin have not increased. Maintaining high participation in the LHIP annual blood lead screening in OU 1 and increasing participation in OU 3 is important to identify children who require intervention, especially when dust monitoring does not occur. In addition, the success of interventions hinges on completing follow-ups with families with children with elevated blood lead levels.	
OU 3	Long-term disposal of remedial action wastes.	Regarding long-term disposal need from remedial actions, establish process with remedial design teams and long-term planners to identify waste quantities and timing associated with remedial actions.	Ongoing	IDEQ and the CDA Trust produces annual Waste Management Strategy (WMS) Memorandum's which analyze waste streams for Box and Basin Repositories. The WMS's update expected design capacity life, remedial waste streams, and makes recommendations of when to bring a new repository online.	
OU 3	Additional repository site(s).	Continue search and evaluation of potential new repository sites, as needed	Ongoing	DEQ and the CDA Trust continue to identify additional Community Fill Plan (CFP) sites within the Box & Basin to extend the design life of the operating repositories. The annual WMS identify when a new repository will need to be brought online.	
OU 3	Trail of the Coeur d'Alenes	Develop management and use strategies to prevent further unauthorized uses of the Trail of the Coeur d'Alenes, which increase the risk of exposure to trail users.	Ongoing	Recreational use is growing throughout the Coeur d'Alene Basin and unauthorized uses are dynamic. Management strategies are continually evolved by State of Idaho and Coeur d'Alene Tribe in coordination with UPRR and EPA. O&M of the trail corridor by UPRR continues to evolve with changing access and use and address new use issues as they are identified.	
OU 3	Easement interest transfer for Ag-to-Wetland clean waterfowl habitat pilot project near Medimont.	Transfer the easement interest in the ag-to-wetland pilot project to the State of Idaho. The State will accept the transfer, without cost to Idaho, to a third-party conservation organization (Ducks Unlimited, Inc.)	Ongoing	The easement for the clean waterfowl habitat located near Medimont, Idaho will be transferred to the Inland Northwest Land Conservancy in the fall of 2021, facilitated by the state of Idaho.	

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