Analysis of Brownfields Cleanup Alternatives and Voluntary Remediation Workplan for the Panhandle Smelting and Refining Company, Ponderay, ID

Final

Prepared for: The City of Ponderay
IDEQ EDMS#2023BBE1

August 30, 2023

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DEQ Seeks Public Comment on Draft Work Plan To Address Soil Contamination in Ponderay, Idaho

In compliance with the "Idaho Land Remediation Rules" (IDAPA 58.01.18), the Idaho Department of Environmental Quality (DEQ) has scheduled a 30-day public comment period on a draft work plan to address soil contamination at the former Panhandle Smelting and Refining Company (PSRC) site in Ponderay, Idaho. The PSRC property consists of five parcels and sits along the shoreline of Lake Pend Oreille at the terminus of the Pend d'Oreille Bay Trail. Portions of the property are contaminated from historic lead and silver ore refining activities.

The purpose of the Voluntary Remediation Work Plan is to guide cleanup of the property and describe implementation of the proposed cleanup method. The proposed cleanup will employ excavation and use of an onsite repository for the contaminated soil. The draft work plan can be reviewed on DEQ's website at https://www.deq.idaho.gov/public-information/public-comment-opportunities/, at DEQ's Coeur d'Alene Regional Office (2110 Ironwood Parkway in Coeur d'Alene), and the Ponderay City Hall (288 Fourth Street) Written comments will be accepted through October 12, 2023, at 5 p.m. PDT. Submit questions and/or written comments on DEQ's website or by mail or email to:

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Legal#5572
AD#14065
September 12, 2023

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Acronyms and Abbreviations

Alta	Alta Science & Engineering, Inc.
As	Arsenic
USEPA	U.S. Environmental Protection Agency
ABA	acid-base accounting
ABCA	Analysis of Brownfields Cleanup Alternatives
ALM	Adult Lead Model
APN	Assessor Parcel Number
bgs	below ground surface
BMP	Best Management Practice
BNSF	Burlington Northern Santa Fe Railway Company
Cd	Cadmium
COC	chemicals of concern
COOP	National Weather Service Cooperative Observer Program
CWA	Clean Water Act
EPC	exposure point concentration
ESA	Environmental Site Assessment
FPOBT	Friends of the Pend d'Oreille Trail
FR	Federal Register
Hg	Mercury
IDEQ	Idaho Department of Environmental Quality
IDPH	Idaho Division of Public Health
IEUBK	Integrated Exposure Uptake Biokinetic Model
ISM	Incremental Sampling Method
MCL	Maximum Contaminant Level
NTP	Notice to Proceed
O&M	Operation and Maintenance
Pb	Lead
POBT	Pend d'Oreille Bay Trail
PSRC	Panhandle Smelting and Refining Company
QAPP	Quality Assurance Project Plan
RA	Risk Assessment
RCRA	Resource Conservation and Recovery Act
REC	recognized environmental condition

REM	Risk Evaluation Manual
ROW	right of way or right-of-way
RPR	resident project representative
RME	reasonable maximum exposure
RSL	Regional Screening Level
RTCA	Rivers, Trails, and Conservation Assistance
SPLP	synthetic precipitation leaching procedure
SWPPP	Stormwater Pollution Prevention Plan
TCLP	toxicity characteristic leaching procedure
TerraGraphics	TerraGraphics Environmental Engineering, Inc.
URS	URS Corporation
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
VRWP	Voluntary Remediation Workplan
XRF	X-ray Fluorescence
Zn	Zinc

Units

mg/kg	milligrams per kilogram
mg/L	milligram per liter

Section 1 Introduction

In September 2019, the City of Ponderay (the City) entered into a Brownfields Multipurpose Cooperative Agreement with the U.S. Environmental Protection Agency (USEPA) to clean up the former Panhandle Smelting and Refining Company site (PSRC). Because of past smelting activities, soils contain elevated levels of lead (Pb) and other metals that present potential impacts to human health (e.g., PSRC users) and the environment.

In preparation for cleanup of the PSRC, the City contracted with Alta Science & Engineering, Inc. (Alta) to conduct additional site assessment activities, develop an Analysis of Brownfields Cleanup Alternatives (ABCA) and Voluntary Remediation Workplan (VRWP), and prepare a cleanup design for the PSRC. The design report will provide the basis for bidding and contracting of a remediation contractor to implement the remedy.

1.1 Report Structure

Section 1 Introduction provides an overview and brief description of the purpose and scope of the ABCA/VRWP.

Section 2 Background includes a brief history of the PSRC and a summary of prior environmental investigations at the PSRC. Issues of concern are also discussed in this section.

Section 3 Development of Cleanup Objectives and Goals includes a discussion of the current and future land use, contaminants of concern, exposure pathways, and applicable standards that were considered when developing cleanup objectives and goals for the PSRC. Resulting cleanup objectives and goals for the PSRC are also described in this section.

Section 4 Identification of Cleanup Alternatives identifies and describes four proposed cleanup alternatives, including a "No Action" alternative.

Section 5 Detailed Analysis of Alternatives describes the criteria used to evaluate the proposed alternatives. The cleanup alternatives described in Section 4 are evaluated using the criteria established in this section.

Section 6 Comparison Analysis of Alternatives compares the proposed cleanup alternatives, identifies a preferred alternative, and provides a discussion describing the recommendation(s) of the preferred alternative.

Section 7 Preferred Alternative Statement of Work describes the construction materials and summarizes the design aspects for the preferred alternative and completion milestones for construction.

Section 8 References provides references for reports cited in this document.

Section 2 Background

2.1 PSRC Location and Description

The PSRC is located in the City of Ponderay and sits along the shoreline of Lake Pend Oreille at the terminus of the Pend d'Oreille Bay Trail (POBT) (Figure 1). The Burlington Northern Santa Fe (BNSF) Railway Company right of way (ROW) borders the PSRC to the northwest with vacant forested land to the southwest and northeast and the lake serving as a boundary to the southeast. The PSRC consists of five (5) parcels totaling 18.13 acres and is generally located in the Southeast Quarter of Section 11, Township 57 North, Range 2 West, Boise Meridian, Bonner County, within the City of Ponderay, Idaho. The five individual parcel descriptions are:

- Bonner County, Idaho, Assessor Parcel Number (APN) RPP00000118252A, the area of this parcel is 11.2 acres.
- Bonner County, Idaho APN RPP00000117850A, the area of this parcel is 1.65 acres.
- Bonner County, Idaho APN RPP00000118150A, the area of this parcel is 1.04 acres.
- Bonner County, Idaho APN RPP00000118275A, the area of this parcel is 0.89 acres.
- Bonner County, Idaho APN RPP00000117800A, the area of this parcel is 3.35 acres.

A portion of parcel RPP00000118252A, RPP00000117850A, and a portion of RPP00000117800A will be addressed by the cleanup actions described herein.

2.2 PSRC Use History

The PSRC was developed in 1904 as a Pb/silver smelter for local mines and the first ingots were poured on June 12, 1907. Production continued until legal action stopped the smelter in July 1907. After a retrofit with roasters and other equipment, the smelter started back up on October 20, 1908, and ran sporadically through March 1909. Salvage crews dismantled the plant and scrapped all salvageable materials in December 1922. Not much evidence of previous activities remains at the PSRC today, except for concrete ruins that are remnants of the smelter operations, ore and waste rock piles, and a large slag, locally known as "Black Rock", that extends out into the lake. Slag is a waste byproduct left over from the smelting or refining of ore products.

Because of past smelting activities, the soil in this area contains high levels of Pb and other metals. Contaminated soils, ore piles, and slag at the Site present potential human health risks to PSRC users and potential environmental impacts to Lake Pend Oreille due to the presence of metals-contaminated soils and smelter waste (including unprocessed ore and slag).

2.3 PSRC Development Plan

The revitalization strategy for the POBT and surrounding area has been an ongoing effort for the City since 2008, which is also the year the Friends of the Pend d'Oreille Trail (FPOBT) formed.

In 2008, the FPOBT secured technical assistance from the National Park Service Rivers, Trails, and Conservation Assistance (RTCA) program to develop a trail plan. After a 2-year public engagement process, the award winning POBT Concept Plan was published in 2010. That same year, the City hosted a community "Vision-to-Action" workshop conducted by the U.S. Army Corps of Engineers (USACE), to spur ideas about the community's future.

From 2011 to 2013, with the help of a community-wide fundraising campaign, more than a mile of shoreline was purchased by the Cities of Sandpoint and Ponderay. These purchases allow the public to access 1.5 miles of the trail and shoreline starting near Sandpoint's water treatment facility and ending at the PSRC property.

Following these efforts, cleanup of the PSRC became a priority for the community. Using LOR Foundation grants, the City developed the Ponderay Village Subarea Plan, a Ponderay Greenbelts and Pathways Plan, and the Highway 2/200 corridor study. The Village Subarea Plan is a conceptual plan that includes public access to the shoreline and a vision for connecting Ponderay and Kootenai to the trail once the PSRC is cleaned up. The Greenbelts plan and Highway 2/200 study were adopted by the City in 2016.

In 2016, the City initiated public outreach through the annual Ponderay Neighbor Day, a city-sponsored festival. Surveys from Neighbor Day showed that public access to the lake and revitalization of the PSRC are top priorities for the community.

In 2020, the City conducted an additional survey of community members to gather feedback on the City's future and its waterfront. Most respondents indicated that if the waterfront were cleaned up, they would like it to be used as a beach with public access that provided a variety of lakefront recreational opportunities.

Based on the community's priorities, existing conditions, and public input gathered at the City's Neighbor Day held in September 2022, Alta presented potential land reuse options for the PSRC to the City for initial feedback.

In February 2023, Alta held a design concepts meeting to explore land reuse options with representatives from the City of Ponderay, the City's engineering consultant, and the Idaho Department of Environmental Quality (IDEQ). The design concepts meeting included the following options: development of a beach area for public access, preservation and stabilization of the slag pile including a breakwater to protect the slag from wave action, construction of an onsite repository for consolidation of contaminated soils and smelter waste (including unprocessed ore and slag), preservation of the remains of the historic smelter building, reclamation of the area of the former PSRC, and connectivity to the Pend d'Oreille Bay Trail.

2.4 PSRC Characterization

Numerous environmental site assessments have been completed for the PSRC over the last several years. In July and August 2010, URS Corporation (URS) conducted a Phase I Environmental Site Assessment (ESA) of the PSRC (URS 2011) for IDEQ. The Phase I ESA identified several recognized environmental conditions (RECs) in connection with the PSRC including: 1) a portion of a BNSF ROW, which has been operating for more than 100 years, with potential of having released hazardous substances and petroleum products and the presence of residual coal ash and railroad tie preservatives; 2) the former PSRC facility, which received and refined Pb and silver ores from local mines, and consists of the remnants of a furnace, three roasters, two smoke stacks, an assay and metal sample room, a few ore piles, and a slag pile located on the Lake Pend Oreille shoreline; and 3) the Delco Dump, a dump area in the southwestern portion of the PSRC where a large number of discarded automotive generators and a few Pb-acid battery parts were found by the USACE in 1996.

In November 2011, IDEQ contracted with TerraGraphics Environmental Engineering, Inc. (TerraGraphics) to complete Phase II ESA soil and slag sampling (TerraGraphics 2012a). The Phase II ESA addressed select RECs and associated chemicals of concern (COCs) identified in the Phase I ESA (URS 2011). Soil sampling conducted during the Phase II ESA was limited to areas where RECs had been identified, areas proposed for trail development, and areas frequently accessed by the public. At the time of the Phase II site assessment, IDEQ did not have an access agreement with the BNSF and Montana Rail Link, and as a result, no sampling was conducted on the BNSF ROW. Figure 2 shows the Phase II ESA sample units and approximate locations of historic PSRC structures.

The results from the Phase II ESA and the Risk Assessment (RA; TerraGraphics 2012a) identified several COCs: arsenic (As), cadmium (Cd), Pb, mercury (Hg), and zinc (Zn). The Phase II ESA determined that soil contamination was generally greatest in areas associated with ore stockpiling, processing, or smelting during smelter operations. The highest Pb and As concentrations (Pb: 77,100 milligrams per kilogram [mg/kg], As: 2,610 mg/kg) were observed at a depth of 1 to 6 inches in sample unit RO2, which consisted of three mounds that are the remnants of ore roasters. High Pb and As concentrations were also observed in sample units OR1, RL1, TR5, and LA3, which were all likely previously used as stockpile areas for ore. Lead and As concentrations were also elevated where the smelter blast furnace had been located (FU1, FU2) (TerraGraphics 2012a).

Test pit sample results indicated that Cd, Pb, Hg, and Zn concentrations were generally highest within the 0-to-6 inch and 6-to-12-inch soil horizons. Arsenic concentrations did not show a consistent pattern with depth. Differences in As concentration profiles may be related to differences in soil or waste characteristics between sample units that affect As mobility within the soil (TerraGraphics 2012a).

In April 2012, IDEQ contracted with Strata to sample five groundwater seeps emanating from the PSRC and vicinity. Because these seeps originate from groundwater underlying the PSRC, metals concentrations in the seep samples are compared to the USEPA's National Primary Drinking Water Maximum Contaminant Levels (MCLs), not surface water quality criteria from the Idaho Administrative Procedures Act (IDAPA) Water Quality Standards (IDAPA 58.01.02). Water from one seep that emerges below the POBT and the PSRC had a Cd concentration slightly above the MCL. An original/split sample pair was collected from this seep and Cd concentrations exceeded the MCL in the split sample only. The report noted that this could be explained by entrained sediment that settled at the bottom of the split sample (Strata 2012).

In December 2012, TerraGraphics characterized the waste piles and groundwater at the PSRC and summarized the results in a Site Investigation Report (TerraGraphics 2012b). This report provided: 1) geotechnical and environmental data to characterize slag, smelter waste, and contaminated and native soils, 2) groundwater monitoring data, 3) topographic data, and 4) volume estimates of slag, ore, smelter waste, and contaminated soils at the PSRC.

Groundwater samples were collected in 2012 from three monitoring wells (MW-1, MW-2, and MW-3) (Figure 2). MW-1 was the only well with a metal at concentrations above the MCL with a total Pb concentration of 0.0179 milligrams per liter (mg/L).

Following completion of the Phase II ESA and waste pile and groundwater investigations, IDEQ engaged TerraGraphics to develop an ABCA and Cleanup Workplan for the PSRC. The Draft ABCA and Cleanup Workplan (completed in 2013) provided a preferred alternative for the PSRC that included: 1) the construction of an onsite waste repository to dispose of contaminated soils and smelter waste (including unprocessed ore and slag) exceeding cleanup levels and onsite disposal criteria, 2) the encapsulation of the slag pile, a retaining wall system, and concrete deck, and 3) the capping and/or fencing of soils that exceed cleanup levels and are not suitable for disposal in an onsite waste repository (TerraGraphics 2013).

In September 2019, the City entered into a Brownfields Multipurpose Cooperative Agreement with the USEPA to clean up the former PSRC, and engaged Alta to begin cleanup planning in October of 2022.

Alta performed additional assessment in March 2023 to address existing data gaps. Assessment activities included 1) Incremental Sampling Method (ISM) sampling for beach sediments in the vicinity of the slag pile, 2) slag characterization sampling to evaluate the leaching of metals from non-crushed and crushed slag material (Synthetic Precipitation Leachate Procedure [SPLP] tests and wall wash samples collected from the slag face), and 3) soil geotechnical characterization sampling (particle size testing and Atterberg limits). ISM decision units, wall wash sample locations, and geotechnical test pit locations are shown on Figure 2.

No metals were detected in ISM beach sediment samples at concentrations that exceed the USEPA Regional Screening Levels (RSLs) for resident soils and U.S. Geological Survey (USGS) background values for Bonner County (USGS 2016). However, results from slag SPLP and wall wash samples suggest that metals have the potential to leach or mobilize from slag material to nearby surface water (Alta 2023a).

In May 2023, additional sediment sampling was conducted to determine the vertical extent of metals in sediments in the vicinity of the slag pile and along approximately 1,500 feet of shoreline near the PSRC to the south and north of the slag pile. Thirteen boring locations were advanced using a hand auger and fifteen samples from soils 0-1 feet and 1-2 feet below ground surface (bgs) were analyzed for metals. Boring locations are shown in Figure 2. Most of the sediment samples had metals concentrations below the USEPA RSLs for resident soils and USGS background values for Bonner County (USGS 2016) with the exception of two samples collected from 1-2 feet bgs from SS-2 and SS-3 near the toe of the slag pile. These samples had concentrations of 2,710 mg/kg (Pb) and 40.9 mg/kg (As) in SS-2 and 6,600 mg/kg (Pb) and 36.9 mg/kg (As) in SS-3 (Alta 2023b).

Additional surface water sampling was conducted in June 2023 to evaluate metals concentrations in surface water that was in contact with the slag pile at the time of sampling. Surface water samples were collected from three locations where the lake was in contact with the slag pile and from one background location outside of the PSRC boundaries (Figure 2). Surface water results for metals were compared to surface water quality criteria from the IDAPA Water Quality Standards for protection of aquatic life and for protection of human health (IDAPA 58.01.02). For metals for which there are no IDAPA Water Quality Standards, results will be compared to MCLs found in the USEPA's Resident Tapwater Table RSLs (USEPA 2022b). None of the samples had metals concentrations that exceeded IDAPA Water Quality Standards or MCLs.

Section 3 Development of Cleanup Objectives and Goals

3.1 Land Use

3.1.1 Current Land Use

Current Site use is recreational. An unimproved trail traverses the PRSC from the southern to the northern boundaries along unimproved land owned by the USACE. There are no permanent buildings, parking facilities, or roads. There are no residents on or within 200 feet of the PSRC.

A gate limits vehicle access along the POBT which terminates near the PRSC and signs are posted to inform visitors of the hazards associated with the metals in soil at the PRSC.

Most of the PSRC is undeveloped and consists of steep, overgrown slopes and vacant open space. Campfires, off-road bicycling, picnicking, swimming, and sunbathing have been noted as popular recreational activities at the PSRC. The USACE levee and several trails from the BNSF ROW currently provide unsanctioned access to the PRSC. There are also several trails throughout the main area of smelter operations; however, most of these trails are overgrown and difficult to use.

3.1.2 Anticipated Future Land Use

The current and reasonably likely future land uses at and adjacent to the PSRC are identified and evaluated in order to determine potential exposure points, exposure pathways, and exposure factors and subsequent cleanup action levels. Cleanup levels vary depending on land use. The current zoning of the PSRC and surrounding properties (with the exception of the BNSF railroad property) is recreational and proposed future land use will also be recreational.

3.1.3 Regional Land Use

The Cities of Ponderay and Sandpoint located in Bonner County offer recreation, forest products, and retail as the region's primary land use. Most of the land surrounding Ponderay and Sandpoint is densely forested, undeveloped land. The largest employers in the area are Lake Pend Oreille School District, Bonner General Health, Bonner County Government, Litehouse Foods, and Wal-Mart.

3.1.4 Groundwater Use

Currently, there are no production wells or drinking water wells located onsite. However, several wells are located upgradient to the northwest in the City of Ponderay. There are currently three monitoring wells located onsite (MW-1, MW-2, and MW-3) that have been used for water quality monitoring. MW-1 was screened from 25 to 40 feet bgs, MW-2 was screened from 8 to 23 feet bgs and MW-3 was screened from 9.5 to 24.5 feet bgs. In 2012, depth to groundwater was measured in all three wells. Groundwater elevations (expressed in feet above mean sea level) at each monitoring well were calculated to be 2,096.55 feet at MW-1, 2,080.20 feet at MW-2, and 2,058.11 feet at MW-3. At the time of sampling, groundwater flow at the PSRC was to the south towards the lake at a calculated gradient of 0.154 foot per foot (TerraGraphics 2012b).

3.1.5 Surface Water Use

The PSRC does not use surface water as a water source. However, recreational activities including boating, swimming, and fishing are all conducted in Lake Pend Oreille.

3.1.6 Climate Change Considerations

The City of Ponderay is located at an elevation of 2,116 feet above mean sea level. It sees an average of 61 inches of snow and 31 inches of rain per year, accompanied by approximately 171 sunny days per year (Best Places 2022).

Historical temperature and precipitation data have been collected from 1910 to 2016 from the National Weather Service Cooperative Observer Program (COOP) weather station No. 108137, also known as the Sandpoint Experiment Station (WRCC 2022). This COOP station is maintained in the nearby city of Sandpoint, Idaho. The mean annual high temperature for station No. 108137 is 56.6ºF and the mean annual low temperature is 34.4ºF.

Information provided by the USEPA (USEPA 2016) indicates that North Idaho's climate is changing with warming in Idaho similar to the average warming nationwide. From 1955 to 2015, the snowpack has decreased as much as 80% in the higher elevations around the project area (USEPA 2016). Scientists from the U.S. Global Climate Change Research Program state the warming trend is likely to continue. Idaho's future climate projections from models participating in Fifth Coupled Model Intercomparison Project predict continued and substantial warming through the 21st century (Abatzoglou et al. 2021).

Lake Pend Oreille water surface elevations are controlled by the Albeni Falls Dam.

All the permanent remedial actions discussed and evaluated in this report are accompanied by unquantifiable amounts of risk to their long-term performance due to uncertainties that may be introduced by a changing climate. These risks are discussed within each Alternative.

3.2 PSRC Hazards and Contaminants of Concern

As described in Section 2.4, metals concentrations in surface and subsurface soil, slag, groundwater, seep, and surface water at the PSRC have been characterized through PSRC investigation activities beginning in 2010 (Figure 2).

The results from the Phase II ESA and the RA (TerraGraphics 2012a) and more recent PSRC assessment activities (Alta 2023a and 2023b) identified the following COCs in soil: As, Cd, Pb, and Hg. These COCs were identified by comparing the maximum concentration detected in soil with the respective USEPA RSLs for resident soils and USGS background values for Bonner County (USGS 2016). In general, PSRC areas associated with ore stockpiling, processing, or smelting operations had the highest metals concentrations. Metals concentrations for all soil samples collected from 2011 through 2023 are presented in Table 1.

Lead was identified as a COC in groundwater when it was detected above the MCL in one onsite well.

3.3 Exposure Pathways

Potential exposure pathways were identified in the Phase II ESA and the RA (TerraGraphics 2012a). A complete exposure pathway consists of four necessary elements: i) a source and mechanism of chemical release to the environment, ii) an environmental transport medium for a released chemical, iii) a point of potential human contact with the impacted medium (referred to as the exposure point), and iv) an exposure route (e.g., soil ingestion) at the exposure point.

Table 1. Metal Soil Results by Area, Sample type, and Depth (Prior to Cleanup)

Area Name	Unit	Sample type	Depth (inches)	Arsenic (mg/kg)	Cadmium (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Zinc (mg/kg)
Beach	BE1	Composite	0-1	5.5	0.42	350 J	0.02	539
		Composite	1-6	6.4	0.25	325 J	0.21	480
		SS-2	12-24	**40.9 J**	0.45	**2710**	0.45	3340
		SS-3	12-24	**36.9 J**	0.71	**6600**	0.05	5490
	BE2	Composite	0-1	6.2	0.10 U	273 J	0.01	397
		Composite	1-6	6.4	0.10 U	310 J	0.01	453
	BE3	Composite	0-1	3.7	0.74	72.0 J	0.05	253
		Composite	1-6	2.8	0.40	38.0 J	0.01	133
	DU1	ISM	0-6	3.0	0.16	13.1	0.10 U	6
	DU2	ISM	0-6	3.0	0.14	13.1	0.10 U	6
	DU3	ISM	0-6	3.0	0.14	13.1	0.10 U	6
Black Rock	BR1	Composite	0-1	7.8	0.62	**535 J**	0.05	356
		Composite	1-6	14.2	0.62	**986 J**	0.06	624
	BR2	Composite	0-1	13.8	0.72	**820 J**	1.55	226
		Composite	1-6	15.4	0.70	**1,030 J**	0.18	257
City	CT1	Composite	0-1	6.8	0.35	105 J	0.06	49
		Composite	1-6	7.4	0.25	140 J	0.06	47
Furnace	FU1	Composite	0-1	**480**	**25.7**	**3,510 J**	5.27	820
		Composite	1-6	**1,570**	**75.7**	**10,600 J**	**18.1**	1420
		Pit 1	0-6	15.5	0.71	**847 J**	0.24	284
		Pit 1	6-12	17.9	0.72	**539 J**	0.16	162
		Pit 1	12-18	**28.8**	0.10	**4,190**	0.15	837
		TP-11	24	3.3	0.20 U	117	0.02	45
	FU2	Composite	0-1	**180**	**9.7**	**1,440**	10.5	243
		Composite	1-6	**765**	**33.6**	**6,650**	**41.0**	376
	FU3	Composite	0-1	9.5	0.27	259	0.13	107
		Composite	1-6	9.6	0.10 U	247	0.07	91
Landing	LA1	Composite	0-1	21.1	0.82	**418**	0.09	224
		Composite	1-6	**65.0**	1.16	**1,800**	0.11	395
		Pit 2	0-6	**337**	**7.1**	**7,680**	0.88	1340
		Pit 2	6-12	6.8	0.10 U	111	0.03	59
		Pit 2	12-18	5.1	0.10 U	80.6	0.02	33
		Pit 2	18-24	2.2	0.10 U	21.5	0.02	26
	LA2	Composite	0-1	**256**	5.2	**2,580**	0.24	883
		Composite	1-6	**1,350**	5.4	**10,900**	1.15	1140
		Pit 3	0-6	**2,120**	**10**	**5,050**	0.26	1440
		Pit 3	6-12	**929**	**9.4**	130	0.12	1060
		Pit 3	12-18	**1,160**	0.10 U	29.2	0.04	39
		Pit 3	18-24	25.2	0.4	10.1	0.02	110
		TP-10	low XRF results					
	LA3	Composite	0-1	**146**	5.8	**6,680**	1.21	1020
		Composite	1-6	**237**	6.4	**12,200**	3.02	1230
Lower Slope	LS1	Composite	0-1	**101**	4.9	**953**	5.52	183
		Composite	1-6	**240**	6.5	**1,750**	9.44	134
	LS2	Composite	0-1	10.7	0.21	141	0.13	80
		Composite	1-6	9.6	0.10 U	130	0.05	68
Marshy Slope	MS1	Composite	0-1	6.9	0.10 U	83.3	0.06	57
		Composite	1-6	7.4	0.10 U	107	0.08	59
	MS2	Composite	0-1	5.5	0.30	94.7	0.10	66
		Composite	1-6	5.7	0.28	98.4	0.11	57
Ore Piles	OR1	Composite	0-1	**107**	1.35	**26,600**	0.24	3530
		Composite	1-6	**280**	3.14	**54,000**	0.42	7900
		TP-6	24	**262**	3.82	**94,400**	0.40	9390
		TP-6	48	8.3	0.53	235	0.10	906
	OR2	Composite	0-1	**38.2**	0.83	**803**	0.22	305
		Composite	1-6	**217**	2.0	**7,040**	0.42	1070
		TP-7	48	23.9	0.20 U	335	0.26	271
		TP-8	48	**63.8**	0.92	**2,900**	0.77	722
		TP-9	24	**98.8**	0.33	**2,360**	0.55	543

Table 1. Metal Soil Results by Area, Sample type, and Depth (Prior to Cleanup)

Area Name	Unit	Sample type	Depth (inches)	Arsenic (mg/kg)	Cadmium (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Zinc (mg/kg)
Rail Line	RL1	Composite	0-1	**946**	**9.5**	**19,200**	**11.8**	1240
		Composite	1-6	**1,300**	**12.9**	**33,800**	**18.9**	1780
		Pit 4	0-6	**461**	0.10 U	**20,900**	0.42	561
		Pit 4	6-12	17.1	0.10 U	**923**	0.20	238
		Pit 4	12-18	3.4	0.10 U	29.1	0.11	117
		Pit 4	18-24	3.8	0.10 U	21.7	0.08	143
	RL2	Composite	0-1	15.6	0.39	**991**	0.20	167
		Composite	1-6	**34.3**	0.20	**4,110**	0.22	189
		Pit 5	0-6	8.4	0.20	232	0.15	85
		Pit 5	6-12	8.0	0.10 U	288	0.28	86
		Pit 5	12-18	3.3	0.10 U	16.8	0.02	38
		Pit 5	18-24	3.3	0.10 U	14.0	0.03	35
	RL3	Composite	0-1	20.7	0.33	**503**	0.77	163
		Composite	1-6	**51.0**	0.92	**3,040**	3.49	329
Roasters	RO1	Composite	0-1	**87.4**	2.0	**2,060**	1.28	280
		Composite	1-6	**148**	2.2	**2,750**	3.07	297
		TP-4	not fully excavated					
	RO2	Composite	0-1	**262**	2.8	**9,530**	0.29	375
		Composite	1-6	**2,610**	**25**	**77,100**	2.40	2260
		Pit 6	0-6	**605**	**12.1**	**12,200**	0.30	638
		Pit 6	6-12	**1,960**	**26.4**	**60,300**	0.52	1470
		Pit 6	12-18	**733**	0.61	185	0.08	75
		Pit 6	18-24	**1,210**	0.69	**1,250**	0.12	108
		TP-3	not analyzed					
		TP-5 XRF	12	**734**	3.3	**6,170**	--	253
		TP-5 composite	24-48	**158**	0.64	**1,120**	1.73	74
	RO3	Composite	0-1	**27.9**	0.50	**976**	0.70	204
		Composite	1-6	27.3	0.62	**979**	0.97	185
		Pit 7	0-6	**100**	1.3	**6,430**	0.31	507
		Pit 7	6-12	5.7	2.7	195	0.02	1020
		Pit 7	12-18	3.8	0.10 U	128	0.04	162
		Pit 7	18-24	3.6	0.10 U	65.1	0.01	138
		TP-2	24	**196**	0.29	388	0.23	125
		TP-2 composite	48-72	**105**	0.20 U	24	0.03	52
Stack	ST1	Composite	0-1	7.4	0.21	146	0.05	67
		Composite	1-6	11.3	0.25	238	0.11	80
		Pit 8	0-6	11.6	0.35	226	0.13	65
		Pit 8	6-12	5.8	0.10 U	69.4	0.05	37
		Pit 8	12-18	4.4	0.10 U	17.5	0.02	26
		Pit 8	18-24	3.8	0.10 U	8.0	0.01	22
		TP-1	low XRF results					
Trail	TR1	Composite	0-1	8.0	0.28	268	0.04	108
		Composite	1-6	14.0	0.32	**538**	0.08	131
	TR2	Composite	0-1	20.4	0.71	**627**	0.33	132
		Composite	1-6	--	--	--	--	--
	TR3	Composite	0-1	21.4	1.2	**1,560**	0.22	295
		Composite	1-6	**28.1**	0.84	**2,200**	0.23	302
	TR4	Composite	0-1	**28.0**	2.5	**6,280**	0.12	373
		Composite	1-6	**99.1**	4.0	**11,600**	0.20	780
	TR5	Composite	0-1	**84.2**	2.5	**10,400**	0.23	837
		Composite	1-6	**136**	4.0	**20,300**	0.25	1830
	TR6	Composite	0-1	11.2	0.40	**503**	0.11	178
		Composite	1-6	14.6	0.38	**762**	0.14	247
	TR7	Composite	0-1	12.3	0.10 U	**960**	0.07	167
		Composite	1-6	23.3	0.25	**2,000**	0.10	254
Upper Slope	US1	Composite	0-1	**34.5**	1.2	**2,930**	0.09	371
		Composite	1-6	**42.2**	1.3	**3,350**	0.10	378
Wolters	WO1	Composite	0-1	2.8	0.10 U	27.6	0.05	44
		Composite	1-6	3.1	0.10 U	25.3	0.05	41
RSL for Resident Soil (mg/kg)				0.68	7.1	400	11	23,000
Bonner County Background (mg/kg)	Mean			5.7	-	30.8	0.078	72.3
	Minimum			1.1	-	24.1	0.02	35.7
	Maximum			27.6	-	82.8	0.129	180.4

Bold values exceed RSL for Resident Soil (USEPA 2023) and maximum Bonner County background concentrations.

RSL = Regional Screening Level for Resident Soil (USEPA 2023)

Bonner County background concentrations available at https://mrdata.usgs.gov/geochem/county.php?place=f16017&el=Pb&rf=northwestern (USGS 2016)

J = result is an estimate

mg/kg = milligram per kilogram

XRF = X-Ray fluorescence

The following complete exposure pathways were identified in the RA.

- Incidental ingestion and inhalation of, and dermal contact with, contaminated soils and smelter waste (including unprocessed ore and slag), and
- Incidental ingestion of and dermal contact with surface water.

The incidental ingestion and inhalation of and dermal contact with contaminated soils exposure pathways are considered complete for the PSRC. However, risks associated with inhalation of and dermal contact with Pb and As in soils and sediments are negligible and therefore considered insignificant exposure pathways.

The slag ingestion pathway is addressed via the soil ingestion pathway by assuming that slag that is of the particle size that can easily be ingested are contained in soil and sediment samples collected throughout the PSRC. As with soils and sediments, the inhalation and dermal contact pathways for slag are considered insignificant.

The PSRC is a popular swimming area and incidental ingestion of and dermal contact with surface water may occur while swimming at the PSRC. However, because metals and As do not generally penetrate the skin barrier and enter the body, the dermal exposure pathway is considered to be insignificant.

The groundwater ingestion exposure pathway is considered incomplete because no groundwater is currently being used at the PSRC.

3.4 Exposure Scenarios

The PSRC is currently used for recreational purposes and is likely to be used for recreational purposes in the foreseeable future. As a result, recreational visitors and trespassers have the greatest potential to come in contact with PSRC COCs. These recreational visitors and trespassers range from children and adults passing through the PSRC to children, adults, and families spending several hours recreating at the PSRC and beach area.

The following exposure scenarios were identified in the RA (TerraGraphics 2012a):

- Child Recreational Visitor Scenario: This scenario assumes that a child (seven years old or younger) spends time recreating at the PSRC (e.g., swimming, playing for extended periods of time, picnicking, or biking).
- Age-Adjusted Recreational Visitor Scenario: This scenario assumes that an individual spends time as a child (six years old or younger) and as an adult recreating at the PSRC. This scenario is important when assessing cancer risks associated with a lifetime of chronic exposure and is not applied to Pb.
- Adult Recreational Visitor Scenario: This scenario assumes that an adult spends time recreating at the PSRC.
- Adult Occupational Scenario: This scenario assumes that an adult works at the PSRC as an onsite manager or groundskeeper.

Trespasser scenarios are assumed to represent exposures associated with infrequent short-term visits to the PSRC. Risk associated with these scenarios were not evaluated in the RA (TerraGraphics 2012a) as it was assumed that exposure to PSRC COCs under these scenarios were very limited and that a risk management or cleanup plan that is protective of more frequent, longer-term users will also protect an adult and/or child trespasser.

3.5 Applicable Standards

Cleanup actions at the PSRC must provide for adequate protection of human health and the environment based on the current and potential future uses of the property. While there are no applicable cleanup standards for recreational exposures to soils contaminated with metals, there are several human and ecological health standards that are relevant to the PSRC and should be considered during and after cleanup. These standards include:

Soils

- The USEPA has set a residential soil lead standard of 400 mg/kg Pb for bare soil in children's play areas and 1,200 mg/kg Pb for bare soil in non-play areas.
- USEPA has established RSLs for soil to assist in initial PSRC screening of and cleanup goals for contaminated properties based on current or future uses. RSLs combine current human health toxicity values with standard exposure factors to estimate contaminant concentrations in soil, air, and water that are considered to be protective of human health. Chemical concentrations above these levels do not automatically trigger a response action. However, exceeding an RSL suggests that further evaluation of the potential risks that may be posed by PSRC contaminants is appropriate. Further evaluation may include additional sampling, consideration of ambient levels in the environment, or a reassessment of the assumptions contained in these screening-level estimates (i.e., appropriateness of generic exposure factors for a specific site etc.).

Drinking Water

- The National Primary Drinking Water Standards set forth Maximum Contaminant Levels (MCLs) for public drinking water supply systems. Because groundwater could be developed for drinking water at the PSRC, MCLs for the COCs at the PSRC are listed here. The MCLs for As, Cd, Pb, and Hg are 0.01 mg/L, 0.005 mg/L, 0.015 mg/L, and 0.002 mg/L, respectively.

Surface Water

- Idaho Water Quality Standards require protection of State waters for appropriate beneficial uses and establish State water quality standards for toxic substances for the protection of aquatic life and human health.
- National Recommended Water Quality Criteria provide guidance for States and Tribes in adopting surface water quality standards for the protection of aquatic life and human health under the Clean Water Act (CWA) and provide guidance for States and Tribes to use in adopting water quality standards. With regard to water quality, a number of requirements exist that provide protection of both surface water and ground water. Included are Idaho Water Quality Standards, as well as Federal requirements (e.g., the CWA). To address these water quality criteria, specific design elements will be developed and incorporated into this project, generally focusing on controlling sediment and erosion. Examples include installation of Best Management Practices (BMPs), surface water management, and other temporary measures to be employed during construction (e.g., silt fence, temporary covers over exposed slopes, etc.) that will prevent contaminants from entering Lake Pend Oreille or the local groundwater. To ensure that there are no adverse effects on water quality, a Stormwater Pollution Prevention Plan (SWPPP) is necessary. The SWPPP will follow all regulations set forth by the USEPA and the City.

Hazardous Materials

- The Resource Conservation and Recovery Act (RCRA) set forth standards for the management of hazardous waste including the characterization, treatment, storage, and disposal of hazardous waste.
- Idaho Rules and Standards for Hazardous Waste establish requirements for the management, transportation, storage, and disposal of hazardous wastes generated during remedial actions.

Historic Preservation

- The National Historic Preservation Act states that Federal agencies must identify possible effects of proposed cleanup activities on historic properties (cultural resources). If historic properties or landmarks eligible for, or included in, the National Register of Historic Places exist within the remediation areas, remediation activities must be designed to minimize the effect on such properties or landmarks.
- The Idaho Preservation of Historical Sites Statute and the Idaho State Historical Society cover historical sites and historical districts within the State of Idaho and the excavation of archeological resources.

Endangered Species

- The Endangered Species Act protects endangered or threatened species and their habitats. If endangered or threatened species are in the vicinity of remediation work, the U.S. Fish and Wildlife Service must be consulted and the remediation activities must be designed to conserve endangered or threatened species and habitats.

3.6 Cleanup Goals and Objectives

The goal of this ABCA/VRWP is to adequately mitigate potential exposures to PSRC COCs. Risk-based cleanup objectives (i.e., post-cleanup soil concentrations) were developed in the Risk Management Plan based on the potential future uses of and activities at the PSRC (TerraGraphics 2012a). Acceptable post-cleanup soil concentrations for those exposures expected to occur at the PSRC were established using the USEPA Integrated Exposure Uptake Biokinetic Model (IEUBK) (USEPA 1994), Adult Lead Model (ALM), the Idaho Risk Evaluation Manual (REM) (IDEQ 2004), and the USEPA's Guidance for Risk Characterization (USEPA 1995).

Of the four COCs evaluated, Pb and As were by far the greatest contributors to cumulative cancer and noncancer risks. Cadmium, Hg, and Zn posed minimal risk to recreational and occupational users of the PSRC and most surface soil concentrations for 0-6 inches for these COCs were below RSLs for Resident Soil (Table 1). Therefore, acceptable post-cleanup soil concentrations were developed for site-specific exposure scenarios (described in Section 3.4) for Pb and As only.

Acceptable post-cleanup exposure point concentrations (EPC) were developed for the reasonable maximum exposure (RME) that is expected to occur at the PSRC. By design, the estimated RME is higher than what is expected to be experienced by most of the exposed population and is therefore a conservative estimate of exposure and subsequent risk.

Post-cleanup soil EPCs that are required to meet target health risk levels for the RME recreational scenario ranged from 900 mg/kg to 1,300 mg/kg for lead and from 25 mg/kg to 100 mg/kg for arsenic (children and adult recreational exposures, respectively). The calculated post-cleanup soil EPC for adult occupational exposures are 600 mg/kg for lead and 70 mg/kg for arsenic.

Since the completion of the Risk Management Plan and the development of acceptable post-cleanup soil EPCs for the PSRC in 2012, the IEUBK and ALM blood lead models have been updated and, as a result, acceptable post-cleanup EPCs are expected to be less than those estimated to be protective of recreational and occupational users in the 2012 RA (TerraGraphics 2012a).

If areas where Pb and As concentrations exceed 1,200 mg/kg and 100 mg/kg in the 0-6 inch soil interval (Figure 3 and Tables 1 and 2), are remediated such that residual soil concentrations are ≤ 100 mg/kg Pb and ≤ 25 mg/kg As, the average post-cleanup soil concentrations would be reduced to 255 mg/kg Pb and 17 mg/kg As (Table 3) and the post-cleanup EPC (the 95th upper confidence limit [95UCL] of the mean) would be 309 mg/kg Pb and 19 mg/kg As (Table 3). These post-cleanup levels are below the RSL for resident soil for Pb (400 mg/kg) and are within the range of background concentrations for As (5.68 to 27.6 mg/kg).

By cleaning up those areas where Pb and As concentrations exceed risk-based site-specific cleanup action levels (1,200 mg/kg Pb and 100 mg/kg As), the resultant EPC is presumed to be protective of the recreational and occupational exposures expected to occur at the PSRC.

Table 2. Lead and Arsenic Soil Concentrations by Area, Sample type, and Depth (Post-Cleanup)

Area Name	Unit	Sample type	Depth (inches)	Arsenic (mg/kg)	Lead (mg/kg)
Beach	BE1	Composite	0-1	5.5	350
		Composite	1-6	6.4	325
	BE2	Composite	0-1	6.2	273
		Composite	1-6	6.4	310
	BE3	Composite	0-1	3.7	72.3
		Composite	1-6	2.8	37.8
	DU1	ISM	0-6	3.0	13.1
	DU2	ISM	0-6	3.0	13.1
	DU3	ISM	0-6	3.0	13.1
Black Rock	BR1	Composite	0-1	7.8	**535**
		Composite	1-6	14.2	**986**
	BR2	Composite	0-1	13.8	**820**
		Composite	1-6	15.4	**1,030**
City	CT1	Composite	0-1	6.8	105
		Composite	1-6	7.4	140
Furnace	FU1	Composite	0-1	**25.0**	**100**
		Composite	1-6	**25.0**	**100**
		Pit 1	0-6	15.5	**847**
	FU2	Composite	0-1	**25.0**	**100**
		Composite	1-6	**25.0**	**100**
	FU3	Composite	0-1	9.5	259
		Composite	1-6	9.6	247
Landing	LA1	Composite	0-1	21.1	**418**
		Composite	1-6	**25.0**	**100**
		Pit 2	0-6	**25.0**	**100**
	LA2	Composite	0-1	**25.0**	**100**
		Composite	1-6	**25.0**	**100**
		Pit 3	0-6	**25.0**	**100**
	LA3	Composite	0-1	**25.0**	**100**
		Composite	1-6	**25.0**	**100**
Lower Slope	LS1	Composite	0-1	**25.0**	**100**
		Composite	1-6	**25.0**	**100**
	LS2	Composite	0-1	10.7	141
		Composite	1-6	9.6	130
Marshy Slope	MS1	Composite	0-1	6.9	83.3
		Composite	1-6	7.4	107
	MS2	Composite	0-1	5.5	94.7
		Composite	1-6	5.7	98.4

Table 2. Lead and Arsenic Soil Concentrations by Area, Sample type, and Depth (Post-Cleanup)

Area Name	Unit	Sample type	Depth (inches)	Arsenic (mg/kg)	Lead (mg/kg)
Ore Piles	OR1	Composite	0-1	**25.0**	**100**
		Composite	1-6	**25.0**	**100**
	OR2	Composite	0-1	**38.2**	**803**
		Composite	1-6	**25.0**	**100**
Rail Line	RL1	Composite	0-1	**25.0**	**100**
		Composite	1-6	**25.0**	**100**
		Pit 4	0-6	**25.0**	**100**
	RL2	Composite	0-1	15.6	**991**
		Composite	1-6	**25.0**	**100**
		Pit 5	0-6	8.4	232
	RL3	Composite	0-1	20.7	**503**
		Composite	1-6	**25.0**	**100**
Roasters	RO1	Composite	0-1	**25.0**	**100**
		Composite	1-6	**25.0**	**100**
	RO2	Composite	0-1	**25.0**	**100**
		Composite	1-6	**25.0**	**100**
		Pit 6	0-6	**25.0**	**100**
	RO3	Composite	0-1	**27.9**	**976**
		Composite	1-6	27.3	**979**
		Pit 7	0-6	**25.0**	**100**
Stack	ST1	Composite	0-1	7.4	146
		Composite	1-6	11.3	238
		Pit 8	0-6	11.6	226
Trail	TR1	Composite	0-1	8.0	268
		Composite	1-6	14.0	**538**
	TR2	Composite	0-1	20.4	**627**
	TR3	Composite	0-1	25.0	**100**
		Composite	1-6	**25.0**	**100**
	TR4	Composite	0-1	**25.0**	**100**
		Composite	1-6	**25.0**	**100**
	TR5	Composite	0-1	**25.0**	**100**
		Composite	1-6	**25.0**	**100**
	TR6	Composite	0-1	11.2	**503**
		Composite	1-6	14.6	**762**
	TR7	Composite	0-1	12.3	**960**
		Composite	1-6	25.0	**100**
Upper Slope	US1	Composite	0-1	**25.0**	**100**
		Composite	1-6	**25.0**	**100**
Wolters	WO1	Composite	0-1	2.8	27.6
		Composite	1-6	3.1	25.3
RSL (mg/kg)				0.68	400
Bonnor County Background (mg/kg)	Mean			5.68	30.8
	Minimum			1.11	24.1
	Maximum			27.6	82.8
			post cleanup average	17	255
			post cleanup 95UCL	19	309

Bold values indicate that pre-cleanup concentrations exceed Regional Screening Level for Resident Soil (USEPA 2023) and maximum Bonner County background concentrations.

Bonner County background concentrations available at https://mrdata.usgs.gov/geochem/county.php?place=f16017&el=Pb&rf=northwestern (USGS 2016)

mg/kg = milligram per kilogram

RSL = Regional Screening Level for Resident Soil (USEPA 2023)

Table 3. Areas Requiring Cleanup by Depth

Area Name	Unit	Depth (inches)	Arsenic greater than 100 mg/kg	Lead greater than 1,200 mg/kg
Furnace	FU1	0-18 (hit slag at 18)	x	x
	FU2	0-6	x	x
Landing	LA1	0-6	x	x
	LA2	0-6	x	x
		6-18	x	
	LA3	0-6	x	x
Lower Slope	LS1	0-6	x	x
Ore Piles	OR1	0-24	x	x
	OR2	0-6	x	x
		6-24	no information	no information
		24-48		x
Rail Line	RL1	0-6	x	x
	RL2	0-6		x
	RL3	0-6		x
Roasters	RO1	0-6	x	x
	RO2	0-24	x	x
		24-48	x	
	RO3	0-6	x	x
		6-24	no information	no information
		24-72	x	
Trail	TR3	0-6		x
	TR4	0-6		x
	TR5	0-6	x	x
	TR7	0-6		x
Upper Slope	US1	0-6		x

An **x** indicates that the soil in this area is greater than cleanup levels (e.g., arsenic is greater than 100 mg/kg and/or lead is greater than 1,200 mg/kg)

mg/kg = milligram per kilogram

Section 4 Identification of Cleanup Alternatives

Based on the RA (TerraGraphics 2012a), there are many areas of the PSRC that exceed the cleanup action levels of 1,200 mg/kg Pb and/or 100 mg/kg As. Table 1 shows all metals concentration in soils by area and depth of contamination. Figure 3 shows areas requiring excavation. Table 3 shows post-cleanup surface soil concentrations.

4.1 Cleanup Elements

The following section describes specific cleanup elements necessary to ensure a safe environment for PSRC visitors. As part of the ABCA/VRWP, cleanup and design criteria are established for each of these cleanup elements. As described above, site-specific cleanup levels were established using a risk-based approach and applicable standards to be protective of human health and the environment. Design criteria were established based on the City of Ponderay use specifications for the PSRC with the intent of the PSRC being open to use by the public as a park or parklike recreational setting. These cleanup elements and associated criteria are described below.

4.1.1 Removal of Contaminated Soils and Smelter Waste

This element includes excavating and removing contaminated material and either disposing of the material off site or at an onsite repository designed to safely contain the waste. The objective is to provide areas for visitors to view the remains of the historic smelter and Lake Pend Oreille. Following excavation, the PSRC will be graded to fill low spots with clean soil for the purpose of avoiding areas with ponding water. Clean paths and oases will be constructed so that visitors can safely access the PSRC.

Cleanup Criteria for the PSRC require that surface concentrations equal to or greater than 1,200 mg/kg Pb and/or 100 mg/kg As be excavated and replaced/covered with clean material.

Design Criteria: Alternatives for development of a waterfront park within the footprint of the former smelter facility should i) isolate contaminated soils and smelter waste (including unprocessed ore and slag) and dust from humans, ii) provide a clean and safe area for PSRC visitors to recreate, and iii) retain historical features/structures related to the former smelter facility.

Proposed approach: Soils and waste with COC concentrations that exceed site-specific cleanup levels will be excavated for disposal and replaced/covered with clean material. A clean walking trail that services most of the PSRC will be developed, allowing visitors to view the lake and historic features associated with the former smelter operations.

4.1.2 Slag Pile Stabilization and/or Encapsulation

This cleanup element includes the removal or stabilization and/or encapsulation of the slag pile.

Cleanup Criteria for the slag pile require that surface concentrations equal to or greater than 1,200 mg/kg Pb and/or 100 mg/kg As be excavated or covered with a clean cap.

Design criteria for the slag pile. The slag pile closure must i) reduce or eliminate human contact with slag material, ii) reduce the risk of recontamination of cleaned areas, and iii) reduce or eliminate the potential for erosion and leaching and/or mobilization of metals from the slag pile to Lake Pend Oreille.

Proposed approach: The slag pile will be retained as a historic feature and point of interest at the PSRC. Barriers will be construction around the slag pile to reduce surface water infiltration, eliminate human contact with the slag material, reduce contact between the slag material and surface water in Lake Pend Oreille, and reduce the potential for leaching and/or mobilization of metals to the lake through ongoing degradation caused by wave action.

4.1.3 Access Restrictions

This cleanup element includes restricting public access from areas where physical hazards exist and directing access to clean oases.

Cleanup Criteria for this element require that the public do not access areas of the PSRC where physical hazards related to the historic smelter operation remain.

Design Criteria: Proposed access restrictions must keep visitors from restricted areas and must fit with the natural setting along Lake Pend Oreille.

Proposed approach: Fencing and/or existing physical barriers will be used to restrict visitor access to select areas of the PSRC where physical hazards remain. Fencing and/or existing physical barriers will also be utilized to restrict visitors from accessing the area of the onsite repository for the purpose of protecting the installed repository cap and areas where contaminated soils or smelter waste remain.

4.1.4 Activity Use Limitations through an Environmental Covenant

This cleanup element includes application of an environmental covenant specifying activity use restrictions for parcels RPP00000118252A, RPP00000117850A, and RPP00000117800A following cleanup of the PSRC.

Cleanup Criteria for this element require that no activities occur at the PSRC that could pose an unacceptable risk to human health (e.g., groundwater extraction for domestic use or future residential use) following cleanup.

Design Criteria: Proposed restrictions must keep PSRC visitors and others from ingesting groundwater under the PSRC and must not allow for future uses of the PSRC that could result in unacceptable risks to human health.

Proposed approach: Placement of an environmental covenant on the activity use restrictions.

4.1.5 Monitoring and Maintenance of the Remedy

This cleanup element includes development of a long-term monitoring program and institutional controls plan to reduce the potential for recontamination following cleanup of the PSRC. These plans will be referenced in an Environmental Covenant.

Cleanup Criteria: Average soil concentrations for the PSRC must remain below 600 mg/kg Pb and 25 mg/kg As (per the RA; TerraGraphics 2012a) following remediation to ensure that significant recontamination is not occurring.

Design Criteria: Proposed monitoring and maintenance activities must ensure that recontamination via wind/water transport is curtailed to the extent practicable, identify when recontamination of remediated areas is occurring, and assess if recontaminated areas require additional cleanup or controls.

Proposed approach: Long-term sampling and monitoring of cleaned areas, engineered erosion controls, and institutional controls are required to maintain remediated areas.

4.2 Cleanup Alternatives

Various cleanup alternatives were developed for each of the cleanup elements described above. Each alternative was required to meet the cleanup and design criteria established for its corresponding cleanup element. If the alternative did not meet these criteria, it was not considered for further evaluation.

Three cleanup alternatives and a No Action alternative for the PSRC are discussed in detail in the following sections and are summarized below.

Alternative 1- Removal of Contaminated Soils and Smelter Waste (including the Slag Pile) for Offsite Disposal includes:

- Removal and replacement of all soils and waste ≥ 1,200 mg/kg Pb and ≥ 100 mg/kg As from the PSRC,
- Removal of the slag pile, and
- Offsite disposal of excavated soils, waste, and slag material at a certified hazardous waste disposal facility.

Alternative 2- Removal of Contaminated Soils and Smelter Waste for Disposal in an Onsite Repository and Slag Pile Stabilization includes:

- Removal and replacement of soils and waste ≥ 1,200 mg/kg Pb and ≥ 100 mg/kg As from the PSRC,
- Consolidation and disposal of excavated soils and waste in an onsite repository, and
- Stabilization of the slag pile.

Alternative 3- Removal of Contaminated Soils and Smelter Waste for Disposal in an Onsite Repository and Slag Pile Stabilization and Partial Encapsulation includes:

- Removal and replacement of soils and waste ≥ 1,200 mg/kg Pb and ≥ 100 mg/kg As from the PSRC,
- Consolidation and disposal of excavated soils and waste in an onsite repository, and
- Stabilization and encapsulation of the slag pile.

Alternative 4 includes no remedial action.

4.2.1 Cleanup Alternative 1 – Removal of Contaminated Soils and Smelter Waste (including the Slag Pile) for Offsite Disposal

Description

This alternative consists of excavating contaminated soils and smelter waste (including unprocessed ore and slag) with COC concentrations above the site-specific risk-based cleanup action levels (1,200 mg/kg Pb and 100 mg/kg As) to an offsite facility for hazardous waste disposal. Cost estimates assume that all waste material fails to meet toxicity characteristic leaching procedure (TCLP) criteria and will require disposal in a certified hazardous waste disposal facility.

The waste removal areas and any temporary access roads and staging areas would be reclaimed by ripping and grading the areas to blend with the surrounding topography. The areas would be seeded with a native seed mix and erosion control BMPs would be installed. Following removal of the slag pile, the lakeshore/beach area would be stabilized and reclaimed to prevent erosion.

Advantages/Disadvantages

As an advantage, this scenario removes contaminated soils and smelter waste (including unprocessed ore and slag) above the cleanup action levels; therefore, there would be no restrictions on future land use associated with the previous contamination. Because natural vegetation has grown through and around the waste, accessing this waste would require the removal of many of the trees onsite. Significant costs associated with excavation, transportation, and disposal exist with this alternative.

4.2.2 Cleanup Alternative 2 – Removal of Contaminated Soils and Smelter Waste for Disposal in an Onsite Repository and Slag Pile Stabilization

Description

This alternative consists of excavating contaminated soils and smelter waste (including unprocessed ore and slag) with COC concentrations above established site-specific risk-based cleanup action levels for consolidation in an onsite repository and capping the remaining soils. The purpose of the repository is to permanently store contaminated soils in a manner that is protective of human health and the environment. Water quality and human health will be protected by a system of clean barriers (cap/cover) and water management strategies described below.

The repository would be constructed in an area above the lake peak water level on City property. Location of the repository would be on the upper bench in the vicinity of the roasters. The location is the most environmentally advantageous location on the PSRC because it is perched up on a flat bench where it is not vulnerable to erosion cause by stormwater run-on from the adjacent areas, it is situated as far from the lake as possible, and it is in a location where groundwater is at least 10 feet bgs.

Ditches will be constructed around the perimeter of the repository to intercept and direct stormwater runoff from the repository surface away to clean areas. Because the upper bench where the repository will be constructed is flat, there is minimal opportunity for stormwater to run onto the PSRC near the repository. A perimeter drain (curtain drain) consisting of a perforated pipe and drain rock will be installed around the perimeter of the repository to intercept shallow groundwater and divert it to clean areas away from the repository. This reduces water contact with contaminated material. The bottom of the repository will be located approximately 10 feet above the known static groundwater elevation to avoid contamination and reduce the potential for contaminant mobility.

The repository will be covered with a clean cap and vegetated. The cap will be a typical evapotranspiration-type of cover system that is used for repository and unlined mine-waste pile closures. The cap will consist of a geotextile liner, extremely low permeability clay soil or geocomposite clay liner, a capillary break constructed with gravel, a soil medium, and vegetation. The perimeter will be surrounded by a physical barrier including fencing and hostile vegetation. Permanent monuments will be set identifying the repository limits.

The repository configuration could range from a simple unlined soil-covered repository to a fully lined and capped repository. Non-leachable soil and rock could be disposed of in an unlined repository; however, leachable material that fails to meet TCLP criteria may require disposal in a lined repository subject to RCRA hazardous waste standards. Similarly, excavated material that meets TCLP criteria but is still leachable, as determined by acid-base accounting (ABA) and SPLP testing, could potentially impact surface or groundwater quality and may require disposal in a lined repository if safe conditions cannot be met with an unlined facility. For this preliminary screening evaluation, it is assumed that a leachate collection and treatment system will not be required.

The slag pile would be stabilized in place by protecting it from wave action with a breakwater feature, protecting it from erosion caused by surface water running onto the slag from the upland areas, and isolating it from erosion caused by pedestrian access.

The waste removal areas and any temporary access roads and staging areas would be reclaimed by grading the areas to blend with the surrounding topography. The areas would be seeded with a native seed mix and erosion control BMPs would be installed. The lakeshore/beach surrounding the slag pile would be stabilized and reclaimed to prevent erosion.

Advantages/Disadvantages

This alternative provides flexibility for incorporation of the proposed future land use. Excavation, transportation, and disposal costs will be less than Alternative 1; however, there are additional engineering and construction costs associated with the onsite repository. Long-term Operation and Maintenance (O&M) and monitoring would be needed to ensure the integrity of the repositories and/or caps.

Although slag pile stabilization would protect the slag pile from further deterioration and reduce the potential for erosion, it may not address the potential for metals to leach and/or mobilize from the slag pile to Lake Pend Oreille.

4.2.3 Cleanup Alternative 3 – Removal of Contaminated Soils and Smelter Waste for Disposal in an Onsite Repository and Slag Pile Stabilization and Partial Encapsulation

Description

This alternative consists of excavating contaminated soils and smelter waste (including unprocessed ore) with COC concentrations above established site-specific risk-based cleanup action levels for consolidation in an onsite repository and capping the remaining soils as described in Alternative 2. Under this alternative, in addition to stabilizing the slag pile as described in Alternative 2, the slag pile would also be encapsulated using a reinforced hydrophobic concrete cap intended to minimize infiltration and to protect the slag from weathering and pedestrian access.

The waste removal areas and any temporary access roads and staging areas would be reclaimed by grading the areas to blend with the surrounding topography. The areas would be seeded with a native seed mix and erosion control BMPs would be installed. The lakeshore/beach surrounding the slag pile would be stabilized and reclaimed to prevent erosion in the same manner with a breakwater described under Alternative 2.

Advantages/Disadvantages

This alternative provides flexibility for incorporation of the proposed future land use. Transportation and disposal costs will be less than Alternative 1; however, there are additional engineering and construction costs associated with the onsite repository. Long-term O&M and monitoring would be needed to ensure the integrity of the repositories and/or caps.

The slag pile stabilization and encapsulation would protect the slag pile from further deterioration and reduce the potential for erosion and may address the potential for metals to leach and/or mobilize from the slag pile to Lake Pend Oreille. The encapsulation eliminates human contact with the slag pile and encapsulation prevents water from infiltrating through the slag reducing the potential of metals mobilization.

4.2.4 Clean-up Alternative 4 – No Action

Description

The No Action Alternative assumes no remedial action will be taken at the PSRC and must be considered as part of the comparative analysis process.

Advantages and Disadvantages

Practically, this alternative would prevent public use of the PSRC due to risks posed by the identified COCs. Public access to the PSRC should continue to be restricted or prohibited if the PSRC is not cleaned up. Environmental conditions and risk would likely remain unchanged or get worse with no action at the PSRC.

Section 5 Detailed Analysis of Clean-up Alternatives

5.1 Description of Evaluation Criteria

The cleanup alternatives identified for the PSRC (see Section 4) are evaluated in this section based on the following performance criteria: (1) overall protection of human health and the environment; (2) ease of implementation; (3) cost of remediation; (4) sustainability and long-term effectiveness; (5) ability to meet proposed land use; (6) compliance with applicable standards; and (7) impacts to the environment – "green" remediation approaches. The following sections describing these performance criteria serve as a basis for conducting a comparative analysis of the proposed remedial alternatives.

5.1.1 Overall Protection of Human Health and the Environment

This criterion is used to evaluate whether human health and the environment are adequately protected. Human health protection includes reducing risk to acceptable levels, either by reducing contamination concentrations or eliminating potential routes for exposure. Environmental protection includes minimizing or avoiding negative impacts to natural, cultural, and historical resources.

5.1.2 Ease of Implementation

Ease to implement refers to the technical and administrative feasibility of carrying out an alternative and the availability of the required services and materials. The following factors are considered for each alternative:

- The likelihood of technical difficulties in constructing the alternative and delays due to technical problems.
- The potential for regulatory constraints to develop (e.g., as a result of uncovering buried cultural resources or encountering endangered species).
- The availability of necessary equipment, specialists, and provisions, as necessary.

5.1.3 Cost

This criterion considers the cost of implementing an alternative, including capital costs, O&M costs, opportunity costs, and monitoring costs.

5.1.4 Sustainability, Long-term Effectiveness, and Climate Resiliency

Sustainability and long-term effectiveness includes an assessment for the potential need to replace the alternative's technical components in the long-term. This criterion also considers the alternative's resiliency in light of reasonably foreseeable changing climate conditions (e.g., sea level rise, increased frequency and intensity of flooding and/or extreme weather events, etc.).

5.1.5 Ability to Meet Proposed Land Use

This criterion addresses the cleanup alternative's ability to meet the use and design requirements of a municipal waterfront park. These requirements include the preservation of the Site's native species diversity, wetlands, and access to the river.

5.1.6 Impacts to the Environment – "Green" Remediation Approaches

This criterion evaluates the potential impacts to the environment as a result of onsite activities.

5.2 Detailed Analysis of Alternatives

All of the proposed technologies have the potential to provide for overall protection of human health and the environment and would be designed so they are in compliance with applicable federal, state, and local codes. Because a No Action Alternative does not provide for protection of human health and the environment, and current risks at the PSRC are unacceptable for the proposed land use, the No Action alternative is not evaluated as a possible cleanup alternative.

5.2.1 Detailed Analysis of Alternative 1 – Removal of Contaminated Soils and Smelter Waste (including the Slag Pile) for Offsite Disposal

5.2.1.1 Overall Protection of Human Health and the Environment

Alternative 1 includes the removal of all contaminated soils and smelter waste (including unprocessed ore and slag) from the PSRC. The overall protection of human health and the environment in the long term would be high. This alternative results in a significant reduction in risk because exposure to contaminated soils and smelter waste would be eliminated.

This alternative presents increased short-term environmental risks during construction. These short-term risks are associated with hauling roughly 5,000 cubic yards of contaminated material along 2 miles of shoreline and along several miles of regional roads and highways to a disposal facility. Removal of the slag pile requires blasting which poses the risk of human exposure to and potential migration of contaminants via airborne particulate matter.

5.2.1.2 Ease of Implementation

This alternative is difficult to implement. It can be implemented using standard construction equipment and methods; however, excavation and removal of the slag pile is difficult with significant risks associated with blasting and hauling along 2 miles of shoreline. This alternative requires extensive measures to prevent potential impacts to the lake water quality due to shoreline destabilization during construction. The overall implementability is contingent on the location of the nearest certified hazardous waste disposal facility with the capacity to accept 5000 cubic yards of contaminated soils and smelter waste for a reasonable tipping fee. Transportation of contaminated soils and smelter waste for offsite disposal and importation of clean fill is difficult due to the high number of haul loads for this alternative and PSRC access limitations.

5.2.1.3 Cost

This alternative is expensive requiring specialized blasting and pollution prevention measures. No long-term O&M or institutional controls would be required for this alternative.

5.2.1.4 Sustainability, Long-term Effectiveness, and Climate Resiliency

This alternative would be highly sustainable and effective long-term. Removal of the contaminated soils and smelter waste above PSRC remedial action criteria for offsite disposal at a hazardous waste facility are proven and reliable methods of preventing the potential for contact with contaminated soils and smelter waste. This alternative eliminates long-term O&M costs due to the removal of all contaminated soils and smelter waste. This alternative provides strong long-term effectiveness because the waste is removed and disposed of offsite.

This alternative provides the greatest level of climate resiliency because there would be no contaminated material left at the PSRC following cleanup that could be vulnerable to impacts from changing climate conditions.

5.2.1.5 Ability to Meet Proposed Land Use

This alternative meets any desired land use requirements in terms of not having any restrictions due to contaminants at the PSRC. Additional work may be needed to provide the necessary fill and/or substantial re-grading to provide adequate slopes and contours for proposed development. These costs for re-grading could be significant.

5.2.1.6 Impacts the Environment – "Green" Remediation Approaches

This alternative has significant impacts to the environment due to the amount of fossil fuels being used for excavation and transportation and the resulting greenhouse gas emissions. The disturbance of some waste materials may increase the short-term environmental exposure potential. Additionally, landfill space would be used offsite when onsite disposal could meet project goals.

5.2.2 Detailed Analysis of Alternative 2 – Removal of Contaminated Soils and Smelter Waste for Disposal in an Onsite Repository and Slag Pile Stabilization

5.2.2.1 Overall Protection of Human Health and the Environment

Alternative 2 includes management of all wastes onsite through consolidation and construction of onsite repository and stabilization of the slag pile. The overall protection of human health and the environment in the long-term would not be as high as Alternative 1 because some contaminated soils and the slag pile will remain onsite. However, this alternative still results in a reduction in risk to human health and the environment because exposure to contaminated soils and smelter waste would be greatly reduced.

5.2.2.2 Ease of Implementation

The onsite repository and slag pile stabilization can be implemented using standard engineering and construction equipment and methods. The overall implementability depends on the availability of a suitable onsite area for the repository and the ease of access to the smelter waste, ore piles, and contaminated soils. An unlined repository with a soil cap would be the easiest to implement. A lined and capped repository would be the most difficult in comparison to other options and requires specialized liner materials and construction methods.

This alternative requires import of clean fill and the slag pile stabilization will require importation of construction materials needed for stabilization (concrete, rebar etc.) which may be difficult due to the high number of haul loads for this alternative and PSRC access limitations.

5.2.2.3 Cost

This alternative would be moderately to highly expensive. An unlined repository with a soil cover would be least expensive and a fully lined and capped repository would be the most expensive. The slag pile stabilization costs would be less than offsite disposal of slag material (Alternative 1) and less than the cost to stabilize and encapsulate the slag pile (Alternative 3). This alternative would include O&M costs for the engineered liner and capping systems. This alternative requires institutional controls be put in place.

5.2.2.4 Sustainability, Long-term Effectiveness, and Climate Resiliency

This alternative would be moderately to highly sustainable and effective over the long term. Removal of the contaminated soils and smelter waste above PSRC remedial action criteria would be protective of both human health and the environment. The remediation features would be permanent, with an indefinite design life.

Consolidation in a fully lined and capped repository would be most effective by preventing meteoric waters from infiltrating through the waste materials and potentially leaching contaminants to groundwater. A capped repository would also be less prone to erosion and potential re-exposure of the waste material. An unlined repository would be effective at minimizing potential surface exposures but would not be as protective of groundwater, particularly for leachable wastes. Capping the remaining contaminated soils and smelter waste in place would prevent human exposure and limit ecological exposure to burrowing animals, insects, and deep rooting plants.

Stabilization of the slag pile would protect the slag pile from further deterioration and reduce the potential for erosion and recontamination of clean soils.

This alternative is highly resilient to changes in climate. The caps and covers are natural materials that do not degrade with changing climate conditions. For example, in excessively dry years, there is less precipitation that reduces the risk of infiltration through contaminated media and decreases the potential mobilization of metals. In excessively wet years, precipitation and stormwater runoff is diverted away from the repository reducing the potential mobilization of metals. The caps and cover systems would be designed to minimize runoff velocity and minimize erosion.

Long-term monitoring would still be necessary to confirm that consolidation of leachable wastes do not cause increased impacts to groundwater and recontamination does not occur following cleanup.

5.2.2.5 Ability to Meet Proposed Land Use

This alternative would meet the proposed recreational land use requirements. However, waste material and contaminated media would remain onsite and could limit, complicate, or increase the cost for future development of the PSRC.

5.2.2.6 Impacts the Environment – "Green" Remediation Approaches

Contaminated soils and smelter waste will be maintained in an onsite repository which reduces the need for excavation and transportation and does not require additional space in an offsite landfill. This would represent a reduction in fuel consumption and greenhouse gas emissions when compared to Alternative 1.

5.2.3 Detailed Analysis of Alternative 3 – Removal of Contaminated Soils and Smelter Waste for Disposal in an Onsite Repository and Slag Pile Stabilization and Encapsulation

5.2.3.1 Overall Protection of Human Health and the Environment

Similar to Alternative 2, this alternative includes management of all wastes onsite through consolidation and construction of an onsite repository and stabilization of the slag pile. In addition, under this alternative, the slag pile would also be encapsulated to reduce the potential for metals to leach and/or mobilize from the slag pile to Lake Pend Oreille. For this alternative, the overall protection of human health and the environment in the long term would not be as high as Alternative 1 because some contaminated soils and the slag pile would remain onsite, but would be higher than Alternative 2 because encapsulation would reduce human contact with metals in the slag and would reduce the potential for metals to leach and/or mobilize to the lake. Overall, this alternative would result in a notable reduction in risk because exposure to contaminated soils and smelter waste would be greatly reduced.

5.2.3.2 Ease of Implementation

The onsite repository and slag pile stabilization can be implemented using standard engineering and construction equipment and methods. Similar to Alternative 2, the overall implementability is dependent on the availability of a suitable onsite area for the repository and the ease of access to the smelter waste and contaminated soils. An unlined repository with a soil cap would be the easiest to implement. A lined and capped repository would be the most difficult in comparison to other options and may require specialized liner materials and construction methods.

This alternative would also require importation of clean fill and the slag pile stabilization and encapsulation would require importation of construction materials needed for both stabilization (concrete, rebar etc.) and encapsulation (shot crete) which may be difficult due to the high number of haul loads for this alternative and PSRC access limitations.

5.2.3.3 Cost

This alternative would be moderately to highly expensive. As with Alternative 2, overall costs for the repository will depend on whether the repository is lined and capped or unlined with a simple soil cover. The slag pile stabilization and encapsulation costs would be less than offsite disposal of slag material (Alternative 1) and more than the cost of slag pile stabilization alone (Alternative 2). This alternative would include O&M costs for the engineered liner and capping systems and would require that institutional controls be put in place.

5.2.3.4 Sustainability, Long-term Effectiveness, and Climate Resiliency

This alternative would be moderately to highly sustainable and effective over the long term. Removal of the contaminated soils and smelter waste above PSRC remedial action criteria would be protective of both human health and the environment with consolidation in a fully lined and capped repository as the most effective option in the long term.

With the addition of encapsulating the top of the slag pile, this alternative provides extra protection from deterioration by reducing infiltration, weathering, and erosion potential and further minimizes the risk of recontamination of clean soils.

This alternative is highly resilient to changes in climate conditions. The caps and covers are natural and/or durable materials that do not degrade with changing climate conditions. For example, in excessively dry years, there is less precipitation that reduces the risk of infiltration through contaminated media and decreases the potential mobilization of metals. In excessively wet years, precipitation and stormwater runoff is diverted away from the repository reducing the potential mobilization of metals. The caps and cover systems would be designed to minimize runoff velocity and minimize erosion. There would be no appreciable difference in the effectiveness of the concrete cap encapsulating the top of the slag pile under changing climate conditions.

As with Alternative 2, Alternative 3 would also require long-term monitoring of soils to ensure no adverse impacts or recontamination occurs following cleanup.

5.2.3.5 Ability to Meet Proposed Land Use

This alternative would meet the proposed recreational land use requirements. However, as with Alternative 2, waste material and contaminated media would remain onsite and could limit, complicate, or increase the cost for future development of the PSRC.

5.2.3.6 Impacts the Environment – "Green" Remediation Approaches

Contaminated soils and smelter waste will be maintained in an onsite repository which reduces the need for excavation and transportation and does not require additional space in an offsite landfill. This would represent a reduction in fuel consumption and greenhouse gas emissions when compared to Alternative 1 similar to Alternative 2.

Section 6 Comparative Analysis of Clean-up Alternatives

Table 4 compares the analysis of the four proposed alternatives against the evaluation criteria. Rankings were made on a scale of "1" through "3" with:

- 1= Low Success,
- 2= Moderate or average Success, and
- 3= High Success.

The comparison ranked the No Action Alternative last. Overall long-term effectiveness and protection of human health and the environment makes Alternative 3 the preferred alternative at this point. However, should the PSRC be further developed, Alternative 1 is the most preferred based on the overall protection of human health and the environment and the ability to meet future needs.

6.1 Overall Protection of Human health and the Environment

With the exception of the No Action Alternative (Alternative 4), the remaining alternatives considered would provide adequate protection of human health and the environment. Each of these three remaining alternatives might have different mitigation measures, but they all would provide the necessary protections to human health and the environment. All of the alternatives would meet the design criteria established for closure of the slag pile which are to i) reduce or eliminate human contact with slag material, ii) reduce the risk of recontamination of cleaned areas, and iii) reduce or eliminate the potential for erosion and leaching and/or mobilization of metals from the slag pile to Lake Pend Oreille. However, Alternative 2 would be the least effective achieving these design criteria because the slag would not be fully encapsulated or removed from the PSRC. Therefore, Alternatives 1 and 3 are expected to be highly successful in protecting human health and the environment while Alternative 2 is expected to be moderately successful in protecting human health and the environment.

6.2 Ease of Implementation

The No Action Alternative (Alternative 4) is the easiest to implement while Alternatives 1 through 3 each have complexities that would result in uniquely difficult implementations. Challenges associated with implementation of Alternative 1 include handling and transporting large volumes of contaminated soils and smelter waste from the PSRC to an offsite certified hazardous waste disposal facility. Alternatives 2 and 3, on the other hand, offer a different set of challenges associated with finding sufficient room for proper disposal of the contaminated material onsite. Staging material and contouring the PSRC to handle all the onsite wastes could limit the proposed land use and further complicates its implementation. For the slag pile, stabilization (Alternative 2) or stabilization and encapsulation (Alternative 3) are easier to implement compared to the complete removal and offsite disposal of slag material (Alternative 1). Therefore, Alternatives 2 and 3 are expected to have a high level of success in the ease of implementation while Alternative 1 is expected to be moderately successful in ease of implementation.

6.3 Cost of Remediation

Alternative 1 has a high cost of remediation due to costs associated with the excavation, transportation, and offsite disposal of a large volume of contaminated soils and smelter waste. The consolidation and management of waste in an onsite repository presented in Alternatives 2

Table 4. Comparative Analysis of Clean-up Alternatives

Cleanup Alternatives	Overall Protection of Human Health and Environment	Ease of Implementation	Cost	Sustainability, Long-term Effectiveness, and Climate Resiliency	Ability to Meet Proposed Land Use	Reduction Impacts to the Environment	Total Score
Alternative 1- Removal of Contaminated Soils and Waste (including Slag Pile) for Off-Site Disposal	3	1	1	3	3	1	12
Alternative 2- Removal of Contaminated Soils and Waste for Disposal in an Onsite Repository and Slag Pile Stabilization	2	2	2	2	3	2	13
Alternative 3- Removal of Contaminated Soils and Waste for Disposal in an Onsite Repository and Slag Pile Stabilization and Encapsulation	3	2	2	2	3	2	14
Alternative 4- No Action	1	3	3	1	1	3	12

Notes:
(1=Low Success, 2=Moderate Success, 3=High Success)
(For Cost: 1=High Cost, 2=Moderate Cost, 3=Low Cost)

and 3 eliminates the higher transportation and disposal costs of Alternative 1. Remediation costs for Alternatives 2 and 3 are considered to be moderate to high due to increased engineering and constructions costs for the onsite repository and the slag stabilization/encapsulation with slightly higher costs associated with the encapsulation of the slag pile in Alternative 3. There are no costs associated with the No Action Alternative.

6.4 Sustainability, Long-term Effectiveness, and Climate Resiliency

Alternative 1 is highly sustainable and effective in the long-term because complete removal of contaminated soils and smelter waste for offsite disposal in a certified hazardous waste disposal facility eliminates any post-remediation O&M and closure monitoring obligations.

Both Alternatives 2 and 3 require O&M, long-term monitoring, and appropriate engineering and/or institutional controls to ensure that the cleanup remains effective. Therefore Alternatives 2 and 3 are considered to be moderately sustainable and effective in the long-term in comparison to Alternative 1. However, Alternative 3 is slightly more effective long-term compared to Alternative 2 because of the extra measures employed on the slag pile.

All the alternatives are resilient to changing climate conditions because they either remove all the contaminated materials or rely on remediation strategies that are inherently resilient. Alternative 1 has the greatest climate resilience because there would be no permanent contaminated material left at the PSRC.

6.5 Ability to Meet Proposed Land Use

Alternative 1 would provide the most flexibility for future land use because all contaminated soils and smelter waste would be removed from the PSRC. Alternatives 2 and 3 would require land use restrictions due to the presence of an onsite repository to avoid damaging the repository; however, both Alternatives 2 and 3 would work to incorporate the proposed recreation land use into the remedial design to balance the remediation goals with future land use needs. Alternatives 1, 2, and 3 would successfully meet the proposed land use.

6.6 Reduction of Impacts to the Environment

Alternative 1 is considered to have a low success in reducing impacts to the environment due to the increased fuel consumption and greenhouse gas emissions caused by offsite transportation of contaminated soils and smelter waste and the increased need for existing landfill space. Alternatives 2 and 3 would be moderately successful in reducing impacts to the environment by eliminating the transportation of waste for offsite disposal and reducing fuel consumption and greenhouse gas emissions.

In summary, Alternatives 1, 2, and 3 would adequately protect human health and the environment and meet the proposed land use needs for the PSRC. Alternatives 2 and 3 are less costly and easier to implement, with fewer impacts to the environment during implementation than Alternative 1. However, Alternative 3 is the preferred alternative because it is expected to be more successful at protecting human health and the environment than Alternative 2. The No Action Alternatives is feasible, but would not protect human health and the environment and would not be compatible with the land use goals for this PSRC.

Section 7 Preferred Alternative Statement of Work

The preferred alternative for meeting the anticipated use goals of the PRSC is Alternative 3. This alternative involves managing all materials onsite using a combination of waste consolidation and isolation. Contaminated soils and smelter waste will be excavated and consolidated into an onsite repository. The slag pile will be isolated from contact using physical barriers.

The Workplan for Alternative 3, including design details, completion milestones, and detailed cost estimates, is described below.

7.1 Construction Materials and Design Details

Construction materials for the cleanup include common soil, rock, concrete, fencing, and related appurtenances that are generally available in the Ponderay area. Specialty materials are needed for the repository cap and slag pile cap as described in the table below. Specialty construction techniques are required for the repository and breakwater.

Table 5. Required Construction Materials for Preferred Alternative

Cleanup Elements	Construction Materials Required
Upland area – site preparation and vegetation removal	Erosion and sediment control Best Management Practices (BMPs). Wildfire control measures during slash burning.
Upland area - excavation and haul contaminated soils (including ore piles and other smelter waste) to repository	Erosion and sediment control BMPs.
Upland area – clean backfill for excavation zones	Clean soil capable of supporting vegetation, native vegetation, clean gravel for pathways, and fencing.
Repository	Drain rock, perforated drainpipe, geotextile fabric, low permeability clay or geocomposite clay liner, topsoil, and vegetation.
Beach Area	Erosion and sediment control BMPs including straw waddles and silt fencing.
Slag Pile	Reinforcing steel, hydrophobic concrete, gravel, fencing, and drainpipe.
Breakwater and shoreline features	Quarry spall rock, large angular rip rap, geotextile fabric, and gravel.
Haul road	Haul roads will be surfaced with a compacted crushed aggregate material.
General	Erosion and stormwater control BMPs including silt fence, straw wattles, vegetation, gravel, and construction fencing.
Monitoring and Maintenance of the Remedy	Same materials used in the original construction for periodic repairs.

7.1.1 Upland Area

7.1.1.1 PSRC Preparation and Vegetation Removal

The area of the PSRC where excavation is required (based on Pb and As concentrations) will be clearcut to remove all vegetation to facilitate the cleanup. All trees will be felled and burned onsite in a safe, legal manner in slash piles.

Tree stumps from trees with a breast height caliper greater than 6 inches that are within 4 feet of existing concrete ruins will be ground in place to limit the risk of damaging the concrete ruins. All other tree stumps will be pulled using an excavator and burned onsite as slash.

Vegetation shall be pulled and burned as slash prior to excavating contaminated soils and smelter waste.

7.1.1.2 Repository

A 2,200 cubic yard repository will be constructed onsite in the area near the roaster piles that is known to be contaminated. The area is the best onsite location for the repository because it is perched on a flat bench that is not vulnerable to erosion cause by stormwater run-on from the adjacent areas, it is situated as far from the Lake as possible, and it is in a location where groundwater is at least 10 feet bgs.

The purpose of the repository is to permanently store contaminated soils in a manner that is protective of human health and the environment. Water quality and human health will be protected by a system of clean barriers (cap/cover) and water management strategies described below.

The repository will be partially buried and partially mounded above the surrounding ground surface creating a landform feature. The purpose of the landform design is to shed surface water to deter infiltration through the contaminated media and protect groundwater. Secondary benefits of the landform design are dampening noise from the nearby railroad and creating a physical deterrent for illegal and ill-advised railroad crossings by pedestrians.

Ditches will be constructed around the perimeter of the repository to intercept and divert stormwater runoff from the repository surface to clean areas. Because the upper bench where the repository will be constructed is flat, there is minimal opportunity for stormwater to run onto other areas of the PSRC near the repository. A perimeter drain (curtain drain) consisting of a perforated pipe and drain rock will be installed around the perimeter of the repository to intercept shallow groundwater and divert it to clean areas away from the repository. This reduces water contact with contaminated material. The bottom of the repository will be located approximately 10 feet above the known static groundwater elevation to avoid contamination and reduce the potential for contaminant mobility.

The repository will be covered with a clean cap and vegetated. The cap will be a typical evapotranspiration-type of cover system that is used for repository and unlined mine waste pile closures. The cap will consist of a geotextile, extremely low permeability clay soil or geocomposite clay liner, a capillary break constructed with gravel, a soil medium, and vegetation. The cap and perimeter drain systems will extend to the roaster closure area as described in the following section. The perimeter will be surrounded by a physical barrier including fencing and hostile vegetation. Permanent monuments will be set identifying the repository limits.

7.1.1.3 Roaster Closure Area

The roaster area contains approximately 2,200 cubic yards of contaminated material. Test pits indicate that contaminated material is found up to 72 inches (6 feet) bgs in this area. This material will be left in place adjacent to the repository and capped. A perimeter drain (trench or curtain drain) consisting of a perforated pipe and drain rock will be installed around the perimeter of the roaster area to intercept shallow groundwater and divert it to clean areas. This reduces water contact with contaminated material.

The roaster closure area will be covered as an extension of the repository with the same clean cap material and vegetated as the repository. The cap will consist of a geotextile, extremely low permeability clay soil or geocomposite clay liner, a capillary break constructed with gravel, a soil medium, and vegetation. The perimeter will be surrounded by a physical barrier including fencing and hostile vegetation. Permanent monuments set to identify the repository limits will include the limits of the roastery closure area.

7.1.1.4 Contaminated Soils Excavation and Haul to Onsite Repository

Approximately 1.75 acres of the PSRC is contaminated at depths ranging from 6 inches to 6 feet. All contaminated material except for the 0.25 acre roaster closure area will be excavated and hauled to the onsite repository. Excavation depths will range from 0.5 feet to 4 feet. The excavation zones are shown on Figure 3.

Haul routes will be determined by the construction contractor, but the construction specifications will require erosion and sediment controls to prevent off site runoff and to ensure contaminated materials are not tracked onto clean area.

A handheld X-ray Fluorescence (XRF) analyzer will be used to screen soils during excavation to confirm that the contamination is removed and clean soils remain in the excavated zones. Pb and As residual concentrations, as detected by the XRF, will be used to determine if the soil excavation is sufficient or will need additional excavation to reach the target concentrations. Confirmation soils samples will also be collected for laboratory analysis to confirm that XRF results are suitable for use in cleanup decisions.

After the contaminated material is excavated and hauled to the repository, the PSRC will be graded to fill in low spots. Topsoil or organic amendments will be imported to establish vegetation in the excavated areas. Table 6 below presents estimated excavation volumes.

Table 6. Estimated Excavation Quantities of the Preferred Alternative.

Repository Calculations					
Area	**Depth (in)**	**Depth (ft)**	**Area (SF)**	**Volume (CF)**	**Volume (CY)**
SW Trail	6	0.5	1927	963	36
Largest 6" Area	6	0.5	49400	24700	915
SCH. A Area East of Wall	18	1.5	6901	10351	383
Middle Area	18	1.5	2010	3014	112
Smallest Area Near Trail	24	2	536	1071	40
Deep Area Near Trail	48	4	4688	18751	694
Roaster Piles	48	4	2880	11520	427
Roaster	72	6	9771	58623	2171
Total			**78111**	**128995**	**4778**
Knowns:					

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Repository Calculations					
Groundwater Elevation	2096.55				
10-ft Separation from GW Table	2106.55				
EX. Repository Site Upper (NW) Elevation	2117				
EX. Repository Site Lower (SE) Elevation	2116				
Depth of Cover (ft)	4.83				

7.1.2 Preservation of Existing Concrete Structures

All the existing concrete ruins from the smelter buildings and infrastructure will remain in arrested decay. The intent is to preserve some of the physical history of the PSRC. The ruins will be protected during construction by using specialized excavation and fill requirements for any work within 6 feet of the ruins. The techniques include excluding equipment from within the 6-foot zone and requiring handwork within 2 feet of the ruins.

The ruins will be prevented from deteriorating further (arrested decay) to the extent practicable by removing vegetation that is growing into the features and grading the PSRC to prevent water from pooling behind the ruins.

Permanent "KEEP OFF" signs will be installed around the ruins for safety and to attempt to preserve the ruins. Fencing will also be installed at select locations.

7.1.3 Clean Backfill and Access Trails

Clean backfill will be generated onsite and imported and placed in selected areas that are excavated. The purpose of placement of clean backfill is (1) to ensure clean oases are accessible to visitors throughout the PSRC, (2) to help reestablish native vegetation, and (3) to create thick, durable designated walking trails that are not vulnerable to erosion.

7.2 Lakeshore Cleanup

The majority of the slag material will be removed from the beach area by excavating the beach area 12 inches deep and passing the excavated material through a grizzly rock screen. The grizzly rock screen will have a 1-inch x 1-inch screen opening. Slag that is screened from the beach will be consolidated and permanently contained behind a new breakwater at the base of the existing slag pile. Material smaller than 1 inch will be regraded across the beach to match the surrounding conditions.

7.3 Slag Pile Stabilization

The slag pile will remain and be stabilized in place. The objective is to retain the iconic "Black Rock" outcrop while keeping visitors safe from exposure to contaminated materials and, at the same time, isolating the slag pile from the environment to the extent practicable. The two primary features for stabilizing the slag pile are a reinforced concrete cap and a breakwater.

7.3.1 Reinforced Concrete Cap

The slag pile will be stabilized by installing a reinforced concrete cap over the top of the pile and constructing a breakwater between the dump and the lake. The objective of the cap is to minimize the potential for water infiltration and to isolate the slag pile from human contact. The objective of the breakwater is to protect the slag pile from erosion caused by wave action and to provide a clean oasis for visitors to view the PSRC.

The cap will be pitched to direct surface water runoff away from the slag. The cap will be 4 inches thick and reinforced with No. 3 rebar (3/8" diameter) at 18 inches on center. Control joints will be tooled into the slab.

Black powder-coated metal fencing with vertical stiles will be installed at the waterside perimeter of the slag pile. The purpose of fencing is fall protection. The fencing will be installed according to International Building Code requirements and anchored into the concrete pad. The fencing will be set back at least 24 inches from the edge of the concrete so that the slag cannot be touched when reaching through the fence rails.

7.3.2 Breakwater

A permanent breakwater will be installed across the face of the slag pile. The purpose of the breakwater is to protect the slag pile from erosion caused by wave action and to provide a clean oasis for visitors to view the PSRC.

The breakwater will be constructed of large angular rock and quarry spalls. The top will be a 10-foot-wide walking pathway surfaced with ¾" minus gravel. The top elevation of the breakwater will be at the same elevation as the top of the rip rap shoreline protection that was installed by the USACE along 1,000 feet of adjacent shoreline.

The breakwater will be offset from the slag pile providing a catchment area for slag that erodes from the face of the dump. The catchment area is intended to be maintenance free by being large enough to contain 50 cubic yards of material. The catchment will be filled with large angular rock above the Lake Pend Oreille summer pool elevation to deter access.

7.3.3 Access Restrictions

Parts of the PSRC will not be accessible to visitors. These areas include the exposed face of the slag pile and the steep northeast vegetated area between the trail and lake. Physical barriers will be installed to prevent access to these areas of the PSRC. The types of physical barriers include vegetation, fencing, and large angular rip rap that is difficult to walk on.

In addition to these access restrictions, access to clean oases will be promoted through the installation of clean walking trails and a staircase near the slag pile.

Signs describing the hazard should be considered in the design.

7.4 Monitoring and Maintenance of the Remedy

The remedy is designed to minimize the City's long-term maintenance requirements. All elements of the cleanup are intended to have an indefinite design life except for the metal fencing (30 years) and slag pile's concrete cap (40 years).

Monitoring will include long-term soil sampling, visual monitoring as described in the follow paragraphs, and periodic elevation measurements using a simple laser level or similar.

The purpose of monitoring is to identify when design features require maintenance. The soil monitoring will be performed in accordance with a Quality Assurance Project Plan (QAPP). Visual monitoring protocols will be provided in an O&M plan to be prepared following construction. The O&M plan will be referenced in the Environmental Covenant.

7.5 Completion Milestones

Table 7 lists the completion milestones and target completion dates for the cleanup. The cleanup timeline start date coincides with the date of final agency approval of this Workplan. Cleanup milestones are described below.

Table 7. Cleanup Completion Milestones

Completion Milestones	Target Completion Dates
90% Design Final/Bid Package	September 2023
Notice to Proceed/Start Construction	After October 2023 – Tree Felling All other work - As soon as the weather permits following Final approval of the Workplan and permits
Complete Construction	12 months from start of construction accounting for sequencing work with lake levels
Complete and Implement Long-term Monitoring Plan	Prior to opening to the Public
Complete Institutional Controls Plan	90 days following construction completion
Completion Report Final	90 days following construction completion including as-built drawings

7.5.1 90% Design Final

The design stage includes a PSRC visit by design engineers to determine and field-locate all design elements and to review PSRC drainage and controls issues. A Basis of Design Report describing all elements of the cleanup and many other identified issues such as property easements, access, permit requirements, biological and hydrological issues, construction wastes, public and worker safety, and PSRC preparation will be issued to the City for review at the 90% Design Stage. Following this review, the final design effort (90% Design) will be completed.

Once the final (90%) design and specifications are complete and approved they will be incorporated into a bid package. The bid will be advertised and a meeting will be conducted with prospective bidders. A winning bid will be chosen based on the criteria delineated in the bid package, and the final contract will be negotiated between the City and the bidder. At this point, a Notice to Proceed will be issued.

7.5.2 Notice to Proceed/Start Construction

Following the issuance of a Notice to Proceed (NTP), the owner will meet with the contractor to clarify the terms and expectations of the contract. The contractor can then begin mobilizing equipment and workers to the PSRC as soon as the weather permits. A timeline target date has not been set for this milestone due to uncertainties associated with who the contractor will be and their schedule.

7.5.3 Construction Phase

The construction schedule is shown in three phases (Table 8) associated with the major work elements. Phase 2 and 3 may be performed at the same time. The construction contractor is responsible for providing a critical-path schedule with sequencing and milestones demonstrating that the project will be completed within the number of days allowed in the construction contract.

Table 8. Construction Phase Elements

Phase	Elements
Phase 1	Mobilize, install erosion and sediment control BMPs, and improve haul road.
Phase 2	Clear and grub, develop staging areas, prepare repository area and onsite haul routes, complete excavation and grading, implement stormwater controls, and construct slag pile cap and breakwater.
Phase 3	Revegetate, install clean fill, complete final grading, demobilize and reclaim haul routes.

The construction contractor is solely responsible for the execution of the work in compliance with contract documents including all means and methods, site health and safety, pollution controls, traffic controls, and related.

Bi-weekly construction meetings will be held with the construction contractor, engineer, City, and agencies. Meeting notes will be provided every other week documenting cleanup activities to date and will note problems and any deviations from the cleanup design and timeline.

7.5.4 Complete and Implement Long-term Monitoring Plan

A Long-term Monitoring Plan will be developed that describes soil sampling and visual observations required prior to opening to the public and on a reoccurring basis thereafter. Sampling will be conducted by the City or their designated representative and results will be reported to IDEQ.

7.5.5 Complete Institutional Controls Plan

An Institutional Controls Plan will be developed following completion of construction. This plan will include guidance for minimum O&M and institutional control protocols to ensure that activities at the PSRC do not contribute to recontamination of remediated areas. The plan will also outline land use restrictions established via an Environmental Covenant.

7.5.6 Construction Completion Report Final

Once construction is completed, a Construction Completion Report will be compiled and submitted to IDEQ for review.

The Construction Completion Report is projected to be finalized 90 days after construction is complete. The report will include as-built drawings to document the installed remedies.

7.5.7 Construction Oversight

A full-time resident project representative (RPR) needs to be onsite during construction. The RPR will track construction progress, act as a liaison between the engineer and the construction contractor, observe and document the quality of construction relative to the design criteria, complete daily logs, provide the engineer with periodic progress reports, and perform clean soil quality assurance testing. Clean soil quality assurance testing will be completed in accordance with the QAPP.

The RPR will report to the engineer any part of contractor's work in progress i) that s/he believes will not produce a completed project that conforms generally to the contract documents or will imperil the integrity of the design concept of the completed project, ii) that has been damaged, or iii) that does not meet their approval; and will advise the engineer of that part of work in progress that should be corrected or rejected or requires observation or special testing or approval.

The RPR will have OSHA 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) Training required under 29 CFR 1910.120.

7.5.8 Timeline Uncertainties

There are several uncertainties that could result in changes to the proposed timeline. These uncertainties include delays caused by required regulatory review and compliance (i.e., Workplan approval, construction permitting), the availability of specific materials necessary for the cleanup to be completed, funding changes, and delays caused by weather.

7.6 Cost Estimates

The planning level cost opinion for Alternative 3 is $3,175,935. See Appendix A. These are feasibility level estimates (+/-50%) and are subject to a number of uncertainties and market conditions. Actual costs will depend on the final selected design, material costs, local conditions, and other factors.

7.7 Health and Safety Plan

The prime remediation contractor that enters a construction contract with the City will have the sole and complete obligation to provide a safe and healthy working environment for their employees, subcontractors and suppliers, and for other people at the PSRC who may be exposed to the contracted work. Neither the City, the Engineer, or their designated representatives will have any control over the contractor's health and safety practices or compliance.

Remediation contractors are required to demonstrate compliance with 29 CFR 1910.120 by submittal of a Safety and Health Plan for the scope of work prior to commencing work. Cleanup contractors will perform work in a safe manner and comply with all Federal, State, and local safety rules and regulations, including, but not limited to, the Occupational Safety and Health Act (OSHA) of 1970. Cleanup contractors will provide written documentation that all employees engaged in work have received the OSHA 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) Training as well as current annual refresher training as required under 29 CFR 1910.120.

Section 8 References

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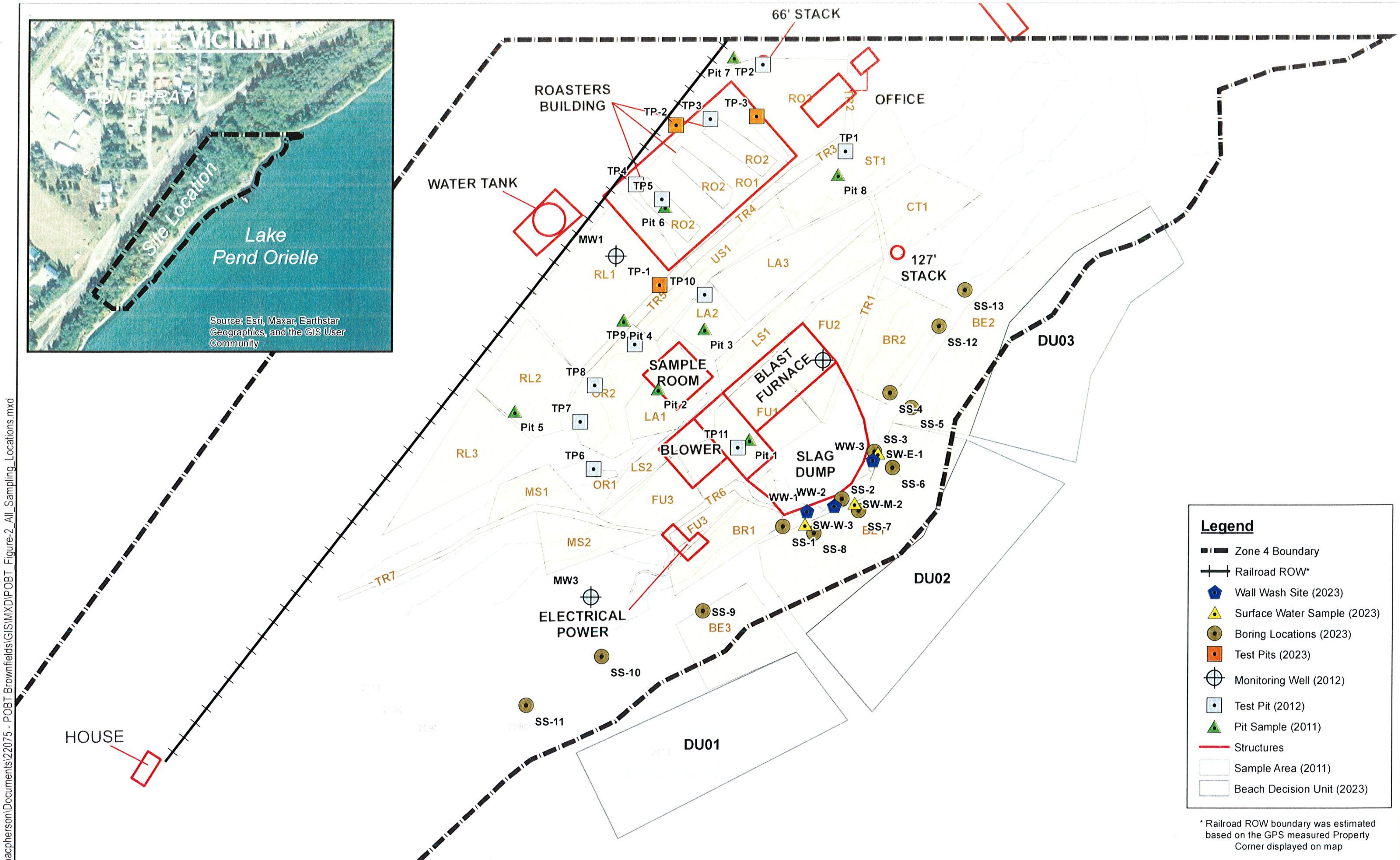
Alta Science & Engineering, Inc.	PRINT DATE October 14, 2022	PROJECTION UTM NAD 83, Zone 11N	PROJECT NAME City of Ponderay Brownfields Project Ponderay, ID	FIGURE 1 Site Location with Regional Map	This map was produced using information obtained from several different sources that have not been independently verified. These sources have also not provided information on the precision and accuracy of the data. Information on this map is not a substitute for survey data.
	PROJECT NUMBER 22075	PROJECT MANAGER D. Forseth			
		CARTOGRAPHER M. Studer			



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Alta Science & Engineering, Inc.

File: GIS/POBT_Figure-2_All_Sampling_Locations.mxd	Requestor: City of Ponderay	Project Name: City of Ponderay Brownfields Project Ponderay, ID	Figure 2 All Sampling Units and Locations	This map was produced using information obtained from several different sources that have not been independently verified. These sources have also not provided information on the precision and accuracy of the data. Information on this map is not a substitute for survey data
Print Date: July 12 2023	Project Manager: Derek Forseth			
Project Number: 22075	Cartographer: S Morosky/C MacPherson			

1 inch = 70 feet

0 70 140 Feet

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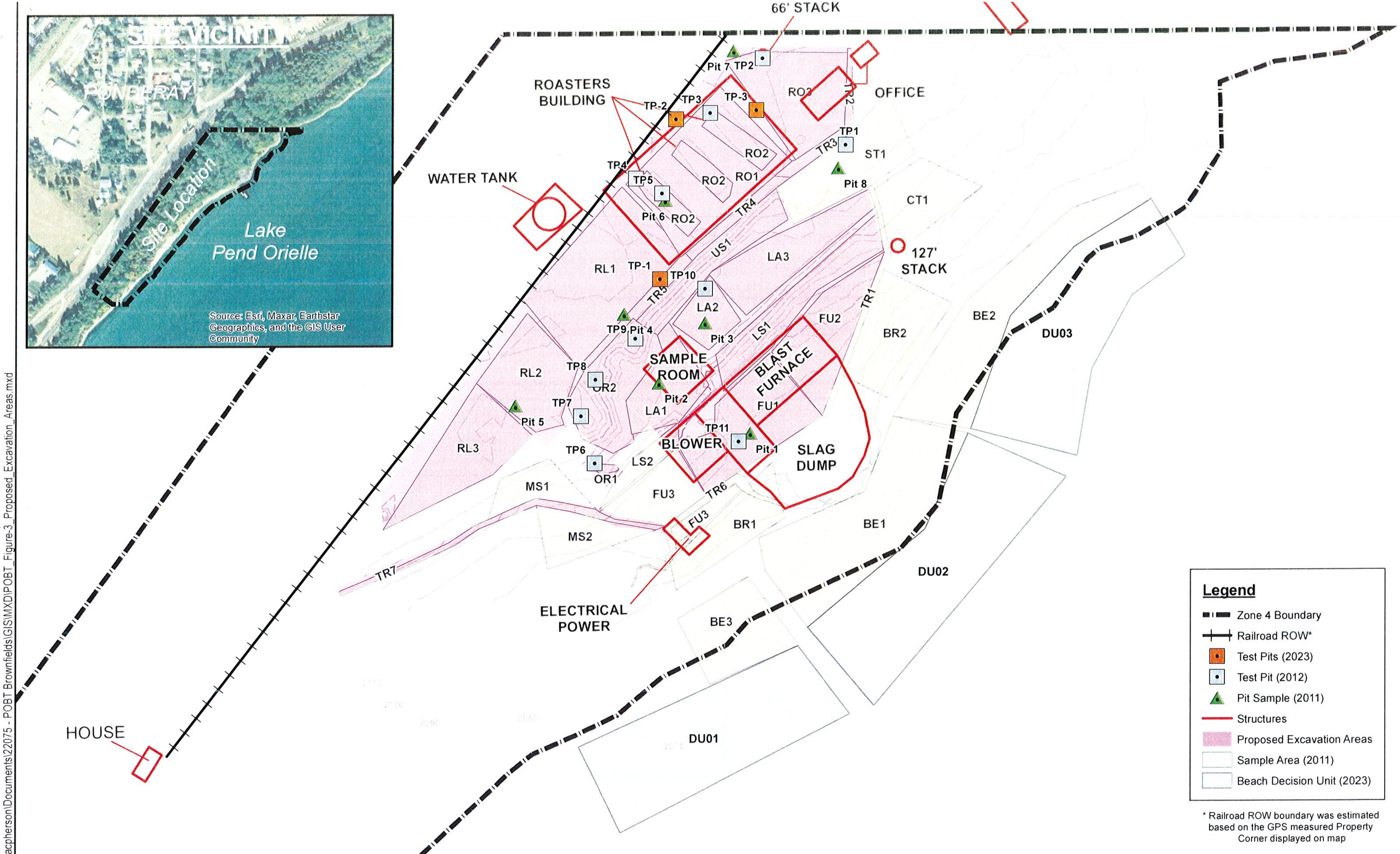

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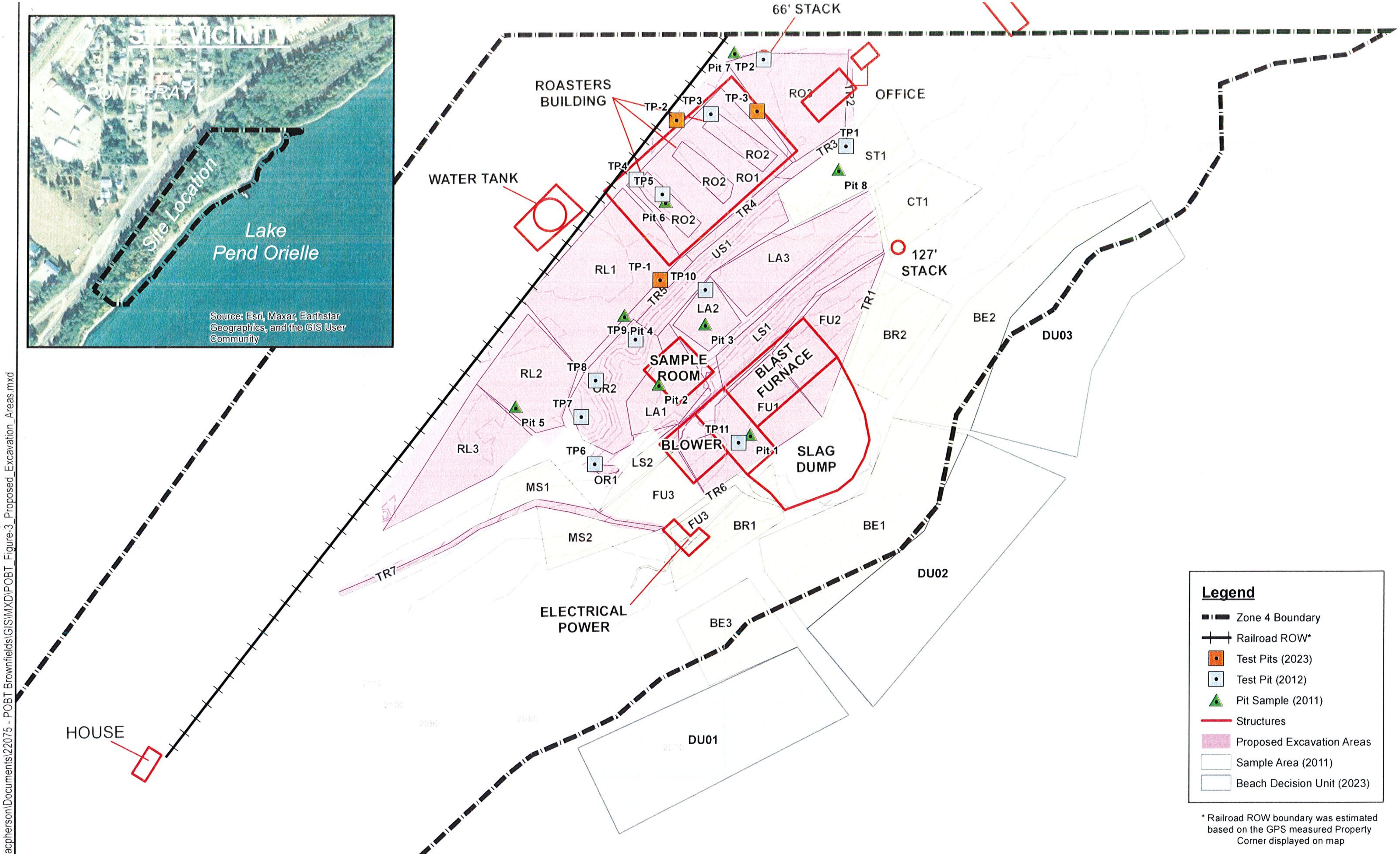
Alta Science & Engineering, Inc.

File: GIS/POBT_Figure-3_Proposed_Excavation_Areas.mxd	Requestor: City of Ponderay	Project Name: City of Ponderay Brownfields Project Ponderay, ID	**Figure 3 Proposed Excavation Areas**	This map was produced using information obtained from several different sources that have not been independently verified. These sources have also not provided information on the precision and accuracy of the data. Information on this map is not a substitute for survey data.	1 inch = 70 feet; 0, 70, 140 Feet	N
Print Date: July 12, 2023	Project Manager: Derek Forseth					
Project Number: 22075	Cartographer: S. Morosky/C. MacPherson					



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Alta Science & Engineering, Inc.

File: GIS/POBT_Figure-3_Proposed_Excavation_Areas.mxd	Requestor: City of Ponderay	Project Name: City of Ponderay Brownfields Project Ponderay, ID	Figure 3 Proposed Excavation Areas	This map was produced using information obtained from several different sources that have not been independently verified. These sources have also not provided information on the precision and accuracy of the data. Information on this map is not a substitute for survey data.
Print Date: July 12 2023	Project Manager: Derek Forseth			
Project Number: 22075	Cartographer: S Morosky/C MacPherson			

1 inch = 70 feet

0 70 140 Feet

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Appendix A
Alternatives Cost Estimates

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ENGINEER'S OPINION OF PROBABLE COST-Alternative 3 - Onsite Repository with Black Rock Encapsulation

Alternative Summery:

Excavate hazardous materials with Pb concentrations > 2,500 mg/kg in designated. Consolidate and impound hazardous materials in an onsite repository. Repository configuration assumes excavation of footprint to 6-FT depth and replace with hazardous materials. No excavation in roaster area. Clean excavated materials would be used for repository cap and regraded in other disturbed areas to reclaim site. Reclaimed scarified surfaces would be vegetated and stabilized. This alternative includes construction of 14 ft wide gravel access road from the south. This cost estimate assumes encapsulating top of Black Rock slag pile.

Project Name:	Ponderay Brownfield
Project #:	22148
Type of Estimate:	Planning Level
Prepared by:	Felicia Cassidy
Reviewed by:	Derek Forseth

Ref No.	Description	2022 Notes	Est. Quantity[1]	Unit	Unit Price[2]	Item Total
Mobilization/Demobilization						
1	Mobilize/Demobilize including laydown area	10% of Construction Total	1	EA	$ 167,753.62	$ 167,753.62
2	Railroad Crossing for Site Access	Assumed unit rates	1	EA	$ 25,000.00	$ 25,000.00
Site Controls						
3	BMP's (Straw wattles, silt fencing, etc.)	Assumed unit rates	1	LS	$ 60,000.00	$ 60,000.00
4	Traffic Flagger	ITD Previous 3 Year D1	160	HR	$ 55.00	$ 8,800.00
5	Temporary Traffic Signs 30" x 30" Reflective	ITD Previous 3 Year D1	200	SF	$ 14.50	$ 2,900.00
6	Turbidity Curtain	Paramount materials website	300	LF	$ 24.00	$ 7,200.00
7	Install and Maintain Turbidity Curtain	Assumed unit rates	1	LS	$ 5,000.00	$ 5,000.00
8	Temporary Berm	ITD Previous 3 Year D1	200	CY	$ 57.48	$ 11,496.00
9	Dewatering Pumping	Assumed unit rates	20	DAY	$ 500.00	$ 10,000.00
Access Road Improvement						
10	Base course, 3/4" Agg Base	ITD Previous 3 Year D1	4,212	TON	$ 53.79	$ 226,563.48
11	30" CMP Culverts	ITD Previous 3 Year D1, 24" Culvert	105	FT	$ 82.05	$ 8,615.25
Temporary Haul Road						
12	Clear, Grub, Cut, Chip and remove stumps	Assumed unit rates	0.3	AC	$ 15,000.00	$ 4,387.05
13	Base course, 3/4" Agg Base	ITD Previous 3 Year D1	420	TON	$ 53.79	$ 22,591.80
Repository Construction						
14	Clear, Grub, Cut, Chip and remove stumps	Assumed unit rates	0.7	AC	$ 15,000.00	$ 10,206.61
15	Excavate and Stockpile	ITD Previous 3 Year D1	2,650	CY	$ 31.87	$ 84,455.50
16	Geotextile (8oz non-woven)	ITD Previous 3 Year D1	5,000	SY	$ 3.21	$ 16,050.00
17	Clean Gravel Drainage Layer	Assumed unit rates	650	CY	$ 50.00	$ 32,500.00
Hazardous Waste Removal and Disposal in Repository						
18	Clear, Grub, Cut, Chip and remove stumps	Assumed unit rates	1.0	AC	$ 15,000.00	$ 15,000.00
19	Excavate and Place in Repository	ITD Previous 3 Year D1	2,570	CY	$ 31.87	$ 81,905.90
Breakwater and Beach Remediation						
20	Site prep	ITD Previous 3 Year D1	100	CY	$ 31.87	$ 3,187.00
21	Install Wave Protection Rock Wall	Assumed Unit Rates	1,500	CY	$ 175.00	$ 262,500.00
22	Slag screening, consolidation, grade sands	Assumed unit rates	175	CY	$ 50.00	$ 8,750.00
Concrete Deck and Slope Stabilization - Black Rock						
23	Base course, 2.5" minus crushed	ITD Previous 3 Year D1	10	CY	$ 55.13	$ 537.10
24	Concrete Slab, 4", dyed charcoal	ITD Previous 3 Year D1	44	CY	$ 1,125.00	$ 49,325.63
25	Metal Reinforcement, Slab	ITD Previous 3 Year D1	6,577	LBS	$ 1.89	$ 12,430.06
26	Metal Railing	Book value	125	LF	$ 25.00	$ 3,125.00
27						
Repository Cover						
28	GSE Bentoliner NSL GCL	Past Project Experience	29,700	SF	$ 0.60	$ 17,820.00

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29	GCL Install and CQA	Past Project Experience	29,700	SF	$ 0.30	$ 8,910.00
30	Place and Compact 2 FT Clean Soil Barrier	ITD Previous 3 Year D1, granular borrow	2,200	CY	$ 38.52	$ 84,744.00
31	Topsoil	ITD Previous 3 Year D1	3,630	SY	$ 4.80	$ 17,424.00
32	Seed Bed Preparation	ITD Previous 3 Year D1	0.80	AC	$ 6,300.00	$ 5,040.00
33	Seeding	ITD Previous 3 Year D1	0.80	AC	$ 3,750.00	$ 3,000.00
34	Mulching	ITD Previous 3 Year D1	0.80	AC	$ 6,900.00	$ 5,520.00
35	Fertilizing	ITD Previous 3 Year D1	0.80	AC	$ 1,300.00	$ 1,040.00
Site Reclamation						
36	Place and Compact 1 FT Clean Soil Barrier	ITD Previous 3 Year D1	2,570	CY	$ 38.52	$ 98,996.40
37	Base course 3/4" Agg Base	ITD Previous 3 Year D1	250	TON	$ 53.79	$ 13,447.50
38	Geotextile (8oz non-woven)	ITD Previous 3 Year D1	3,950	SY	$ 3.21	$ 12,679.50
39	Topsoil	ITD Previous 3 Year D1	5,808	SY	$ 4.80	$ 27,878.40
40	Seed Bed Preparation	ITD Previous 3 Year D1	1.2	AC	$ 6,300.00	$ 7,560.00
41	Seeding	ITD Previous 3 Year D1	1.2	AC	$ 3,750.00	$ 4,500.00
42	Mulching	ITD Previous 3 Year D1	1.2	AC	$ 6,900.00	$ 8,280.00
43	Fertilizing	ITD Previous 3 Year D1	1.2	AC	$ 1,300.00	$ 1,560.00
44	Native Shrubs and Trees, Seedlings Installed	Based on assumed unit rates	300	EA	$ 250.00	$ 75,000.00
Miscellaneous						
45	Property Fence	Assumed unit rates	1,060	LF	$ 60.00	$ 63,600.00
46	Sign and post	Assumed unit rates	6	EA	$ 500.00	$ 3,000.00
47	As-Built Survey	Assumed unit rates	1	LS	$ 25,000.00	$ 25,000.00
48	Overview Fence	Assumed unit rates	175	LF	$ 75.00	$ 13,125.00
Construction Oversight and Review						
49	Sr. Professional Engineer	Assumed unit rates	288	HR	$ 195.00	$ 56,160.00
50	Onsite Inspector/Project Representative	Assumed unit rates	800	HR	$ 130.00	$ 104,000.00
51	Reimbursable Costs	Assumed unit rates	84	DAY	$ 350.00	$ 29,400.00
			Construction Subtotal			**$ 1,845,290**
Engineering Design & Brownfields Closure Reporting						
54	Construction Drawings, Specifications, Bid, SWPPP	Assumed unit rates	1	LS	$ 225,000.00	$ 225,000.00
55	Certified Record Drawings	Assumed unit rates	1	LS	$ 15,000.00	$ 15,000.00
56	Brownfield Cleanup Completion Report	Assumed unit rates	1	LS	$ 12,000.00	$ 12,000.00
57	Conformation sampling and Reporting	Assumed unit rates	1	LS	$ 20,000.00	$ 20,000.00
					Total:	**$ 2,117,290**
			Contingent Total (+50%):			**$ 3,175,935**

Units:

AC	Acre	LF	Linear foot
CY	Cubic yard	SF	Square feet
SY	Square yard	EA	Each
LS	Lump sum	DAY	Day
TON	Ton	HR	Hour

Notes:

[1]Quantities were estimated using AutoCAD Civil 3D and known site information for Zone 4 of the POBT.

[2]Unit rates determined using recent bids for similar work available at the time of estimating, and engineer's knowledge of similar work