

**FINAL
Engineering Evaluation and
Cost Analysis
Josephine Mill No. 1
CERCLIS ID No. WAN001002401
Metaline Falls, Washington**

**027-30179-00
March 2010**

Prepared for
Stimson Lumber Company

Portland, Oregon 97201

Prepared by
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March 10, 2010

027-30179-00

Mr. Robert S. Whittier Jr.
United States Environmental Protection Agency, Region 10
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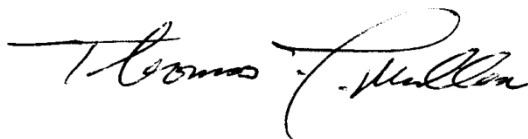
Subject: Final Engineering Evaluation and Cost Analysis (EE/CA) for the Josephine Mill No. 1,
CERCLIS ID No. WAN001002401, Metaline Falls, Washington

Dear Mr. Whittier:

LFR an ARCADIS Company is pleased to provide this Final Engineering Evaluation and Cost Analysis (EE/CA) for the Josephine Mill No. 1, CERCLIS ID No. WAN001002401, Metaline Falls, Washington. This final EE/CA incorporates responses to EPA comments dated February 12, 2010. With regard to your first comment, we are not aware of the "signs" you reference, so we have modified the language consistent with our understanding. With regard to your comment 4, it is our understanding that lead, zinc, and cadmium are the only contaminants being carried forward for EE/CA analysis.

If you have any questions, please feel free to call either of the undersigned at (509) 535-7225.

Sincerely,



Thomas F. Mullen, LEG
Senior Geologist



Paula A. Lyon, LG
Senior Geologist

Enclosure

cc: Mr. Steven Petrin, Stimson Lumber Company
Mr. Max Miller, Tonkon & Torp
Mr. Earl Liverman, EPA
Mr. Richard Mednick, EPA

March 10, 2010

027-30179-00

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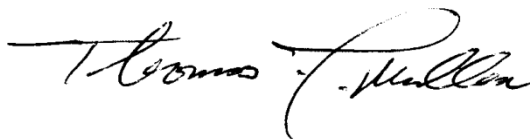
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CERCLIS ID No. WAN001002401, Metaline Falls, Washington

Dear Mr. Petrin:

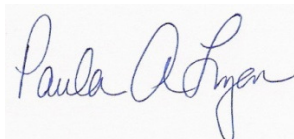
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CERTIFICATION

All information, conclusions, and recommendations in this document were prepared under the supervision of and reviewed by an LFR Inc. Washington Licensed Engineering Geologist.

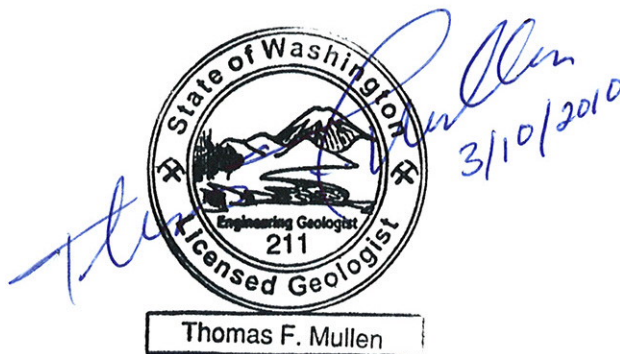
3/10/2010

Thomas F. Mullen

Date

Senior Geologist

Washington Licensed Engineering Geologist No. 211



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ACRONYMS AND ABBREVIATIONS

amsl	above mean sea level
AOC	Administrative Order of Consent
ARARs	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
BMPs	Best Management Practices
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CGS	Coordinate Grid System
COCs	Constituents of Concern / Chemicals of Concern
COPCs	Constituents of Potential Concern
cy	cubic yard(s)
°F	degrees Fahrenheit
Ecology	Washington State Department of Ecology
E&E	Ecology and Environment, Inc.
EE/CA	Engineering Evaluation/Cost Analysis
EPA	U.S. Environmental Protection Agency
fbg	feet below grade
FPXRF	Field Portable X-ray Fluorescence
µg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MTCA	Model Toxic Control Act
NCP	National Contingency Plan
ppm	parts per million
PA/SI	Preliminary Assessment/Site Inspection
PRSC	Post Removal Site Control
QAPP	Quality Assurance Project Plan
RA	Removal Action
RAOs	Removal Action Objectives
SAP	Sampling and Analysis Plan
Site	Josephine Mill No. 1

SOPs	Standard Operating Procedures
T&E	Threatened and Endangered
TBCs	To-be-Considered Materials
TCLP	Toxicity Characteristic Leaching Procedure
TP	Test pits
USDA	United States Department of Agriculture
USFWS	U.S. Fish and Wildlife
WDFW	Washington Department of Fish and Wildlife
XRF	X-ray Fluorescence

EXECUTIVE SUMMARY

This Engineering Evaluation/Cost Analysis (EE/CA) addresses soil contamination identified at the Josephine Mill No. 1 Site (the “Site”), Pend Oreille County, Washington. The purpose of the EE/CA is to summarize the nature and extent of contamination associated with the site, and to evaluate alternatives for the purpose of selecting an appropriate response action to address such contamination.

The removal action described in this EE/CA will be conducted pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA). This EE/CA has been prepared in accordance with and in a manner consistent with the National Contingency Plan (NCP) and the U.S. Environmental Protection Agency’s (EPA) the *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (EPA, 1993).

This EE/CA was prepared by Stimson Lumber Company as ordered by the United States Environmental Protection Agency (EPA). Idaho Forest Industries, LLC (IFI) also contributed to the work presented in Sections 2.10 and 2.11 of this EE/CA.

The Josephine Mill No. 1 is an inactive mill located in northeast Washington, approximately 1.5 miles northwest of Metaline Falls, Pend Oreille County, Washington. The mill was one of two mills that supported operations at the Josephine Mine. The Site consists of approximately 5.3 acres of land that contains a partially forested steep rock slope with remnant wood and concrete mill structures, tailings and waste rock piles, and miscellaneous metal. Processing at the mill ended in the mid 1930’s and the mill has generally been abandoned since that time.

The goal of this EE/CA is to effectively address the mine-waste-contamination associated with former mining and milling activities in soil at the Site, and to reduce the potential for this affected media to act as a source to surface water and ground water, in a manner that is protective of human health and the environment and to attain applicable or relevant and appropriate requirements (ARARs) to the extent practicable considering the exigencies of the situation and the scope of the removal.

The Site characterization information, and identification and analyses of removal action alternatives presented in this EE/CA are based both on the findings or previous investigations and reports conducted at the Site performed by others and the site-specific investigations performed by the Respondents.

Based on the potential human health and ecological risks identified for the Site, the following removal action objectives (RAOs) are identified for the Site:

Human Receptors

- Prevent human exposure to contaminated soil containing hazardous substances at concentrations that exceed the 250 mg/kg lead action level established for the Site by EPA, and

- Reduce loadings of hazardous substances to surface water so that loadings do not cause exceedances of surface water Applicable or Relevant and Appropriate Requirements (ARARs).

Ecological Receptors

- Reduce ecological exposures to contaminated soil containing hazardous substances at concentrations that exceed the 250 mg/kg lead action level established for the site by EPA, and
- Reduce loadings of hazardous substances to sediment and surface water so that loadings do not cause exceedances of ARARs.

In accordance with the EE/CA Guidance, several removal action alternatives were identified for consideration within the EE/CA. The categories considered were:

- No Action;
- Institutional Controls;
- Consolidation;
- Containment; and
- Excavation.

The potential alternatives were subsequently evaluated and screened with respect to implementability, effectiveness, and cost. The following removal action categories survived the initial screening and were retained for further evaluation:

Alternative 1 - No Action;

Alternative 2 - Institutional Controls;

Alternative 3 - Institutional Controls, Excavation, and On-Site Consolidation and Containment; and

Alternative 4 - Excavation and Off-Site Disposal.

Based on the findings of the individual and comparative analyses, Alternative 3 is the recommended removal action. Alternative 3 consists of:

Institutional controls (ICs) prohibit activities that may interfere with a cleanup action, maintenance and repair, and monitoring, or that may result in the release of a hazardous substance that was contained as part of the removal action.

In addition to ICs, the excavation of mine-waste-contaminated materials with on-site consolidation and containment beneath a protective barrier would minimize the potential for human health and ecological exposure. Further, the protective barrier would minimize erosion of waste beneath the barrier.

Best Management Practices (BMPs) would be implemented during construction to protect workers, the community, and the environment from short-term construction impacts such as erosion, fugitive dust, and other similar potential impacts.

A long-term monitoring program would be implemented to ensure the continuing effectiveness of the removal action. As part of a long-term monitoring program, annual or episodic inspections of the protective barrier placed over the consolidation area, as well as existing drainage systems would be evaluated for functionality, and inspected to ensure that the Constituents of Concern (COCs) remain adequately contained.

1 INTRODUCTION

This Engineering Evaluation/Cost Analysis (EE/CA) addresses contamination identified at the Josephine Mill No. 1 Site (Site), Pend Oreille County, Washington (Figure 1). The Site consists of approximately 5.3 acres of land that contains a partially forested steep rock slope with remnant wood and concrete mill structures north of an unpaved access road, tailings and waste rock piles, and miscellaneous metal debris south of the access road on the north bank of Flume Creek (Figure 2).

The response action described in this EE/CA will be conducted pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). This EE/CA has been prepared in accordance with and in a manner consistent with the National Contingency Plan (NCP) and the U.S. Environmental Protection Agency's (EPA) the *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (EPA, August 1993).

The Site characterization information, and identification and analyses of removal action alternatives presented in this EE/CA are based both on the findings or previous investigations and reports conducted at the Site performed by others and the site-specific investigation performed by the Respondents.

2 SITE CHARACTERIZATION

This section of the EE/CA provides general information regarding the Site including the location, type of former operations conducted at the Site, and a synopsis of the Site history. The geography and topography of the area are described along with descriptions of the regional geology and soils, adjacent land use, population near the Site, meteorology, and sensitive ecosystems. Information related to the source, nature, and extent of contamination associated with the Site is presented, including analytical data from sampling efforts to characterize conditions associated with the Site. Finally, the streamlined risk evaluation provides an overall characterization of the potential impacts to human health and the environment associated with mine waste found at the Site, and to provide a basis for evaluating whether response actions recommended in this EE/CA protect human health and the environment.

2.1 Site Location

The Site is located in northeast Washington, approximately 1.5 miles northwest of Metaline Falls (Figure 1) in the southwest half (SW $\frac{1}{2}$) of Section 16, Township 39N, Range 43 W, Willamette Meridian, Pend Oreille County, Washington. The Sites approximate geographic coordinates are Latitude 48°52'29.99" N, Longitude 117° 22'50.77 W. The Site is accessed by Pend Oreille County Highway 2975 (also referred to as the Boundary Dam Road) and the unpaved Old Pend Oreille Mine Road. Site access to the public is limited by a locked gate which does not necessarily prevent the potential for trespassers and recreational users to gain unauthorized entry to the Site.

The Old Pend Oreille Mine Road divides the Site into the upper portion and lower portion of the Site (Figure 2). The Site is bounded to the southeast by Flume Creek, which flows to the north-northeast and discharges into the Pend Oreille River. The New Josephine Mill No. 2 and Josephine Mine are located farther to the north and northeast of the Site on the western side of the Pend Oreille River.

2.2 Type of Facility and Operational Status

The Site is one of three properties associated with the Josephine Mine; the other two are located nearby on Bureau of Land Management (BLM) property. The Josephine Mine has also been historically referred to as the “Clark Mine” or “Hortense Mine.” The Josephine Mine was a cadmium, lead, silver, and zinc mine that reportedly operated from approximately 1909 to 1955. The Josephine Mill No. 1 and the Josephine Mill No. 2 were the two mills that supported operations at the Josephine Mine. The Josephine Mill No. 1 reportedly began operations in about 1907. Operations at the Josephine Mill No. 1 were curtailed in the mid 1930’s when milling operations were conducted at the newly constructed Josephine Mill No. 2 located off-site. Operations at the Josephine Mill No. 1 ceased in about 1936.

The Site was owned by the Lead-Zinc Company until approximately 1928, by Metaline Falls Lead and Zinc from approximately 1928-1931, by Metaline Metals from approximately 1931-1945, by Metaline Contact Mines from approximately 1945-1952, by the Bunker Hill Company from approximately 1962-1982, and by Bunker Hill Limited Partnership from approximately 1982-1992.

IFI purchased the real property at the Site from Bunker Hill Limited Partnership in 1992 for the purpose of forest products management. Stimson acquired the surface rights to the Site from IFI in October, 2000 as part of the purchase of about 90,000 acres of timberland from IFI. Based on the presently available information, it appears that neither Stimson nor IFI have performed any mining or mill-related activities at the Site, nor any active timber harvesting or forest management-related activities during their respective periods of ownership.

2.3 Geologic Setting

2.3.1 Geology

The Site lies within the Kootenay Arc sub-province, and the geology as mapped throughout most of this region consists of predominantly Quaternary, Cretaceous, early Paleozoic (Cambrian through Devonian), and Precambrian-aged formations (Yates et al. 1966). The majority of the Cretaceous and Paleozoic formations are covered by the Quaternary units consisting of recent alluvium, and lake deposits, glaciofluvial deposits and glacial till of Pleistocene age. Cretaceous formations typically consist of granodiorite and quartz monzonite associated with the Kaniksu Batholith. Precambrian and Paleozoic formations typically consist of metasedimentary rocks, quartzites, limestone, hydrothermally altered limestones, silicified or crystalline dolostones, and

argillites. These formations are irregularly dispersed throughout the region over hundreds of square miles.

The structural history of the sub-province is complex with several periods of folding and faulting. The internal structure of the Kootenay Arc is generally characterized by northeasterly-southwesterly trending folds and thrust faults (Yates et al. 1966). Superimposed on these structures are high-angle normal faults with northeast and north trends (Dings and Whitebread 1965; Yates et al. 1966).

The general vicinity of the Site is composed of the Metaline Limestone of Middle Cambrian age, which consists predominantly of carbonaceous limestone and dolomite (Park et al. 1943). The distinctive feature of the Metaline Limestone in the vicinity of the Site west of the Pend Oreille River is the strongly fractured and irregularly silicified dolomite and dolomite breccia (USGS 1965). The steep walls exposed along Flume Creek are composed of both limestone and dolomite. Slightly farther to the east of the Site, the Metaline Limestone is overlain by the Ledbetter Slate of Early and Middle Ordovician age. More recent Quaternary age lake deposits (Qld) are exposed along the base of the steep Metaline limestone rock faces and make up the more gentle sloping areas along Flume Creek.

Irregular ore deposits of sphalerite (zinc sulfide, ZnFeS) and galena (lead sulfide, PbS) occur in the Metaline Mining District, primarily as mineralized replacement deposits within the upper contact of the Metaline Limestone Formation. At the Josephine Mine, ore occurs in the Josephine horizon, a carbonaceous and locally siliceous breccia within the upper portion of the Metaline Formation beneath the Ledbetter Slate (Derkey et al. 1990). Mineralized rock is typically medium to moderately dark gray, massive, and faintly to strongly brecciated (USGS 1965). The northeast to southwest trending Flume Creek Fault, a vertical fault is present approximately 1 mile west of the Site.

2.3.2 Soils

The site surficial soils consist of an accumulation of waste rock and tailings derived from historical mining operations. According to the USDA Soil Survey provided at <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>, the underlying soils at the Site are classified as Belzar, high precipitation – Rock Outcrops. The forested portions flanking the northeastern portion of the Site are classified as Dufort silt loam of one to 15 percent slopes; and the western portion classified as the Martella silt loam of 15 to 25 percent slopes. Soils along Flume Creek are generally classified as Typical Xerothents of 30 to 65 percent slopes.

2.3.3 Hydrogeology

Groundwater generally occurs in the Metaline Mining District in a shallow, unconfined system with a steep hydraulic gradient (E&E, 2003). Primary recharge sources to this groundwater system include infiltration of precipitation and snowmelt, recharge from streams, and potential contribution from bedrock sources (E&E, 2003). Ephemeral groundwater within the surficial deposits present on the hillsides is expected to drain

relatively quickly to the tributary valley groundwater system in and along Flume Creek. Discharge from the tributary valley system primarily enters the shallow alluvial deposits of the Pend Oreille River Valley (E&E, 2003). The expected general flow direction of the regional aquifer in this area is to the east-southeast towards the Pend Oreille River.

Actual depth to groundwater at the Site is not known; therefore, the local and regional geologic conditions described herein are based solely on available literature regarding the area. A search of the Washington Department of Ecology (Ecology) well search database for Township 39 North, Range 43 East, Sections 9, 10, 15, 16, 17, 20, 21, and 22 was conducted. No well log records are on file for Section 16. The nearest well (domestic) is located approximately 0.5-mile southwest of the Site in the southwest quarter (SW ¼) of the northwest quarter (NW ¼) of Section 21 and is registered to Harry Bright, completed on September 1, 1992. As presented on the well log, the well is screened from 160 feet to 340 feet below ground surface (bgs) in grey and black limestone. The static water level was recorded at 180 feet bgs at the time of installation.

2.4 Hydrology

Flume Creek, a tributary to the Pend Oreille River, enters the Site from the northwest as it flows to the southeast. The segment of Flume Creek immediately adjacent to the Site is classified as a Type B2 Stream according to Rosgen, 1984. The substrate consists of cobble and/or bedrock materials with little to no fines observed and is a moderately confined stream channel. Bankfull width at the Site is relatively narrow and estimated at less than 15 feet. Upgradient from the Site, Flume Creek is of a lower gradient as it flows through a wetland complex, then transitions from low gradient to a steeper gradient as it moves across the Site. As it flows downgradient of the Site Flume Creek passes through a series of bedrock cascades and falls and ultimately discharges to the mouth of the Pend Oreille River at Dead Man's Eddy approximately 0.5- mile downstream. Flume Creek is expected to have high flows during periods of spring runoff, but low flows during the remainder of the year. Flume Creek is located in Water Resource Inventory Area (WRIA) 62 and is not listed on the 2009 U.S. Clean Water Act 303(d) list of impaired water bodies (Ecology, 2008).

2.5 Surrounding Land Use and Populations

Previous reports by E&E and LFR identified that the surrounding land uses include forestry, livestock grazing, mining, and localized agriculture. Federally-owned adjacent property affords access to the public for recreational opportunities. The BLM owns the land adjacent to the Site, which includes both the former New Josephine Mill No. 2 and the Josephine Mine.

There is a single-family residence located within one-half mile of the Site. The nearest residential communities are Metaline Falls and Metaline located approximately 0.9 miles southeast and 1.8 miles southwest of the Site, respectively (Figure 1).

Pend Oreille County has a population of approximately 12,859 and the population density in non-urban areas is approximately 9.2 persons per square mile.

2.6 Sensitive Ecosystems

Concurrent to the development of this EE/CA, a Biological Assessment (BA) has been performed to evaluate the potential effects of Site Removal Action(s) under consideration. The characterization of sensitive ecosystems at the Site included a review of published information on the biological resources of the area and the completion of a field inspection and evaluation of the Site by a qualified wildlife biologist, Inland Northwest Resources, LLC (Inland), in accordance with the requirements of Section 7 of the Endangered Species Act (ESA). This initial findings of the draft BA indicate that according to the Upper Columbia USFWS Office (USFWS, 2009), the threatened and endangered (T&E) species that could be present in the vicinity of the Site include the threatened Canada Lynx (*Lynx Canadensis*), Grizzly Bear (*Ursus arctos horribilis*), and Bull Trout (*Salvelinus confluentus*). The final BA will be completed following selection of the Site removal action by EPA.

2.7 Climate

The climate of the Metaline Falls, Washington area is relatively mild with four well-defined seasons. According to data obtained from the National Weather Service Metaline Experimental Station (455317) for the period from December 1, 1900, to May 31, 1965, the average maximum temperatures recorded for the Metaline Falls area during the summer months (June to August) range from 74.4 to 82.3 degrees Fahrenheit (°F); and during the winter months (January to March) range from 29.9 to 46.9 °F. Average total precipitation is 27.38 inches. Average snowfall is 85.2 inches.

2.8 Previous Removal Actions

According to EPA and Ecology files, there have been no previous government or private removal actions conducted at the Site. Neither Stimson nor IFI have knowledge of any previous removal actions conducted at the Site following closure of the milling operations.

2.9 Previous Investigations

According to IFI representatives, IFI conducted one or more Environmental Site Assessments prior to its purchase of the property from Bunker Hill Limited Partnership in 1992, but IFI is unable to locate reports of such assessments. In July 2002, EPA and BLM conducted a visual inspection of the Site and surrounding environment (E&E, 2002). The inspection included soil screening using field-portable x-ray fluorescence (FPXRF) instrument at four potential source locations including a tailings pile and a waste rock pile. The screening concentrations of lead in soil exceeded the Washington State Department of Ecology (Ecology) Model Toxics Control Act (MTCA) Method A

soil cleanup level for lead for Unrestricted Land Uses of 250 milligram per kilogram (mg/kg).

In March 2003, EPA conducted a Preliminary Assessment using readily available information, and concluded that the Site is a potential source of hazardous substance releases and warrants further investigation under CERCLA or other statutes (E&E, 2003).

In May 2003, EPA and BLM conducted a Removal Assessment to determine the potential for off-site contamination migration and to determine if the Site warrants a CERCLA removal action (E&E, 2003). The laboratory result for lead for one soil sample (593 mg/kg) and FPXRF screening concentrations for lead for two soil samples collected at the Site exceeded the MTCA Method A soil cleanup level for lead for Unrestricted Land Uses.

LFR performed a Site Investigation (SI) in October 2008, to delineate the extent and volume of mill tailings and waste rock accumulated at the Site. The findings from the Final SI report indicated an estimated 12,000 cubic yards of elevated lead, zinc and cadmium concentrations present in tailings and waste rock exceeding state regulatory thresholds (MTCA Method A) for unrestricted land use. (LFR, 2010)

Both the previous EPA E&E Reports and the LFR SI report noted the presence of remnant structures from the former mill operations including remnant concrete foundations and footings, miscellaneous subsurface wood debris, and a wooden ore storage bin located on the northern portion of the Site. In the lower portion of the Site a wooden remnant structure is present and appears to have been associated with the wooden flume from the mill. The remaining portion of the wooden structure is covered with tailings materials; the uppermost portion was partially exposed. A subsurface wooden crib was encountered during the test pit field investigation activities (See Figures 3 and 4). Based upon the placement of the wooden cribbing at the Site, it appears to have functioned as a barrier to contain mill tailings from the riparian zone along Flume Creek.

A Cultural Resources Evaluation (CRE) for the Site was performed in the Fall of 2009 Site by Archeological and Historical Services (AHS) of Eastern Washington University (EWU). The report dated January 2010 evaluated the area of potential effects (APE) to cover less than two acres of the five-acre Site. The findings of the report indicate that the Josephine Mill No. 1 Site is within an eligible historic district as determined by the Washington Department of Archaeology and Historic Preservation (DAPH) and is identified as "The Josephine Mine Historic Mining District [DT216]". However, there is some misinterpretation as to the contribution of the Josephine Mill No. 1 features as being included within this particular district due to its location and nomenclature designations over time. The Josephine Mine Historic Mining District [DT216] has been determined to be eligible by the Washington DAPH, but is not yet listed on the National Register of Historic Places (NRHP).

The CRE report concluded no findings with respect to any traditional cultural or prehistoric resources present at or within the Site. The findings of the CRE for the Site identified 10 individual cultural resources as a result of the survey which included remnant mill structures, concrete foundations and trash dumps. The findings concluded that removal activities will likely adversely affect three of the ten features identified, namely the collapsed wooden structure, the trash dump site and the wood crib feature located in the lower portion of the Site.

2.10 Source, Nature and Extent of Contamination

In October 2008, LFR, Inc. completed field sampling for a SI at the Site. The scope and objectives of the SI were defined in the EPA approved SI Work Plan and Field Sampling Plan (LFR, 2008). Procedures used during the SI were in accordance with Standard Operating Procedures (SOPs) developed for the project. The SOPs for the SI were discussed in the Quality Assurance Project Plan (QAPP), which was a part of the SAP.

This section describes the investigations that were conducted at the Site by LFR to collect information and data to define the nature and extent of any contamination at the Site, to conduct the streamlined risk evaluations, and to develop and evaluate alternatives to address any identified unacceptable risks to human health and the environment.

A Site walkover was conducted by LFR prior to the start of the field investigation in areas at the Site described in the SAP for which visual inspections were proposed. This walkover was completed so the sampling locations could be chosen to represent depositional areas, prevailing wind direction, and actual Site conditions at the time of the investigation.

2.10.1 Constituents of Potential Concern

The constituents of potential concern (COPCs) for the various source materials and potentially affected media at the Site were defined in the EPA approved SI Work Plan. The selection of COPCs was based on historical site activities and the analytical results from prior investigations.

The data collected as part of the SI were compared to screening values to determine which COPCs needed to be considered in the streamlined risk evaluation. The screening values used for the SI were compared to the following sources:

- Natural Background Soil Metals Concentrations in Washington State (Ecology, 1994);
- Model Toxics Control Act (MTCA) cleanup values for human health (WAC 173-340-700);

- USEPA Ecological Soil Screening Level (EC0-SSLs) and MTCA Table 749-3 soil concentrations for plants and animals (WAC 173-340-7493);
- Washington State Ambient Water Quality Criteria (WAC173-201A);
- Federal National Recommended Water Quality Criteria (USEPA, 2009) ; and
- NOAA Squirt Table (USEPA, 2003) Threshold Effects Level (NOAA, 1999) for aquatic life.

The specific regulatory criteria that were used to screen the investigative data are presented in Tables 4 and 5.

2.10.2 Site Characterization

The primary source materials at the Site are from the milling of lead and zinc ores, resulting in accumulations of waste rock, mine tailings, and possibly concentrates. Small accumulations of ore and tailings are present north of the unpaved roadway in the central portion of the Site; some tailings and crushed ore are mixed with the crushed rock of the unpaved roadbed; and tailings and waste rock piles and miscellaneous metal debris are present south of the roadway.

The Site was separated into three discrete soil sampling areas - mill tailings in the vicinity of the former mill structures in the upper portion of the Site; old Pend Oreille Mine Road right-of-way (ROW); and mill tailings and waste rock piles in the lower portion of the Site. In addition, sediment and surface water samples were collected from Flume Creek. This section discusses the investigation at these areas. The investigation results for lead and zinc only are summarized below. Sampling procedures and methodologies were conducted as specified in the EPA-approved SIWP dated October 3, 2008 and the Final SI report dated January 15, 2010. The Final SI report concluded that the mine waste containing elevated COPC metals (cadmium, lead and zinc) were distributed within an areal extent of less than two acres at the Site.

2.10.2.1 Mill Tailings (Lower Portion of the Site)

Fifteen test pits (T1 through T15) and three hand-augured borings were constructed in the mill tailings, and 18 analytical composite samples were collected (Figure 3). The FPXRF readings (reported as ppm) were collected at depths ranging from the above-grade surface of the mill tailings to 11 feet below the above-grade surface (Table 1). Lead concentrations ranged from less than the limit of detection (LOD) to 39,101 ppm and zinc concentrations ranged from less than the LOD to 223,945 ppm. The analytical results for composite samples collected from the test pits and one boring showed lead ranging from 485 mg/kg to 67,000 mg/kg and zinc ranging from 36,900 mg/kg to 162,000 mg/kg as presented in Table 2.

2.10.2.2 Old Pend Oreille Mine Road ROW

Five test pits (ROW 1A, ROW 1B, ROW 1C, ROW 1D, ROW 1E) were constructed in the Old Pend Oreille Mine Road ROW and one analytical composite sample was collected (Figure 3). The FPXRF readings were collected at depths ranging from 6 to 22 inches below ground surface (Table 1). Lead concentrations ranged from 29.82 ppm to 2,734.67 ppm and zinc concentrations ranged from 367.32 ppm to 9,305.28 ppm. The analytical results for a composite sample collected from the test pits in the ROW showed lead at 1,790 mg/kg and zinc at 13,200 mg/kg as presented in Table 2.

2.10.2.3 Remnant or Former Mill Structures (Upper Portion of the Site)

Four test pits were constructed in the vicinity of the remnant or former mill structures (T1A, T1B, T1C, T2), and subsamples were collected (see Figure 3). The FPXRF readings were collected at depths ranging from surface to 168 inches into the piles (Table 1). Lead concentrations ranged from 18 ppm to 39,101 ppm, and zinc ranged from less than the LOD to 223,945 ppm. The analytical results for composite samples collected from the test pits showed lead ranging from 4,170 mg/kg to 60,000 mg/kg, and zinc ranging from 85,200 mg/kg to 162,000 mg/kg as presented in Table 2.

2.10.2.4 Waste Rock Piles

Three test pits (WR1A, WR1B, WR2) were constructed in the waste rock piles, and subsamples were collected (Figure 3). The FPXRF readings were collected at depths ranging from surface to 168 inches into the piles (Table 1). Lead concentrations ranged from 30 to 9,978 ppm, and zinc ranged from 258 to 80,564 ppm. The analytical results for composite samples collected from the test pits showed lead ranging from 106 to 11,500 mg/kg, and zinc ranging from 1,340 to 53,400 mg/kg as presented in Table 2.

2.10.2.5 Flume Creek Stream

Two sediment samples (FC1-sed and FC2-sed) were collected from observed depositional areas within the interface of the bed and bank of Flume Creek. Analytical results reported from the SI report indicated that in general, metal COCs in upgradient sediment sample FC1-sed are slightly elevated when compared to on-site sediment sample FC2-sed. The sediment sample locations are depicted in Figure 3.

2.10.2.6 Flume Creek Surface Water

Two surface water samples (FC1 and FC2) were collocated with the sediment samples. The analytical results showed zinc detected at a concentration of 17 µg/L in water sample FC1 at the upgradient property boundary is roughly equivalent to the zinc concentration of 19.2 µg/L detected in on-site water sample FC2. Lead concentration of 1.38 µg/L was detected in the upgradient surface water sample FC1 as compared to a lead concentration of less than 1 µg/L detected on-site surface water sample FC2. In general, metal COCs in upgradient surface water sample FC1 when compared to on-

site surface water sample FC2 appear to be roughly equivalent. The surface water sample locations are depicted in Figure 3.

2.11 Volume Estimate of Mine Waste

The distribution of mine waste and concentrates within the site was estimated by using visual indicators and supported or verified with FPXRF readings and analytical laboratory results. For the initial estimate of waste volume the Site was divided into three geographic areas; the Upper Portion (north of the unpaved access road), the unpaved access road, and the Lower Portion (south of the access road). Based on the findings of the Site Investigation, metal containing mine wastes were distributed over an areal extent of less than two acres of the Site. Volume estimates are presented in Table 3.

The total volume of mine-waste-contaminated materials on-site estimated in the SI is approximately 11,960 cubic yards (cy). A discussion of the volume estimates for each area is provided in the following sections.

2.11.1 Upper Portion

The Upper Portion has been impacted by mill tailings, waste rock, and possibly concentrates in the vicinity of the former mill structure(s). The volume estimates were derived using average waste thicknesses from the test pits and areal extent of the surface expression of the waste on the ground surface. The volume of waste material in the Upper Portion is estimated to be approximately 1,200 cy.

2.11.2 Access Road

Waste materials encountered in the access road test pits are considered to be tailings. The volume estimate for waste material within the access road was derived using the thickest measurement of waste materials (22 inches) encountered in the five test pits and assuming a conservative road width of 20 feet and an impacted length of 525 feet (approximately 100 feet west from the westernmost test pit ROW 1A to 50 feet east of the easternmost test pit ROW 1E). The volume of waste material in the access road is estimated to be approximately 700 cy.

2.11.3 Mill Tailings and Waste Piles in the Lower Portion of the Site

The Lower Portion of the Site is more varied in terrain and waste encountered than the other two geographic areas of the Site. The waste consisted principally of waste rock distributed in two piles, a mass layer of relatively homogeneous tailings over the majority of the impacted Site with a few small piles, and one dump area containing garbage and discarded vehicle parts that were deposited amongst the tailings.

The volume calculation was determined in that test pits were assigned equal areal weight, which reduced the volume calculation by averaging the waste thickness from

each test pit and multiplying the result by the total area encompassing the test pits. The volume of lower concentration waste material in the Lower Portion is estimated to be approximately 9,400 cy.

3 STREAMLINED RISK EVALUATION

This streamlined risk evaluation for the Site was prepared using the general guidance provided in the EPA's *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (EPA, 1993). This risk evaluation is intermediate in scope between a limited evaluation conducted for emergency removal actions and the conventional baseline risk assessment normally conducted for remedial actions.

This streamlined risk evaluation for the Site assumes that mining related source materials or associated soils with COPCs above the action levels established for the Site by EPA pose an actual or potential threat to human health and welfare or the environment. COPCs exceeding human health and ecological screening criteria in source materials and affected media are summarized in Table 5.

4 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

This section presents the objectives for the proposed removal action at the site. The purpose, scope, and scheduling requirements for implementation of the removal action alternatives are also described in this section in order to define removal action requirements based on time, budget, technical feasibility, and relevant criteria and standards.

4.1 STATUTORY LIMITS

To the extent that a private entity undertakes the proposed CERCLA removal action, the statutory limits (monetary ceiling and duration) for fund-financed removal actions do not apply.

4.2 SCOPE, GOALS, AND OBJECTIVES

4.2.1 Scope of the Removal Action

The removal actions presented within this EE/CA are intended to address the human health and ecological risks identified within the streamlined risk evaluation.

4.2.2 Goals and Objectives of the Removal Action

The goal of this EE/CA is to effectively address the mine-waste-related contamination associated with former milling activities in soil at the Site and to reduce the potential for this affected media to act as a source to surface water, sediment, and groundwater, in a manner that is protective of human health and the environment, and to attain

applicable or relevant and appropriate requirements (ARARs) to the extent practicable considering the exigencies of the situation.

Based on the potential human health and ecological risks identified for the Site, the following removal action objectives (RAOs) are identified for the Site:

Human Receptors

- Prevent human exposure to contaminated soil containing hazardous substances at concentrations that exceed the 250 mg/kg action level for lead established by EPA for the site, and
- Reduce loadings of hazardous substances to surface water so that loadings do not cause exceedances of surface water ARARs.

Ecological Receptors

- Reduce ecological exposures to contaminated soil containing hazardous substances at concentrations that exceed the 250 mg/kg action level for lead established by EPA for the Site, and
- Reduce loadings of hazardous substances to sediment and surface water, so that loadings do not cause exceedances of ARARs.

4.2.3 Compliance with ARARs and Other Criteria

Section 300.415(i) of the NCP provides that removal actions pursuant to CERCLA section 106 attain ARARs under Federal or State environmental laws or facility siting laws, to the extent practicable considering the urgency of the situation and the scope of the removal. In addition to legally binding laws and regulations, many federal and state environmental and public health programs also develop criteria, policies, guidance, and proposed standards that are not legally binding; however, they may provide useful information or recommended procedures. These “to-be-considered” (or “TBC”) constituents are not potential ARARs, but are evaluated along with ARARs. Applicable ARARs and TBCs for this EE/CA are summarized in Appendix A.

4.2.4 Determination of Removal Schedule

The general schedule for removal activities, including both the start and completion time for the action, will be subject to negotiation of an AOC between Stimson and EPA for conduct of the action itself.

5 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

Based on the analysis of the nature and extent of contamination and on the cleanup objectives developed in the previous section, a limited number of alternatives

appropriate for addressing the removal action objectives were identified. Technologies represent specific components or processes that are part of a potential cleanup. The various alternatives may be combined into a single removal action.

5.1 Identification of Potential Removal Action Alternatives

The potential removal action alternatives considered are:

- No Action;
- Institutional controls;
- Institutional controls; on-site consolidation; and
- Excavation and off-site disposal.

For the purposes of this analysis, monitoring alone was not considered as a specific alternative. However, monitoring is considered to have application with all alternatives to determine whether or not a technology is achieving RAOs and to evaluate its continuing effectiveness.

5.1.1 No Action

This alternative would require no further removal or monitoring activities at the Site and would leave the existing conditions as they currently exist. Contamination that is present would remain in-place, and no removal actions would be taken. This process is retained in all EE/CAs by statute, as a baseline for comparison with other alternatives.

5.1.2 Institutional Controls

Institutional controls (ICs) are administrative and legal measures that do not involve construction or physical changes to the site. ICs come in different types and may include restricting site use or modifying behavior and providing information to people, and are normally used when contaminated media is left on-site and when there remains some limitation to the activities that can take place at the site without risk to human health or the environment. ICs are typically meant to supplement engineering controls, as appropriate, for short- and long-term management to prevent or limit exposure to hazardous wastes and constituents. ICS are not generally expected to be the sole removal action, but often accompany or supplement another selected removal action.

Institutional controls include administrative and/or legal controls and access modifications that help to minimize the potential for human exposure to contamination and protect the integrity of an action. Monitoring is often required to ensure the continuing effectiveness of an IC.

5.1.3 Containment

Containment alternatives are directed at controlling contaminant movement and preventing contaminated media from coming into contact with potential human health and ecological receptors. Containment includes capping or covering the waste materials with a variety of materials including gravel, soil, vegetation, and geosynthetic materials.

5.1.4 Consolidation

The foot-print of contaminated materials could be reduced by consolidating the materials elsewhere on- or off-site. Consolidation would minimize the long-term need for maintenance and possibly reduce access and use modifications

5.1.5 Excavation

Excavation is a component of both on-site consolidation and/or removal by off-site disposal. In the case of on-site disposal (e.g., consolidation into an on-site repository), excavation would include those areas outside of the foot print of the on-site repository. For off-site disposal, the entire area containing contaminated materials would be excavated and the materials would be transported and disposed of off-site.

5.2 Identification of the Removal Action Alternatives

Based on the identification and analysis of the foregoing removal action alternatives and compliance with ARARs and other criteria, the following alternatives are selected for detailed analysis:

5.2.1 Alternative 1 – No Action

This alternative (A1) would leave mine-waste-contaminated materials in-place with no change in existing conditions. This alternative provides a baseline against which to compare the removal action alternatives. Capital and operations and maintenance (O&M) costs would be zero.

5.2.2 Alternative 2 – Institutional Controls

This alternative (A2) would help to minimize the potential for human exposure to mine-waste-contaminated materials through constructing fences or other barriers such as large woody debris around certain areas to prevent or limit access. Signs to provide location-specific warnings would be placed, where appropriate. The footprint of the affected area to be fenced is estimated to cover an areal extent of approximately 1.5 acres. Restrictive covenants would prevent activities that could further spread the contaminated materials. Refer to Figure 5 for a schematic representation of A2. A long-term monitoring program would be implemented to ensure the continuing effectiveness of the institutional controls and to monitor site conditions.

The capital cost of the Alternative 2 would be approximately \$35,000 and the present net value of the O&M costs would be approximately \$3,000 (Table 6). Thus, the total present net value cost of Alternative 2 would be approximately \$38,000.

5.2.3 Alternative 3 – Institutional Controls, Excavation, Consolidation, and On-Site Containment

In addition to the institutional controls described in Alternative 2, this alternative (A3) would minimize the potential for human health and ecological exposure to mine-waste-contaminated materials through excavating the materials and consolidating and containing the materials beneath a protective barrier consisting of a flexible membrane liner and a minimum of 12-inches of clean rock and/or soil. The footprint of the consolidated area is estimated to cover an areal extent of approximately 0.6 acre. These two components would be separated by a crushed rock drain layer and overlying geotextile. A limestone quarry (e.g., Lehigh quarry) located just east of Metaline Falls (approximately 6 miles by road) has been identified as a potential borrow source for the clean rock cover and underlying crushed rock drain layer. The barrier would significantly reduce infiltration and minimize erosion of waste beneath the liner. In addition, the use of a limestone aggregate would further provide a buffering affect of any incidental infiltration.

Disposition of any concrete, metal, and/or wood debris from the Site removal actions will be either placed beneath the protective barrier if it complies with the design and disposal criteria. Materials which do not meet the design or disposal criteria will be disposed of, or decontaminated and recycled for offsite disposition at an approved facility.

Areas affected by the action would be graded to control for erosion protection and management of stormwater, stabilized via hydroseeding and/or mulching to facilitate the reestablishment of vegetation. Refer to Figure 6 for a schematic representation of A3, and a cross-section of the consolidation area is provided in Figure 7. Additionally a portion of the existing access road way will be excavated replaced with imported clean material and graded so as to manage surface water drainage patterns at the Site as illustrated in Figure 7. Fencing around the perimeter of the 0.6 acre consolidation area with 6-foot chain link fence or placing large woody debris around the perimeter will be considered to restrict access, as well as the possible placement of large woody debris on the surface of the protective barrier.

Best Management Practices (BMPs) would be implemented during construction to protect workers, the community, and the environment from short-term construction impacts such as erosion, fugitive dust, and other similar potential impacts.

A long-term monitoring and maintenance and repair (M&R) program would be implemented to ensure the continuing effectiveness of the removal action, particularly with respect to surface water, and to monitor site conditions. As part of the monitoring program, semi-annual or episodic inspections of capped and rock filled areas, as well as existing drainage systems would be evaluated for functionality, and the soil cover

placed on the consolidation area would be cored at several locations, inspected for clean soil cover thickness and analyzed to verify that the COCs remain adequately contained. These inspections would occur for the first two years. Following this period, inspections would be reduced to an annual basis.

The capital cost of the Alternative 3 would be approximately \$341,000 and the present net value of the O&M costs would be approximately \$33,000 (Table 6). Thus, the total present net value cost of Alternative 3 would be approximately \$374,000.

5.2.4 Alternative 4 – Excavation and Off-Site Disposal

This alternative (A4) would result in the excavation of all mine-waste-contaminated materials exceeding actionable concentrations. These materials would be transported off-site for disposal in a Resource Conservation and Recovery Act (RCRA) approved facility. All areas affected by the action would be graded to control for erosion protection. Refer to Figure 8 for a schematic representation of A4. BMPs would be implemented during construction to protect workers, the community, and the environment from short-term construction impacts such as erosion, fugitive dust, and other similar potential impacts.

Disposition of any concrete, metal, and/or wood debris from the Site removal actions will be either placed beneath the protective barrier if it complies with the design and disposal criteria. Materials which do not meet the design or disposal criteria will be disposed of, or decontaminated and recycled for offsite disposition at an approved facility.

Neither ICs nor long-term monitoring would be required because mine waste materials would not be left on-site exceeding any actionable concentration. Areas affected by the action would be graded to control for erosion protection and management of stormwater, stabilized via hydroseeding and/or mulching to facilitate the reestablishment of vegetation.

The capital cost of the Alternative 4 would be approximately \$4.7M and the present net value of the O&M costs would be zero. Thus, the total present net value cost of Alternative 4 would be approximately \$4.7M (Table 6).

6 COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

In this section, removal action alternatives are analyzed against the short- and long-term aspects of three criteria: effectiveness, implementability, and cost. Each of these criteria is described below. The comparative analysis is presented in Table 7.

- *Effectiveness* – The ability of an alternative to meet RAOs within the scope of the removal action.

- *Implementability* – The technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation.
- *Cost* - The direct and indirect capital costs and annual post removal site control (PRSC) costs associated with an alternative.

The analysis of the four alternatives is summarized below.

Alternative 1 – No Action: This alternative does not meet the RAOs. Concentrations of contaminants in soils at the Site would remain above the action level specified in the RAOs. This alternative requires that no actual removal or reclamation activities would occur at the Site to control contaminant migration or to reduce toxicity of volume. No further investigation or monitoring activities would be conducted. There are no factors to consider regarding implementability, and no response costs are associated with this alternative.

Alternative 2 – Institutional Controls: This alternative involves reducing potential exposure to the human receptors (e.g. general public or trespassers) by implementing institutional controls to limit access or usage of the Site. These controls would involve a combination of administrative and engineering controls such as installing fencing and warning signs around the Site, installing gates to prevent access to the Site, and developing restrictive covenants regarding the future use of the Site. Although fencing and signage may restrict access to the site, these controls may not absolutely prevent possible direct exposure to contaminated materials by recreationists, trespassers, and other persons, and potential ecological receptors. Further, this alternative would not reduce loadings of hazardous substances to sediments or surface water. Alternative 2 provides greater protection of the public from direct exposure than Alternative 1, but significantly less than Alternatives 3 and 4, which include excavation and on-site consolidation and containment of mine-waste-contaminated materials or excavation and off-site disposal of the materials, respectively.

Alternative 3 – Institutional Controls, Excavation, Consolidation, and On-site Containment: Alternative 3 would meet the RAOs. Institutional controls would prohibit activities that may interfere with the cleanup action, and the placement of mine-waste-contaminated materials beneath a protective barrier would keep human receptors from contacting the contaminated materials. Alternative 3 also provides protection to ecological receptors by minimizing contact with impacted soils and protecting against further sediment or surface water contamination from soils.

Alternative 4 – Excavation and Off-site Disposal: Alternative 4 would meet the RAOs because all mine-waste-contaminated materials exceeding actionable concentrations would be excavated and transported off-site for disposal in a RCRA-approved facility, thereby eliminating direct exposure to human and ecological receptors and protecting against further sediment or surface water contamination from soils. Institutional controls would not be required.

Below is a summary of comparative evaluation of the alternatives with regard to effectiveness, implementability, and cost.

Effectiveness

Alternative 1 would not be protective of human health and the environment and would have the lowest overall effectiveness and permanence of all the alternatives. This alternative would not be effective because soils with contaminant concentrations exceeding the human health standard of 250 mg/kg lead and ecological standards would remain exposed and accessible. Further, this alternative will not reduce loadings of hazardous substances to potential sediment or surface water. This alternative is not evaluated further because it is not protective of public health and the environment.

Alternative 2 would reduce the potential for human exposure to mine-waste-contaminated materials. Institutional controls would be used to restrict access to the contaminated area, and restrictive covenants would be applied to reduce the possibility that people will come into contact with contamination. However, it would not reduce the potential for ecological receptor exposure to the contaminated soils. Contaminated soils would remain in place, thus the potential for ecological exposures and the loading of hazardous substances to sediment or surface water may result in unacceptable risks. Alternative 2 reduces human exposures via the use of ICs, but does not reduce the potential to ecological exposures and risks associated with exposures to sediment and surface water. Therefore alternative 2 is not evaluated as a stand-alone alternative, but rather as part of a balanced, practical approach to site cleanup that relies on both engineered and non-engineered alternatives. Overall, this alternative is not evaluated further because it is not deemed to be protective of the environment.

Alternative 3 would be protective of human health and the environment because it would reduce and control risks associated with exposure to mine-waste-contaminated materials. The contaminants of concern would be excavated to a concentration not to exceed the cleanup standard established by EPA for the Site, except in an area where it would be consolidated and contained beneath a protective barrier. The barrier would keep human and environmental receptors from coming into contact with the materials, and would significantly reduce infiltration and minimize erosion of waste beneath the liner, thereby protecting against further sediment or surface water contamination from soils. Institutional controls would be used to restrict access to the consolidation area, and restrictive covenants would be applied to assure the continued protection of human health and the environment and the integrity of the cleanup action. BMPs would be implemented during construction to protect workers, the community, and the environment from short-term construction impacts such as water and wind erosion, dust from excavation and material handling, and other similar potential impacts.

Alternative 4 would also be protective of human health and the environment because it would eliminate residual risks associated with exposure to mine-waste-contaminated materials. The contaminants of concern would be excavated to a concentration not

to exceed the cleanup standard established for the Site by EPA. Institutional controls would not be required because the contaminated materials would be transported off-site for disposal in a RCRA-approved facility. BMPs would be implemented during construction to protect workers, the community, and the environment from short-term construction impacts such as water and wind erosion, dust from excavation and material handling, and other similar potential impacts. However, this alternative presents increased risk to workers and the community because the contaminated materials are transported off-site for disposal, thus there is a higher probability for an accident to occur.

Implementability

Alternative 1 is inherently implementable because it does not require any cleanup activity.

Alternative 2 is easily implementable. Access restrictions such as fences could be constructed using readily available equipment and materials, and personnel and services. This alternative includes a nominal M&R program to maintain the effectiveness of the ICs such as repairing and replacing fencing and signage which may be damaged due to weather, vandalism, rock slides, or other unanticipated events. The administrative feasibility of implementing ICs such as restrictive covenants and zoning restrictions could be accomplished with nominal effort.

Alternative 3 is technically feasible. The cleanup action would use conventional earth moving equipment such as bulldozers, excavators, and haul trucks, and proven and reliable landfill design and construction principles including waste acceptance, waste placement, and cover construction. This alternative would use readily equipment and materials, and personnel and services. The cleanup action would likely be completed within a single construction season. The administrative feasibility of this alternative is straightforward. Institutional controls would be implemented, including access restrictions and other controls pursuant to the Washington State Uniform Environmental Covent Act (UECA) that are necessary to assure the continued protection of human health and the environment and the integrity of the cleanup action. A long-term monitoring and maintenance and repair (M&R) program would be implemented to ensure the continuing effectiveness of the removal action.

Alternative 4 is technically feasible. The cleanup action would use conventional earth-moving equipment such as bulldozers and excavators, and long-distance haul trucks. This alternative would use readily equipment and materials, and personnel and services. The contaminated materials would be transported off-site to a RCRA-approved facility. The cleanup action would likely be completed within a single construction season. The administrative feasibility of this alternative is straightforward. Permits for transporting contaminated material off-site would be required. Best management practices would be implemented during construction to protect workers, the community, and the environment from short-term construction impacts such as water and wind erosion, dust from excavation and material handling, and other similar potential impacts.

Cost

Cost estimates for each alternative are presented in Section 5 and are detailed in Appendix B. Because of the uncertainty in volumes of materials, a contingency of 20 percent has been applied to all capital cost estimates. The annual O&M costs have been estimated based upon a percentage of the total capital costs, and have been converted to a present net value cost based upon a 10-year period of O&M following completion of remedial actions. The total present value costs for each alternative are as follows:

Alternative 1: \$0

Alternative 2: \$38,000

Alternative 3: \$374,000

Alternative 4: \$4.7 million

Therefore, Alternative 4 would have the highest cost by a significant margin, and Alternative 1 would have the least cost. Alternative 3 would have costs an order of magnitude greater than Alternative 2, but would be significantly less costly than Alternative 4.

The cost estimates in this EE/CA are based on the description of the alternatives and associated conceptual design assumptions presented in this EE/CA. The design assumptions used here are representative and sufficient for the purposes of comparative evaluation of the alternatives, but are not necessarily the same as the design basis that would be used for the final, detailed design. Pre-design investigations (i.e., borrow source investigations and topographic mapping) will be included in the final design phase for any of the action remedies, and the results of those investigations could result in changes from the preliminary designs presented in this EE/CA.

The cost estimates were prepared to allow comparative evaluation of alternatives, not for budgeting purposes. The design basis is subject to change during final, detailed design of the selected alternative, and these changes would affect the cost of the remedy. The uncertainties in the EE/CA designs and associated cost estimates are such that actual costs could vary significantly from these estimates. However, the uncertainty in the relative cost of the alternatives is much less than the uncertainty in the magnitude of the costs, and these cost estimates are suitable for comparative evaluation of the alternatives.

7 RECOMMENDED REMOVAL ACTION ALTERNATIVE

Alternative 3 best satisfies the evaluation criteria based on the comparative analysis in the previous section.

7.1 Evaluation Process Used to Develop the Recommend Alternative

In summary, Alternatives 1 and 2 would not satisfy the RAOs. Alternative 1 would leave mine-waste-contaminated materials in-place with no change in existing conditions. As such, this alternative would not prevent human or ecological exposures to contaminated solid and would not reduce loadings of hazardous materials to sediment or surface water. Alternative 2 would also leave mine-waste-contaminated materials in-place. Institutional controls and restrictive covenants would be used to reduce human exposure to the contaminants; however, would not reduce the potential for ecological exposure to the contaminated soils. Contaminated soils would remain in place, thus the potential for ecological exposures and the loading of hazardous substances to sediment or surface water may result in unacceptable risks. Further, the NCP emphasizes that ICs are meant to supplement engineering controls and cautions against the use of ICs as the sole action unless active response measures are determined to be impracticable.

Alternatives 3 and 4 achieve the threshold criteria of overall protection of human health and the environment to meet and comply with the RAOs. Alternatives 3 and 4 are readily implementable. Alternative 3 would require ICs to provide long-term protectiveness, and there is some uncertainty associated with enforcing ICs; whereas, Alternative 4 would likely not require ICs because mine-waste-contaminants would be excavated and transported off-site for disposal. BMPs would be used to control the short-term effects of cleanup; however, the short-term risks to workers and the community associated with Alternative 4 are potentially greater because the mine-waste-contaminated materials would be transported off-site. Both Alternatives 3 and 4 could be implemented within one year. Overall, Alternative 3 is less expensive than Alternative 4 because contaminated materials would remain on-site beneath a protective barrier. However, this alternative would require periodic monitoring and maintenance and repair to ensure the protectiveness of the cleanup action.

Results of the comparative analysis provide the rationale for selection of the preferred alternative - Alternative 3.

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TABLES

FIGURES

APPENDIX A

Summary of ARARs

APPENDIX B

Cost Estimates for Removal Alternatives

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Table 1
XRF Data
Engineering Evaluation and Cost Analysis
Josephine Mill No. 1
Metaline, Washington

Date Time	Reading Number	Test Pit or Sample Location	Depth (inches), Material Type Observations	RCRA 8 Metals								Additional Metals										
				Arsenic (As)	Barium (Ba)	Cadmium (Cd)	Chromium (Cr)	Lead (Pb)	Mercury (Hg)	Selenium (Se)	Silver (Ag)	Zinc (Zn)	Calcium (Ca)	Cobalt (Co)	Copper (Cu)	Iron (Fe)	Potassium (K)	Manganese (Mn)	Nickel (Ni)	Antimony (Sb)	Titanium (Ti)	Vanadium (V)
Unpaved Access Road																						
10/6/2008 9:26	13	ROW1A	Incomplete Reading	< LOD				< LOD	< LOD	< LOD		2,711.70		< LOD	< LOD	15,634.54		< LOD	< LOD			
10/6/2008 9:28	14	ROW1A-Redo	12-16 Native	< LOD	386.86	40.91	< LOD	582.58	< LOD	< LOD	17.42	2,572.86	70,584.14	< LOD	< LOD	16,154.80	9,833.08	629.92	< LOD	69.25	1,462.05	87.99
10/6/2008 9:36	16	ROW1B	18 Native	< LOD	395.18	19.34	< LOD	146.92	< LOD	< LOD	< LOD	623.10	13,982.29	< LOD	< LOD	22,940.18	14,548.43	682.07	< LOD	35.33	3,346.05	< LOD
10/6/2008 9:40	17	ROW1C	6-17 Native	< LOD	< LOD	< LOD	< LOD	747.72	< LOD	< LOD	< LOD	1,878.61	21,744.34	< LOD	< LOD	24,102.61	16,375.68	425.28	< LOD	< LOD	2,452.89	157.30
10/6/2008 9:47	18	ROW1D	8-22 Native	166.87	1,039.21	62.44	< LOD	2,734.67	< LOD	< LOD	21.59	9,305.28	65,315.38	< LOD	< LOD	20,452.95	5,211.41	748.23	< LOD	133.62	912.13	< LOD
10/6/2008 9:48	19	ROW1D	Incomplete Reading	< LOD				173.41	< LOD	< LOD		7,390.60		< LOD	< LOD	24,341.83		488.90	< LOD			
10/6/2008 9:50	20	ROW1D-redo	8-22 Native	26.27	422.82	35.99	< LOD	200.22	< LOD	< LOD	< LOD	7,674.55	16,711.67	< LOD	< LOD	24,085.83	11,728.39	508.80	< LOD	38.30	2,739.33	130.13
10/6/2008 9:52	21	ROW	Incomplete Reading	< LOD				< LOD	< LOD	< LOD		5,137.27		< LOD	< LOD	< LOD		< LOD	< LOD			
10/6/2008 9:52	22	ROW	Incomplete Reading	< LOD				2,175.02	< LOD	< LOD		4,010.78		< LOD	< LOD	5,622.45		< LOD	< LOD			
10/6/2008 9:54	23	ROW1D-sidewall	8 Tailings	< LOD	503.40	41.62	< LOD	2,085.46	< LOD	< LOD	21.60	3,978.68	213,474.13	< LOD	< LOD	8,515.99	4,767.27	151.85	< LOD	94.34	464.22	< LOD
10/6/2008 10:01	24	ROW1E	20 Native	< LOD	242.87	< LOD	50.42	29.82	< LOD	< LOD	< LOD	367.32	18,356.09	193.56	< LOD	20,039.32	15,272.83	380.21	< LOD	< LOD	3,257.84	< LOD
10/6/2008 10:08	25	ROW1	0 to 22 Tailings composite of subsamples ROW1A-E	< LOD	116.66	20.64	121.49	1,406.59	< LOD	< LOD	< LOD	5,110.43	46,858.58	< LOD	< LOD	22,489.25	7,884.39	436.15	< LOD	< LOD	4,445.42	< LOD
Upper Portion/Former Mill Location																						
10/6/2008 10:26	27	T1A	30 Native	< LOD	520.61	< LOD	< LOD	17.87	< LOD	< LOD	12.63	1,199.72	10,361.12	< LOD	< LOD	16,674.35	9,954.10	336.87	< LOD	38.68	2,757.00	< LOD
10/6/2008 10:33	28	T1A	0-6 Tailings	< LOD	290.34	250.77	89.89	39,100.60	< LOD	< LOD	18.86	134,720.27	174,615.67	< LOD	< LOD	11,403.14	< LOD	590.60	< LOD	65.37	< LOD	82.47
10/6/2008 10:36	29	T1A	0-24 Native	< LOD	785.60	153.52	< LOD	455.08	< LOD	< LOD	22.29	7,704.34	38,997.72	< LOD	< LOD	13,027.69	3,384.11	323.22	< LOD	126.41	939.29	< LOD
10/6/2008 10:48	30	T1B	0-53 Tailings	< LOD	239.80	283.04	< LOD	1,014.15	< LOD	< LOD	< LOD	110,967.79	44,464.64	< LOD	< LOD	21,161.33	4,503.89	694.71	< LOD	60.71	1,275.30	< LOD
10/6/2008 10:57	31	T1B	Incomplete Reading	< LOD				< LOD	< LOD	< LOD		< LOD		< LOD	< LOD	< LOD		< LOD	< LOD			
10/6/2008 10:59	32	T1B	68 Native	< LOD	< LOD	28.33	70.88	17.60	< LOD	< LOD	< LOD	2,356.14	14,360.00	< LOD	< LOD	11,158.98	14,061.08	304.74	< LOD	< LOD	2,063.12	< LOD
10/6/2008 11:04	33	T1B	67 Tailings	649.53	844.15	392.47	< LOD	33,477.26	199.32	< LOD	39.99	223,944.80	48,072.69	< LOD	592.72	54,089.10	865.94	< LOD	< LOD	191.27	< LOD	< LOD
10/6/2008 11:22	34	T1C	76 Native	< LOD	< LOD	< LOD	41.75	30.60	< LOD	< LOD	< LOD	3,146.75	14,683.58	< LOD	< LOD	10,944.01	16,753.44	298.40	< LOD	< LOD	2,426.06	< LOD
10/6/2008 11:28	35	T1C	0-48 Tailings	386.33	314.90	311.20	46.46	13,841.36	< LOD	< LOD	19.84	112,572.29	71,906.52	< LOD	226.72	19,491.19	3,568.26	570.19	< LOD	99.97	581.26	< LOD
10/6/2008 11:51	36	T1C	Incomplete Reading	471.79				7,375.88	< LOD	< LOD		120,565.75		< LOD	564.22	12,578.31		< LOD	< LOD			
10/6/2008 11:51	37	T1C	Incomplete Reading	< LOD				5,283.60	< LOD	< LOD		100,230.55		< LOD	< LOD	< LOD		< LOD	< LOD			
10/6/2008 11:53	38	T2	43 Tailings/concentrates	< LOD	274.94	340.09	74.55	3,253.44	236.21	46.72	< LOD	149,489.33	57,543.03	< LOD	< LOD	6,697.97	1,055.53	< LOD	< LOD	166.21	< LOD	< LOD
10/6/2008 11:56	39	T2	22 Tailings/concentrates	< LOD	456.15	369.33	78.64	1,025.71	106.41	24.07	< LOD	103,240.78	104,379.29	< LOD	< LOD	5,340.41	794.24	251.55	< LOD	71.95	< LOD	45.86
10/6/2008 11:58	40	T2	0-22 Tailings	201.56	482.46	101.13	48.07	4,656.36	< LOD	< LOD	24.61	22,944.14	124,331.81	< LOD	< LOD	2,915.39	729.03	260.47	< LOD	97.80	< LOD	< LOD
10/6/2008 12:19	41	TP1	36 Interface w/bedrock	< LOD	< LOD	< LOD	56.60	321.16	< LOD	< LOD	< LOD	7,754.48	76,149.88	< LOD	< LOD	15,778.96	4,763.54	502.85	< LOD	< LOD	1,327.89	< LOD
10/6/2008 12:21	43	TP1	19 Tailings	< LOD	795.89	1,162.11	114.27	1,364.79	979.87	288.98	< LOD	735,417.06	49,705.04	< LOD	< LOD	28,514.74	465.61	765.41	< LOD	169.70	108.65	< LOD
10/6/2008 12:25	44	TP1	0-6 Tailings	228.94	665.36	263.37	36.31	2,020.36	147.16	37.17	35.35	114,012.20	67,258.08	< LOD	< LOD	11,072.89	2,967.12	461.38	< LOD	148.55	380.75	< LOD
10/6/2008 12:36	45	T1B	Incomplete Reading	< LOD				3,078.92	< LOD	< LOD		130,879.02		< LOD	< LOD	16,791.41		< LOD	< LOD			
10/6/2008 12:38	46	T1B	52 Tailings	< LOD	285.80	323.63	51.99	3,538.47	251.61	50.37	25.83	177,766.61	55,890.91	< LOD	< LOD	19,696.92	1,916.09	507.46	< LOD	70.85	276.03	< LOD
10/6/2008 12:40	47	T1B	40 Tailings	60.22	186.49	86.48	58.11	440.96	55.18	< LOD	< LOD	40,217.42	114,529.05	< LOD	< LOD	7,891.22	2,466.10	327.16	< LOD	< LOD	396.36	< LOD
10/6/2008 12:55	48	T1B	29 Tailings-Subfloor	176.51	470.20	379.56	36.34	2,769.99	160.27	39.42	< LOD	181,513.64	73,957.02	< LOD	< LOD	18,356.90	3,607.84	533.59	< LOD	58.77	670.63	< LOD
10/6/2008 12:58	49	T1B	13 Tailings-Floor Joists	< LOD	305.02	230.99	43.93	3,933.96	< LOD	< LOD	24.39	103,746.63	88,756.36	< LOD	1,403.95	10,867.91	1,661.64	232.60	< LOD	93.75	173.10	54.86
Lower Portion Waste Rock Pile																						
10/6/2008 14:12	51	WR1A	32 Waste Rock	< LOD	879.51	61.27	< LOD	37.58	< LOD	< LOD	45.62	257.89	6,418.14	< LOD	< LOD	27,300.19	5,643.50	447.27	< LOD	183.64	1,162.03	< LOD
10/6/2008 14:17	52	WR1B	32 Waste Rock	16.88	718.52	30.38	< LOD	30.90	< LOD	< LOD	< LOD	559.16	8,380.42	< LOD	< LOD	28,422.22	17,090.00	239.02	< LOD	72.97	2,695.01	140.61
10/6/2008 14:20	53	WR1C	32 Waste Rock	< LOD	242.76	125.39	32.41	246.58	< LOD	< LOD	20.39	26,987.02	94,461.88	< LOD	< LOD	3,665.51	2,642.81	< LOD	< LOD	57.31	490.32	56.15
Lower Portion Tailings and Waste Rock																						
10/6/2008 14:30	54	T3	46 Organics/Wood	< LOD	< LOD	< LOD	186.23	< LOD	< LOD	5.38	< LOD	145.92	32,259.17	< LOD	< LOD	237.53	< LOD	< LOD	< LOD	< LOD	< LOD	85.57
10/6/2008 14:34	55	T3	10 Tailings	< LOD	93.92	104.37	111.07	648.58	< LOD	< LOD	< LOD	41,284.21	78,426.83	< LOD	< LOD	4,230.14	1,666.35	< LOD	< LOD	46.44	172.39	< LOD
10/6/2008 14:41	56	T4	52 Peat	< LOD	< LOD	< LOD	157.39	< LOD	< LOD	5.32	< LOD	77.91	25,120.51	< LOD	< LOD	568.92	< LOD	< LOD	< LOD	< LOD	161.50	< LOD
10/6/2008 14:47	58	T4	0-24 Tailings	< LOD	< LOD	99.98	153.77	2,838.03	< LOD	< LOD	< LOD	36,213.00	60,402.67	< LOD	< LOD	5,765.32	801.43	207.53	< LOD	34.67	345.32	95.02
10/6/2008 14:56	59	T5	132 Native	< LOD	187.26	< LOD	98.46	17.33	< LOD	< LOD	< LOD	653.67	12,075.66	< LOD	< LOD	14,370.98	12,346.41	83.95	< LOD	< LOD	3,505.40	118.88

Table 1
XRF Data
Engineering Evaluation and Cost Analysis
Josephine Mill No. 1
Metaline, Washington

Date Time	Reading Number	Test Pit or Sample Location	Depth (inches), Material Type Observations	RCRA 8 Metals								Additional Metals										
				Arsenic (As)	Barium (Ba)	Cadmium (Cd)	Chromium (Cr)	Lead (Pb)	Mercury (Hg)	Selenium (Se)	Silver (Ag)	Zinc (Zn)	Calcium (Ca)	Cobalt (Co)	Copper (Cu)	Iron (Fe)	Potassium (K)	Manganese (Mn)	Nickel (Ni)	Antimony (Sb)	Titanium (Ti)	Vanadium (V)
10/6/2008 15:02	60	T5	0-38 Tailings	< LOD	< LOD	109.52	141.43	236.30	< LOD	< LOD	< LOD	24,846.02	71,312.13	< LOD	< LOD	1,941.55	779.28	101.81	< LOD	28.57	398.21	79.78
10/6/2008 15:05	62	T6	68 Native	11.89	314.78	< LOD	109.81	25.99	< LOD	< LOD	< LOD	2,698.18	10,876.72	< LOD	< LOD	20,374.72	12,961.54	377.22	< LOD	25.97	3,631.09	124.96
10/6/2008 15:11	63	T6	12-54 Tailings	< LOD	< LOD	58.96	184.58	41.41	< LOD	< LOD	< LOD	3,815.81	11,390.36	< LOD	< LOD	21,532.28	14,379.02	281.09	< LOD	< LOD	3,928.10	< LOD
10/6/2008 15:16	64	T7	126 Native	< LOD	301.82	29.79	202.24	24.53	< LOD	< LOD	< LOD	2,293.21	9,905.05	< LOD	< LOD	17,766.20	11,796.13	313.73	< LOD	39.70	3,565.15	< LOD
10/6/2008 15:23	65	T7	Invalid Reading	< LOD	< LOD	31.41	180.19	44.38	< LOD	< LOD	< LOD	2,577.08	10,733.00	< LOD	< LOD	19,787.02	12,924.86	282.66	< LOD	< LOD	3,860.75	< LOD
10/6/2008 15:26	66	T7	0-50 Tailings	< LOD	< LOD	76.91	163.80	377.39	< LOD	< LOD	< LOD	21,807.92	51,056.57	< LOD	< LOD	2,447.70	1,740.95	131.02	< LOD	< LOD	538.08	< LOD
10/6/2008 15:33	67	T8	102 Native Organics	< LOD	< LOD	< LOD	218.57	15.96	< LOD	< LOD	< LOD	228.68	6,924.88	201.97	< LOD	17,194.32	9,479.27	114.81	< LOD	< LOD	3,161.47	182.81
10/6/2008 15:37	68	T8	0-84 Tailings	< LOD	100.45	140.76	134.47	625.57	63.37	11.54	< LOD	44,812.23	64,356.73	< LOD	< LOD	4,050.22	2,528.03	149.66	< LOD	< LOD	572.16	75.88
10/6/2008 15:42	69	T9	38 Native - Dry	26.39	100.46	< LOD	266.67	116.93	< LOD	< LOD	< LOD	9,879.50	14,220.17	< LOD	< LOD	18,436.07	6,173.88	< LOD	< LOD	< LOD	2,369.62	120.98
10/6/2008 15:47	70	T9	40 Native - Saturated	< LOD	< LOD	< LOD	239.20	24.66	15.57	< LOD	< LOD	3,574.38	4,223.27	351.38	< LOD	19,382.94	7,911.35	102.43	< LOD	< LOD	#####	< LOD
10/6/2008 15:48	71	T9	Incomplete Reading	< LOD				< LOD	< LOD	< LOD		< LOD		< LOD	< LOD	25,142.72		< LOD	< LOD			
10/6/2008 15:51	73	T9	0-38 Tailings	< LOD	129.20	137.53	120.12	1,042.34	50.06	< LOD	< LOD	51,814.23	57,051.90	< LOD	< LOD	5,775.61	2,387.91	141.23	< LOD	40.82	630.45	66.78
10/6/2008 15:56	74	T10	36 Native	< LOD	< LOD	< LOD	250.40	14.43	< LOD	< LOD	< LOD	2,739.25	8,133.35	< LOD	< LOD	12,446.84	6,722.01	89.34	< LOD	< LOD	#####	< LOD
10/6/2008 16:02	75	T10	0-34 Tailings	< LOD	< LOD	150.38	118.62	727.86	47.60	< LOD	< LOD	41,280.09	62,493.79	< LOD	< LOD	3,493.15	2,077.77	< LOD	< LOD	< LOD	540.19	79.89
10/6/2008 16:15	76	T11	Incomplete Reading	< LOD				50.10	< LOD	< LOD		5,678.23		< LOD	< LOD	19,269.95		450.84	< LOD			
10/6/2008 16:15	77	T11	Incomplete Reading	< LOD				555.60	< LOD	< LOD		17,815.38		< LOD	< LOD	19,384.80		592.84	< LOD			
10/6/2008 16:17	78	T11	55 Native	< LOD	96.39	< LOD	122.03	33.66	< LOD	< LOD	< LOD	5,254.70	9,447.16	< LOD	< LOD	20,986.04	9,652.71	458.39	< LOD	< LOD	2,492.63	105.39
10/6/2008 16:21	79	T11	0-50 Tailings	< LOD	< LOD	70.31	162.28	127.64	47.38	< LOD	< LOD	26,894.55	75,939.23	< LOD	< LOD	2,274.60	1,293.78	114.46	< LOD	< LOD	395.83	58.18
10/6/2008 16:25	80	T12	50 Native	< LOD	< LOD	< LOD	233.39	< LOD	< LOD	< LOD	< LOD	2,240.70	7,096.82	< LOD	< LOD	8,696.93	6,596.91	157.11	< LOD	< LOD	#####	< LOD
10/6/2008 16:30	81	T12	0-36 Tailings	< LOD	< LOD	154.36	176.08	219.50	< LOD	< LOD	< LOD	55,418.46	68,727.20	< LOD	< LOD	3,880.46	1,335.65	< LOD	< LOD	< LOD	377.74	72.38
10/6/2008 16:34	82	T13	89-101 Native	< LOD	95.10	< LOD	238.49	< LOD	< LOD	< LOD	< LOD	1,001.08	5,549.86	< LOD	< LOD	17,699.55	9,151.07	105.33	< LOD	< LOD	2,987.86	< LOD
10/6/2008 16:41	83	T13	0-89 Tailings	< LOD	168.98	275.45	197.00	3,958.61	120.42	< LOD	< LOD	124,133.09	34,568.57	< LOD	< LOD	10,390.29	2,424.46	< LOD	< LOD	< LOD	514.12	104.86
10/6/2008 16:47	84	T14	18 Native	< LOD	< LOD	< LOD	234.47	10.95	< LOD	< LOD	< LOD	118.69	6,686.40	< LOD	< LOD	16,186.13	8,983.13	387.30	< LOD	< LOD	3,185.16	< LOD
10/6/2008 16:52	85	T14	0-6 Tailings	< LOD	< LOD	221.49	153.65	816.47	88.61	18.45	< LOD	66,464.41	33,749.59	< LOD	< LOD	7,701.39	2,474.68	289.58	< LOD	< LOD	606.48	75.98
10/6/2008 17:00	86	WR2	168 Interior Waste Rock	330.84	330.07	187.23	237.87	9,977.97	< LOD	33.78	123.68	80,033.29	61,294.88	< LOD	3,981.78	23,911.01	5,428.16	2,655.98	< LOD	261.66	2,651.52	< LOD
10/6/2008 17:04	87	WR2	Surficial Grab - West	< LOD	540.87	125.33	239.44	9,949.21	< LOD	23.32	228.13	46,050.58	61,865.35	< LOD	3,068.97	23,403.11	5,489.97	2,318.25	< LOD	386.39	3,149.30	< LOD
10/6/2008 17:08	88	WR2	24-26 Grab - East	< LOD	429.89	94.77	231.24	5,852.30	< LOD	18.78	104.98	40,575.11	62,116.54	< LOD	2,545.54	17,603.18	6,258.75	2,085.02	< LOD	274.34	3,210.40	< LOD
10/7/2008 8:34	90	WR3	Waste Rock Surface	327.75	< LOD	94.84	246.30	7,839.42	< LOD	< LOD	< LOD	80,563.53	71,836.96	< LOD	< LOD	11,583.00	909.92	325.82	< LOD	< LOD	574.09	90.05
10/7/2008 8:41	91	WR3	Incomplete Reading	346.52				6,120.66	< LOD	< LOD		43,198.75		< LOD	< LOD	6,434.50		211.82	< LOD			
10/7/2008 8:42	92	WR3	18 Waste Rock	401.01	217.10	130.72	169.83	4,313.93	< LOD	< LOD	< LOD	29,672.65	62,006.43	< LOD	< LOD	5,213.25	< LOD	262.81	< LOD	67.98	349.94	< LOD
10/7/2008 10:17	93	T15	26 Native	< LOD	180.50	< LOD	148.83	52.14	< LOD	< LOD	< LOD	358.64	6,312.93	< LOD	< LOD	25,890.55	11,879.14	505.44	< LOD	< LOD	4,008.94	< LOD
10/7/2008 10:36	94	T15	Incomplete Reading	< LOD				< LOD	< LOD	< LOD		1,188.94		< LOD	< LOD	< LOD		< LOD	< LOD			
10/7/2008 10:41	95	T15	0-26 Tailings	< LOD	219.95	211.92	185.28	731.74	< LOD	< LOD	< LOD	68,204.14	43,457.20	< LOD	< LOD	5,347.99	1,676.22	< LOD	< LOD	39.60	417.92	70.42
10/7/2008 11:02	96	T15B	14 Native	< LOD	< LOD	< LOD	155.76	61.15	< LOD	< LOD	< LOD	1,803.43	15,364.62	< LOD	< LOD	21,345.53	14,603.38	513.46	< LOD	< LOD	3,353.59	< LOD
10/7/2008 11:06	97	T15B	0-14 Tailings	< LOD	< LOD	261.41	230.41	1,085.03	< LOD	< LOD	< LOD	86,757.08	35,377.15	< LOD	< LOD	8,723.44	2,342.31	330.97	< LOD	< LOD	914.10	95.79
Creek Bank (Hand-Augered)																						
10/7/2008 11:37	98	CB1A	24 Native	< LOD	< LOD	< LOD	222.33	11.92	< LOD	< LOD	< LOD	2,262.72	15,188.25	< LOD	< LOD	8,094.39	6,312.43	< LOD	< LOD	< LOD	1,750.47	< LOD
10/7/2008 11:44	99	CB1A	6-22 Tailings (vegetated)	< LOD	94.84	78.35	155.61	402.78	< LOD	< LOD	< LOD	31,621.52	63,517.24	< LOD	< LOD	1,907.16	< LOD	223.40	< LOD	< LOD	206.96	58.15
10/7/2008 12:02	100	CB1B	14 Native	11.59	< LOD	< LOD	284.40	30.06	< LOD	< LOD	< LOD	2,528.68	5,116.26	< LOD	< LOD	14,250.11	4,315.89	125.90	< LOD	< LOD	4,234.95	< LOD
10/7/2008 12:08	101	CB1B	0-14 Tailings (vegetated)	< LOD	< LOD	85.91	232.83	1,205.02	< LOD	< LOD	< LOD	38,367.97	50,472.76	< LOD	< LOD	3,434.15	655.31	142.62	< LOD	< LOD	1,123.75	79.50
10/7/2008 12:27	102	CB1C	22 Native	< LOD	73.14	< LOD	330.85	< LOD	< LOD	< LOD	< LOD	539.38	4,495.99	< LOD	< LOD	11,974.29	8,472.02	< LOD	< LOD	< LOD	3,777.08	124.70
10/7/2008 12:31	103	CB1C	0-16 Tailings (vegetated)	< LOD	< LOD	78.09	262.19	205.32	< LOD	< LOD	< LOD	21,268.30	47,147.31	< LOD	< LOD	3,094.38	796.52	106.63	< LOD	< LOD	5,310.42	< LOD
Dump Site																						
10/7/2008 13:27	104	Dump	25 Native	< LOD	< LOD	< LOD	248.46	18.46	< LOD	< LOD	< LOD	219.94	11,507.35	< LOD	< LOD	7,337.33	7,777.35	< LOD	< LOD	< LOD	2,148.79	< LOD
10/7/2008 13:31	105	Dump	0-16 Tailings	< LOD	< LOD	50.75	177.39	2,884.80	< LOD	< LOD	< LOD	35,654.00	33,707.21	< LOD	286.91	4,691.32	643.62	243.11	< LOD	< LOD	281.00	73.97
Average Concentration:				225.93	361.40	166.83	156.09	2,679.36	171.27	46.41	47.48	46,621.50	45,691.13	248.97	1,583.85	13,874.98	6,129.33	436.81	< LOD	102.75	2,300.51	93.18

Legend:

Native
Waste Rock
Tailings
Incomplete

Table 2
Waste Rock and Tailings Sample Analytical Data for Metals
Engineering Evaluation and Cost Analysis
Josephine Mill No. 1
Metalline, Washington

Sample Location	Sample Material Type and Depth	Total Metals ⁽¹⁾																						
		Arsenic (As)	Barium (Ba)	Cadmium (Cd)	Chromium (Cr)	Lead (Pb)	Mercury (Hg)	Selenium (Se)	Silver (Ag)	Zinc (Zn)	Aluminum (Al)	Antimony (Sb)	Beryllium (Be)	Calcium (Ca)	Cobalt (Co)	Copper (Cu)	Iron (Fe)	Magnesium (Mg)	Manganese (Mn)	Nickel (Ni)	Potassium (K)	Sodium (Na)	Thallium (Tl)	Vanadium (V)
WR1	Waste Rock - Composite from WR1A and WR1B from 0" to 32"	3.84	69.1	6.24	8.16	106	0.214	ND	ND	1,340	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WR2	Waste Rock - Composite of 5 test pit sidewall subsample composites from surface to 168 " (14' depth)	33.90	18.1	318	10.8	11,500	1.44	13	115	53,400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WR3	Waste Rock - Composite made up of 3 test pit sidewall subsample composites from surface to 18 "	11.90	28	229	6	9,090	3.85	3.57	ND	68,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ROW1	Tailings - Composite from surface to 22"	6.78	66.5	47.1	9.19	1,790	1.2	ND	ND	13,200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
T1	Tailings - Composite from test pit sidewallsubsamples from T1A, T1B & T1C from surface to 68"	8.95	43.7	286	2.23	20,400	14.8	5.25	3.02	85,200	2,100	13.1	ND	230,000	1.22	143	10,000	31,400	297	7.85	127	59.8	ND	14.2
T1B	Tailings-Composite from surface to 53"	7.09	36	552	3.63	4,170	10.6	3.59	ND	144,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
T2	Tailings - Composite from surface to 43"	17.70	24	373	2.85	60,000 J	11.9	6.09	9.26 J	162,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dup-2	Tailings - Composite from surface to 43" (blind field duplicate of T2)	12.90	20.6	367	2.29	18,100 J	13.7	6.49	2.37 J	133,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
T3	Tailings - Composite from surface to 46"	5.58	4.37	146	1.89	485	2.73	6.68	ND	46,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
T4	Tailings - Composite from surface to 52"	5.27	7	200	1.45	2,170	3.15	6.1	ND	68,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
T5	Tailings - Composite from surface to 132"	4.68	6.01	117	1.54	481	2.85	6.02	ND	36,900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
T6	Tailings - Composite from surface to 68"	5.99	6.66	181	1.94	561	4.12	5.09	ND	59,900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
T7	Tailings - Composite from surface to 126"	4.23	4.41	141	2.75	660	3.85	5.11	ND	45,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
T8	Tailings - Composite from surface to 102"	6.83	7.53	206	1.81	941	4.52	5.4	ND	62,900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
T9	Tailings - Composite from surface to 40"	5.27	8.49	162	2.22	1,280	4.61	6.07	ND	56,900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
T10	Tailings - Composite from surface to 34"	6.81	10.9	277	2.79	1,090	11	5.08	ND	83,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
T11	Tailings - Composite from surface to 55"	4.64	4.12	165	0.788	518	5.02	5.86	ND	59,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
T12	Tailings - Composite from surface to 50"	7.55	8.35	298	2.24	799	9.89	5.14	ND	93,900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
T13	Tailings - Composite from surface to 89"	11.60	12.2	352	4.57	3,730	26.4	3.4	0.647	98,000	1,140	ND	ND	51,600	0.941	67.7	4,710	22,100	164	5.89	244	ND	NA	18.1
Dup-1	Tailings - Composite from surface to 89" (blind field duplicate of T13)	11.90	14.7	371	4.64	3,270	38.1	ND	ND	107,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
T14	Tailings - Composite from surface to 6"	8.22	20.6	257	4.55	1,030	11.8	3.37	ND	86,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
T15	Tailings - Composite from surface to 26"	8.21	18	289	3.82	1,090	13	3.44	ND	96,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dump-Comp	Tailings - Composite from surface to 16"	9.72	16	143	6.29	12,900	4.86	ND	ND	57,200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CB1	Tailings - Composite from 3 hand-auger boring subsample composites from surface to 22"	8.59	7.86	197	3.34	701	2.02	6.55	ND	60,200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MTCA - Soil, Method A, Unrestricted Land Use		20	NS	2	19 ⁽²⁾ /2,000 ⁽³⁾	250	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MTCA - Soil, Method B, Unrestricted Land Use [Non-carcinogen-Direct Contact - ingestion only]		24	16,000	80	NS	NS	24	NS	NS	24,000	NS	32	160	NS	NS	3,000	NS	NS	11,000	1,600	NS	NS	NS	NS
Washington State Natural Background Soil Metals Concentrations (Ecology, 1994)		6	No Data	1	38	10	0	No Data	No Data	67	25,591	No Data	No Data	No Data	No Data	26	29,631	No Data	527	No Data	No Data	No Data	No Data	No Data

Notes:

- (1) Total Metals = Mercury analyzed using EPA Method 7471, other metals Metals analyzed using EPA Method 6010C,
- (2) Chromium VI
- (3) Chromium III
- (4) Screening Level for elemental mercury
- (5) Screening Level for mercury, inorganic salts

NS No Standard Available

ND not detected above laboratory method reporting limit

NA constituent not analyzed

J The associated analytical result is an approximation of the analyte in the sample; see Data Validation Summary for details.

All concentrations reported in milligrams per kilogram (mg/kg) or parts per million (ppm)

Concentrations shown in **Bold** indicate exceedance of the MTCA - Soil Method B Unrestricted Land Use cleanup levels or MTCA Method A Unrestricted Land Use

Table 3
Summary of Estimated Mine Waste Volumes
Engineering Evaluation and Cost Analysis
Josephine Mill No. 1
Metalline, Washington

Geographic Location	Total Volume (cubic yards)
Upper Portion	1,200
Access Road	700
Stockpile - Soil	nd
Lower Portion	10,060
TOTAL	11,960

Table 4
Potentially Applicable Human Health Screening Criteria for Soils
Engineering Evaluation and Cost Analysis
Josephine Mill No. 1
Metalline, Washington

Metal Constituents of Potential Concern	MTCA Method A Unrestricted Soil Levels (WAC 173-340)	MTCA Method B Unrestricted Soil Levels (WAC 173-340)	Washington State Background Levels (Ecology, 1994)	EPA Regional Screening Levels (July, 2008)	Proposed Soil Screening Criteria
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
<i>Receptors</i>	<i>Human</i>	<i>Human</i>	<i>Human</i>	<i>Human</i>	<i>Human</i>
Cadmium	2	80	1	70	2
Lead	250	NS	10	400	250
Zinc	NS	24,000	67	23,000	24,000

Table 5
Screening Level Exceedences for Human and Ecological Receptors
Engineering Evaluation and Cost Analysis
Josephine Mill No. 1
Metaline, Washington

Unrestricted Land Use Soils Screening Level Exceedences							
Human Risk				Ecological Risk			
Sample	Pb > 250 mg/kg	Zn > 24,000 mg/kg	Cd > 2 mg/kg	Sample	Pb > 500 mg/kg	Zn > 360mg/kg	Cd > 20 mg/kg
<i>Upper Portion of the Site</i>				<i>Upper Portion of the Site</i>			
T1	Yes	Yes	Yes	T1	Yes	Yes	Yes
T1B	Yes	Yes	Yes	T1B	Yes	Yes	Yes
T2	Yes	Yes	Yes	T2	Yes	Yes	Yes
ROW1	Yes	No	No	ROW1	Yes	Yes	Yes
<i>Waste Rock Piles</i>				<i>Waste Rock Piles</i>			
WR1	No	No	No	WR1	No	Yes	No
WR2	Yes	Yes	Yes	WR2	Yes	Yes	Yes
WR3	Yes	Yes	Yes	WR3	Yes	Yes	Yes
<i>Tailings in Lower Portion of the Site</i>				<i>Tailings in Lower Portion of the Site</i>			
T3	Yes	Yes	Yes	T3	No	Yes	Yes
T4	Yes	Yes	Yes	T4	Yes	Yes	Yes
T5	Yes	Yes	Yes	T5	Yes	Yes	Yes
T6	Yes	Yes	Yes	T6	Yes	Yes	Yes
T7	Yes	Yes	Yes	T7	Yes	Yes	Yes
T8	Yes	Yes	Yes	T8	Yes	Yes	Yes
T9	Yes	Yes	Yes	T9	Yes	Yes	Yes
T10	Yes	Yes	Yes	T10	Yes	Yes	Yes
T11	Yes	Yes	Yes	T11	Yes	Yes	Yes
T12	Yes	Yes	Yes	T12	Yes	Yes	Yes
T13	Yes	Yes	Yes	T13	Yes	Yes	Yes
T14	Yes	Yes	Yes	T14	Yes	Yes	Yes
T15	Yes	Yes	Yes	T15	Yes	Yes	Yes
Dump Site	Yes	Yes	Yes	Dump Site	Yes	Yes	Yes
CB1	Yes	Yes	Yes	CB1	Yes	Yes	Yes

Table 5
Screening Level Exceedences for Human and Ecological Receptors
Engineering Evaluation and Cost Analysis
Josephine Mill No. 1
Metalline, Washington

Ecological Risk Screening Level Exceedences							
Sediment				Surface Water			
Sample	Pb > 35.8 mg/kg	Zn > 121 mg/kg	Cd > 1 mg/kg	Sample	Pb > 0.54 µg/L	Zn > 32 µg/L	Cd > 0.37 µg/L
FC1-Sed Upgradient	Yes	Yes	No	FC1-Upgradient	Yes	No	Yes
FC2-Sed On-site	Yes	No	No	FC2-On-site	Yes	No	Yes

Table 6
Summary of Construction and Capital Costs
Engineering Evaluation and Cost Analysis
Josephine Mill No. 1
Metaline Falls, Washington

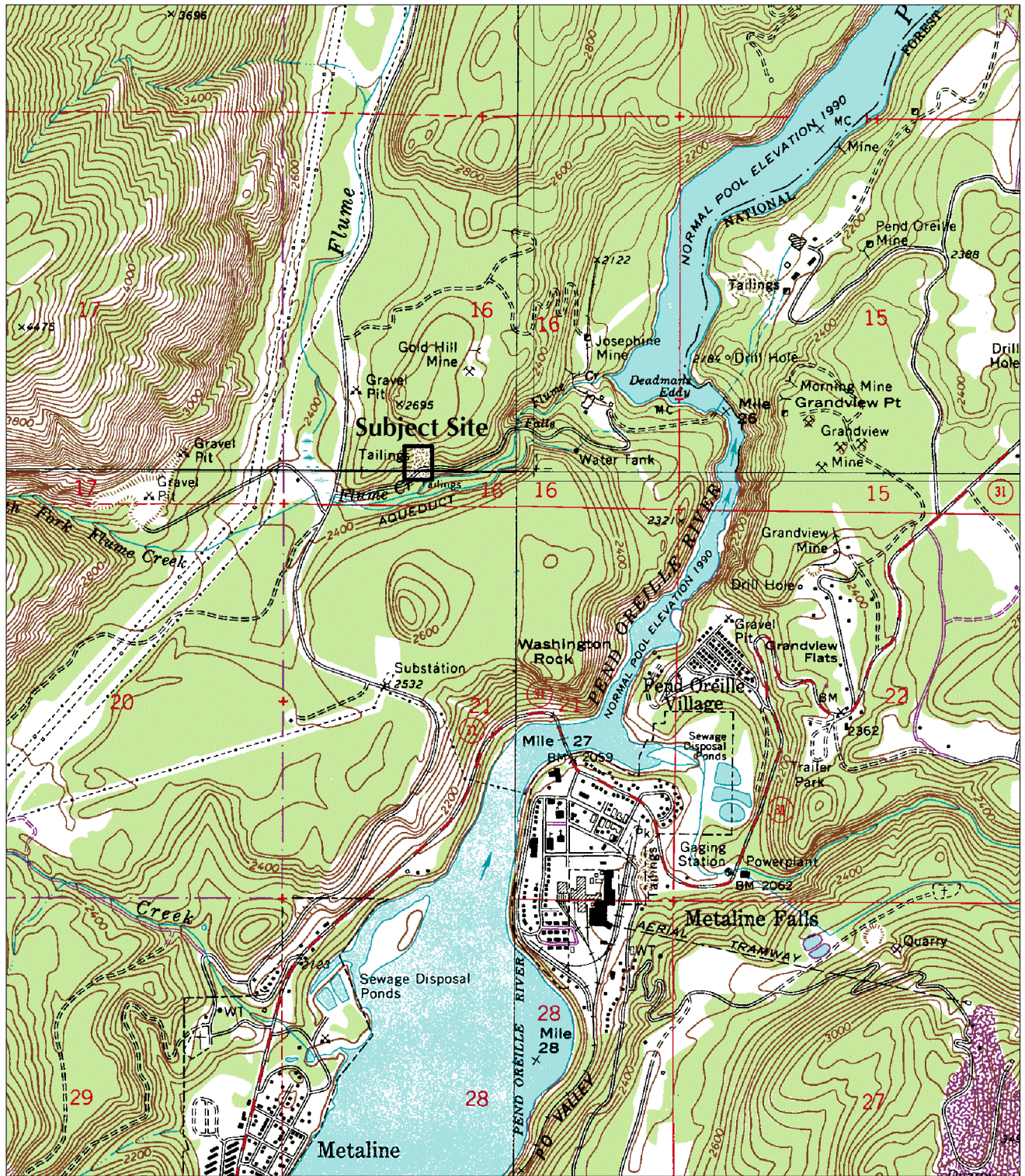
Alternative	Action	Total Estimated Construction Costs	Total Capital Costs	Annual O&M Costs (Years 1-2)	Annual O&M Costs (Years 3-10)	Present Value Costs for O&M (Years 1-2)	Present Value Costs for O&M (Years 3-10)	Present Value Costs for O&M	Total Present Value Costs
1	No Action	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2	Institutional Controls	\$15,360	\$34,772	\$869	\$348	\$1,572	\$1,814	\$3,385	\$38,157
3	Institutional Controls, Excavation, and Consolidation	\$245,283	\$341,227	\$8,531	\$3,412	\$15,424	\$17,797	\$33,221	\$374,447
4	Excavation and Off-Site Disposal	\$4,681,142	\$4,723,320	\$0	\$0	\$0	\$0	\$0	\$4,723,320

Notes: 1) Annual O&M costs assume 2.5% and 1% for years 1-2 and 3-10, respectively.

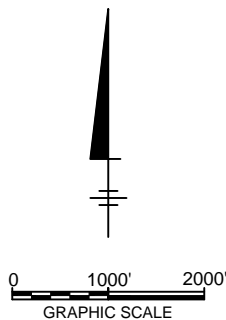
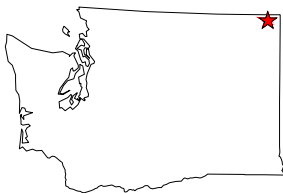
2) Present worth analysis assumes a 7% discount rate as per U.S. EPA document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study". EPA 540-R-00-002. July 2002.

Table 7
Comparative Analysis Summary Table
Engineering Evaluation and Cost Analysis
Josephine Mill No. 1
Metaline Falls, Washington

Alternative	Action	ObjectivesCriteria		
		Protectiveness and ability to Achieve Removal Objectives	Implementability	Cost
1	No Action	Meets RAOs: No Overall Protection to Human Health and Environment: No Reduction of Sediment, Surface Water, and Groundwater Contamination from Soils: No	Implementability is not applicable to this alternative.	Capital Cost: \$0 PRSC Cost: \$0 Present Value Cost: \$0
2	Institutional Controls	Meets RAOs: No Overall Protection to Human Health and Environment: Moderately protective to human health; not protective to the environment Reduction of Sediment, Surface Water, and Groundwater Contamination from Soils: No	Alternative is technically and administratively feasible, and the services and materials are readily available	Capital Cost: \$34,772 PRSC Cost: \$3,385 Present Value Cost: \$38,157
3	Institutional Controls, Excavation, and Consolidation	Meets RAOs: Yes Overall Protection to Human Health and Environment: Protective to human health; protective to the environment Reduction of Sediment, Surface Water, and Groundwater Contamination from Soils: Yes	Alternative is technically and administratively feasible, and the services and materials are readily available	Capital Cost: \$341,227 PRSC Cost: \$33,221 Present Value Cost: \$374,447
4	Excavation and Off-Site Disposal	Meets RAOs: Yes Overall Protection to Human Health and Environment: Protective to human health; protective to the environment Reduction of Sediment, Surface Water, and Groundwater Contamination from Soils: Yes	Alternative is technically and administratively feasible, and the services and materials are readily available	Capital Cost: \$4,723,320 PRSC Cost: \$0 Present Value Cost: \$4,723,320



Map Source: USGS 7.5 Topographic Maps: Abercrombie Mountain, Boundary Dam, Metaline Falls, and Metaline, Washington (1986)

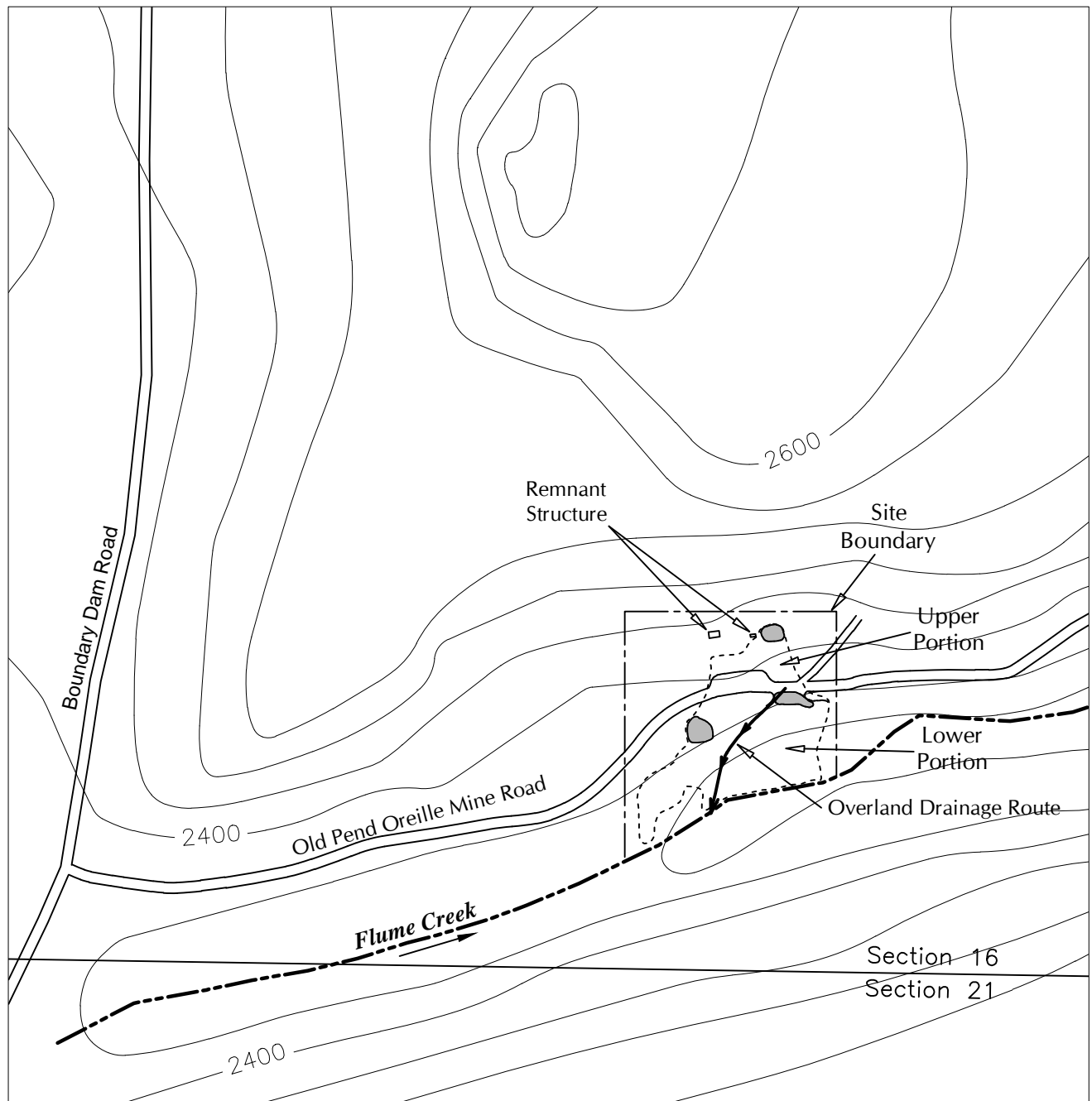


STIMSON LUMBER COMPANY
 JOSEPHINE MILL NO. 1
 METALINE FALLS, WASHINGTON
ENGINEERING EVALUATION/COST ANALYSIS



SITE VICINITY MAP

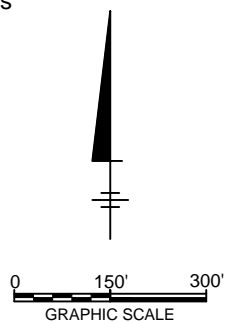


FIGURE
1



Legend

-  Waste Pile
-  Mine Waste Materials/Tailings

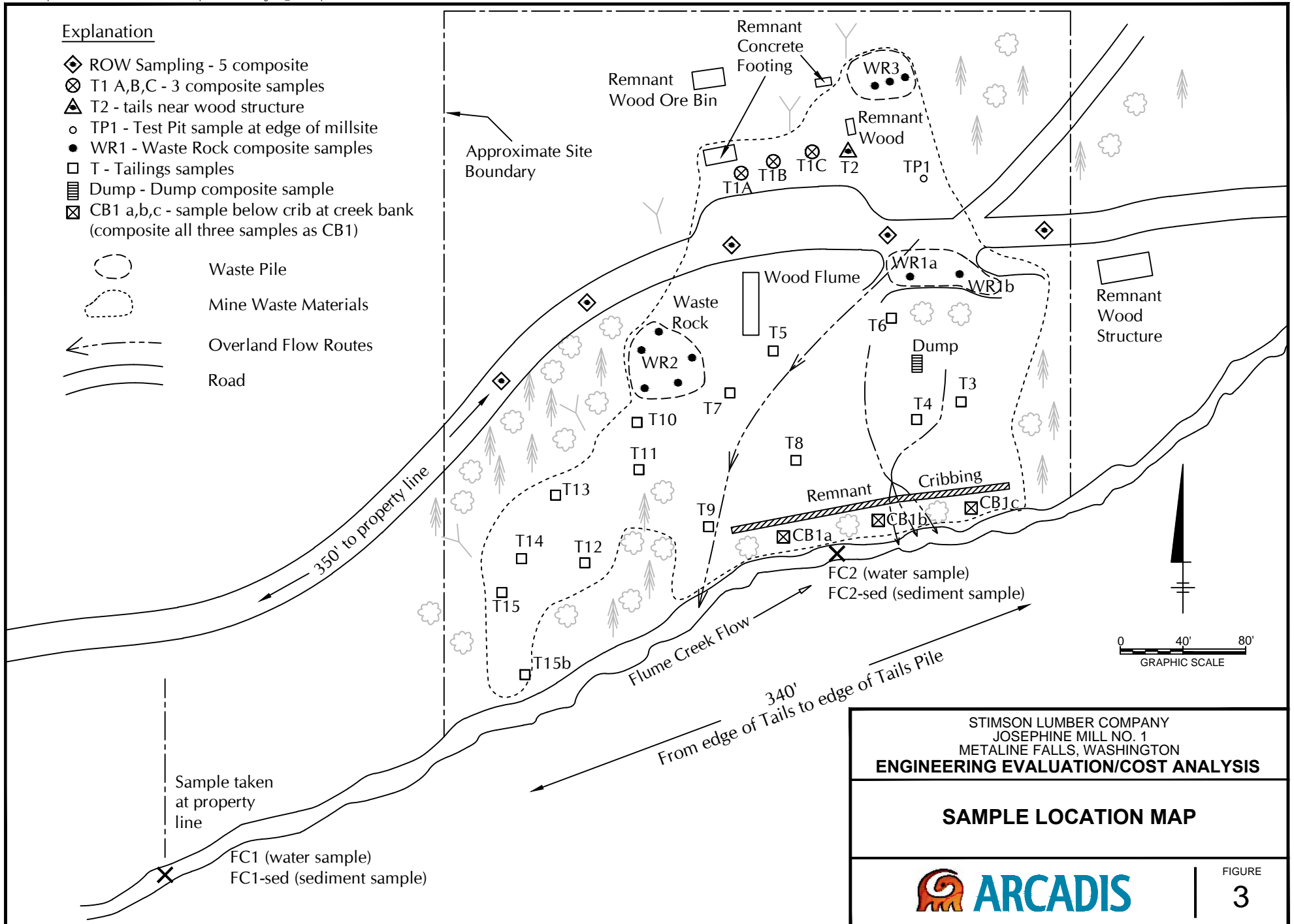


STIMSON LUMBER COMPANY
 JOSEPHINE MILL NO. 1
 METALINE FALLS, WASHINGTON
ENGINEERING EVALUATION/COST ANALYSIS

SITE MAP



FIGURE
2



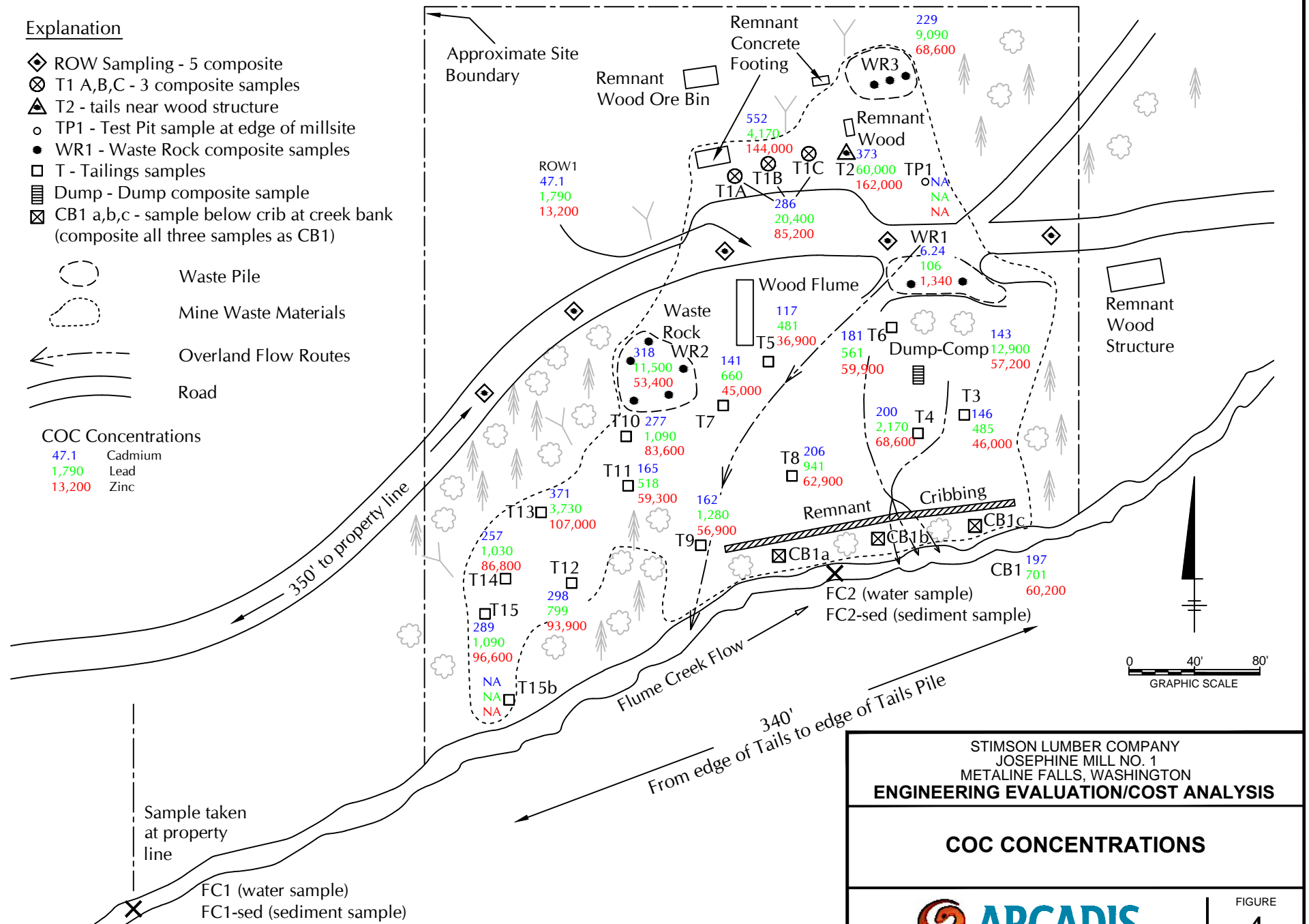
Explanation

- ◆ ROW Sampling - 5 composite
- ⊗ T1 A,B,C - 3 composite samples
- ▲ T2 - tails near wood structure
- TP1 - Test Pit sample at edge of millsite
- WR1 - Waste Rock composite samples
- T - Tailings samples
- ▨ Dump - Dump composite sample
- ⊠ CB1 a,b,c - sample below crib at creek bank (composite all three samples as CB1)

- Waste Pile
- Mine Waste Materials
- Overland Flow Routes
- Road

COC Concentrations

47.1 Cadmium
 1,790 Lead
 13,200 Zinc



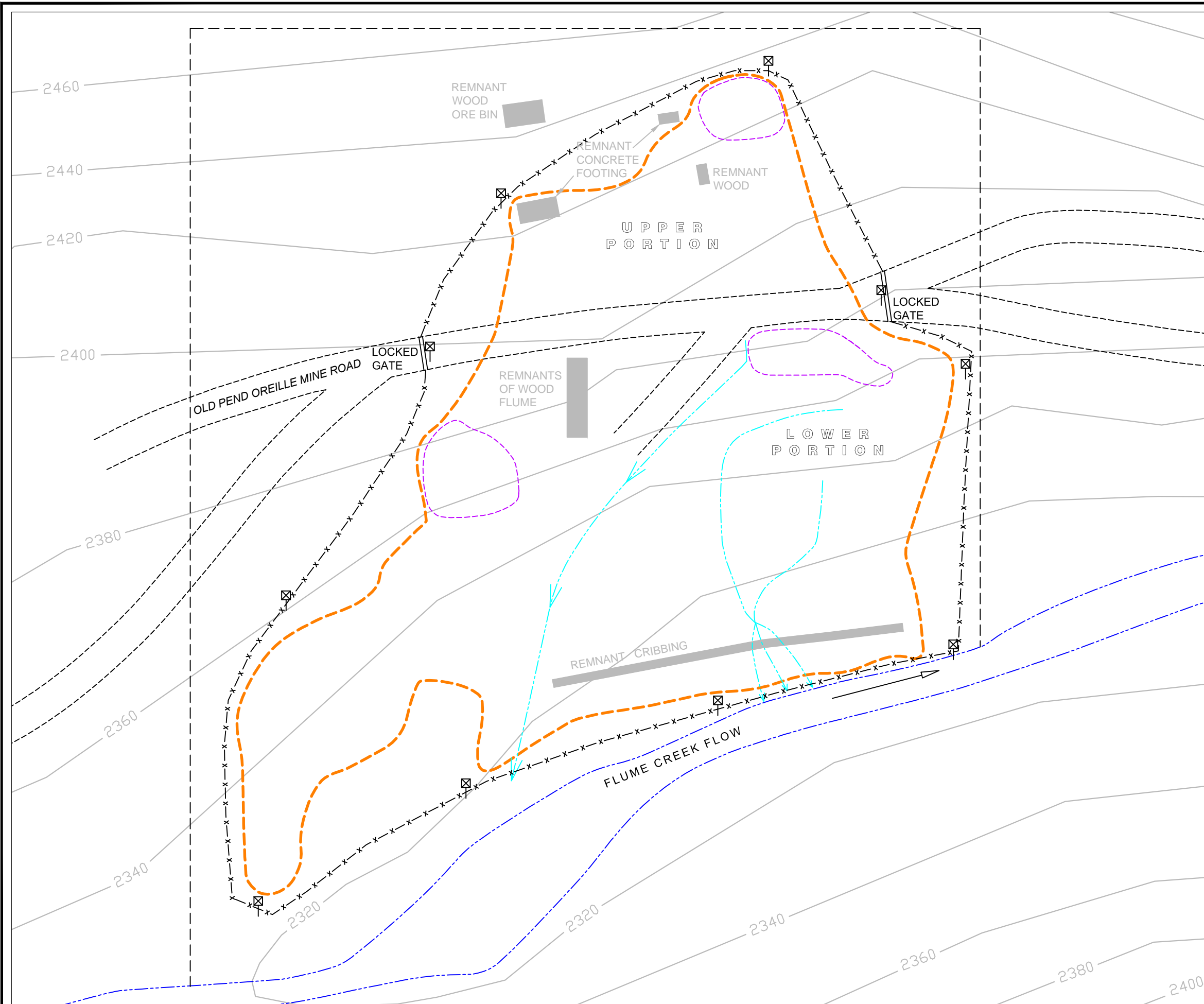
STIMSON LUMBER COMPANY
 JOSEPHINE MILL NO. 1
 METALINE FALLS, WASHINGTON
ENGINEERING EVALUATION/COST ANALYSIS

COC CONCENTRATIONS



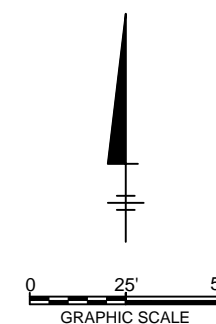
FIGURE

4



EXPLANATION

- SITE BOUNDARY
- ROAD
- FLUME CREEK
- OVERLAND FLOW ROUTE
- EXISTING MINE WASTE MATERIALS
- WASTE ROCK PILE
- x-x-x- 6 FT CHAINLINK FENCE
- ⊠ NO TRESPASSING SIGN POSTED



Existing contours generated at 20 foot contour interval from
USGS 1:24,000, 10 meter DEM data.
Locations of stream, road and site features are approximate and are for
representative purposes only.

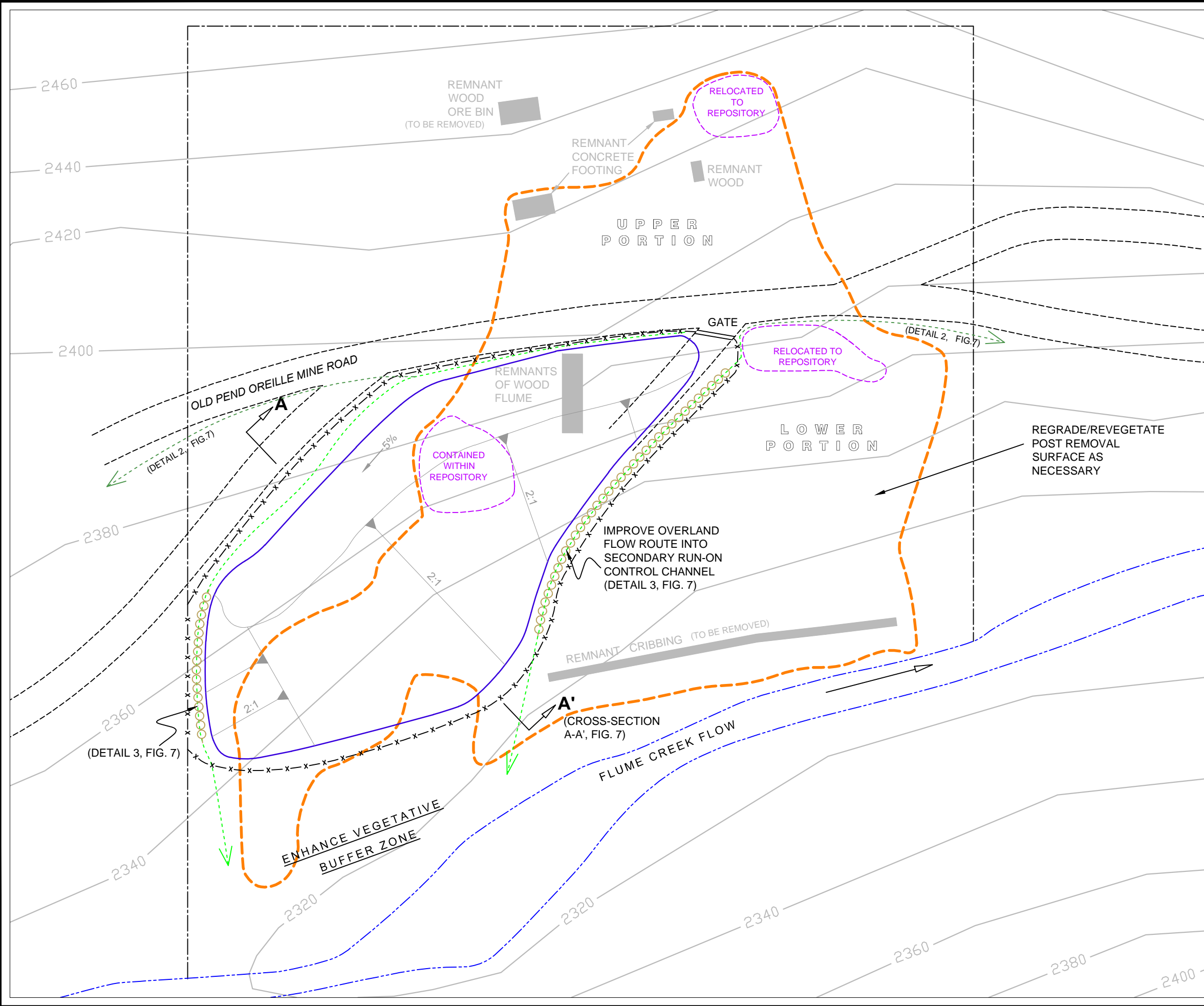
STIMSON LUMBER COMPANY
JOSEPHINE MILL NO. 1
METALINE FALLS, WASHINGTON
ENGINEERING EVALUATION/COST ANALYSIS

**SCHEMATIC REPRESENTATION OF
ALTERNATIVE 2**



FIGURE
5

CITY: SPOKANE DIV/GROUP: EN/SR/E4 DB: JASPER GEOGRAPHICS PM: PL
\\w3p1\Data\PROJECTS\K030179.000\JosephineMILL\EECA\Figures_030310.pdf PROJECT NAME: JOSEPHINE MILL EECA DATE: 3/3/2010

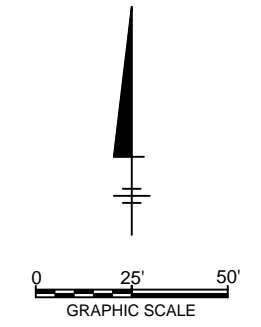


EXPLANATION

- SITE BOUNDARY
- ROAD
- FLUME CREEK
- EXTENT OF MINE WASTE MATERIALS REMOVAL FOR RELOCATION TO REPOSITORY
- WASTE ROCK PILE
- APPROX. LIMIT OF CONSOLIDATED REPOSITORY
- PRIMARY RUN-ON CONTROL CHANNEL
- SECONDARY RUN-ON CONTROL CHANNEL
- x-x-x- PROTECTIVE BARRIER (CHAINLINK FENCE OR LARGE WOODY DEBRIS)
- ooooo RIPRAP

Notes:

- 1) Consolidation area would be grubbed, as necessary.
- 2) Removed cribbing and wood to be disposed of accordingly.
- 3) Post-removal surface to be regraded to control surface water run-on and run-off and revegetated as necessary and as per the final design criteria.



Existing contours generated at 20 foot contour interval from USGS 1:24,000, 10 meter DEM data.
Locations of stream, road and site features are approximate and are for representative purposes only.

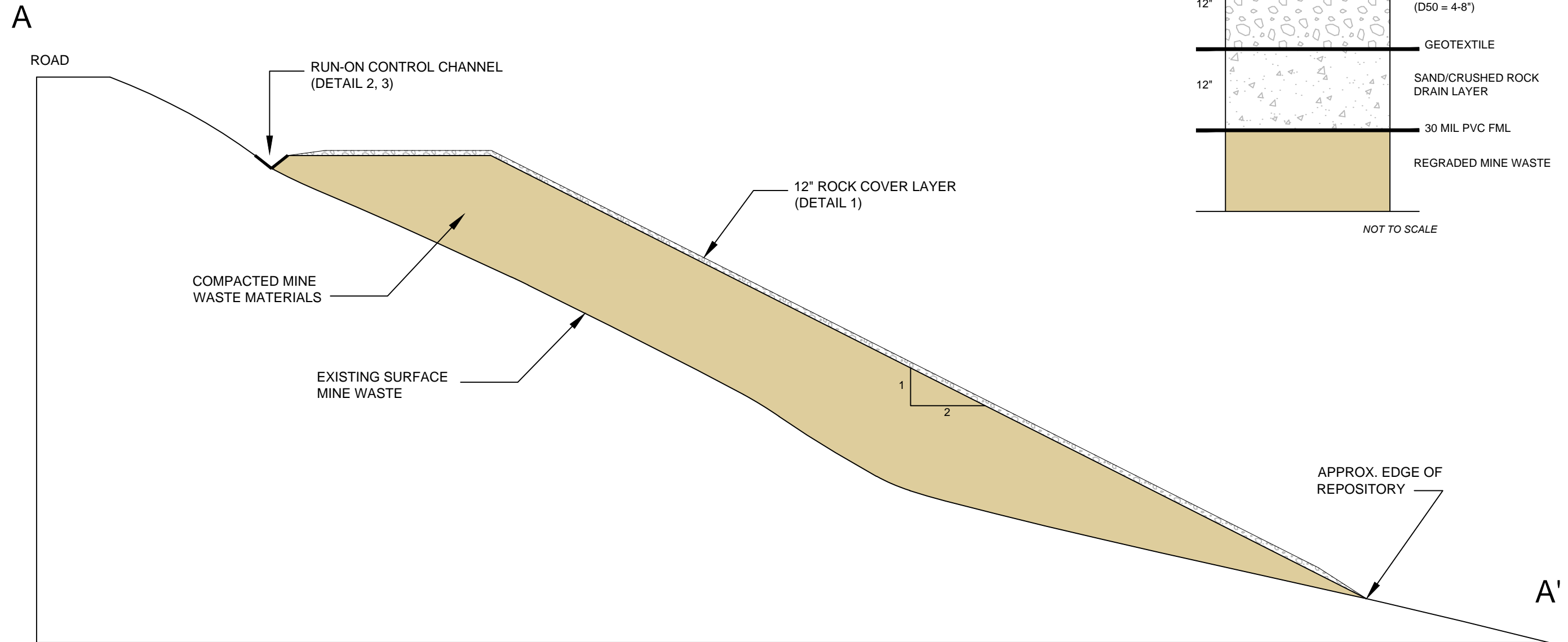
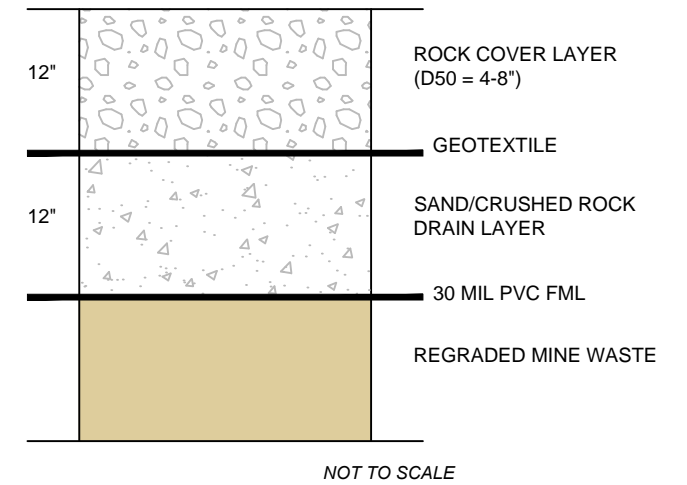
STIMSON LUMBER COMPANY
JOSEPHINE MILL NO. 1
METALINE FALLS, WASHINGTON
ENGINEERING EVALUATION/COST ANALYSIS

**SCHEMATIC REPRESENTATION OF
ALTERNATIVE 3**

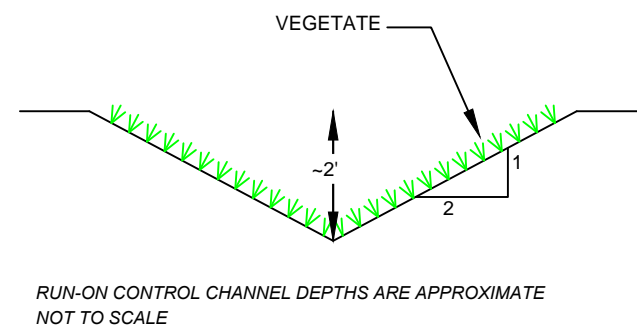
FIGURE
6

CITY: SPOKANE DIV/GROUP: ENSR/E4 DB: JASPER GEOGRAPHICS PM: PL
\\wa3fp1\Data\PROJECT\SK030179.000\JosephineMILL\EECA\Figures_030310.pdf PROJECT NAME: JOSEPHINE MILL EECA DATE: 3/3/2010

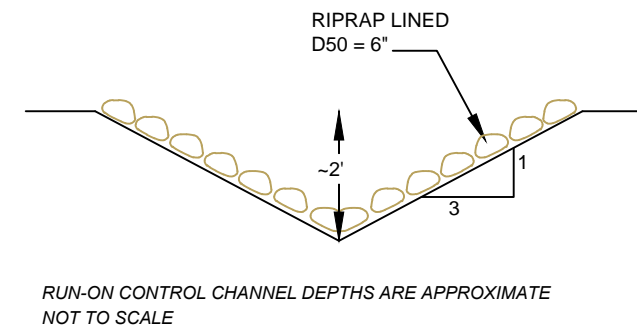
DETAIL 1: ROCK COVER



DETAIL 2: RUN-ON CONTROL CHANNEL



DETAIL 3: RIPRAP LINED RUN-ON CONTROL CHANNEL



NOTE: RUN-ON CONTROL CHANNELS WILL INCLUDE PERMANENT CHECK DAMS AND OUTFALL APRONS AS APPLICABLE TO THE FINAL DESIGN

STIMSON LUMBER COMPANY JOSEPHINE MILL NO. 1 METALINE FALLS, WASHINGTON ENGINEERING EVALUATION/COST ANALYSIS	
CROSS-SECTION OF ALTERNATIVE 3 PROTECTIVE BARRIER	
	FIGURE 7

APPENDIX A

Potential Applicable or Relevant and Appropriate Requirements (ARARs)

ARARs are defined in CERCLA Section 121 and the NCP [40 CFR Part 300]. “Applicable” requirements are those cleanup standards and other environmental protection requirements promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, location, response action, or other circumstance at a site. While not applicable to a particular circumstance at a CERCLA site, “relevant and appropriate” requirements address problems or situations sufficiently similar to those encountered at a site that their use is well suited to the site. ARARs fall into three broad categories, based on the manner in which they are applied: chemical-, action-, and location-specific. In general, only the substantive requirements of an ARAR must be implemented at site.

Chemical-specific ARARs include requirements that regulate the release to, or presence in, the environment of materials with certain chemical or physical characteristics, or containing specified chemical compounds. The requirements are usually either health- or risk-based numerical values or methodologies that establish the acceptable amount or concentration of a chemical that may remain in or be discharged to the environment.

Action-specific ARARs set performance, design, or similar controls or restrictions on particular kinds of activities related to the management of hazardous substances, pollutants, or contaminants. The ARARs are activated by the particular response action selected for implementation, and indicate how, or to what level, the alternative must achieve the requirements. Location-specific ARARs relate to the geographic or physical position of the site. Response actions may be restricted or precluded depending on the location or characteristics of the site and the requirements that apply to it. Location-specific ARARs may apply to actions in natural or man-made features. Examples of natural site features include wetlands and floodplains. An example of a man-made feature is an archaeological site.

To-Be-Considered Materials (TBCs)

TBCs are non-promulgated criteria, advisories, guidance, and proposed standards issued by federal, state, or tribal governments that, although not legally enforceable, may be helpful in establishing protective cleanup levels and developing, evaluating, or implementing remedy alternatives. If no ARARs address a particular chemical or situation, or if existing ARARs do not provide adequate information, TBCs may be available for use in developing remedial alternatives.

State Regulations

Under CERCLA, State of Washington cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated by the State of Washington are potential ARARs. Determination of whether these State of

Washington standards, requirements, criteria, and limitations become ARARs is conducted using the eligibility criteria set forth in Section 121 of CERCLA (i.e., the requirements are promulgated, legally enforceable, generally applicable, more stringent than federal requirements, and identified in a timely manner). MTCA sets forth various ways to determine the numeric values for ARARs (i.e., cleanup levels) for surface water, groundwater, and soil. This includes using tables with cleanup standards for individual contaminants [WAC 173-340-704] and methods for addressing multiple contaminants and pathways [WAC 173-340-705, -706, and -708].

Potential Chemical-Specific ARARs

Chemical-specific ARARs may generally include Maximum Concentration Levels (MCLs) promulgated under the Safe Drinking Water Act and incorporated into state standards. However, the scope of the proposed response action for the Anderson-Calhoun Mine/Mill Site does not include treatment of contaminated groundwater. See NCP at 40 CFR 300.415(j)(2) (in determining whether compliance with ARARs is practicable, lead agency may consider scope of the removal action). As such, established federal and state standards for drinking water and groundwater will not be considered ARARs for purposes of this EE/CA.

Washington State Model Toxics Control Act [RCW 70.105D; WAC 173-340]. MTCA, including WAC 173-340-740 (unrestricted land use soil cleanup standards), -745 (industrial cleanup standards), and -7490 through -7494 (terrestrial ecological evaluation), is a potential ARAR under CERCLA and is applicable to soils across the Site under state law.

Potential Action-Specific ARARs

Potential action-specific ARARs for the Site are discussed below.

Resource Conservation and Recovery Act [42 USC § 6901], Subtitle C - Hazardous Waste Management [40 CFR Parts 260 to 279]. Federal hazardous waste regulations specify hazardous waste identification, management, and disposal requirements. However, pursuant to the Bevill Amendment, 42 USC § 6921(b)(3)(A), solid wastes from the extraction, beneficiation, and some processing of ores and minerals are excluded from RCRA Subtitle C requirements. However, certain of these requirements may be relevant and appropriate to ensure the safe management of some solid wastes, including principal threat materials (e.g., metal concentrates). RCRA Subtitle C elements that may be relevant and appropriate may include, for example, selected portions of the requirements for design and operation of a hazardous waste landfill, 40 CFR Part 264, Subpart N. For the management of RCRA hazardous wastes that are not Bevill-exempt, applicability of Subtitle C provisions depend on whether the wastes are managed within an Area of Contamination (AOC). 55 FR 8760 (Mar. 8, 1990). Applicable or relevant and appropriate requirements of RCRA Subtitle C (or the state equivalent) may be satisfied by off-site disposal, consistent with the Off-Site Rule, 40 CFR 300.440. RCRA Subtitle C also provides treatment standards for debris contaminated with hazardous waste (“hazardous debris”), 40 CFR 268.45, although the lead agency may determine that such debris is no longer hazardous, consistent with 40 CFR 261.3(f)(2), or

equivalent state regulations. The particular provisions of Subtitle C that are applicable or relevant and appropriate for discrete response actions will be identified through the remedial design process. Where Washington has an authorized state hazardous waste program (RCW 70.105; Chapter 173-303 WAC), it applies in lieu of the federal program.

Resource Conservation and Recovery Act [42 USC § 6901], Subtitle D - Managing Municipal and Solid Waste [40 CFR Parts 257 and 258]. Subtitle D of RCRA establishes a framework for controlling the management of non-hazardous solid waste. Subtitle D is potentially applicable to solid waste generation and management at the Site.

Washington State Hazardous Waste Management Act and Dangerous Waste Regulations [RCW 70.105; Chapter 173-303 WAC]. Washington State Dangerous Waste regulations govern the handling and disposition of dangerous waste, including identification, accumulation, storage, transport, treatment, and disposal. Washington State has not adopted an exemption for certain mining wastes (such as the Bevill Amendment) from regulation under RCRA Subtitle C. The Dangerous Waste regulations are potentially applicable to generating, handling, and managing dangerous waste at the Site, and would be potentially relevant and appropriate even if dangerous wastes are not managed during remediation.

Washington State Solid Waste Handling Standards [RCW 70.95; Chapter 173-350 WAC]. Washington State Solid Waste Handling Standards apply to facilities and activities that manage solid waste. The regulations set minimum functional performance standards for proper handling and disposal of solid waste; describe responsibilities of various entities; and stipulate requirements for solid waste handling facility location, design, construction, operation, and closure. The tailings and waste rock piles at the Site are landfills that contain solid wastes. Substantive requirements for closure and post-closure of limited purpose landfills [WAC 173-350-400] are potential ARARs. This regulation is also potentially applicable or relevant and appropriate for management of excavated soil or debris that will be generated during the Site cleanup.

Clean Water Act--National Pollution Discharge Elimination System [33 USC § 1342]. The State Department of Ecology has been delegated the authority under the federal Clean Water Act to carry out the NPDES program in the State of Washington. The NPDES regulations establish requirements for point source discharges and storm water runoff. In particular for the Site, these regulations are potentially applicable for any point source discharge of contamination to surface water, including storm water runoff at the Site. If response activities at the Site involve clearing, grading, excavating, or other response activities that will disturb more than one acre of land resulting in storm water discharges, such activities must comply with the substantive requirements for a Construction Stormwater General Permit to prevent or minimize the discharge of pollutants in storm water runoff from the disturbed areas to waters of the United States.

Washington Clean Air Act and Implementing Regulations [WAC 173-400-040(8)]. This regulation is potentially relevant and appropriate to response actions at the Site. It requires the owner or operator of a source of fugitive dust to take reasonable precautions to prevent

fugitive dust from becoming airborne and to maintain and operate the source to minimize emissions.

General Regulations for Air Pollution Sources - Washington State [RCW 70.94; Chapter 173-400 WAC]. The purpose of these regulations is to establish technically feasible and reasonably attainable standards, and to establish rules generally applicable to the control and/or prevention of the emission of air contaminants. Depending on the response action selected, these regulations are potentially applicable to the Site (e.g., generation of fugitive dust during remediation of soil and tailings, or emissions from equipment).

Potential Location-Specific ARARs

Potential location-specific potential ARARs are discussed below.

National Historic Preservation Act [16 USC § 470f; 36 CFR Parts 60, 63, 800]. The National Historic Preservation Act (NHPA) and implementing regulations require federal agencies to consider the possible effects on historic sites or structures of any actions proposed for federal funding or approval. Historic sites or structures are those included on or eligible for the National Register of Historic Places (NRHP), generally older than 50 years. If an agency finds a potential adverse effect on historic sites or structures, such agency must evaluate alternatives to “avoid, minimize, or mitigate” the impact, in consultation with the State Historic Preservation Office (SHPO). The NHPA and implementing regulations are potentially applicable to response actions such as demolition of old mine or mill structures on the Site. In consultation with the SHPO, unavoidable impacts on historic sites or structures may be mitigated through such means as taking photographs and collecting historic records.

Archaeological Resources Protection Act [16 USC § 470aa *et seq.*; 43 CFR Part 7]. The Archaeological Resources Protection Act (ARPA) and implementing regulations prohibit the unauthorized disturbance of archaeological resources on public or Indian lands. Archaeological resources are “any material remains of past human life and activities which are of archaeological interest,” including pottery, baskets, tools, and human skeletal remains. The unauthorized removal of archaeological resources from public or Indian lands is prohibited without a permit, and any archaeological investigations at a site must be conducted by a professional archeologist. ARPA and implementing regulations are applicable for the conduct of any selected response actions that may result in ground disturbance.

Native American Graves Protection and Repatriation Act [25 USC § 3001 *et seq.*; 43 CFR Part 10]. The Native American Graves Protection and Repatriation Act (NAGPRA) and implementing regulations are intended to protect Native American graves from desecration through the removal and trafficking of human remains and “cultural items” including funerary and sacred objects. The requirements of this Act must be followed when graves are discovered or ground-disturbing activities encounter Native American burial sites. This Act is potentially applicable to the Site where response actions involve disturbance/alteration of the ground and/or site terrain.

Endangered Species Act [16 U.S.C. §§ 1531 – 1544; 50 CFR Parts 17, 402]. The Endangered Species Act (ESA) protects species of fish, wildlife, and plants that are listed as threatened or endangered with extinction. It also protects designated critical habitat for listed species. The Act outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species, including consultation with resource agencies. The requirements of this Act are potentially applicable to the Site since listed threatened or endangered species habitat areas will, or could, be impacted by response action. Consistent with ESA Section 7, if any federally designated threatened or endangered species are identified in the vicinity of remediation work, and the action may affect such species and/or their habitat, EPA will consult with USFWS to ensure that response actions are conducted in a manner to avoid adverse habitat modification and jeopardy to the continued existence of such species.

Migratory Bird Treaty Act (MBTA), 16 USC § 703 et seq. The MBTA makes it unlawful to “hunt, take, capture, kill” or take various other actions adversely affecting a broad range of migratory birds, including tundra swans, hawks, falcons, songbirds, without prior approval by the U.S. Fish and Wildlife Service. (See 50 CFR 10.13 for the list of birds protected under the MBTA.) Under the MBTA, permits may be issued for take (e.g., for research) or killing of migratory birds (e.g., hunting licenses). The mortality of migratory birds due to ingestion of contaminated sediment is not a permitted take under the MBTA. The MBTA and its implementing regulations are potentially relevant and appropriate for protecting migratory bird species identified. The selected response action will be carried out in a manner that avoids the taking or killing of protected migratory bird species, including individual birds or their nests or eggs.

TABLE B-1
JOSEPHINE MILL NO. 1 EE/CA
CONSTRUCTION AND CAPITAL COSTS

Alternative No. 2
Institutional Controls

Item/Description	Quantity	Unit	Unit Cost	Total Cost
1) Mobilization/Demobilization	1	LS	\$1,000.00	\$1,000
1) 6-ft Chainlink Fence (Includes labor)	1,600	LF	\$7.00	\$11,200
2) Signage	6	EA	\$100.00	\$600
SUBTOTAL CONSTRUCTION COSTS				\$12,800
Contingency			20%	\$2,560
TOTAL ESTIMATED CONSTRUCTION COSTS				\$15,360
Estimate of Professional/Technical Services Costs			Percentage	Total Cost
Project Management/Administrative Costs			10%	\$1,536
Engineering and Final Design			20%	\$3,072
Construction Management			15%	\$2,304
SUBTOTAL PROFESSIONAL/TECHNICAL SERVICES COSTS				\$6,912
Estimate of Institutional Controls Costs			Unit Cost	Total Cost
Institutional Controls				
Institutional Controls Plan	1	LS	\$ 5,000.00	\$5,000
Development of Restrictive Covenants	1	LS	\$ 5,000.00	\$5,000
Long-Term Monitoring Plan	1	LS	\$ 2,500.00	\$2,500
SUBTOTAL INSTITUTIONAL CONTROLS COSTS				\$12,500
TOTAL CAPITAL COSTS				\$34,772
POST CLOSURE MAINTENANCE COSTS				
Years 1 through 2				
1) 2.5% of Total Capital Costs	2.5%			\$869
Annual Subtotal Years 1 through 2				\$869
Years 3 through 10				
2) 1% of Total Capital Costs	1%			\$348
Annual Subtotal Years 3 through 10				\$348

Notes:

Professional/technical services costs based on U.S. EPA document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study". EPA 540-R-00-002. July 2002.

Post closure monitoring costs limited to periodic inspections and maintenance.

TABLE B-2
JOSEPHINE MILL NO. 1 EE/CA
CONSTRUCTION AND CAPITAL COSTS

Alternative No. 3
Institutional Controls, Excavation, and Consolidation

Item/Description		Quantity	Unit	Unit Cost	Total Cost
1)	Mobilization/Demobilization	1	LS	\$10,000.00	\$10,000
2)	Clearing and Grubbing	3	AC	\$3,000.00	\$9,000
3)	Excavate and Consolidate				
	Contractor Labor				
	Supervisor	150	HR	\$60.00	\$9,000
	Labor	200	HR	\$35.00	\$7,000
	Operator	200	HR	\$35.00	\$7,000
	Equipment				
	Mini Excavator	24	HR	\$55.00	\$1,320
	3-4 cy loader	32	HR	\$85.00	\$2,720
	320 Excavator	32	HR	\$105.00	\$3,360
	Skidsteer Loader	104	HR	\$55.00	\$5,720
	Compactor	104	HR	\$55.00	\$5,720
	Materials				
	Silt Fence	2,000	LF	\$1.50	\$3,000
	Contractor Markup on Materials (15%)				\$450
	Travel				
	Lodging	55	DY	\$75.00	\$4,125
	Meals	55	DY	\$25.00	\$1,375
4)	Cap and Cover				
	Contractor Labor				
	Supervisor	60	HR	\$60.00	\$3,600
	Labor	100	HR	\$35.00	\$3,500
	Operator	100	HR	\$35.00	\$3,500
	Equipment				
	Skidsteer Loader	24	HR	\$55.00	\$1,320
	Compactor	24	HR	\$55.00	\$1,320
	320 Excavator	24	HR	\$105.00	\$2,520
	Materials				
	30 mil PVC FML	33,525	SF	\$0.45	\$15,153
	Geotextile	3,725	SY	\$1.25	\$4,656
	Rock Cover	1,863	CY	\$16.00	\$29,800
	6-ft Chainlink Fence	800	LF	\$7.00	\$5,600
	Sand/Crushed Rock Drain Layer	1,863	CY	\$16.00	\$29,800
	Riprap-lined Run-off Channel	500	LF	\$25.00	\$12,500
	Contractor Markup on Materials (15%)				\$14,626
	Travel				
	Lodging	26	DY	\$75.00	\$1,950
	Meals	26	DY	\$25.00	\$650
5)	Site Stabilization				
	Contractor Labor				
	Supervisor	20	HR	\$60.00	\$1,200
	Labor	20	HR	\$35.00	\$700
	Operator	20	HR	\$35.00	\$700
	Equipment				
	Mini Excavator	16	HR	\$55.00	\$880
	Materials				
	Seed	2	Bag	\$16.00	\$32
	Contractor Markup on Materials (15%)				\$5
	Travel				
	Lodging	6	DY	\$75.00	\$450
	Meals	6	DY	\$25.00	\$150
SUBTOTAL CONSTRUCTION COSTS					\$204,403
Contingency				20%	\$40,881
TOTAL ESTIMATED CONSTRUCTION COSTS					\$245,283

TABLE B-2 (continued)
JOSEPHINE MILL NO. 1 EE/CA
CONSTRUCTION AND CAPITAL COSTS

Alternative No. 3
Institutional Controls, Excavation, and Consolidation

Estimate of Professional/Technical Services Costs			Percentage	Total Cost
Project Management/Administrative Costs			8%	\$19,623
Engineering and Final Design			15%	\$36,793
Construction Management			10%	\$24,528
SUBTOTAL PROFESSIONAL/TECHNICAL SERVICES COSTS				\$80,944
Estimate of Institutional Controls Costs			Unit Cost	Total Cost
Institutional Controls				
Institutional Controls Plan	1	LS	\$ 5,000.00	\$5,000
Development of Restrictive Covenants	1	LS	\$ 5,000.00	\$5,000
Long-Term Monitoring Plan	1	LS	\$ 5,000.00	\$5,000
SUBTOTAL INSTITUTIONAL CONTROLS COSTS				\$15,000
TOTAL CAPITAL COSTS				\$341,227
POST CLOSURE MAINTENANCE COSTS				
Years 1 through 2				
1) 2.5% of Total Capital Costs	2.5%			\$8,531
Annual Subtotal Years 1 through 2				\$8,531
Years 3 through 10				
2) 1% of Total Capital Costs	1%			\$3,412
Annual Subtotal Years 3 through 10				\$3,412

Notes:

Existing mine waste materials are estimated to be approximately 9,650 cubic yards covering 1.6 acres.

The footprint of the consolidated repository occupies approximately 0.6 acre.

Construction quantities and unit costs based on values provided by Zanetti Brothers, Inc., NRC Environmental, and Caterpillar Performance Handbook.

Professional/technical services costs based on U.S. EPA document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study". EPA 540-R-00-002. July 2002.

TABLE B-3
JOSEPHINE MILL NO. 1 EE/CA
CONSTRUCTION AND CAPITAL COSTS

Alternative No. 4
Excavation and Off-Site Disposal

Item/Description		Quantity	Unit	Unit Cost	Total Cost
1)	Mobilization/Demobilization	1	LS	\$10,000.00	\$10,000
2)	Clearing and Grubbing	3	AC	\$3,000.00	\$9,000
3)	Excavate and Load Out				
	Contractor Labor				
	Supervisor	216	HR	\$60.00	\$12,960
	Labor	288	HR	\$35.00	\$10,080
	Operator	288	HR	\$35.00	\$10,080
	Equipment				
	Vehicle	28	DY	\$130.00	\$3,640
	Mini Excavator	7	HR	\$55.00	\$396
	3-4 cy loader	206	HR	\$85.00	\$17,503
	320 Excavator	127	HR	\$105.00	\$13,356
	Skidsteer Loader	17	HR	\$55.00	\$924
	Travel				
	Lodging	86	DY	\$75.00	\$6,480
	Meals	86	DY	\$25.00	\$2,160
4)	Site Stabilization				
	Contractor Labor				
	Supervisor	20	HR	\$60.00	\$1,200
	Labor	20	HR	\$35.00	\$700
	Operator	20	HR	\$35.00	\$700
	Equipment				
	Vehicle	2	DY	\$130.00	\$260
	320 Excavator	38	HR	\$105.00	\$4,032
	Skidsteer Loader	38	HR	\$55.00	\$2,112
	Travel				
	Lodging	2	DY	\$75.00	\$150
	Meals	2	DY	\$25.00	\$50
	Materials				
	Silt Fence	400	LF	\$1.50	\$600
	Seed	2	Bag	\$16.00	\$32
	Contractor Markup on Materials (15%)				\$95
SUBTOTAL CONSTRUCTION COSTS					\$106,510
5)	Transportation				
	Rail to Arlington	16,000	TON	\$44.70	\$715,200
6)	Disposal				
	DW @ Arlington	16,000	TON	\$198.00	\$3,168,000
SUBTOTAL TRANSPORTATION AND DISPOSAL COSTS					\$3,883,200
Contingency				20%	\$797,942
TOTAL ESTIMATED CONSTRUCTION COSTS					\$4,681,142

TABLE B-3 (continued)
JOSEPHINE MILL NO. 1 EE/CA
CONSTRUCTION AND CAPITAL COSTS

Alternative No. 4
Excavation and Off-Site Disposal

Estimate of Professional/Technical Services Costs		Percentage	Total Cost
Project Management/Administrative Costs		8%	\$10,225
Engineering and Final Design		15%	\$19,172
Construction Management		10%	\$12,781
SUBTOTAL PROFESSIONAL/TECHNICAL SERVICES COSTS			\$42,178
TOTAL CAPITAL COSTS			\$4,723,320
POST CLOSURE MAINTENANCE COSTS			
Years 1 through 2			
1)	2.5% of Total Capital Costs	0.0%	\$0
Annual Subtotal Years 1 through 2			\$0
Years 3 through 10			
2)	1% of Total Capital Costs	0%	\$0
Annual Subtotal Years 3 through 10			\$0

Notes:

Construction quantities and unit costs based on values provided by Zanetti Brothers, Inc., NRC Environmental, Waste Management, and Caterpillar Performance Handbook.

Transportation and disposal quantities are based on 9650 cubic yards at 3300 pounds per cubic yard.

Professional/technical services costs based on U.S. EPA document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study". EPA 540-R-00-002. July 2002.

Professional/technical services costs are based on Total Estimated Construction Costs minus Transportation and Disposal Costs (plus contingency)