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Grandview and Josephine Mines Removal Assessment Report Metaline Falls, Washington TDD: 03-05-0003

Contract: 68-S0-01-01
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Region 10

START-2

Superfund Technical Assessment and Response Team

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GRANDVIEW AND JOSEPHINE MINES
REMOVAL ASSESSMENT REPORT
METALINE FALLS, WASHINGTON

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LIST OF ACRONYMS

Acronym	Definition
bgs	below ground surface
BLM	Bureau of Land Management
EPA	United States Environmental Protection Agency
MCL	Maximum contaminant level
mg/kg	milligrams per kilogram
NAWQ	National Ambient Water Quality
NOAA	National Oceanic and Atmospheric Administration
PA/SI	Preliminary Assessment/Site Inspection
ppm	parts per million
PRG	Preliminary Remediation Goal
RA	Removal Assessment
SDWA	Safe Drinking Water Act
SPLP	Synthetic Precipitate Leaching Procedure
SQRT	Screening Quick Reference Tables
START	Superfund Technical Assessment and Response Team
TAL	Target Analyte List
TEL	Threshold Effects Level
tpd	ton per day
XRF	X-Ray Fluorescence

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1. BACKGROUND

In May 2003, the United States Environmental Protection Agency (EPA), Region 10, Office of Environmental Cleanup tasked Ecology and Environment, Inc., under the Superfund Technical Assessment and Response Team (START)-2 contract No. 68-S0-01-01 to conduct Removal Assessments (RAs) at the Grandview Mine and the Josephine Mine near Metaline Falls in Pend Oreille County, Washington, under the Technical Direction Document Number 03-05-0003. The Grandview and Josephine Mines sites are two former lead and zinc mines/mills located on the Pend Oreille River, north of Metaline Falls, Washington, in the Metaline Mining District (Figure 1-1). RAs were conducted at these sites for the purpose of assessing the potential for the migration of contaminants off site and to collect information to facilitate the evaluation of removal alternatives. Background information about the Grandview Mine, including the site's location, terrain, geology, and history, is provided in Section 1.1. Background information about the Josephine Mine is provided in Section 1.2.

1.1 GRANDVIEW MINE

1.1.1 Site Location

The inactive Grandview lead-zinc mine/mill is located in the lower Pend Oreille River Valley approximately 3/4 mile from the east bank of the Pend Oreille River, approximately two miles northeast of Metaline Falls, Washington. The site can be broken into two geographic locations. The first location is the upper mine/mill area that is located off U.S. Highway 31 on Grandview Flats Road. The second location is the tailings deposit area located south of the mine/mill area in Pend Oreille Village. The upper mine/mill area is located at latitude 48° 52' 22.04" North and longitude 117° 21' 26.16" West in the northeast 1/4 of the northwest 1/4 of Section 22 in Township 39 North, Range 43 East. The tailings depository is located in the southwest 1/4 of the northwest 1/4 of Section 22 in Township 39 North, Range 43 East. (E & E 2003)

The annual net precipitation reported for the Metaline Falls area where the mine is located is 27.38 inches. The two-year, 24-hour rainfall event recorded in the area ranges from 1.8 to 2.4 inches. The bull trout and the Pacific fisher are present in the Pend Oreille River, which flows past the mine site

at a flow rate of 24,580 cubic feet per second. Commercial and subsistence fishing does not take place on the river in this area, but sport fishing is a popular activity in the area. (E & E 2002)

1.1.2 Terrain, Geology, and Hydrogeology

The Grandview Mine can be divided into two geographic areas, the upper mine/mill area and the lower tailings deposit area (Figure 1-2). Features at the upper mine/mill area include several intact mill buildings; foundations of former mill buildings; four waste rock piles; and an un-named spring. The un-named spring begins at a point above the site and flows across the site through a concrete culvert system toward the head of an old wastewater drainage ditch. The water exits the culvert system through a grating where water ponds (Figure 1-2). An occupied residence also is present in the upper mine/mill area. The terrain in the upper mine/mill area is flat in the area where the mill buildings are located; however, the western border of the property is characterized by steeply sloping hills. Just south of the upper mine/mill area, the terrain slopes steeply downhill to the tailings deposit area.

During the mine's operation, mill tailings were discharged to a drainage ditch that discharges to a canyon south of the upper mine/mill area. The outlet of the canyon is located at the northern end of the Pend Oreille Village, a small residential area northeast of Metaline Falls. Tailings discharged from the upper mine/mill area accumulated in this area, referred to in this report as the tailings deposit area.

During previous site investigations, tailings were observed to cover about one acre of land in the tailings deposit area. Surface water cuts through the center of the tailings deposit, whose depth is unknown. The size of the tailings deposit remaining at the site is inconsistent with the reported amount of ore produced from the mine. Therefore, it is believed that much of the tailings generated at the mine over the course of its operation were washed over Riverside Bluff into the Pend Oreille River (E & E 2002). Wellheads that serve Pend Oreille Village, a town with 30 residents, and serve as a stand-by water resource for the town of Metaline Falls, a town of 223 people, are located approximately 100 feet southeast of the tailings deposit (E & E 2002). The terrain in the tailings deposit area is relatively flat and is bordered on the east by a steeply sloping hill. West of the tailings deposit area, the terrain slopes downhill for about 300 feet before dropping off steeply to the Pend Oreille River.

The top three to five feet of subsurface soil in the tailings deposit area consists of top soil. Top soil is underlain by a mixture of sand, gravel, clay, and boulders. A significant portion of the subsurface soils at the site consist of fine-grained sands and clay. Bedrock is found at depths greater than 200 feet below ground surface (bgs). Groundwater exists locally within fractures in the bedrock and within overlying unconsolidated deposits. The degree of interconnection of all the saturated intervals over the

area is not known; however, groundwater levels in the tailings deposit area have typically been encountered at 125 feet bgs. (E & E 2002; Ecology 1994a, 1994b, 1994c, and 1995)

1.1.3 Ownership and Operational History

The Grandview Mine was, at one time, the second largest mine in the state of Washington. Production at the Grandview Mine is recorded as taking place from 1924 through 1955. Between 1940 and 1951, about 1,254,000 tons of zinc, lead, and traces of silver were reported to have been produced from the Grandview Mine. (Battien 1998)

Prior to the 1900s, five claims were patented (Battien 1998). In 1928, American Zinc, Lead & Smelting Co. began operation of a 250-ton per day (tpd) mill at the mine (E & E 2002). Mining operations were discontinued in 1930 because of depressed metal prices (E & E 2002). In 1936, American Zinc, Lead & Smelting Co. began leasing the property from Grandview Mines, Inc. (Battien 1998). Between 1936 and 1937, a total of 12 exploratory boreholes were drilled; however, in 1937, low metal prices forced American Zinc, Lead & Smelting Co. to discontinue operations at the mine (E & E 2002). In 1939, operations resumed at the mine (E & E 2002). The mine operated continuously from 1940 until 1955 (Battien 1998). By 1956, a total of 11 claims had been patented (Battien 1998). The Grandview mine and mill shut down on September 5, 1964 (E & E 2002). The mine is currently owned by Washington Resources, Inc. but no operations have taken place at the mine since they purchased the property from American Zinc, Lead & Smelting Co.

From the early 1900s to 1951, about 5,300 feet of underground workings were developed. The Grandview Mine workings were on two levels. The main tunnel was at an elevation of 2,424 above mean sea level. The lower workings were 200 feet lower and were accessed via a 600-foot incline 1,900 feet from the portal. The main tunnel was developed to 2,800 feet and ran in a northerly direction paralleling the Pend Oreille River. Ore from the lower workings was trammed to the skip in 2-ton ore cars by a 5-ton Jeffrey trolley locomotive. It was hauled up the incline in a 6-ton skip car by a converted elevator hoist powered by a 60-hp motor. Tramming on the main level was by two 10-ton Westinghouse trolley locomotives. (E & E 2002)

Open stope mining also was conducted at the Grandview mine. Both bench and sideswipe rounds were used in blasting. Blasting entailed holes shot in rotation starting with the two in the center, followed by a diamond shape comprised of four erasers, then a large diamond, and finally the corners. The holes were drilled seven to eight feet, depending on the formation, using one stick of powder to the foot. (E & E 2002)

After Grandview Mine had been operating on a continuous basis, a 750-tpd floatation mill was constructed (Battien 1998). The new mill was fully operational by 1952 (Battien 1998). Tailings from the milling process were discharged to a drainage ditch that empties into a well-vegetated canyon (E & E 2002). Approximately 0.5 mile down the canyon, the flume discharged the tailings to the ground (E & E 2002). Drainage from the canyon empties over a bluff, known as Riverside Bluff, directly into the Pend Oreille River. It is unknown how long the mill discharged tailings to this area. Also unknown is the total volume of tailings discharged to the canyon over the years that the mill was operational.

1.1.4 Previous Investigations

In October 2000, the START-2 conducted a preliminary assessment/site inspection (PA/SI) at the Grandview Mine site. Surface soil samples were collected from the waste rock piles, the tailings deposit, and from the former wastewater drainage ditch where abandoned drums were once located. The abandoned drums are no longer at the site as Washington Resources, Inc., the current owner of the site, arranged for the transportation and disposal of the drums. Analytical results of the samples indicated that the soils in all of these areas contained significant concentrations of arsenic, cadmium, copper, lead, mercury, selenium, and zinc. Lead concentrations in all areas exceeded the EPA Region 9 Preliminary Remediation Goal (PRG) for residential soil (400 milligrams per kilogram). (E & E 2002)

Also during the PA/SI, samples were collected from suspected targets along potential groundwater migration, surface water migration, and soil exposure pathways. These samples were collected from groundwater wells, the Pend Oreille River, an unnamed spring in the upper mill area, and the former wastewater drainage ditch. Target Analyte List (TAL) metals were not detected in any of the surface water samples collected from the Pend Oreille River, but were detected at significant concentrations in the sediment samples collected from the river. Cadmium, copper, lead, and zinc detected in the sediment samples exceeded the National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQRTs) for freshwater sediment Lowest ARCs H. azteca Threshold Effects Level (TEL) value. Cadmium, chromium, copper, lead, manganese, and zinc detected in sediment also exceeded background concentrations. (E & E 2002)

Arsenic, manganese, selenium, and zinc were detected in groundwater samples collected from the Pend Oreille Village wellheads in the tailings deposit area. The concentration of arsenic in the groundwater collected from these wells exceeded the Safe Drinking Water Act (SDWA) Maximum Contaminant Limit (MCL) of 10 micrograms per liter by a factor of 2. (E & E 2002)

Elevated concentrations of arsenic, lead, manganese, selenium, and zinc were detected in the unnamed spring surface water samples collected during the PA/SI. The concentration of lead and zinc in the water sample exceeded National Ambient Water Quality (NAWQ) standards for acute exposure in freshwater. Arsenic, cadmium, copper, lead, mercury, and zinc were detected in the unnamed spring co-located sediment samples at concentrations that exceeded the NOAA SQRTs for freshwater sediment Lowest ARCs H. azteca TEL or TEL values. (E & E 2002)

No elevated concentrations of TAL metals were detected in surface water samples collected from the Pend Oreille River upstream and downstream of the site; however, elevated concentrations of TAL metals were detected in the co-located sediment samples. Cadmium, copper, lead, and zinc exceeded the NOAA SQRTs for freshwater sediment Lowest ARCs H. azteca TEL or TEL values. The sediment sample collected from the Pend Oreille river downgradient of the site contained over twice as much lead [827 milligrams per kilogram (mg/kg)] than the sediment sample collected from the Pend Oreille river upgradient of the site (349 mg/kg).

The START-2 returned to the Grandview Mine site in July 2002 to further assess the site. The START-2 was accompanied by a Bureau of Land Management (BLM) representative who was there assist with the assessment. The BLM collected field analytical information using X-Ray Fluorescence (XRF) field screening. During the site visit, the START-2 documented all of the features at the site and identified the environmental concerns associated with the site. The BLM used the XRF to analyze the metal content of soils in the upper mine/mill area. The BLM collected field analytical information from three areas: two waste rock piles west of the shop and house and an area on the west side of the former truck loading shed where a gray powder was observed. Analytical results of the soil in all three areas showed the concentration of lead to exceed the PRG for lead in residential and industrial soil.

1.2 JOSEPHINE MINE

1.2.1 Site Location

The Josephine Mine site is a former cadmium, lead, silver, and zinc mine located on the west side of the Pend Oreille River, about 2 miles north of Metaline Falls, Washington. The site can be broken into three geographical areas: the Old Josephine Mill, the New Josephine Mill, and the mine area. The Old Josephine Mill is situated in the southeast 1/4 of the southwest 1/4 of Section 16 in Township 39 North, Range 43 East (USGS 1986). The New Josephine Mill is situated in the north 1/2 of the southeast 1/4 of Section 16 in Township 39 North, Range 43 East at latitude 48° 52' 48.00" North and longitude

117° 22' 15.96"W (USGS 1992). The mine area is located in the south 1/2 of the northeast 1/4 of Section 16 in Township 39 North, Range 43 East (USGS 1992).

The annual net precipitation reported for Metaline Falls area where the mine is located is 27.38 inches. The two-year, 24-hour rainfall event recorded in the area ranges from 1.8 to 2.4 inches. The mine area of the Josephine Mine site is situated in a two-year flood plain. (E & E 2002)

1.2.2 Terrain, Geology, and Hydrogeology

There are two mill areas referred to as the Old Josephine Mill (Figure 1-3) and the New Josephine Mill (Figure 1-4). The Old Josephine Mill is located 0.25 miles east of Boundary Dam Road on Flume Creek Road and encompasses 5.3 acres. Access to the site is unrestricted. The Old Josephine Mill consists of a waste rock pile, tailings piles, and remnants of the old mill building. Tailings material covers about 2.5 acres in the area south of the site access road and extends down to the north bank of Flume Creek. The terrain at the Old Josephine Mill on the north side of the site access road consists of steep, rocky hills. South of the site access road, the slope varies between five and fifty percent[1]. Waste rock and unprocessed ore has been mixed into the tailings material adjacent to the site access road. Flume Creek runs along the toe of the tailings pile. The flow in Flume Creek is estimated by the START-2 to be greater than 10 cubic feet per second. (E & E 2002)

The New Josephine Mill is located 0.7 miles east of Boundary Dam Road, towards the Pend Oreille River (E & E 2002). The New Josephine Mill site encompasses 38.5 acres and straddles Flume Creek (E & E 2002). Two waste rock piles and some remnant mill buildings are present at this site (BLM n.d.). Remnants of a tailings flume are present throughout Flume Creek and at its mouth (BLM n.d.). The terrain is flat in the area where the mill buildings are situated, however, the rest of the New Josephine Mill site, including the waste rock piles, slopes steeply down to Flume Creek (E & E 2002).

The mine area consists of a shaft, a waste rock pile, a small building, and a collapsing wood structure and is located directly across the Pend Oreille River from the waste rock at the Pend Oreille Mine/Mill (Figure 1-5). The shaft is surrounded by an 8-foot, barbed-wire-topped, chain-link fence. The shaft is filled with water up to approximately 25 feet from the surface. Approximately 2 feet southwest of the collapsing wood structure is a spring. The spring is estimated to flow at rates between 2 to 3 gallons per minute. The waste rock pile measures 60 feet long by 10 feet wide by 2 feet deep. The waste rock pile extends into the Pend Oreille River forming part of the bank of the river. A shop building and a

[1] Slopes of fifty percent are located in areas where tailings material is deposited in large piles (Photographs 2.02 and 2.06).

collapsed adit are located one-quarter mile west of the waste rock pile. The collapsed adit is located west of the shop building. (E & E 2002)

1.2.3 Ownership and Operational History

From 1912 until 1924, the Josephine Mine property was owned and operated by the Lead-Zinc Company (Battien 1998). By 1924, the Josephine Mine property consisted of 15 patented claims (Battien 1998). When the Pend Oreille Mines and Metals Company purchased the property in 1934, the Josephine Mine had increased its patented claims to 20 (Battien 1998). The mine is reported to have produced 40,000 tons of ore prior to 1919, 187,000 tons in 1948, and 273,520 tons in 1951 (Derkey 1990). There were two mills that operated at the mine. The Old Josephine Mill was constructed around 1912 and could process up to 750 tpd (Perry 2003, Huntting 1956). A second mill was constructed in the winter of 1935/1936 at the New Josephine Mill area. The new mill was capable of processing 2,400 tpd (Huntting 1956, Perry 2003). The presence of a network of ditches that runs from the side of the Flume Creek ravine to the Pend Oreille River, as well as the remnants of a wooden flume in Flume Creek, indicate that tailings from the New Josephine Mill were discharged directly to the Pend Oreille River (Perry 2003).

A majority of the ore at the Josephine Mine came from underground workings. There is an extensive network of underground workings associated with mine. The underground workings are located on both the east and west sides of the Pend Oreille River and are connected by a tunnel that runs underneath the river. (Perry 2002)

Complete historical ownership information for the Josephine Mine/Mill from the time of patent to the present is unknown. Currently, Teck Cominco American Inc. maintains a prospecting lease for the Josephine Mine property through 2005 (Godlewski 2001). The surface rights to the Old Josephine Mill site are currently owned by Stimson Lumber out of Newport, Washington. The New Josephine Mill site is on property administered by the BLM. Seattle City Light owns property along the banks of the Pend Oreille River north of Metaline Falls. Seattle City Light's right-of-way extends up to 500 feet above the high water mark. The mine area of the Josephine Mine site is situated in the Seattle of City Light's right-of-way.

1.2.4 Previous Investigations

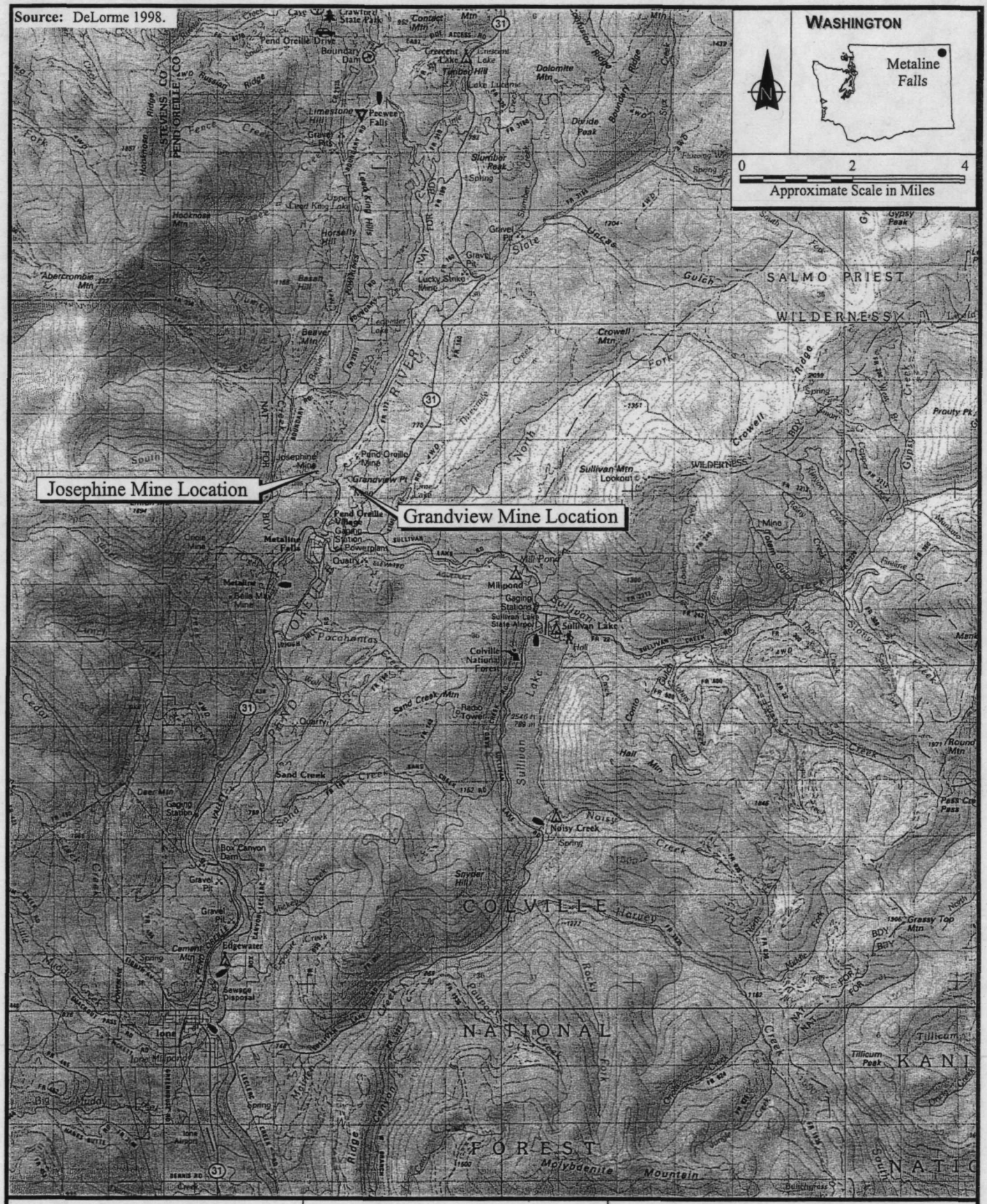
In June 2001, the START-2 conducted a PA/SI at the site and collected a total of two samples from the site. A surface water sample was collected from the un-named spring and a sediment sample

was collected from the waste rock pile at the mine area of the Josephine Mine site. Lead and zinc were detected in the surface water sample at concentrations that exceed the NAWQ standards for continuous exposure. Lead was detected in the waste rock sample at a concentration of 17,400 mg/kg. Arsenic, cadmium, lead, and zinc in the sediment sample exceeded the NOAA SQRTs for freshwater sediment Lowest ARCs H.azteca TEL or TEL values. (E & E 2002)

The START-2 returned to the Josephine Mine site in July 2002 to further assess the site. The START-2 was accompanied by a BLM representative who was there to conduct their own assessment. The BLM collected field analytical information using an XRF field screening method. During the site visit, the START-2 documented all of the features at the site and identified the environmental concerns associated with the site. The BLM used the XRF to analyze the metal content of soils in the two mill areas of the site. (E & E 2002)

At the Old Josephine Mill, the BLM analyzed tailings near the site access road; tailings on the bank of Flume Creek; soil north of the site access road; and soil in the waste rock pile adjacent to the site access road. All of the areas analyzed with the XRF at the Old Josephine Mill contained lead at concentrations greater than the PRG for lead in residential soil. All but one sample location contained lead at a concentration greater than the PRG for lead in industrial soil (750 mg/kg). The sample location not containing lead at a concentration greater than the industrial PRG was located on the bank of Flume Creek. (E & E 2002)

At the New Josephine Mill, the BLM analyzed waste rock, unprocessed ore, tailings, and soil using the XRF. A total of 25 locations were analyzed by the BLM in an effort to characterize the extent and degree of contamination in this area. All waste rock samples were found to contain lead at concentrations greater than the PRG for lead in residential and industrial soil. Most tailings analyzed with the XRF were found to contain lead at concentrations greater than the PRG for lead in residential and industrial soil. The BLM anticipates performing reclamation work at the New Josephine Mill site. (E & E 2002)



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	GRANDVIEW AND JOSEPHINE MINES REMOVAL ASSESSMENTS Metaline Falls, Washington	Figure 1-1 GRANDVIEW AND JOSEPHINE MINES SITE LOCATION MAP Date: 10-22-03 | Drawn by: AES | 10:START-2\03050003\fig 1-1

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2. START-2 ACTIONS

Between August 18 and August 19, 2003, the EPA, the START-2, and the BLM returned to the Grandview Mine and Josephine Mine sites to assess the need to conduct removal actions at the sites. The Grandview Mine visit consisted solely of a site reconnaissance (subsection 2.1). A site reconnaissance and sample collection were conducted at the Josephine Mine site (subsection 2.2).

2.1 GRANDVIEW MINE

On the afternoon of August 18, 2003, the EPA and the START-2 arrived at the Grandview Mine site and met with Mr. Ingval Sundheim, the site caretaker who lives in the residence at the upper mine/mill area. The access agreement with the site owner, Washington Resources, Inc., specifically required the EPA to check in with Mr. Sundheim and to not collect any type of sample at the site including XRF data. Mr. Sundheim gave the EPA and the START-2 a tour of the upper mine/mill area and then escorted the team to the tailings deposit area at Pend Oreille Village.

At the tailings deposit area, the START-2 photographed the tailings deposit area and measured the dimensions of the tailings deposit area. Photographs of the tailings deposit area are provided as Appendix A. The tailings in this area are gray in color and consist of fine-grained sandy soil. Along the east boundary of the tailings deposit, the tailings are about 10 to 15 feet thick and drop off steeply to a large flat area covered in tailings. The tailings in the flat area were observed to extend as far west as the Pend Oreille Village wellheads. A drainage ditch cuts through the center of the thick tailings deposit. Wooden remnants of the flume used to discharge tailings are visible in this location. The drainage ditch is no longer visible after it cuts through the thick section of tailings and no sign of erosion throughout the flat area of tailings was observed. The boundaries of the tailings deposit area were determined by the START-2 to be those areas that did not contain the fine-grained gray sandy soil characteristic of the tailings. A roller tape measuring device was utilized to measure the dimensions of the tailings deposit area. The approximate dimensions of the tailings deposit area are as follows:

- Width at the widest point: 215 feet.
- Length at longest point: 280 feet

- Circumference: 965 feet
- Total Area[2]: 47,300 square feet or 1 acre

During the site visit, the START-2 also followed the seasonal drainage ditch that begins at the west end of the tailings deposit area and ends at the edge of Riverside Bluff. The shallow drainage ditch varies in width between 1 to 3 feet. Throughout the length of the drainage ditch to the edge of the bluff, the START-2 observed deposits of tailings material.

2.2 JOSEPHINE MINE

On the morning of August 19, 2003, the EPA, the START-2, and the BLM arrived at the Josephine Mine to conduct a site reconnaissance of the three mine areas and to collect soil samples from two of the areas.

2.2.1 Old Josephine Mill

The Old Josephine Mill area is located about 0.2 miles off of Boundary Dam Road and is the first area of the mine to be encountered by the site access road. At the Old Josephine Mill area, the START-2 photographed the tailings pile and collected a sample of the tailings. Photographs of the Josephine Mine site are provided as Appendix A.

The tailings in this area are tan in color and consist of fine-grained sandy soil. Tailings are deposited adjacent to the site access road and extend down to the north bank of Flume Creek. Roughly 25 feet from the north bank of Flume Creek on the east and west sides of the main tailings area, are large piles of tailings. Very little vegetation was observed in the areas where tailings are present. Erosion resulting from surface water runoff is visible throughout the primary tailings pile area. Also situated in the tailings pile area adjacent to the site access road is a large pile of unprocessed ore/waste rock.

One soil sample was collected from the tailings pile adjacent to the site access road and east of the unprocessed ore/waste rock pile. The soil sample, OJM01 (Sample Number 03081200), was collected using a plastic spoon and placed into a four-ounce glass jar. The sample was submitted to a commercial laboratory to be analyzed for TAL metals using EPA Methods 6010 and 7471. The sample also was submitted for Synthetic Precipitate Leaching Procedure (SPLP) metals analysis using EPA

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[2] Total area was calculated assuming the shape of the tailings pile was a perfect ellipse. The actual area covered by tailings is likely larger than one acre.

Methods 1312, 6010, and 7470. SPLP metals analysis simulates actual site conditions by using water as the extraction fluid and is useful for determining the potential for heavy metals leaching from the material under wet conditions. The concentration of lead in soil sample OJM01 was greater than the PRG for lead in residential soil but less than the PRG for lead in industrial soil. The concentration of cadmium in soil sample OJM01 also exceeded the PRG for cadmium in residential soil but not the PRG for cadmium in industrial soil. No other metals were detected at concentrations exceeding PRGs for residential soil. Metals were not detected in the SPLP extract of soil sample OJM01 at concentrations greater than the method detection limit. The data validation memorandum for this sample is provided as Appendix B.

During the site visit, the BLM also collected information about the metals concentration in the tailings at the Old Josephine Mill area using XRF field screening. The BLM analyzed the tailings in two areas and found 1,030 parts per million (ppm) lead and 44,000 ppm zinc in one location and 2,300 ppm lead and 47,000 ppm zinc in another. The concentration of lead detected in these two locations exceed both the residential and industrial soil PRG for lead. The concentration of zinc in these two locations exceed the PRG for zinc in residential soil.

2.2.2 Mine Area

The mine area of the Josephine Mine site is located on the west bank of the Pend Oreille River and is not accessible by road. The mine area is only accessible by boat or by foot. An attempt was made to hike to the mine area along the bank of the Pend Oreille River south of Flume Creek's confluence with the river. The terrain along the bank of the Pend Oreille River at this location was rugged, and the EPA OSC decided that the effort required to access the site on foot would not be necessary. A boat will likely be necessary if access to this area is required in the future.

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3. CONCLUSIONS

3.1 GRANDVIEW MINE

On August 18, 2003, the START-2 conducted a site visit at the Grandview Mine near Metaline Falls, Washington. Previous investigations at this former lead and zinc mine have shown that lead is present in the soil and waste rock at the upper mine/mill area and in the tailings at the tailings deposit area at concentrations exceeding EPA Region 9 PRGs for lead in residential soil. Although detectable levels of TAL metals were not detected in surface water samples collected from the Pend Oreille river, sediment samples collected from the Pend Oreille River adjacent to the Grandview Mine site contained heavy metals including lead and zinc at concentrations exceeding background levels and NOAA SQRTs TEL values for freshwater sediment. The concentration of lead detected in the sediment sample collected from the Pend Oreille River downstream from the site contained over twice the concentration of lead detected in a sediment sample collected upstream from the site, indicating that the Pend Oreille river sediments have been impacted by the Grandview Mine site. The extent of sediment contamination in the Pend Oreille river has not been assessed.

Arsenic was detected in groundwater samples collected from the Pend Oreille Village wells at a concentration that exceeds the SDWA MCL. The groundwater samples collected from these wells did not contain lead at detectable levels, indicating that regional groundwater has not been impacted by the tailings; however, the degree to which the tailings leach metals under wet conditions has not been assessed.

During the site visit on August 18, 2003, the START-2 noted that the tailings deposit area is located in a residential area and access to the tailings is unrestricted. The START-2 observed tailings deposits throughout the seasonal drainage ditch that runs from the tailings deposit to the bluff just above the Pend Oreille River, indicating that seasonal runoff has carried tailings off site to the Pend Oreille River. Although commercial and subsistence fishing does not occur on the Pend Oreille River in the vicinity of the site, sport fishing does occur.

3.2 JOSEPHINE MINE

On August 19, 2003, the START-2 conducted a site visit at the Josephine Mine site near Metaline Falls, Washington. Previous investigations at this former lead and zinc mine have shown that lead and zinc are present in the waste rock and tailings at the Old Josephine Mill, the New Josephine Mill, and in the waste rock at the mine area. Lead and zinc were detected in the surface water sample collected from the spring at the mine site at concentrations exceeding NAWQ levels for continuous exposure in fresh water. The spring discharges to the Pend Oreille River.

As part of the site visit, the START-2 collected one sample of the tailings material at the Old Josephine Mill. The tailings sample contained cadmium, lead, and zinc at concentrations exceeding EPA Region 9 PRGs for these metals in residential soil. Analytical results of the SPLP analysis indicate that heavy metals are not prone to leach out of the tailings under wet conditions. The tailings deposit extends from the access road to the north bank of Flume Creek. Surface water runoff at the Old Josephine Mill is a likely transport mechanism carrying tailings material to Flume Creek. Evidence of erosion caused by storm water runoff was observed by the START-2 within the tailings deposit. The extent of contamination in Flume Creek also has not been assessed; however, remnants of a tailings flume in the creek near the New Josephine Mill indicate that Flume Creek may have been used to discharge tailings from the milling process. Flume Creek discharges to the Pend Oreille River; and although commercial and subsistence fishing does not occur on the Pend Oreille River in the vicinity of the site, sport fishing does occur.

The START-2 was unable to access the waste rock pile on the bank of the Pend Oreille River during the site visit. The waste rock contains lead at concentrations exceeding background levels in Pend Oreille River sediment by almost 500 percent; however, the degree to which the waste rock leaches heavy metals under wet conditions has not been assessed.

The contribution of heavy metal contamination from Josephine Mine to the Pend Oreille River has not been thoroughly assessed; however, contamination sources and transport mechanisms have been observed at the Old Josephine Mill, the New Josephine Mill, and the mine area. It should also be noted that access to the site by recreational users is unrestricted.

4. REFERENCES

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APPENDIX A
PHOTOGRAPHIC DOCUMENTATION

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial #: EPA 645493 **TDD #: 03-05-0003**
Lens Type: 35 mm **Site Name: Grandview and Josephine Mines**

Photo No.	Date	By	Direction	Description
1.01	8/18/03	SD	E	A view of the Grandview Mine tailings deposit area located at the Pend Oreille Village.
1.02	8/18/03	SD	E	The area left of the tailings shown in Photograph 1.01.
1.03	8/18/03	SD	W	A view of the access road to the tailings deposit area and a view of the Pend Oreille Village municipal water supply wells.
1.04	8/18/03	SD	E	Looking up at the Grandview Mine tailings deposit area from the drainage area below this area.
1.05	8/18/03	SD	E	A view of the drainage area just above the Grandview Mine tailings deposit area.
1.06	8/18/03	SD	E	Same as Photograph 1.05.
1.07	8/18/03	SD	W	A view of the Grandview Mine tailings deposit area as seen from the northeast corner of the area.
1.08	8/18/03	SD	E	The drainage area located above the tailings area, just east of the drainage pictured in Photograph 1.05.
1.09	8/18/03	SD	W	Remnants of the flume that was used to discharge mill tailings to the Grandview Mine tailings deposit area.
1.10	8/18/03	SD	W	Another view of the tailings deposit area as seen from where Photograph 1.09 was taken.
1.11	8/18/03	SD	W	Another view of the tailings deposit area just south of the area pictured in Photograph 1.10. Photograph 1 of a panoramic series of three photographs.
1.12	8/18/03	SD	W	Same as Photograph 1.10. Photograph 2 of a panoramic series of three photographs.
1.13	8/18/03	SD	W	Another view of the tailings deposit area just north of area pictured in Photograph 1.12. Photograph 3 in a panoramic series of three photographs.
1.14	8/18/03	SD	SE	A view of the east end of the Grandview Mine tailings deposit area.
1.15	8/18/03	SD	Down	Tailings in the drainage ditch located about 170 feet downstream from the Grandview Mine tailings deposit area.
1.16	8/18/03	SD	W	Looking down the drainage ditch that discharges over a bluff to the Pend Oreille River, about 265 feet downstream from the Grandview Mine tailings deposit area.
1.17	8/18/03	SD	Down	More tailings in the drainage ditch below the Grandview Mine tailings deposit area at a location upstream of location pictured in Photograph 1.16.
1.18	8/18/03	SD	Down	More tailings in the drainage ditch below the Grandview Mine tailings deposit area at a location upstream of location pictured in Photograph 1.17.
1.19	8/18/03	SD	N	A view of a mine building at the Grandview Mine.
1.20	8/18/03	SD	N	A view of mill buildings and waste rock at the Grandview Mine.
1.21	8/18/03	SD	W	Another mill building at the Grandview Mine.
2.01	8/19/03	SD	W	Remnants of the wooden mill structure at the Old Mill area at Josephine Mine.
2.02	8/19/03	SD	W	Tailings and waste rock at the Old Mill area at Josephine Mine.

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial #: EPA 645493 **TDD #: 03-05-0003**
Lens Type: 35 mm **Site Name: Grandview and Josephine Mines**

Photo No.	Date	By	Direction	Description
2.03	8/19/03	SD	S	A view of tailings adjacent to Flume Creek at the Old Mill Area of Josephine Mine.
2.04	8/19/03	SD	SW	Tailings west of the tailings pictured in Photograph 2.03.
2.05	8/19/03	SD	N	Recent erosion in the tailings caused by runoff. Tailings in the photograph are located in the Old Mill Area of Josephine Mine.
2.06	8/19/03	SD	E	Tailings located east of the tailings pictured in Photograph 2.03.
2.07	8/19/03	SD	E	Looking downstream at Flume Creek. Photograph taken from bank of tailings area at the Old Mill Area of Josephine Mine.
2.08	8/19/03	SD	N	A view of the tailings at the Old Mill Area of Josephine Mine as seen from the bank of Flume Creek.
2.09	8/19/03	SD	NW	More tailings on the bank of Flume Creek at the Old Mill Area of Josephine Mine.
2.10	8/19/03	SD	N	A view of the tailings adjacent to the access road at the Old Mill Area of Josephine Mine.
2.11	8/19/03	SD	W	A view of the tailings west of the waste rock pile at the Old Mill Area of Josephine Mine.
2.12	8/19/03	SD	N	A view of the bank of the Pend Oreille River at the Josephine Mine site. Waste rock is suspected of being located a few hundred feet upstream from this location on Deadman's Eddy.
2.13	8/19/03	SD	NE	Same as Photograph 2.12. This photograph shows a location on the bank about 100 feet east of the area shown in Photograph 2.12.

Key:

E	East.
N	North.
NE	Northeast.
NW	Northwest.
S	South.
SD	Suzanne Dolberg.
SE	Southeast.
W	West.

ecology and environment, inc.
International Specialists in the Environment
2101 Fourth Avenue, Suite 1900, Seattle, WA 98121
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: September 17, 2003

TO: Suzanne Dolberg, Project Manager, E & E, Seattle, WA

FROM: Mark Woodke, START-Chemist, E & E, Seattle, WA MW

SUBJ: **Organic Data Quality Assurance Review, Grandview and Josephine Mine Sites, Northeastern Washington**

REF: TDD: 03-05-0003 PAN: 001281.0278.01SF

The data quality assurance review of 1 soil sample collected from the Grandview and Josephine Mine sites located in Northeastern Washington has been completed. Target Analyte List (TAL) metals analyses (EPA Methods 6010 and 7471) and Synthetic Precipitate Leaching Procedure (SPLP) metals analyses (EPA Methods 1312, 6010, and 7470) were performed by the Ecology and Environment, Inc., Analytical Services Center, Lancaster, New York.

The sample was numbered: 03081200

Data Qualifications:

1. Sample Holding Times: Acceptable.

The sample was maintained within the QC limits of 4°C ± 2°C. The sample was collected on August 19, 2003, and was extracted and/or analyzed by September 9, 2003, therefore meeting QC criteria of less than 6 months between collection, extraction, and analysis (28 days for mercury) for soil and SPLP soil samples.

2. Initial and Continuing Calibration: Acceptable.

A minimum of one calibration standard and a blank were analyzed at the beginning of the ICP analysis sequence and after every 10 samples. No reported results were greater than 110% of the highest calibration standard. All ICP recoveries were within the QC limits of 90% to 110% (± 1%).

3. Blanks: Satisfactory.

A preparation blank was analyzed for each 20 samples or per matrix per concentration level. Blanks were analyzed after each Initial or Continuing Calibration Verification. No elements were detected in applicable calibration and/or preparation blanks that affected sample results except the TAL metals zinc (0.7006 mg/kg) in the initial calibration blank, copper in the

initial calibration blank (6.833 ug/L), chromium (0.6838 ug/L) and copper (3.595 ug/L) in continuing calibration blank 1, and chromium (1.10 ug/L) and zinc (21.96 ug/L) in continuing calibration blank 2, and the SPLP metals antimony (0.003238 mg/L), copper (0.007645 mg/L), and zinc (0.005241 mg/L) in the leachate blank, antimony (3.317 ug/L) in the initial calibration blank, and antimony (3.162 ug/L) in continuing calibration blank 2. Associated sample results less than five times the highest blank concentration were qualified as not detected (U).

4. ICP Interference Check Sample: Acceptable.

An Interference Check Sample (ICS) was analyzed at the beginning and end of each sequence or at least twice every 8 hours, whichever was more frequent. All ICS (solution AB) results were within QC limits of 80% - 120% recovery.

5. Precision and Bias Determination: Not Performed.

Samples necessary to determine precision and bias were not provided to the laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

6. Performance Evaluation Sample Analysis: Not Provided.

Performance evaluation samples were not provided to the laboratory.

7. ICP Serial Dilution: Acceptable.

All serial dilution results were within QC limits.

8. Matrix Spike Analysis: Acceptable.

Matrix spike(MS)/matrix spike duplicate (MSD) analyses was performed per SDG or per matrix per concentration level, whichever was more frequent. MS and MS duplicate recoveries were within the QC limits.

9. Duplicate Analysis: Acceptable.

All duplicate/spike duplicate results were within QC limits.

10. Laboratory Control Sample Analysis: Acceptable.

A Laboratory Control Sample (LCS) was analyzed per SDG per matrix. All LCS results were within the established control limits.

11. Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical methods, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

J - The associated numerical value is an estimated quantity because the reported concentrations were less than the sample quantitation limits or because quality control criteria limits were not met.

U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

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Ecology and Environment, Inc.

Analytical Services Center
4493 Walden Avenue
Lancaster, New York 14086

Laboratory Results

NYS ELAP ID#: 10486
Phone: (716) 685-8080

Client: E and E Seattle Office
Lab Order: 0308235
Project: Grandview/Josephine Mines
Lab ID: 0308235-01A **Sample Type:** SAMP **Matrix:** Soil

Client Sample ID: 03081200
Alt. Client ID: OJM01
Collection Date: 8/19/2003 10:58:00 A **% Moist:** 0.87
Test Code: 1_6010B_PPM_S

ICP METALS ANALYSIS BY METHOD 6010B **Method:** SW6010B **Prep Method:** SW3050B

Analyte	Result	Q	MDL	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
Antimony	ND		5.9	10.1 U	mg/Kg-dry	10	9/9/2003 6:28:46 PM	OPTIMA3300_030909D	CMO
Arsenic	18.4		5.06	10.1	mg/Kg-dry	10			
Beryllium	0.262	J	0.162	5.04	mg/Kg-dry	10			
Cadmium	91.9		0.329	5.04	mg/Kg-dry	10			
Chromium	1.94	J	0.605	10.1	mg/Kg-dry	10			
Copper	16.3	J	3.22	20.2	mg/Kg-dry	10			
Lead	593		2.21	5.04	mg/Kg-dry	10			
Nickel	3.13	J	1.17	20.2	mg/Kg-dry	10			
Selenium	15.8		8.42	10.1	mg/Kg-dry	10			
Silver	3.30	J	1.63	10.1	mg/Kg-dry	10			
Thallium	ND		7.29	10.1 U	mg/Kg-dry	10			
Zinc	21200	B/P	6.18	10.1	mg/Kg-dry	10		OPTIMA3300_030909H	

9/17/03

Definitions:

* - Recovery outside QC limits
B - Analyte found in Method blank
D - Diluted due to maxtrix or extended target compounds
DF - Dilution Factor
DNI - Did not Ignite
E - Result exceeds Highest Calibration Standard
H - Value Exceeds Maximum Contaminant Level
J - Estimated value
M - Matrix Spike Recovery outside limits
N - Single Column Analysis
NC - Not Calculated for values < RL
ND - Not Detected at the Reporting Limit
NP - Petroleum Pattern is not present
P - Post Spike Recovery outside limits
R - RPD outside recovery limits

Ecology and Environment, Inc.

Analytical Services Center

4493 Walden Avenue
Lancaster, New York 14086

Laboratory Results

NYS ELAP ID#: 10486
Phone: (716) 685-8080

Client: E and E Seattle Office
Lab Order: 0308235
Project: Grandview/Josephine Mines
Lab ID: 0308235-01A **Sample Type:** SAMP **Matrix:** Soil

Client Sample ID: 03081200
Alt. Client ID: OJM01
Collection Date: 8/19/2003 10:58:00 A **% Moist:**
Test Code: 1_1312_6010B_L

SPLP METALS ANALYSIS BY METHOD 6010B **Method:** SW1312_6010B **Prep Method:** SW3010A

Analyte	Result	Q	MDL	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
Antimony	ND		0.0025	0.01	mg/L	1	8/30/2003 8:06:31 AM	OPTIMA_030830A	SDP
Arsenic	ND		0.0076	0.0250	mg/L	1			
Beryllium	ND		0.0013	0.005	mg/L	1			
Cadmium	ND		0.0015	0.005	mg/L	1			
Chromium	ND		0.0032	0.01	mg/L	1			
Copper	ND		0.0038	0.0200	mg/L	1			
Lead	ND		0.0029	0.005	mg/L	1			
Nickel	ND		0.0036	0.0200	mg/L	1			
Selenium	ND		0.0069	0.0200	mg/L	1			
Silver	ND		0.0021	0.01	mg/L	1			
Thallium	ND		0.0069	0.0200	mg/L	1			
Zinc	ND		0.0045	0.01	mg/L	1			

MW 9-17-03

Definitions:

* - Recovery outside QC limits
B - Analyte found in Method blank
D - Diluted due to maxtrix or extended target compounds
DF - Dilution Factor
DNI - Did not Ignite
E - Result exceeds Highest Calibration Standard
H - Value Exceeds Maximum Contaminant Level
J - Estimated value, value may not be accurate
Limit - Reporting Limit
M - Matrix Spike Recovery outside limits
N - Single Column Analysis
NC - Not Calculated for values < RL
ND - Not Detected at the Reporting Limit
P - Post Spike Recovery outside limits
R - RPD outside recovery limits

Ecology and Environment, Inc.

Analytical Services Center
4493 Walden Avenue
Lancaster, New York 14086

Laboratory Results

NYS ELAP ID#: 10486
Phone: (716) 685-8080

Client: E and E Seattle Office
Lab Order: 0308235
Project: Grandview/Josephine Mines
Lab ID: 0308235-01A **Sample Type:** SAMP **Matrix:** Soil

Client Sample ID: 03081200
Alt. Client ID: OJM01
Collection Date: 8/19/2003 10:58:00 A **% Moist:** 0.87
Test Code: 1_7471A_HG_S

MERCURY ANALYSIS IN SOIL BY METHOD 7471A **Method:** SW7471A **Prep Method:** SW7471A

Analyte	Result	Q	MDL	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
Mercury	1.66		0.00785	0.0664	mg/Kg-dry	2	9/9/2003 11:57:50 AM	LEEMAN_030909B	JLS

MN 9-17-03

Definitions:

* - Recovery outside QC limits
DF - Dilution Factor
H - Value Exceeds Maximum Contaminant Level
N - Single Column Analysis
NP - Petroleum Pattern is not present
B - Analyte found in Method blank
DNI - Did not Ignite
J - Estimated value
NC - Not Calculated for values < RL
P - Post Spike Recovery outside limits
D - Diluted due to maxtrix or extended target compounds
E - Result exceeds Highest Calibration Standard
M - Matrix Spike Recovery outside limits
ND - Not Detected at the Reporting Limit
R - RPD outside recovery limits

Ecology and Environment, Inc.

Analytical Services Center
4493 Walden Avenue
Lancaster, New York 14086

Laboratory Results

NYS ELAP ID#: 10486
Phone: (716) 685-8080

Client: E and E Seattle Office
Lab Order: 0308235
Project: Grandview/Josephine Mines
Lab ID: 0308235-01A **Sample Type:** SAMP **Matrix:** Soil

Client Sample ID: 03081200
Alt. Client ID: OJM01
Collection Date: 8/19/2003 10:58:00 A **% Moist:**
Test Code: 1_1312_7470A_L

SPLP MERCURY BY METHOD 7470A **Method:** SW1312_7470A **Prep Method:** SW7470A

Analyte	Result	Q	MDL	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
Mercury	ND		.0000873	0.0200	V mg/L	1	9/3/2003 9:21:22 AM	LEEMAN_030903A	JLS

MN
9-7-03

Definitions:

* - Recovery outside QC limits
DF - Dilution Factor
H - Value Exceeds Maximum Contaminant Level
N - Single Column Analysis
NP - Petroleum Pattern is not present
B - Analyte found in Method blank
DNI - Did not Ignite
J - Estimated value
NC - Not Calculated for values < RL
P - Post Spike Recovery outside limits
D - Diluted due to maxtrix or extended target compounds
E - Result exceeds Highest Calibration Standard
M - Matrix Spike Recovery outside limits
ND - Not Detected at the Reporting Limit
R - RPD outside recovery limits

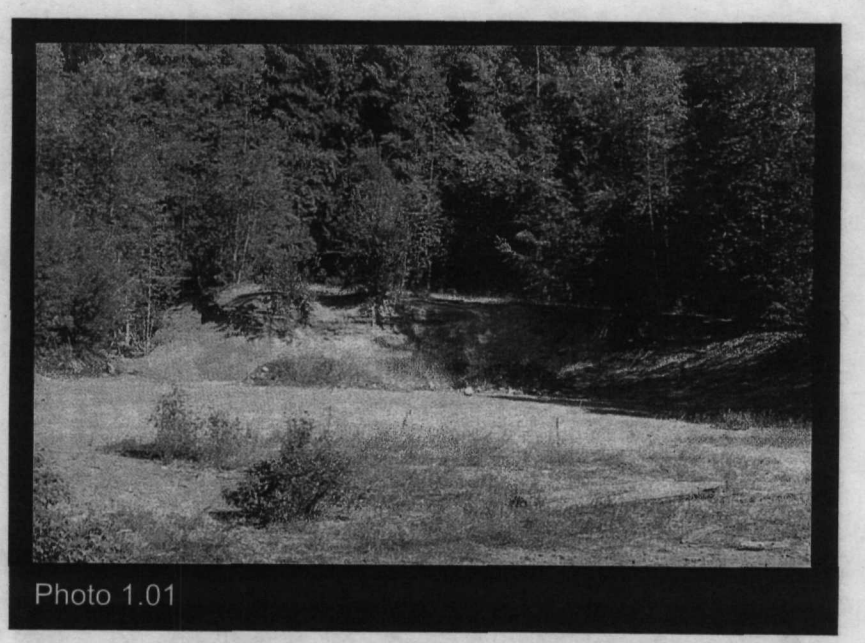

Photo 1.01

Photo 1.02

Photo 1.03

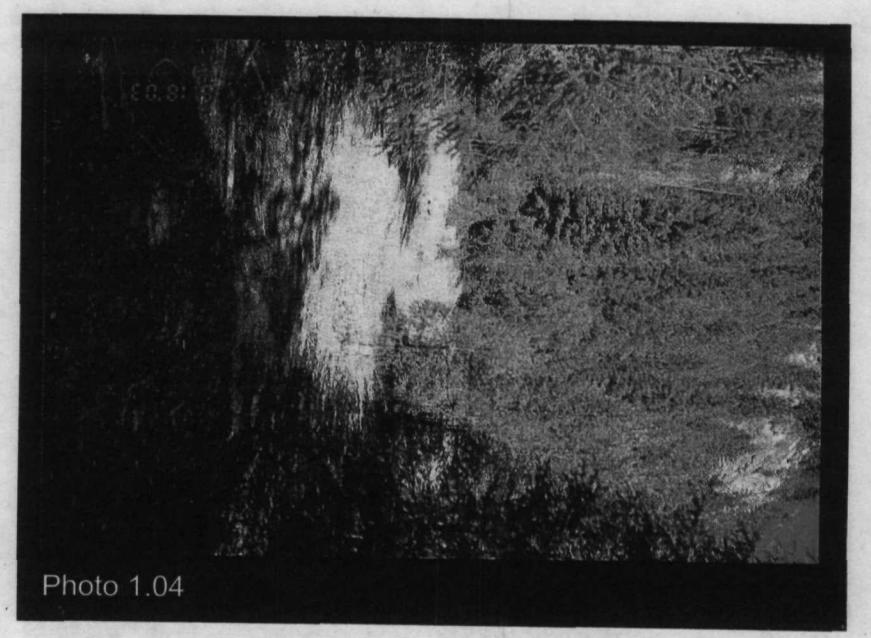

Photo 1.04

Photo 1.05

Photo 1.06

Photo 1.07

Photo 1.08

Photo 1.09

Photo 1.10

Photo 1.11

Photo 1.12

Photo 1.13

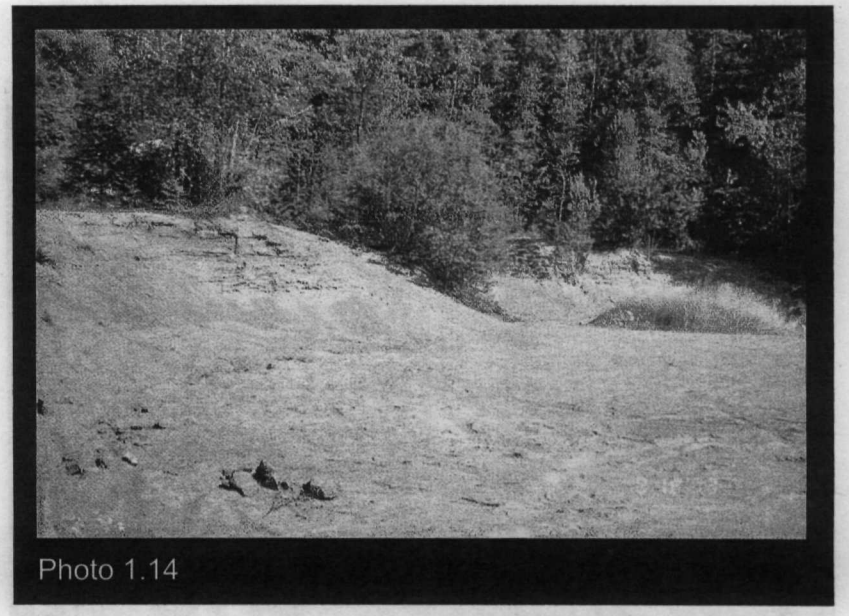

Photo 1.14

Photo 1.15

Photo 1.16

Photo 1.17

Photo 1.18

Photo 1.19

Photo 1.20

Photo 1.21

Photo 2.01

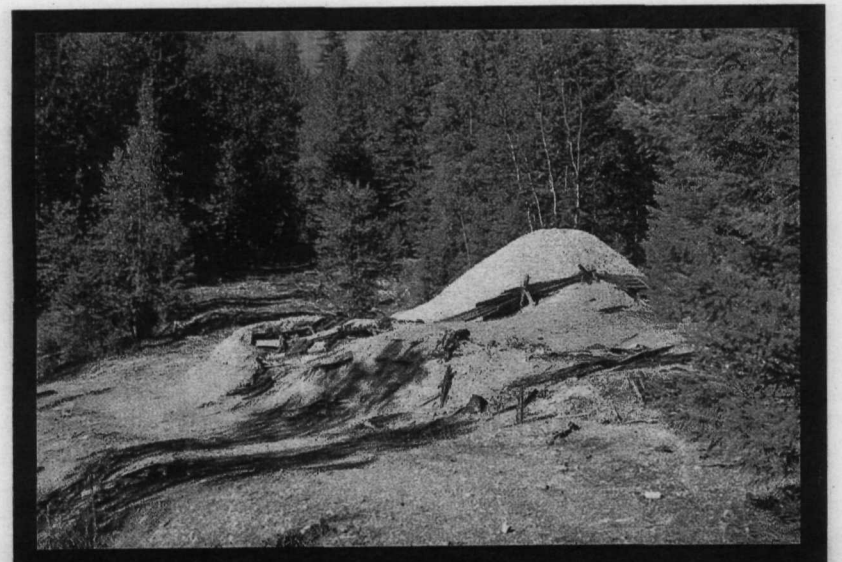

Photo 2.02

Photo 2.03

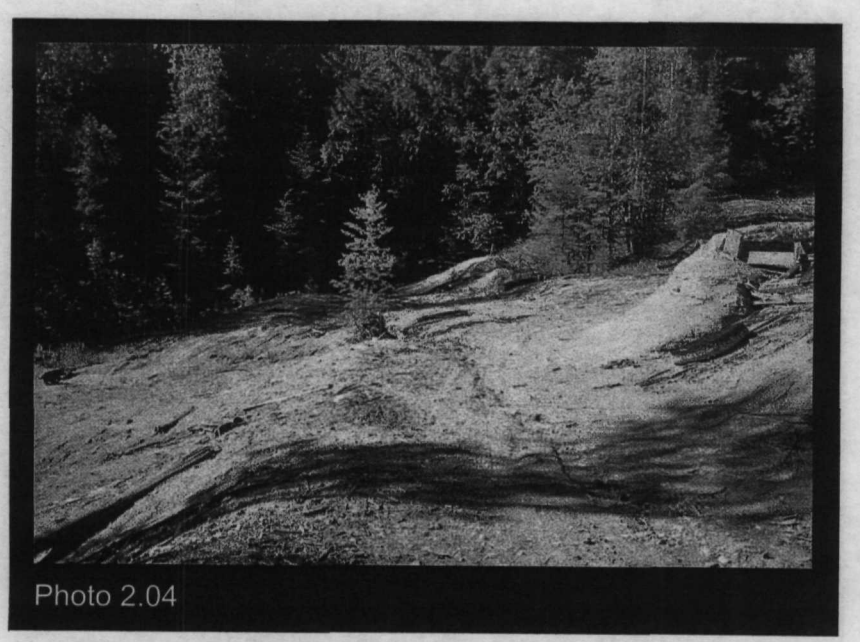

Photo 2.04

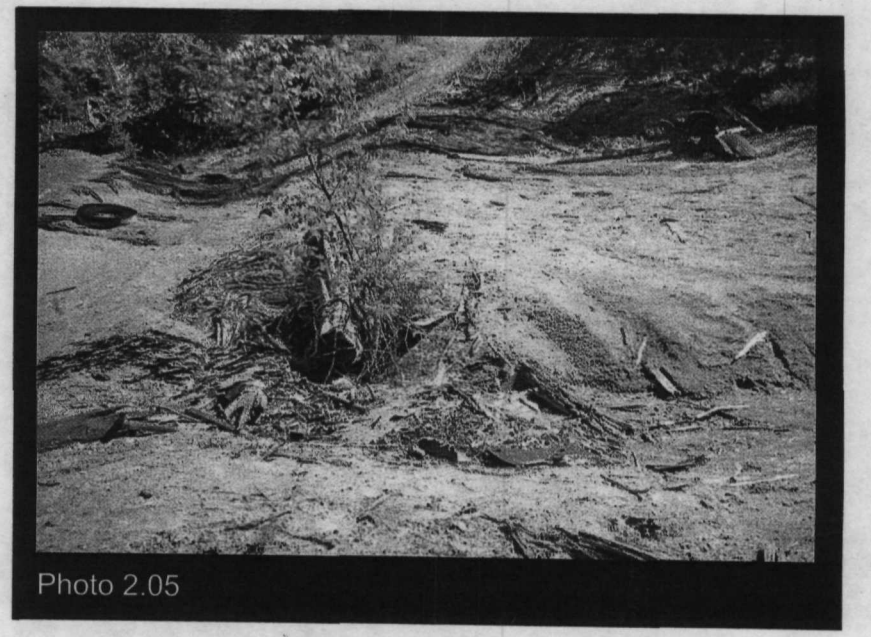

Photo 2.05

Photo 2.06

Photo 2.07

Photo 2.08

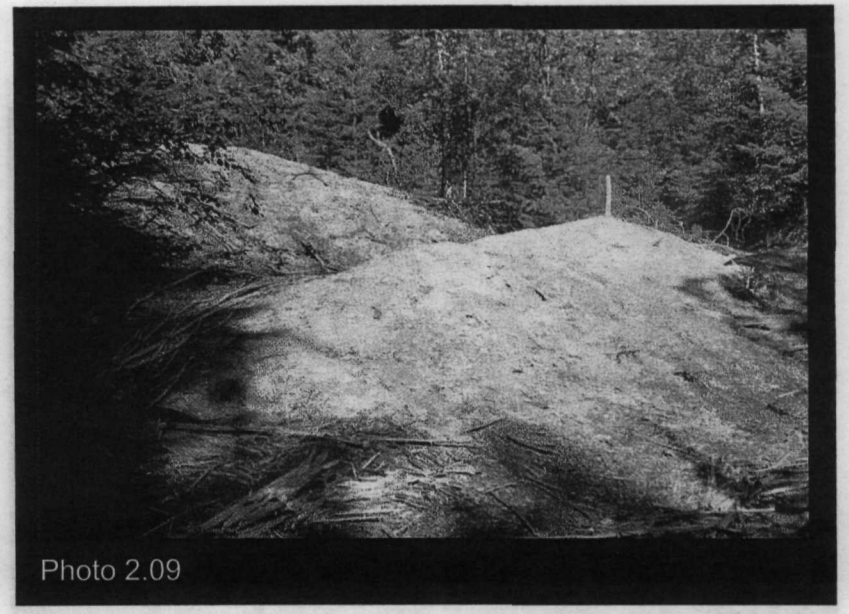
Photo 2.09

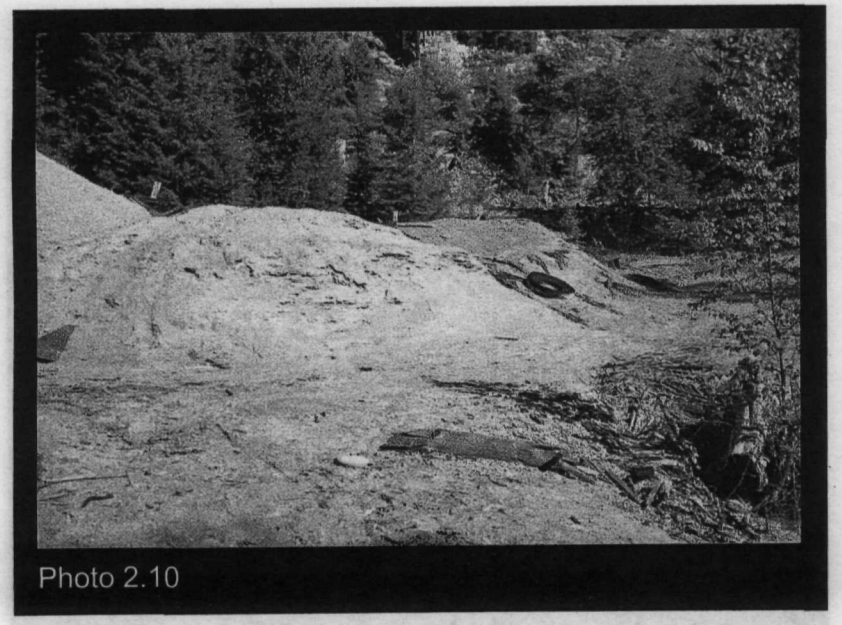
Photo 2.10

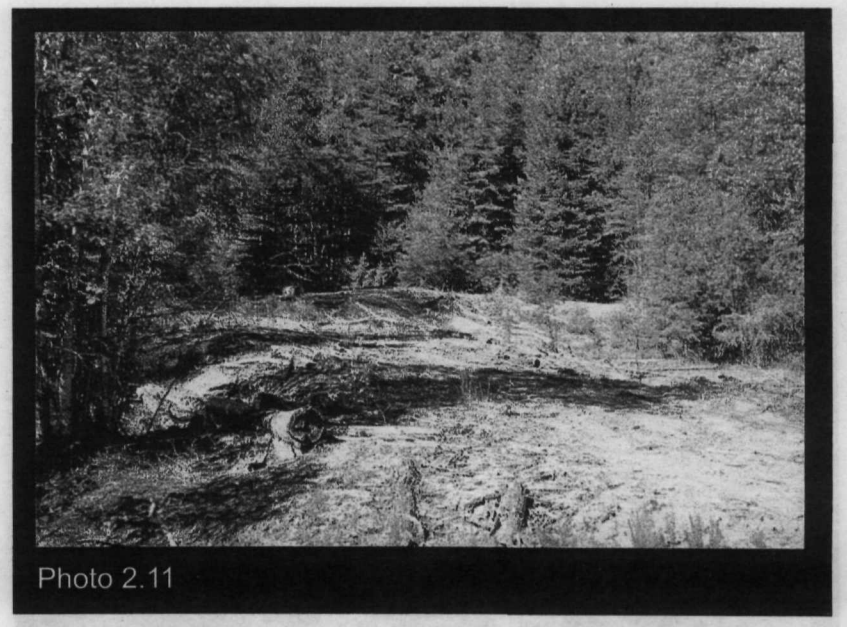
Photo 2.11

Photo 2.12

Photo 2.13

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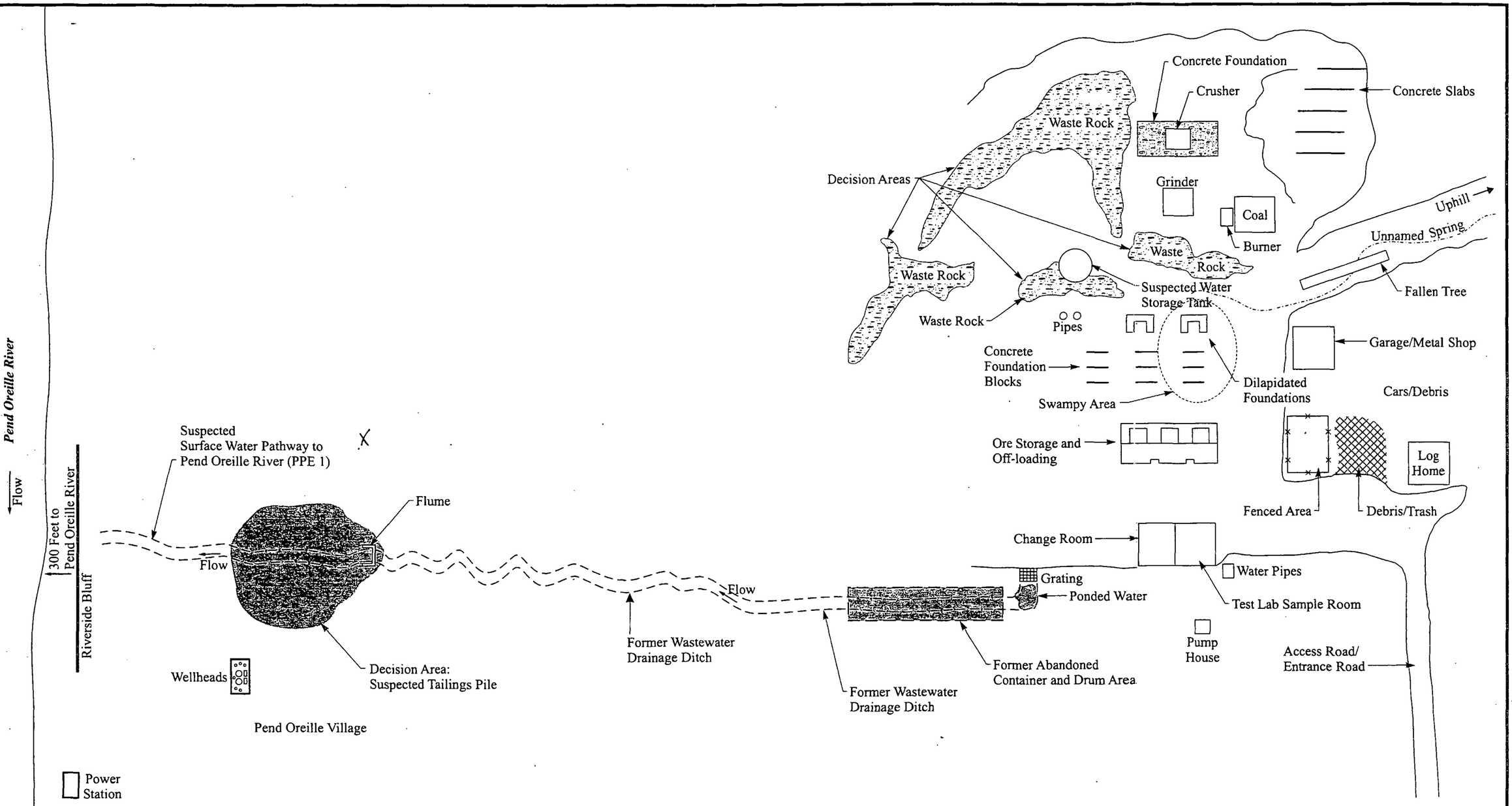

Note: Base map features are not to scale.

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	Not to Scale	GRANDVIEW AND JOSEPHINE MINES REMOVAL ASSESSMENTS Metaline Falls, Washington	Figure 1-2 GRANDVIEW MINE SITE LAYOUT MAP Date: 10/22/03 | Drawn by: AES | 10:START-2\03050003\fig 1-2

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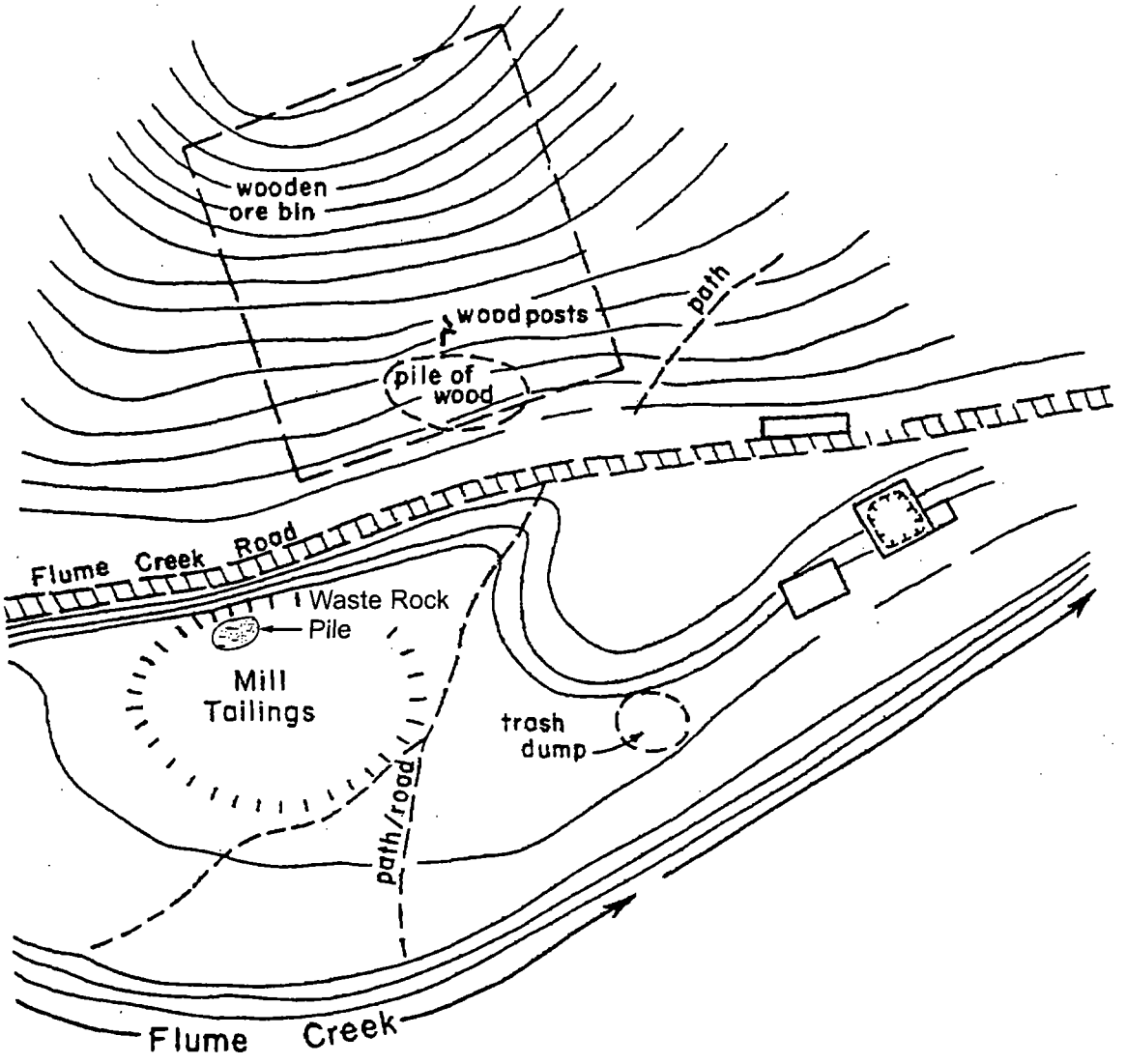
intentionally left blank.

Source: BLM (no date).



0 49 98

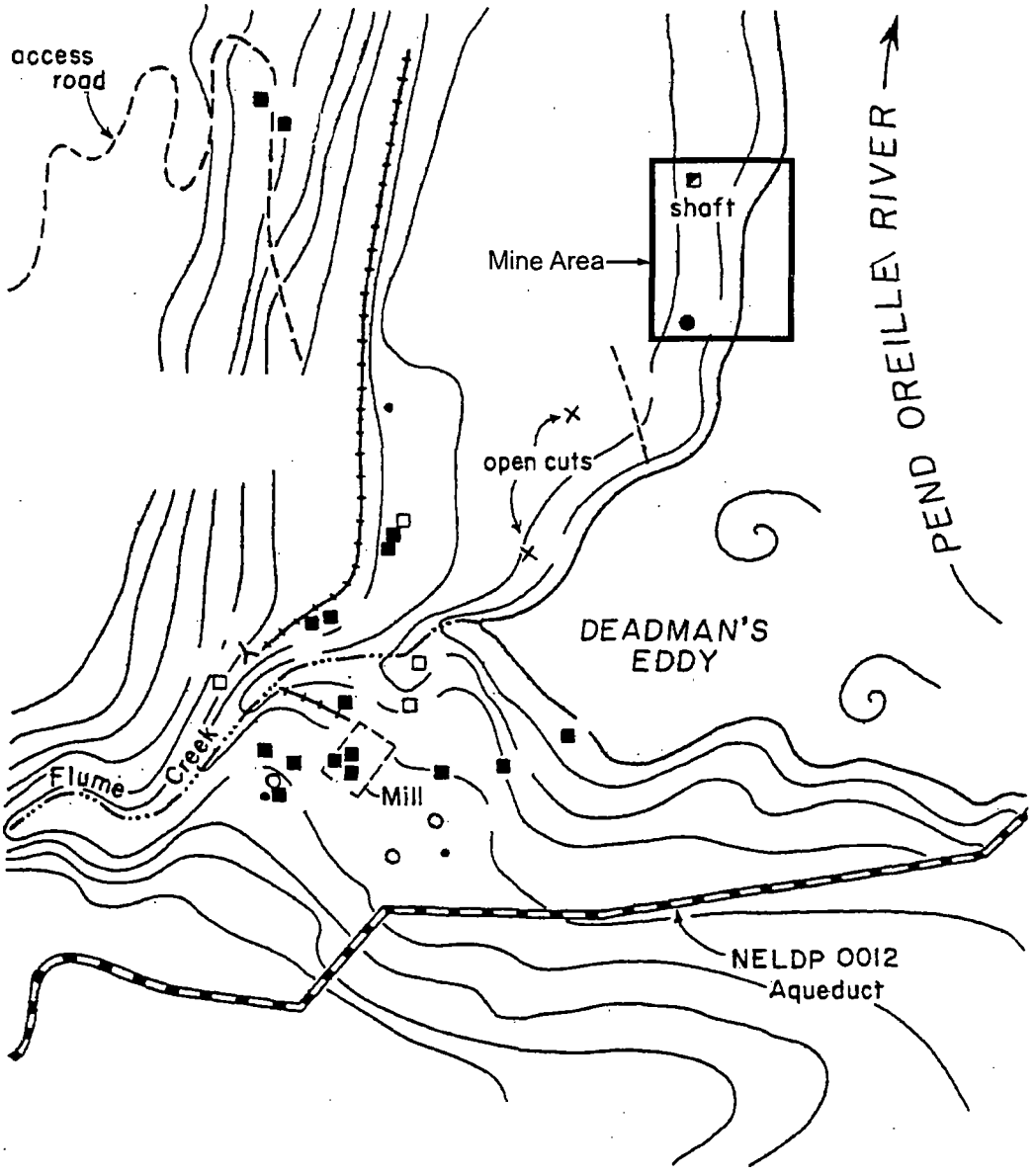
Approximate Scale in Feet

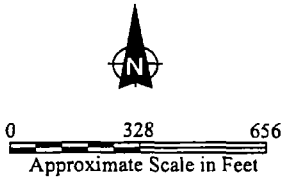
Key:

- structure
- general mill location

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	GRANDVIEW AND JOSEPHINE MINES REMOVAL ASSESSMENTS Metaline Falls, Washington	Figure 1-3 OLD JOSEPHINE MILL SITE LAYOUT MAP
		Date: 10-23-03 / Drawn by: AES / 10:START-2\03050003\fig 1-3

Source: BLM (no date).

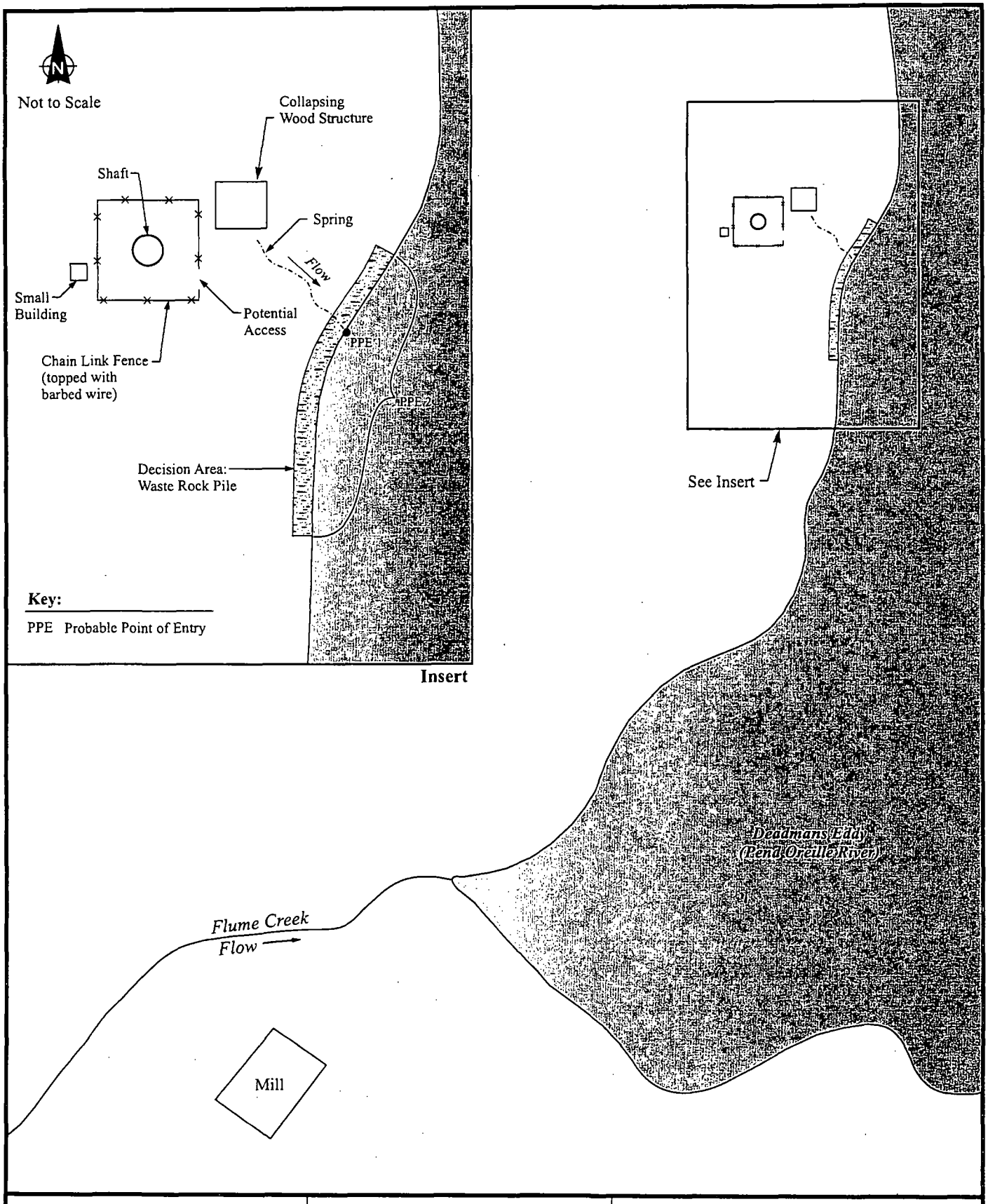




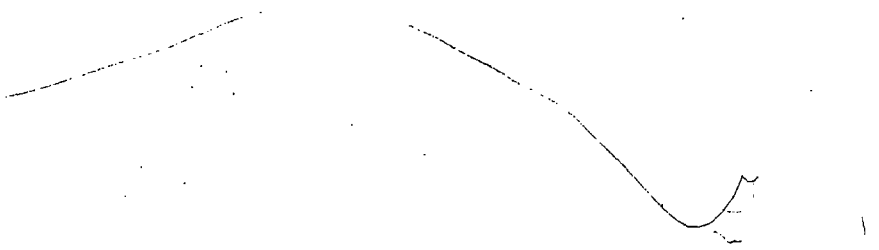
Key:

- ■ - building
- □ - other structure
- • - trash dump ○ - leveled area
- ⟿ - ore cart grade

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	GRANDVIEW AND JOSEPHINE MINES REMOVAL ASSESSMENTS Metaline Falls, Washington	Figure 1-4 NEW JOSEPHINE MILL SITE LAYOUT MAP Date: 10-23-03 | Drawn by: AES | 10:START-2\03050003\fig 1-4



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	GRANDVIEW AND JOSEPHINE MINES REMOVAL ASSESSMENTS Metaline Falls, Washington	Figure 1-5 JOSEPHINE MINE MINE AREA SITE LAYOUT MAP
		Date: 10-22-03 | Drawn by: AES | 10:START-2\03050003\fig 1-5



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