Abandoned Mine Lands
Initial Investigation Report
Hortense Mill
Metaline Falls, Washington

Prepared for
Washington State
Department of Ecology

December 28, 2006
17274-00(H0)

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WASHINGTON STATE
DEPARTMENT OF
ECOLOGY

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Rick Roeder, Project Manager

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Prepared by
Hart Crowser, Inc.

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ABANDONED MINE LANDS INITIAL INVESTIGATION REPORT
HORTENSE MILL
METALINE FALLS, WASHINGTON

1.0 EXECUTIVE SUMMARY

Information obtained during this assessment is summarized in Table 1.

Table 1 – Hortense Mill Data Summary

Mine Name	Hortense Mine (Josephine property, Hortense Mill)
Last Known Operation	1955. Production of the Josephine Mine, which included the Hortense and Sullivan claims, was as follows: 40,000 tons prior to 1919 (Huntting, 1956); 243,000 tons prior to 1935; 187,000 tons in 1949; and 273,520 tons in 1951. The mine included three connected openings, the Josephine shaft, Cascade or 500-foot adit, and a "new" shaft constituting, in all, more than one mile of workings. Two mills were built, a 750-ton flotation mill and a 2,400-ton flotation mill. There was a complete camp at the site in 1956 when Huntting visited the site.
Location	0.8 miles northwest of Metaline Falls, Washington, in Pend Oreille County. Latitude, Longitude: 48.87483, 117.38100 Quadrangle Map: Abercrombie Mtn. TRS: Township 39N, Range 43E, Section 16, NE ¼, SW ¼
Features Observed	5 Waste Rock Piles (5,360 cubic yards) 3 Seeps One small pond Collapsed/dilapidated mill structures Other wood, metal, and rubber (tires) debris
Results Above Criteria	Two seep (water) samples exceeded drininking water MCL criteria for cadmium, lead, zinc and mercury, as well as acute aquatic protection criteria for mercury and zinc and chronic criteria for cadmium and lead. Two sediment samples, and six waste rock samples exceeded MTCA human health criteria for arsenic, cadmium, lead, mercury, zinc, and antimony for one sample. The soil and sediment samples exceeded ecological screeing levels for the same levels as well as selenium and occasionally aluminum or thallium. The applicable criteria for one or more metals.
Work by Others	No previous site assessment information was identified.

Potential Receptors / Degree of Hazard	There are no known residences in this watershed within one mile of the site. Flume Creek is adjacent to the site. Human health risks possible are possible while risks to ecological receptors are likely. Soil and sediments have the potential to fail TCLP criteria for dangerous waste for cadmium, lead, mercury and silver.

2.0 INTRODUCTION

This report summarizes the results of the initial limited soil and surface water investigation at the Hortense Mill site located near Metaline Falls, Washington (Figure 1). Hart Crowser performed this preliminary assessment (PA) for the Washington Department of Ecology (Ecology) under Contract No. C06254 according to the Ecology Statement of Work (SOW) and project Sampling and Analysis Plan (SAP) prepared by Hart Crowser (Hart Crowser, 2006).

The objectives of this PA are to:

- Determine if the site has released or has a high potential to release hazardous substances to the environment at concentrations above Model Toxics Control Act (MTCA) human health or ecological screening levels, to identify sites that may require additional investigation and sampling;

- Identify and document waste source areas including estimates of waste mass and/or volume; and

- Identify and document the presence of potential waste transport pathways and receptors.

For this study, samples were collected of the soil-like fraction of waste rock, mine tailings, and/or natural soil that was potentially affected by mining. Analytical results were compared to the MTCA criteria for soils. Use of terms such as "soils" or "waste rock", etc. are for convenience only and do not indicate potential future designation in accordance with Chapter 173-350 WAC, or Chapter 173-303 WAC, or other regulatory criteria.

Subsurface openings observed for this study may include shafts, adits, prospect pits, collapsed stopes, and/or excavations completed for other purposes. The terms used in this report are based on visual interpretation in the field and may not fully characterize historic site use.

Prior to the site visit, Hart Crowser performed file reviews; evaluated aerial photographs, U.S. Forest Service and USGS maps; reviewed the Inventory of Washington Minerals; and reviewed county tax assessor records in order to:

- Identify the location of mines and associated features/structures;
- Identify property owners, mineral claimants, and mine operators; and
- Obtain contact information to gain permission for site access.

Table 2 presents the project team members and their roles and responsibilities for this investigation. A site visit was accomplished on June 17, 2006.

3.0 SITE DESCRIPTION, OPERATIONAL HISTORY, AND WASTE-CHARACTERISTICS

3.1 Site Location

The Hortense Mill is approximately 0.8 miles northwest of Metaline Falls, WA. The site is adjacent to Flume Creek, a tributary of the Pend Oreille River. To reach the site from Metaline Falls:

- Head south on Highway 31.
- Turn right on Boundary Road
- At approximately 2.1 miles, turn right onto an unnamed road with a locked gate. If you pass a gravel pit on the right side of the road you have gone approximately one-tenth of a mile too far.
- Park at the gate and walk in along the road for approximately 0.25 miles. The Hortense Mill features will be visible on both sides of the road.

The access description provided herein is based on observations at the time the site was visited for this work. References to roads do not reflect property ownership, and does not imply that public access is available.

This site is located on Pend Oreille County Parcel No. 43-39-16-46-0002.

3.2 Site Description

The Hortense Mill is an inactive mill site, possibly used to process ore from the nearby Sullivan, Josephine, and Gold Hill mines. The last date of operation is unknown. Huntting (1956) notes production levels in 1955; however, production may have continued past that date. A well-maintained and gated access road bisects the site. Four wood and metal support structures lie on the hill above the road. Boards and timbers, some of which are charred, and other debris are scattered alongside the supports (Photograph 1). Tailings and metal

debris, including a car frame, lie below the access road, upslope of Flume Creek. The tailings were categorized into five separate piles based on location and composition as is shown in Figure 3 and described below.

A stockpile of old tires lies near WR-1, which is a dry, gray, gravelly Sand. WR-2 overlaps WR-1 and is a moist, brown, gravelly, silty Sand. The volumes of WR-1 and WR-2 are about 560 cubic yards and 100 cubic yards, respectively. The consistency of WR-2 is soil-like (probably mill tailings).

WR-3 is just downslope of WR-1 and WR-2 and consists of a dry to moist, gray, very silty Sand (Photograph 2), and is probably mill tailings. WR-3 is spread throughout the lower portion of the site and raveling indicates that it is likely the main contributor of much of the windblown dust found nearby. The estimated volume of WR-3 is about 1,860 cubic yards. Several small seeps run downslope of WR-3 and WR-1. The seeps join together near a rusted car frame and pass through a wet, grassy area before entering Flume Creek (Photograph 3). Some infiltration may occur in the wet grassy area next to the stream bank. A worn road grade splits from the main access road and leads through WR-3 before forking and heading south toward the Flume Creek and west toward WR-4. A drainage channel runs alongside the road grade, then forks. Both branches pass over WR-3 and head towards the river.

WR-4 is a waste rock pile (tailings) that has about 2,800 cubic yards of moist, brown-gray, fine sandy, Silt. Ravelling on WR-4 indicates wind erosion and dry drainage channels were observed leading to a small stagnant pond between WR-2 and WR-4. WR-5 is an isolated pile to the southeast. It is a moist, brown-gray, gravelly, silty, Sand and is approximately 40 cubic yards in volume (Photograph 3). Signs of human activity (bottles and cans) and animal presence (droppings and footprints) are scattered throughout the site.

3.3 Site Ownership and Operations History

Information on site ownership and operations is based on readily available public information and may not reflect all details of ownership and operations. An ownership timeline is shown in Table 3.

Table 3 – Ownership Timeline

Year	Owner	
Current Land Owner	Stimson Washington Inc.	Parcel No. 43-39-16-46-0002, Pend Oreille County Tax Assessor
Current Claim Owner	No records of currently active or patented claims were located. The property is one of the Josephine (Clark) mines, which includes the Sullivan, Hortense, and Gold Hill claims. Huntting (1956) records 20 claims, and one fraction. At least 17 of those claims were patented.	Pend Oreille County Tax Assessor, BLM, Huntting (1956)
1934 - ?	Pend Oreille Mines & Mateals Company	Huntting (1956)
1924-1926	Metaline Lead Company	Huntting (1956)
1912-1924	Lead-Zinc Company	Huntting (1956)

4.0 SITE INVESTIGATION ACTIVITIES

An initial site investigation was conducted on June 17, 2006. Photos, and GPS coordinates, as well as soil, sediment, and surface water samples were collected. Site sketches showing mine features and sample locations were completed. A total of six waste rock samples, two sediment samples, and two surface water samples were collected from the Hortense Mill site. One waste rock sample was collected from each waste rock pile, with the exception of WR-3, where two samples were collected. The sediment sample Hort_Sed 1 was collected from the north side of WR-1, near the stockpile of old tires. Hort-Sed 2 was collected on the southeast area of the pond. Surface water sample Hort-Seep 1 was collected at the confluence of three small seeps near WR-3. Hort-Seep 1 Out was collected from Flume Creek at the location where Seep 1 enters the Flume Creek. Sample descriptions are given in Table 4. No groundwater wells were identified at or near the site. According to the Washington State Department of Ecology four shallow (7 ft.) monitoring wells at the Josephine Mill No. 2 site (east of the Hortense Mill) in Section 16 were abandoned by BLM in 2003. Photo locations and directions, GPS waypoints, sample locations, and the likely direction of surface water flows are shown on Figure 3.

5.0 ANALYTICAL RESULTS AND ENVIRONMENTAL HAZARD ASSESSMENT

Soil and water quality data were compared to regulatory criteria for screening purposes as discussed below. Further analysis, including risk-based analyses may be appropriate in additional future site assessments.

5.1 Surface Water and Sediment

Surface water sample Hort-Seep 1 exceeded the maximum contaminant level (MCL) for drinking water and the chronic surface water quality standard in Chapter 173-201A WAC for cadmium, lead, and zinc. Hort-Seep 1 also exceeded the acute surface water quality standard for cadmium and zinc. Sample Hort- Seep 1 Out exceeded all three criteria for mercury. Sample analytical results and the applicable cleanup levels are displayed in Table 5.

Cadmium, lead, and mercury concentrations in both sediment samples (Hort-Sed 1 and Hort-Sed 3) exceeded the ecological criteria and MTCA Method A cleanup levels. Both samples also exceeded ecological criterion for aluminum and selenium, and Method B carcinogenic criteria for arsenic and zinc. Hort-Sed-1exceeded Method B cleanup levels for arsenic and iron and ecological protection criteria for copper and silver. Cadmium, lead, and mercury concentrations in both sediment samples have the potential to fail TCLP criteria for dangerous waste.

5.2 Soil

Soil and waste rock sample analytical results were compared with applicable MTCA Method A cleanup levels, MTCA Method B cleanup levels for soil ingestion, soil ingestion and dermal contact combined, and with criteria for ecological protection of plants, soil biota, and wildlife. The six samples collected (Hort-WR1-S1, Hort-WR2-S1, Hort-WR3-S1, Hort-WR3-S2, Hort-WR4-S1, and Hort-WR5-S1) exceeded MTCA Method A criteria for cadmium and lead; Method B carcinogenic criteria for arsenic, cadmium, and zinc; and ecological protection criteria for cadmium, lead, mercury, selenium, and zinc. With the exception of Hort-WR2-S1, mercury concentrations in those samples also exceeded Method A criteria. Samples Hort-WR1-S1 and Hort-WR2-S1 exceeded the ecological protection criteria for antimony, arsenic, copper, and silver. Sample Hort-WR3-S2 exceeded the ecological protection criterion for aluminum and sample Hort-WR1-S1exceeded MTCA the Method A criterion for arsenic.

Cadmium and lead concentrations in the six waste rock samples collected are sufficient to fail the TCLP criteria for dangerous waste. Concentrations of

mercury in Hort-WR1-S1 and Hort-WR4-S1, and silver concentrations in Hort-WR2-S1 are also sufficiently high to fail the dangerous waste criteria.

5.3 Air

Although no air samples were collected, the fine material in WR-3 was seen spread throughout the site. This is likely due to wind eroding the pile and depositing wind-blown dust.

5.4 Methodology for Threatened and Endangered Species Information

We contacted the Washington State Department of Natural Resources (DNR), the Washington State Department of Fish and Wildlife (WDFW), the U.S. Fish and Wildlife Service (USFWS), and the Colville National Forest – USDA Forest Service to obtain information on the presence of state and federal threatened or endangered terrestrial and aquatic species. We determined that the WDFW maintained the most accurate and up-to-date information on species distribution in its Priority Habitats and Species (PHS) Database. We requested maps and narratives identifying documented species presence at the Hortense Mine (Mill). In addition, we contacted DNR and requested information on rare plants and high quality native wetland and terrestrial ecosystems within the vicinity of the Hortense Mine (Mill).

Our search ranges included a 4-mile radius for terrestrial species and a 15-mile radius for aquatic species.

We reviewed approximately 86 PHS maps and accompanying narratives to determine whether any threatened or endangered species were documented within our search ranges. We drew 4- and 15-mile radii around the Hortense Mine (Mill) on a Colville National Forest Map. We then examined the PHS maps in relation to the search ranges for our project areas. All state and federal threatened and endangered species and habitats that occurred within our search ranges were recorded. Species and habitats that occurred on the edge of our search range were considered within the range and recorded.

A summary of the threatened and endangered species within our search ranges is provided in Table 6.

6.0 SUMMARY AND CONCLUSIONS

Wood, metal, rubber, and concrete debris, and a total of about 5,360 cubic yards of waste rock are present at the Hortense Mill site. The waste rock

contains metals that exceed MTCA and/or ecological protection criteria. The main contaminants of concern are arsenic, cadmium, lead, mercury, selenium, and zinc. A portion of the waste rock may also contain elevated concentrations of aluminum, antimony, copper, and silver. Cadmium, lead, mercury, and silver concentrations have the potential to exceed the TCLP criteria for dangerous waste in one or more waste rock piles.

Sediments on site also contain metals concentrations above the applicable criteria. Arsenic, aluminum, cadmium, lead, mercury, selenium, and zinc are the contaminants of concern. Elevated concentrations of copper, iron, and silver may also be of concern in some sediments. Cadmium, lead, and mercury concentrations have the potential to fail TCLP criteria for dangerous waste.

In addition, concentrations of cadmium, lead, mercury, and zinc may be a concern for on-site surface waters. Hardness dependent water quality criteria were calculated using seep water hardness, rather than the potential receiving water hardness.

No residences were observed on site. A gravel pit lies 1,500 feet to the northwest, but the nearest residence is in the Pend Oreille Village, across the Pend Oreille River. There are residences on the same side of the Pend Oreille River, approximately 6,000 feet to the southwest. However, due to the local topology, it is unlikely that any surface water would reach these houses from the site. Human health risks are likely limited to recreational and occupational site users since there are no residences in the vicinity. MTCA Method A and B screening levels may overestimate risk to recreational users since their exposure duration is less than the duration for residential exposure. A site-specific terrestrial ecological evaluation (TEE) would be required to evaluate ecological risks.

7.0 USE OF THIS REPORT

Work for this project was performed, and this report prepared, in accordance with generally accepted professional practices for the nature and conditions of the work completed, in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of the Washington State Department of Ecology for specific application to the referenced property. This report is not meant to represent a legal opinion. No other warranty, express or implied, is made.

The information in this report is intended to be used to determine whether the site has released or has a potential to release hazardous substances to the

environment at concentrations above Model Toxics Control Act (MTCA) human health or ecological screening levels.

8.0 REFERENCES

BLM (Bureau of Land Management) Website
http://www.geocommunicator.gov/

Ecology 1990. Washington Ranking Method Scoring Manual. Ecology Publication 90-14. Revised April 1992.

Ecology 2001a. Model Toxics Control Act Cleanup Levels and Risk Calculations (CLARC II) Update. November 2001.

Ecology 2001b. Adopted Amendments. Model Toxics Control Act Cleanup Regulations. Chapter 173-340-WAC. February 2001.

Ecology 2006. "Water Well Log Viewer" at http://apps.ecy.wa.gov/welllog/.

Hart Crowser 2006. Sampling and Analysis Plan, Abandoned Mine Lands Assessments, Washington State. Prepared for Washington State Department of Ecology. June 9, 2006.

Huntting, Marshall T., 1956, "Inventory of Washington Minerals", Part II Metallic Minerals, 2 volumes. State of Washington Department of Conservation and Development, Bulletin No. 37, Washington State printing office, Olympia, Washington.

Mindat.org website http://www.mindat.org/index.php

Pend Oreille County Tax Assessor's Office, Newport, Washington.

Table 2 - Project Team Roles and Responsibilities

Project Role	Personnel Assignment	Roles/Responsibilities
Ecology Project Manager	Rick Roeder Ecology (509) 454-7837	Client Project Manager
Program Manager	Mike Bailey Hart Crowser (206) 324-9530	Ensures that all work is carried out in accordance with contractual obligations and the Delivery Order statement of work. Assists the Project Manager as needed with technical decisions and in resolving issues. Final reviewer.
Project/Task Manager	Roger McGinnis Hart Crowser (206) 324-9530	Overall responsibility for execution of the Work Plan. Coordinate with Client, Field Manager and Program Manager as necessary to resolve issues.
Corporate Health and Safety Officer (HSO)	Mike Ehlebracht Hart Crowser (206) 324-9530	Overall responsibility for review and answering questions regarding H&S.
Field Manager and Site Safety Coordinators (SSC)	Abby Bazin/Pat Reed Hart Crowser (206) 324-9530	Ensures that explorations are conducted and samples are collected in accordance with project specifications. Coordinates field activities with Project and Program Managers.
Mine Information Research	Pat Reed Mike Swenson Hart Crowser (206) 324-9530	Determined location of mine, access route, and ownership
Project Chemist	Erin Breckel Hart Crowser (206) 324-9530	Performs laboratory coordination and data quality review to assure analytical methods and data are consistent with project needs and data quality objectives.
Laboratory Services	Harvey Jacky Columbia Analytical Services (360) 577-7222	Analyzes soil, sediment, and water samples.

Table 4 – Hortense Mill Sample Inventory

Sample Name	Sample Location	Sample Description
Waste Rock Samples		
Hort-WR1-S1	Center of WR-1.	dry, gray, gravelly SAND
Hort-WR2-S1	Southeast corner of WR-2.	moist, brown, gravelly, silty SAND
Hort-WR3-S1	East side of WR-3.	a dry to moist, gray, very silty SAND
Hort-WR3-S2	West side of WR-3.	a dry to moist, gray, very silty SAND
Hort-WR4-S1	Northwest corner of WR-4.	moist, brown-gray, fine sandy, Silt
Hort-WR5-S1	Center of WR-5.	moist, brown-gray, gravelly, silty, SAND
Soil/Sediment Samples		
Hort-Sed 1	Near debris on WR-1.	N/A
Hort-Sed 3	Drainage channel on WR-3.	N/A
Water Samples		
Hort-Seep 1	Confluence of three smaller seeps.	N/A
Hort-Seep 1 Out	Confluence of Seep 1 and Flume Creek	N/A

Table 5 - Analytical Results for - Hortense Mine

SDG Sample ID Sampling Date	MTCA Method A (a)	MTCA Method B		Ecological Protection (c) Plant/Soil Biota/Wildlife	K0605942 Hort-Sed 1 6/17/2006	K0605942 Hort-Sed 3 6/17/2006	K0605942 Hort-WR1-S1 6/17/2006
		Soil Ingestion (b)	Soil Ingestion & Dermal Contact (b)				
Total Solids in %					99.0	99.7	99.6
Total Metals in mg/kg							
Aluminum	--	80,000	72,072	50 / -- / --	**11,500**	**876**	
Antimony	--	32	29	5 / -- / --	3.02	1.92	**9.3**
Arsenic	20	0.67	0.62	10 / 60 / 132	**12.3**	4.3	**10.6**
Beryllium	--	160	144	10 / -- / --	0.3	0.05	0.05
Cadmium	2	80	74	4 / 20 / 14	**190**	**183**	**340**
Chromium	2,000[e]	120,000[e]	44,571[e]	42 / 42 / 67	16.9	2.4	3.4
Copper	--	2,960	2,700	100 / 50 / 217	**149**	45	**553**
Iron	--	24,000	21,622	-- / -- / --	30,100	5,010	
Lead	250	--	--	50 / 500 / 118	**13,400**	**3,820**	**16,000**
Manganese	--	11,200	10,090	1,100 / -- / 1,500	556	168	
Mercury	2	24	18	0.3 / 0.1 / 5.5	**5.77** J	**4.26** J	**14.4** J
Nickel	--	1,600	1,441	30 / 200 / 980	29.5	3.9	8.3
Selenium	--	400	360	1 / 70 / 0.3	**2.6**	**2.4**	**5.6**
Silver	--	400	360	2 / -- / --	**3.5**	1.12	**4.99**
Thallium	--	5.6	5.0	1 / -- / --	0.41	0.11	0.41
Zinc	--	24,000	22,000	86 / 200 / 360	**87,200**	**75,300**	**104,000**

Notes:

U = Not detected at the detection limit indicated.

J = Estimated value.

-- Not established or Not applicable.

Bold - Concentration exceeds ecological criterion.

Box - Concentration exceeds MTCA Method A or Method B criterion.

(a) WAC 173-340-740(2), WAC 173-340-900 (Table 740-1). Model Toxics Control Act (MTCA) Method A.

(b) WAC 173-340-740(3). MTCA Method B Unrestricted land use soil cleanup standards. For carcinogenic constituents, the value presented is the lower of the non-carcinogenic and carcinogenic level calculated using Equations 740-1 and 740-2 for ingestion only. Equations 740-4 and 740-5 for ingestion and dermal contact. Information from CLARC 3.1 was used unless otherwise noted.

(c) WAC 173-340-740(3)(b)(ii), WAC 173-340-749, WAC 173-340-900 (Table 749-3).

(d) Based on Arsenic V (10 mg/kg)

(e) Based on Chromium III

Table 5 - Analytical Results for - Hortense Mine

SDG	K0605942	K0605942	K0605942	K0605942	K0605942
Sample ID	Hort-WR2-S1	Hort-WR3-S1	Hort-WR3-S2	Hort-WR4-S1	Hort-WR5-S1
Sampling Date	6/17/2006	6/17/2006	6/17/2006	6/17/2006	6/17/2006
Total Solids in %	99.7	100	100	99.6	100
Total Metals in mg/kg					
Aluminum			**339**		
Antimony	**140**	0.17	0.49	1.29	0.84 J
Arsenic	**67**	5.2	3.6	8.2	4.2
Beryllium	0.43	0.03	0.04	0.06	0.04
Cadmium	**174**	**149**	**122**	**324**	**118**
Chromium	21.3	1.4	1.5	3.3	1.8
Copper	**1,860**	18.5	19.2	48	16.6 J
Iron			2,320		
Lead	**18,800**	**1,010**	**485**	**1,020**	**806**
Manganese			164		
Mercury	**1.91** J	**2.15** J	**3.17** J	**10.7** J	**2.69** J
Nickel	29.3	3.7	2.7	5.5	2.7
Selenium	**11.1**	**1.7** J	**1.6** J	**3.2**	**1.5** J
Silver	**155**	0.04 J	0.35	0.77	0.52 J
Thallium	0.07	**0.15**	0.07	**0.18**	0.08
Zinc	**47,500**	**45,600**	**42,700**	**81,400**	**38,200**

Notes:

U = Not detected at the detection limit indicated.

J = Estimated value.

-- Not established or Not applicable.

Bold - Concentration exceeds ecological criterion.

Box - Concentration exceeds MTCA Method A or Method B criterion.

(a) WAC 173-340-740(2), WAC 173-340-900 (Table 740-1). Model Toxics Control Act (MTCA) Method A.

(b) WAC 173-340-740(3). MTCA Method B Unrestricted land use soil cleanup standards. For carcinogenic constituents, the value presented is the lower of the non-carcinogenic and carcinogenic level calculated using Equations 740-1 and 740-2 for ingestion only. Equations 740-4 and 740-5 for ingestion and dermal contact.

(c) WAC 173-340-740(3)(b)(ii), WAC 173-340-749, WAC 173-340-900 (Table 749-3).

(d) Based on Arsenic V (10 mg/kg)

(e) Based on Chromium III

Table 5 - Analytical Results for - Hortense Mine

SDG Sample ID Sampling Date	Drinking Water MCL	Chapter 173-201A WAC[a] Acute	Chronic	K0605186 Hort-Seep 1 6/17/2006	K0605186 Hort-Seep 1 Out 6/17/2006
Conventionals in mg/L					
Hardness as CaCO3				404	130
Sulfate				82	7.5
Total Dissolved Solids				424 J	81 J
Total Suspended Solids				332 J	11 J
Turbidity				36 J	2.9 J
Dissolved Metals in µg/L					
Arsenic	10	360	190	1.91	0.16 J
Cadmium [b]	5	18[c] / 36[d]	3.1[c] / 4.8[d]	**57.1**	1.38
Copper [b]	1300 (at tap)	68[c] / 122[d]	40[c] / 68[d]	5.08	0.61
Lead [b]	15 (treatment)	308[c] / 571[d]	12[c] / 12[d]	**91**	3.87
Zinc [b]	5000 (secondary)	400[c] / 675[d]	365[c] / 616[d]	**18100**	570
Total Metals in µg/L					
Aluminum		--	--	2190	3050
Iron		--	--	6080	5200
Mercury	2	2.1	0.012	**0.0179**	**5.22**

Notes:

-- Not established or Not applicable.

Bold - Concentration exceeds chronic criterion.

Box - Concentration exceeds acute criterion.

Shaded - Concentration exceeds drinking water maximum contaminant level (MCL).

a Chapter 173-201A WAC. Water Quality Standards for Surface Waters of the State of Washington (Last update July 1, 2003).

b Hardness dependent criteria.

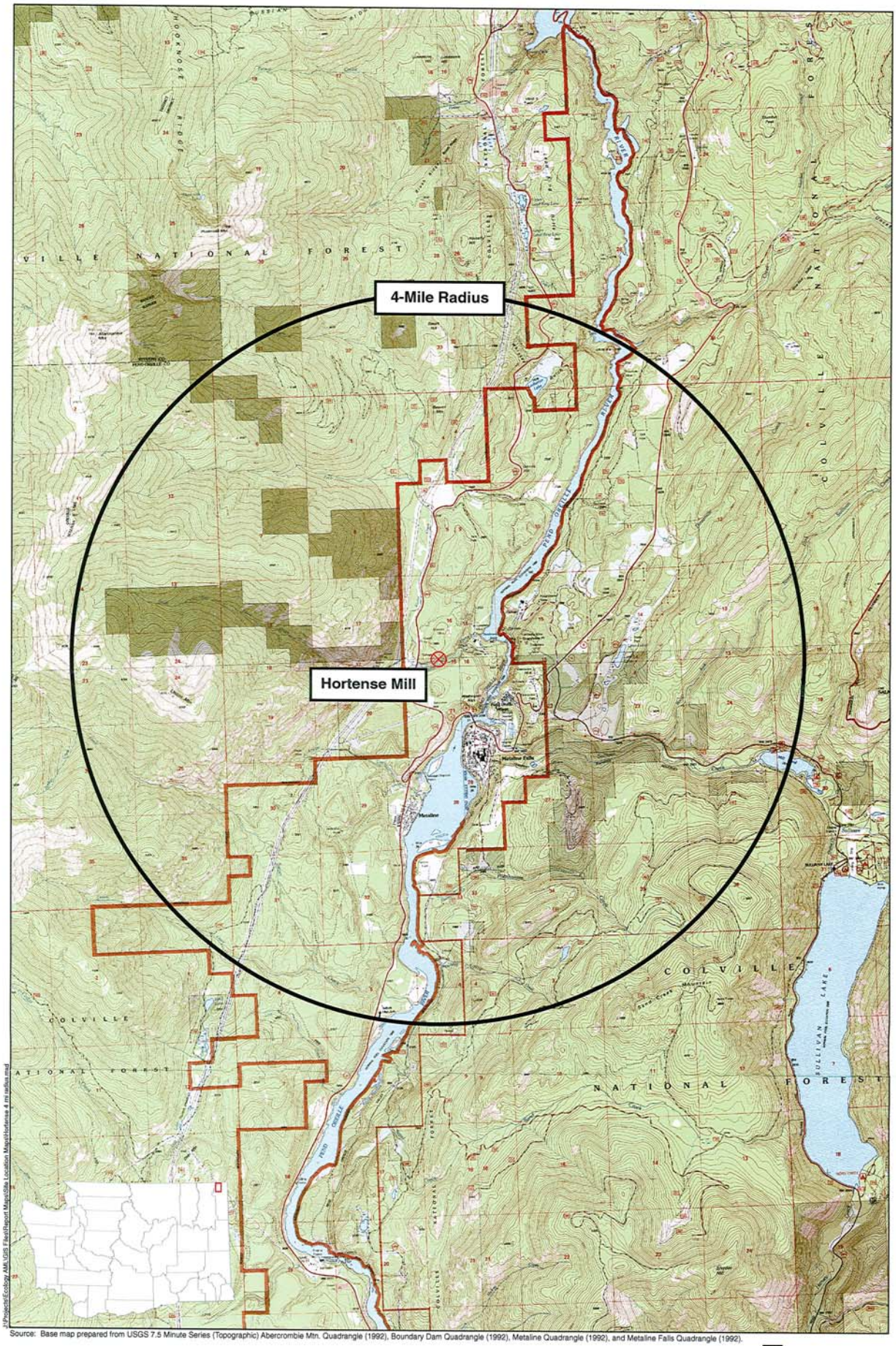
c Hardness = 404 mg/L CaCO3.

d Hardness = 130 mg/L CaCO3.

Table 6 - Threatened & Endangered Species

Species	Federal Status		State Status		Narrative
	T	E	T	E	
Lynx (*Lynx canadensis*)	X		X		Crowell Mtn
Grizzly bear (*Ursus arctos*)	X			X	Flume Creek
Bull trout (*Salvelinus confluentus*)	X				Pend Oreille River, Slate Creek, South Salmo River and Bench Creek
Woodland caribou (*Rangifer trandus*)		X		X	Beaver Creek, Slate Creek
Fisher (*Martes pennanti*)				X	Slate Creek and West of Sullivan Lake
Bald eagle (*Haliaeetus leucocephalus*)	X		X		Pend Oreille River south of Metaline Falls

Site Location Map
Hortense Mill



Source: Base map prepared from USGS 7.5 Minute Series (Topographic) Abercrombie Mtn. Quadrangle (1992), Boundary Dam Quadrangle (1992), Metaline Quadrangle (1992), and Metaline Falls Quadrangle (1992).

0 0.5 1 2
Scale in Miles

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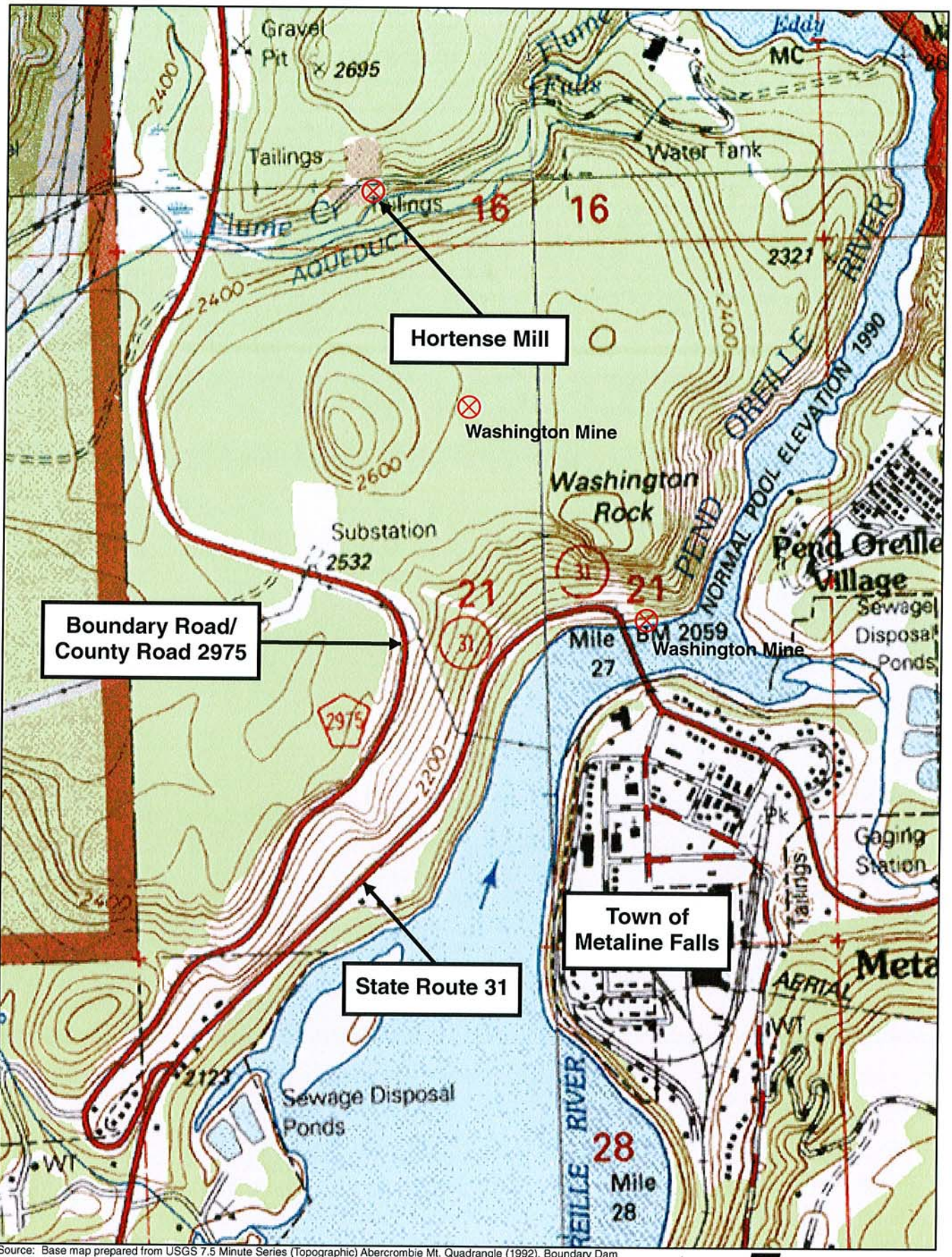
17274-00 (HO) 12/06
Figure 1

Vicinity Map
Hortense Mill



J:\Projects\Ecology AML\GIS Files\Report Maps\Vicinity Maps\Hortense VM.mxd

Source: Base map prepared from USGS 7.5 Minute Series (Topographic) Abercrombie Mt. Quadrangle (1992), Boundary Dam Quadrangle (1992), Metaline Quadrangle (1992), and Metaline Falls Quadrangle (1992).

0 500 1,000

Scale in Feet

⊗ Mine Location Visited in Field

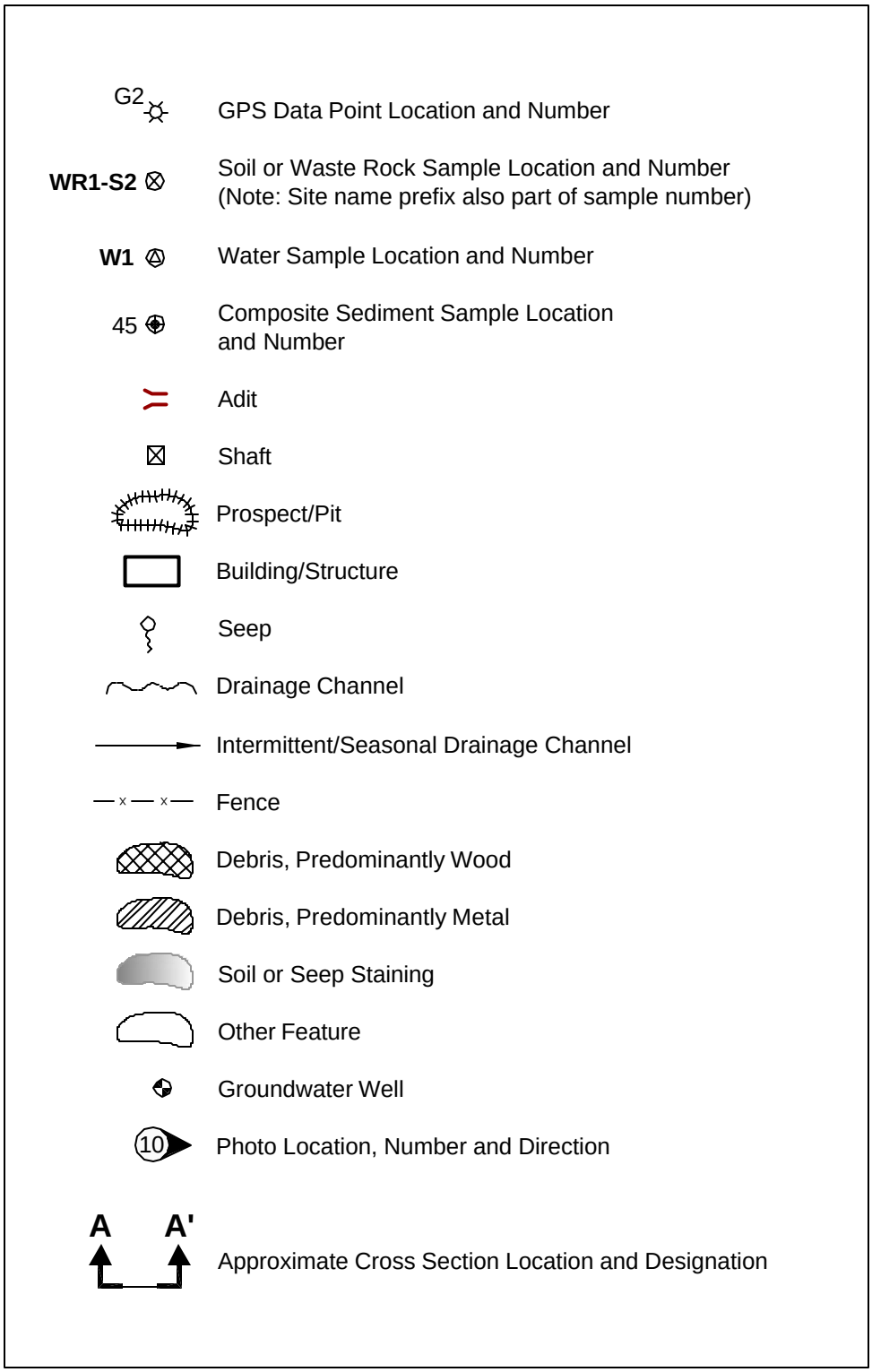
N

HARTCROWSER

17274-00 (HO) 12/06

Figure 2

Standard Key for Site Plan
Hortense Mill



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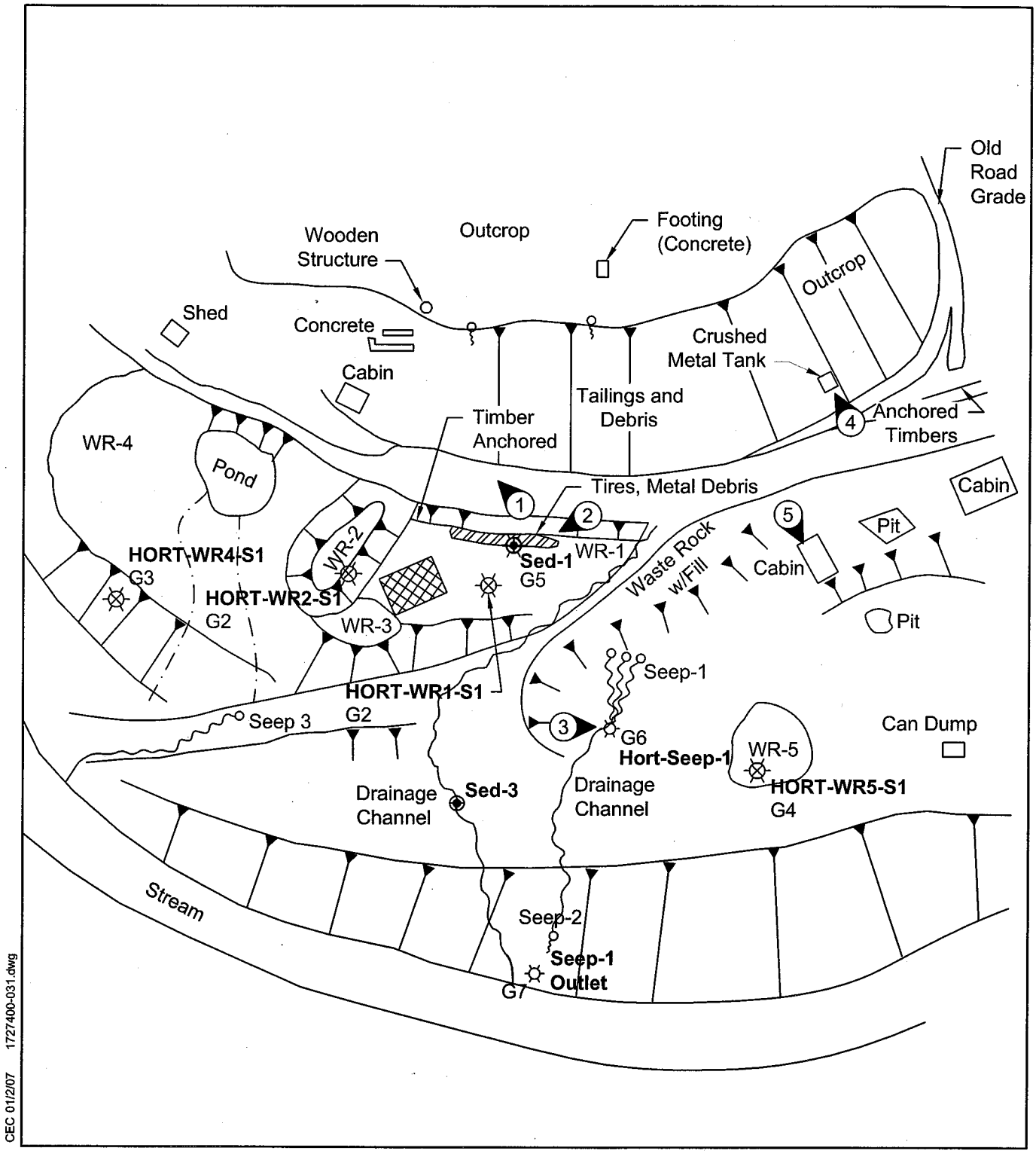
Site Plan
Hortense Mill



CEC 01/2/07 1727400-031.dwg

N

0 40 80

Scale in Feet

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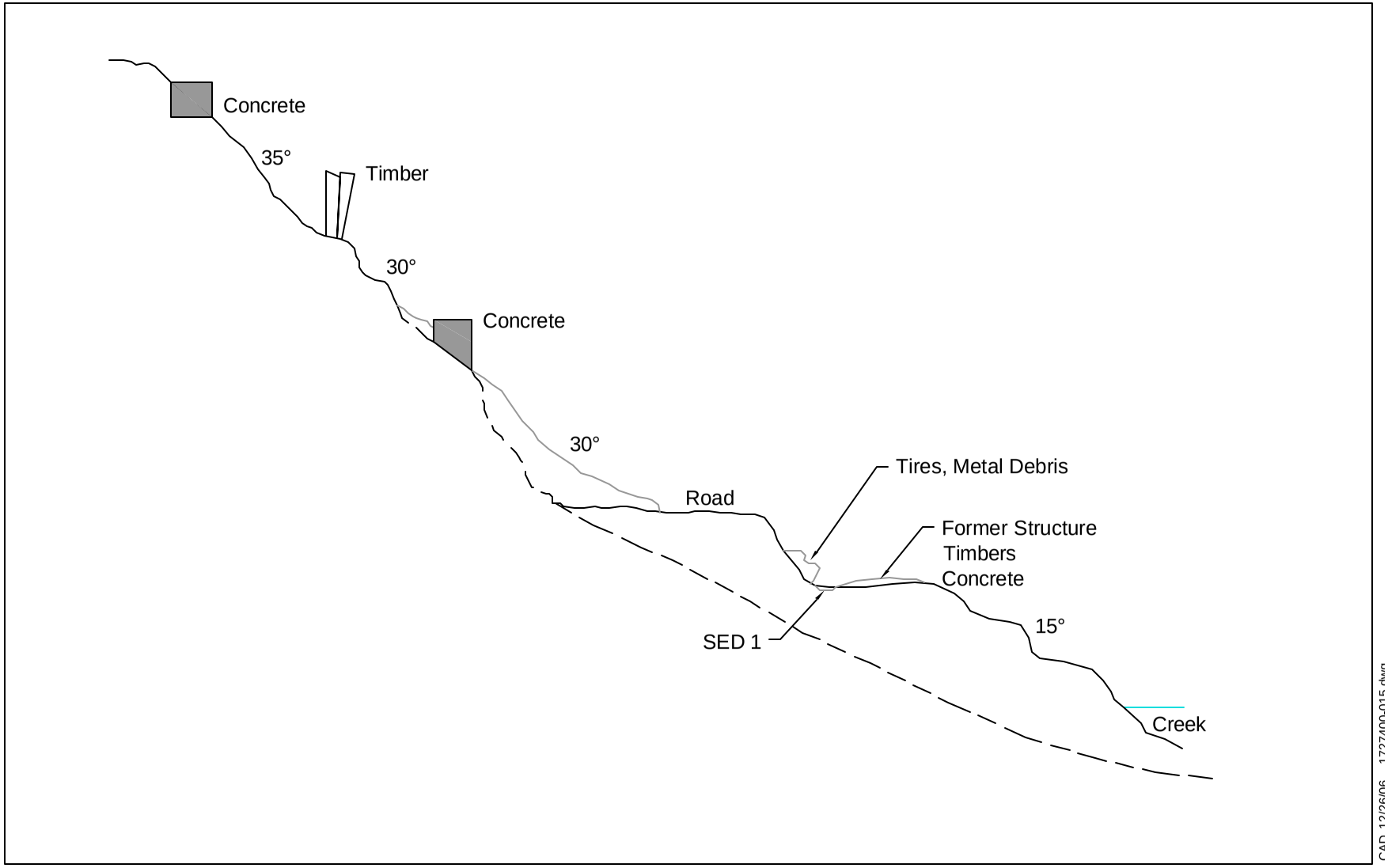
Figure 3

Cross Section A-A'

Hortense Mill



Source: Base map prepared from field notes 06/17/06

0 30 60

Scale in Feet

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Figure 4

Mine Waste Rock Conceptual Site Model for Human and Ecological Risk
Hortense Mill

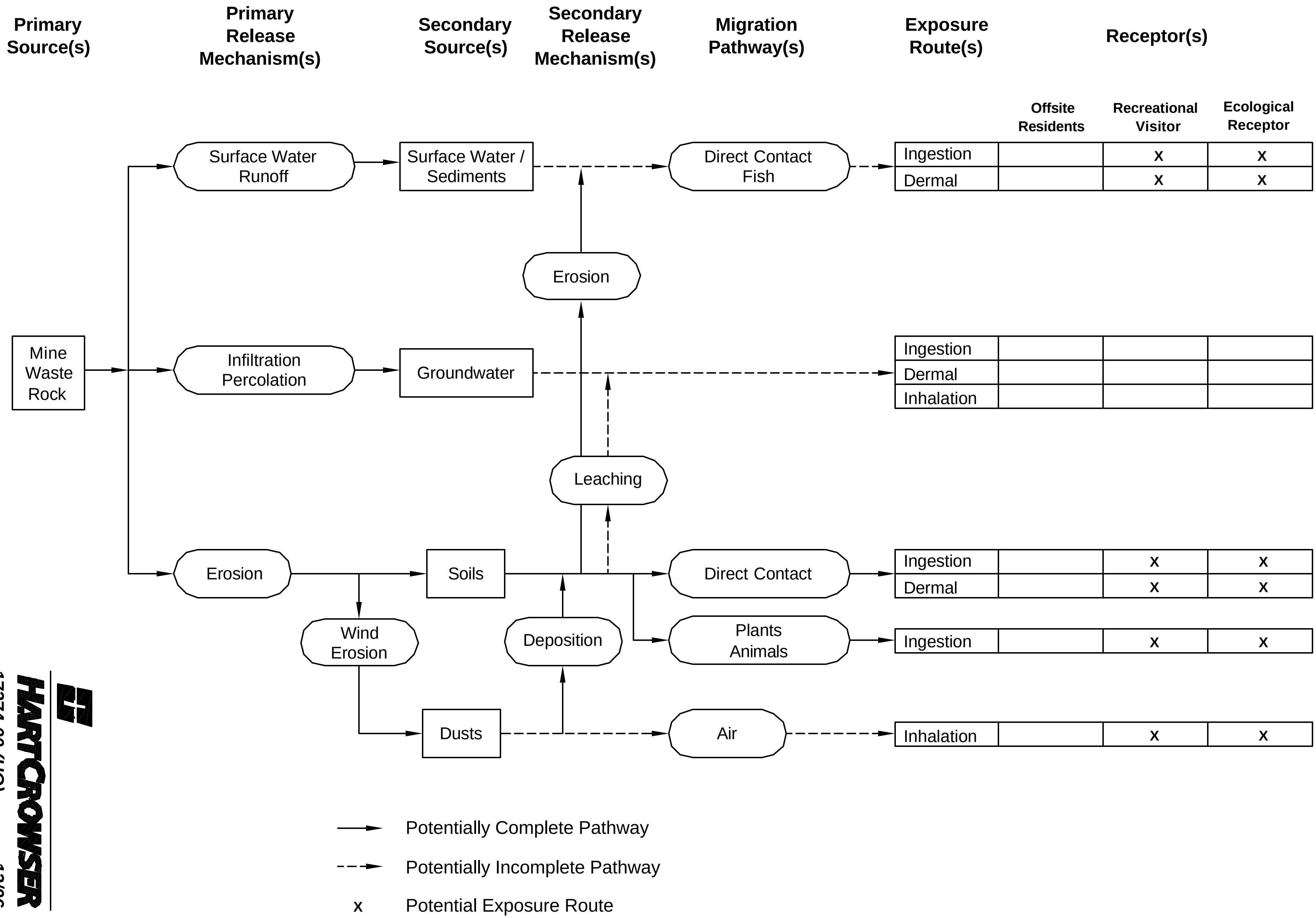

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Figure 5

EAI 12/26/06 1727400-096.dwg

APPENDIX A
FIELD DOCUMENTATION

AML Feature Inventory

Feature ID: Hartenze Mill
Surveyor(s): Pat Reed / Ashley Burin
USGS Quad: Abercrombie
Survey Date: 6/17/02

Directions to Site (from a main road or landmark appearing on map)

From Metaline Falls:
Take Hwy south ~ 1 mile to Boundary Road
go north / mi. pull in to gated road. If you see a gravel pit, you've gone too far.
Walk or drive east 1000 ft. to site.

Terrain Slope (Circle where applicable): 1. Flat 2. Vertical 3. Sloped (if sloped, report approx slope angle) See drawing
slope angle: deg

Physical Features / Sources

Mine Openings:

	Count / ID	Condition: (open / closed / collapsed / flooded / other)	Nominal Dimensions in feet	Water Present (Y / N)	Flowrate in GPM	Parameters: pH	Cond in mS	Temp in C		Animals Present (ie: bats, other)	Photo # (Site-Photo#-Date)	GPS Coord (Report in NAD 83, WA North Zone, State Plane Coordinates, Units of Feet)		Elevation in feet above MSL*
Shaft(s)														
adit(s)														
pit(s)	3	Collapsed (?)	6 x 8	N	—									
other (explain)														

*Elevation Measurement Method: B=barometer, T = Topo Map, O = Other (explain)

Mining Activity-Related Piles:

	Count / ID	Dimensions in ft (L X W X H)	Feature Vol. in yds³	Seepage Visible? (Y / N)	Seepage: Active / Inactive?	Estimated Particle Gradation (eg. 0.5" - 4")	# of Samples	% Ground Cover	Distressed Vegetation (Y / N)	Recent Human Activity (Y / N)	General Description of Location(s):
waste rock pile(s)	1								N	Y	site
tailings pile(s)											
ore / leach pile(s)											
debris pile(s)	1								N	Y	site
other (explain)											

Miscellaneous Notes: In the waste near the dump site is clay-tile pipe 6" w/glaze inside, and rock that may be slag.

AML Feature Inventory

Feature ID Fortune Mill

Survey Date 6/17/06

Surveyor(s) Pat Reed, Abbey Bazin

Physical Features / Sources (Continued)

Mining Activity-Related Ponds or Liquid Containment Structures:

	Count / ID	Dimensions in ft (L X W X H)	Lined (Y / N)	Liquid Present (Y / N)	Feature Vol in yds³	Liquid Vol in yds³	Parameters: pH	Cond in mS	Temp in C		Animals Present (e.g. bats, other)	# of Samples
leach pond(s)	0									DO = 6.6		
tailings pond(s)	1	18 X 14 X 0.5	N	Y	4.7	4.7	8.1	0.37	20	oily sheen - bacteria?		Sed.
tailings impoundment(s)												
other (explain)	1	10' dia x ? galvanized steel tank debris										

Seep(s), Creek(s), Pond(s), Lake(s)

Count / ID	Location	Flowrate in GPM	Parameters: pH	Cond in mS	Temp in C		Odor, sheen, discoloration?
1	Creek at Foot of Waste pile	~60	8.4	.04	9	DO = 11.3	No, clear

Soil or Seep Staining

	Count / ID	Location	Color	Distance from Potential Contaminant Source to Receptor	Source & Receptor
soil	0				
seep	0				
other	0				

Seasonal Flow Paths or Channels

Count / ID	Water Present (Y / N)	Flowrate in GPM	Parameters: pH	Cond in mS	Temp in C		Distance from Potential Contaminant Source to Receptor	Source & Receptor
1	Y	1 Bbl/min						
2	N	-						

Wetlands

Count / ID	Flowrate in GPM	Parameters: pH	Cond in mS	Temp in C		Distance from Potential Contaminant Source to Receptor	Source & Receptor	# of Samples
2	Seeps							

AML Feature Inventory

Feature ID | **Survey Date**

Surveyor(s)

Physical Features / Sources (Continued)

Water Supply Structures

	Count / ID	Inner Diameter	Depth	Soil Type	Served	Distance from Potential Contaminant Source	General Location
groundwater wells	8						
surface water intakes	0	2 pipes					
pit toilets	1						
other							

	Mill Present (Y / N)	Mill Footprint in ft.²	Waste Associated with Mill	Chemicals Assoc with Mill
Mill	Y		Waste rock, timbers, metal debris, tires, glass	

Buildings / Structures

	Count / ID	Bldg. Footprint in ft.²	Suspected Bldg. Use	Bldg. Condition	Comments
Other Buildings	4	120 @	RES		
	1				

Liquid or Waste Containment Structures

	Count / ID	Volume in Gal.	Condition	Suspected Contents
drums				
tanks				
other				

Debris / Refuse

	Number	Size	Description
assay equip & retorts			
drums			
scrap lumber			
scrap metal			
machinery			
other			

Ground Cover, Vegetation, Evidence of Wildlife or Recent Human Activity

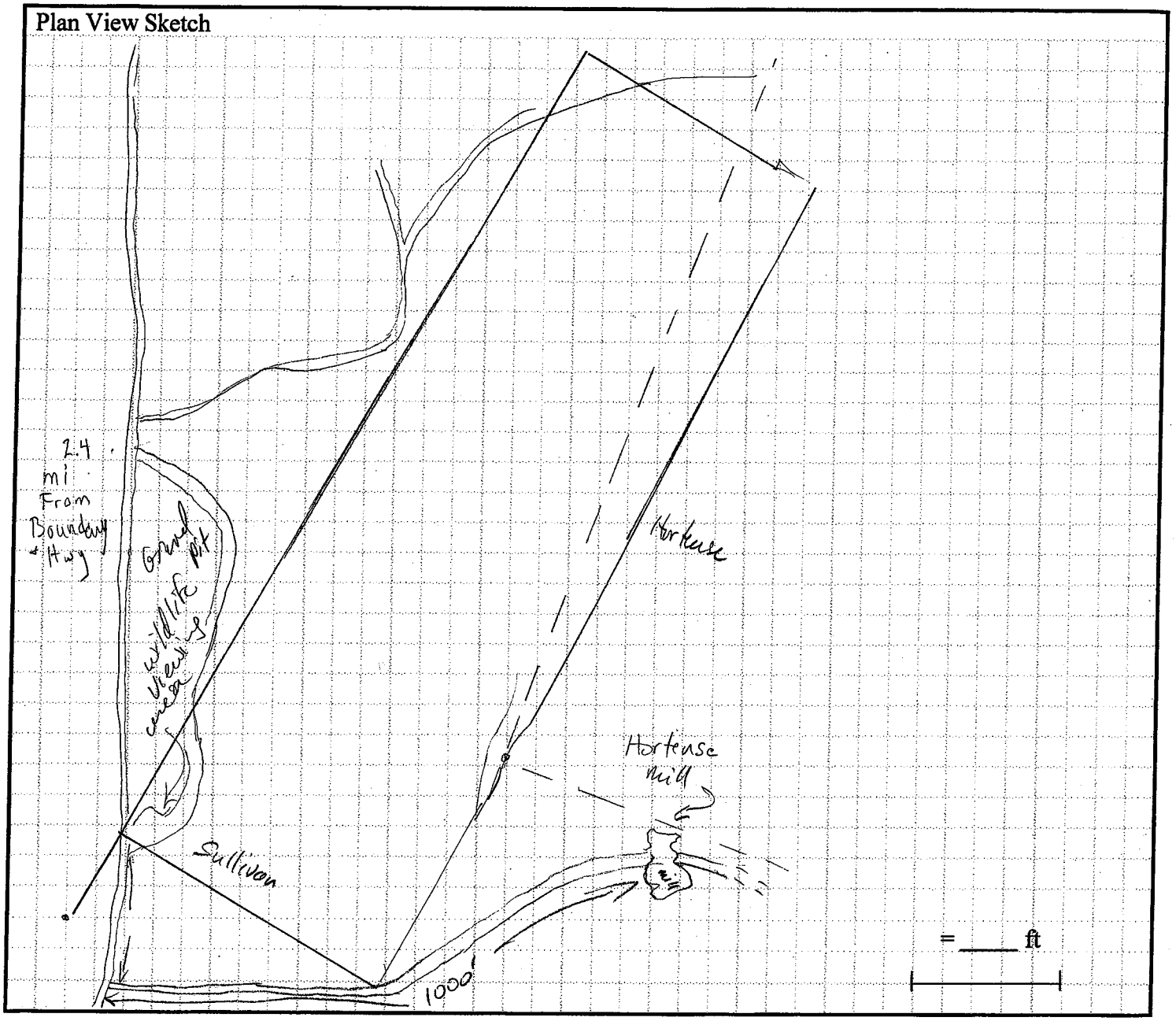
Type / Name	Number	Endangered / Threatened (Y / N)	Comments*

*Note whether vegetation is distressed

AML FEATURE INVENTORY/MONITORING FIELD FORM

Feature ID	Hortense Mill
Date	6/17/06
Weather	Sun

Plan View Sketch



INCLUDE THE FOLLOWING IN THE FIELD SKETCH FOR:

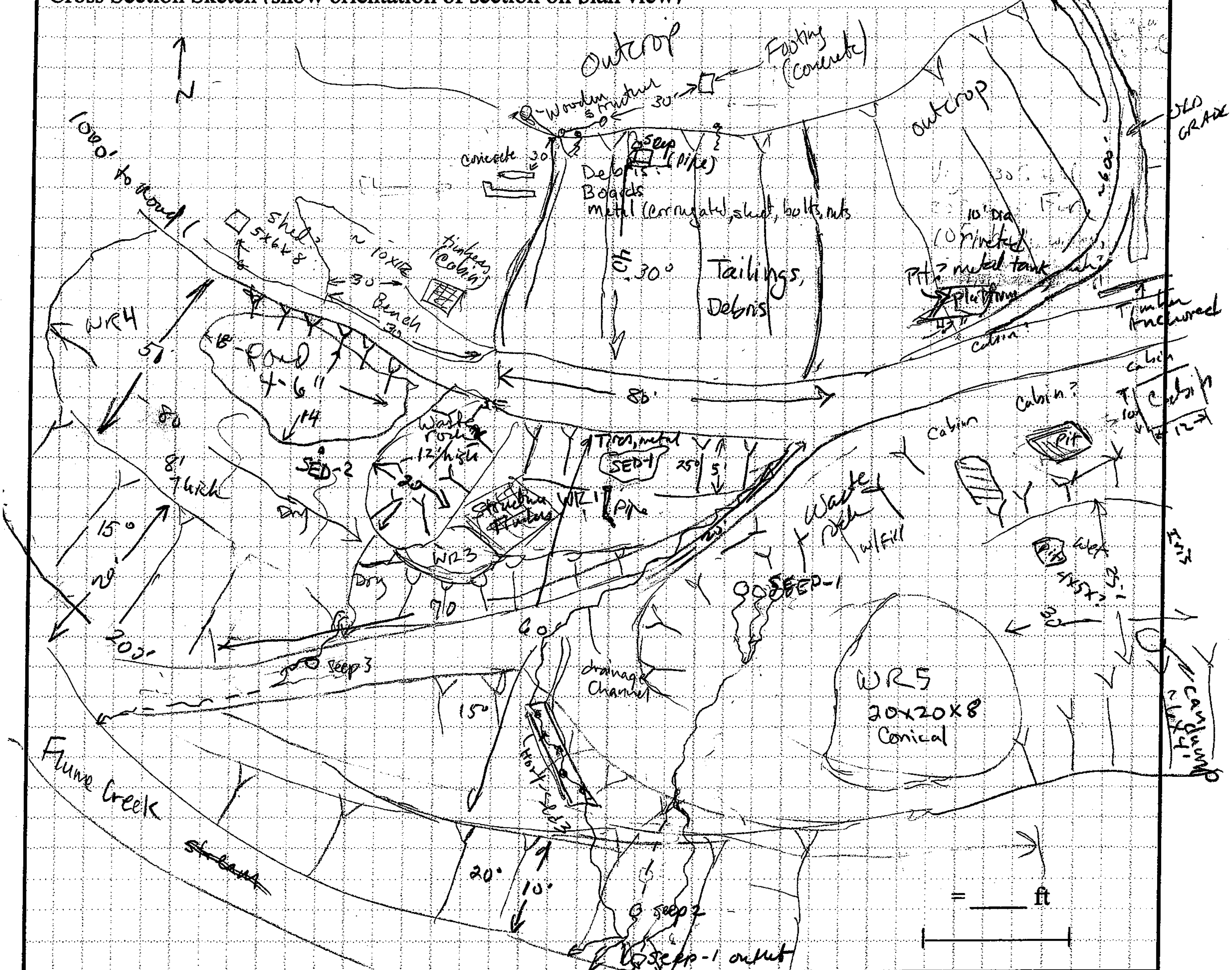
North Arrow
Scale Bar
Photo Location(s) and View Direction(s)
Sample Location(s) and ID(s):
- W-# Water
- S-# Soil
- T-# Tailings
- R-# Rock (Waste)
- O-# Ore
- S-# Other (Describe)

FOOTPRINT(S) OF:
- MILLS
- BUILDINGS
- STRUCTURES
- MINING-RELATED PILES
- OTHER

SURFACE WATER (PONDS, SEEPS, ETC.)
- GPS Collection Location ☼
- Elevation (Topographic Variation)
- Slope Direction

Feature ID	~~Hortense~~ Sullivan Mill
Date	6/17/06
Weather	Sun

Cross Section Sketch (show orientation of section on plan view)



SEEP-1 1250 outlet
pH 8.3 Cond 0.33
Turb 70 DO 7.9
Temp 16°C Sal 0

SEEP-1 1240 6/17
DO 7.4 mg/L Sal 0
Temp 14°C pH 7.8
Cond .01 mS/cm
Turb 0-10

Veg: 30% total
20% Silver/Noble Fir healthy
10% birch, willow, shrubs healthy

INCLUDE THE FOLLOWING IN THE FIELD SKETCH FOR:

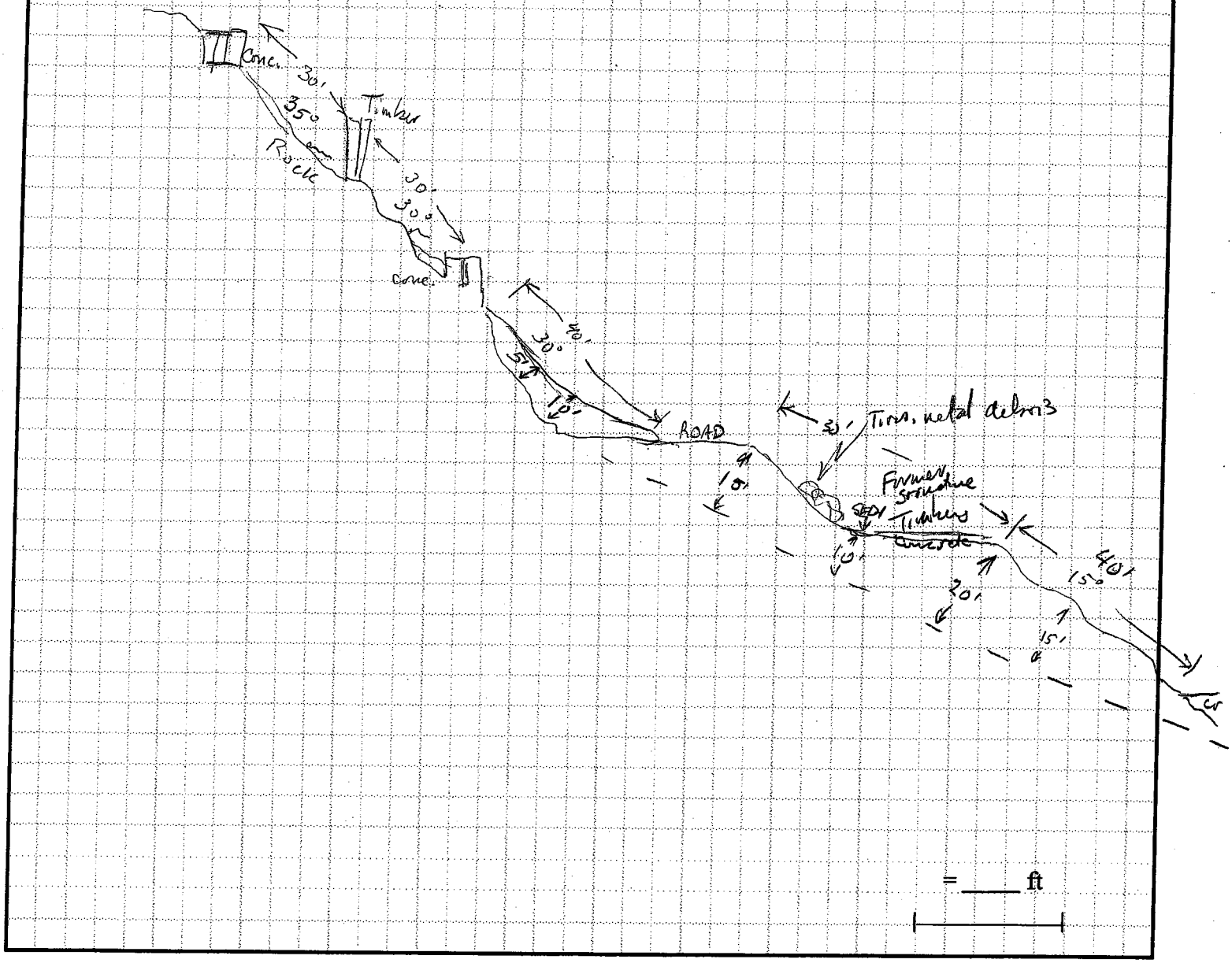
X - X' Cross Section Orientation
Scale Bar
Photo Location(s) and View Direction(s)
Sample Location(s) and ID(s):
- W-# Water
- S-# Soil
- T-# Tailings
- R-# Rock (Waste)
- O-# Ore
- S-# Other (Describe)

LOCATION(S) OF:
- MILLS
- BUILDINGS
- STRUCTURES
- MINING-RELATED PILES
- OTHER

SURFACE WATER (PONDS, SEEPS, ETC.)
GPS Collection Location ☼
Elevation (Topographic Variation)

Feature ID	Sullivan Mill
Date	6/17/06
Weather	Sun

Cross Section Sketch (show orientation of section on plan view)



INCLUDE THE FOLLOWING IN THE FIELD SKETCH FOR:

X - X' Cross Section Orientation
Scale Bar
Photo Location(s) and View Direction(s)
Sample Location(s) and ID(s):
- W-# Water
- S-# Soil
- T-# Tailings
- R-# Rock (Waste)
- O-# Ore
- S-# Other (Describe)

LOCATION(S) OF:
- MILLS
- BUILDINGS
- STRUCTURES
- MINING-RELATED PILES
- OTHER

SURFACE WATER (PONDS, SEEPS, ETC.)
GPS Collection Location ☼
Elevation (Topographic Variation)

Ecology AML

Hortense Mill				
Point	**Coordinate Name**	**Northing**	**Easting**	**Altitude**
G1	HORTENSE WR1 S1	1306726	2391405	2294
G2	HORTENSE WR2 S1	1306700	2391375	2308
G3	HORT WR4	1306617	2391295	2291
G4	HORT WR5	1306675	2391508	2303
G5	HORTENSE SED1	1306746	2391408	2342
G6	HORTENSE SEEP1	1306699	2391450	2277
G7	HORTENSE SEEP1 OUTLET	1306635	2391500	2264
	Average	**1306685**	**2391420**	**2297**

Notes:
Northings and Eastings are reported in units of US Feet, relative to NAD 83 State Plane Coordinate System, Washington Zone South.

Photograph 1 - Debris near field supports

Photograph 2 - View of tire stockpile WR-1, WR_2 and WR_3

Photograph 3 - View of car frame and WR-5

Photograph 4 - Crushed Metal Tank

Photograph 5 - Cabin