Abandoned Mine Lands
Initial Investigation Report
Hubbard Mine
Northport, Washington

Prepared for
Washington State
Department of Ecology

December 28, 2006
17274-00(HU)

HARTCROWSER
Delivering smarter solutions

WASHINGTON STATE
DEPARTMENT OF
ECOLOGY

Abandoned Mine Lands Initial Investigation Report
Hubbard Mine
Northport, Washington

Prepared for
Washington State
Department of Ecology
Rick Roeder, Project Manager

December 28, 2006
17274-00(HU)

Prepared by
Hart Crowser, Inc.

EXPIRES 12/03/2007

Abby S. Bazin, E.I.T.
Senior Staff
Environmental Engineer

Michael J. Bailey, P.E.
Senior Principal Engineer

1910 Fairview Avenue East
Seattle, Washington 98102-3699
Fax 206.328.5581
Tel 206.324.9530

CONTENTS

TABLES

Tables with no page number shown are included following page 10.

CONTENTS (Continued)

Page

FIGURES

APPENDIX A
FIELD DOCUMENTATION

ABANDONED MINE LANDS INITIAL INVESTIGATION REPORT
HUBBARD MINE
NORTHPORT, WASHINGTON

1.0 EXECUTIVE SUMMARY

Information obtained during this assessment is summarized in Table 1.

Table 1 – Hubbard Data Summary

Mine Name:	Hubbard Mine (Royal Gold)
Last Known Operation:	Huntting (1956) reports one carload of ore shipped, no date or volume given. The mine includes five unpatented claims. Development was 275-foot and 125-foot long adits, and two shafts reported about 30 feet deep. Ore is lead, zinc, silver, gold, and copper. The site has been repeatedly claimed and explored from 1977 to 1984. All claims have been closed. It is currently owned by the Colville National Forest.
Location:	10 miles west (by road) of railroad at Northport, Washington, on Forest Service Road. On top of peak at head of Squaw Creek, Stevens County, Washington. Latitude/Longitude: 48.92068, 117.86625 (lower) 48.92101, 117.86860 (upper) Quad Map: Northport Quadrangle TRS: Township 40N, Range 39E, Section 32, E 1/2
Features Observed	Five adits One shaft Three waste rock piles (2,345 cubic yards) Three buildings
Results above Criteria	Waste rock and sediments typically exceed human health criteria for arsenic, cadmium, lead, and occasionally mercury. Most samples exceed Ecological Protection criteria for antimony, arsenic, cadmium, lead, nickel, selenium, silver, and zinc. Waste rock has the potential to fail TCLP dangerous waste criteria for arsenic, cadmium, lead, and silver.
Work by Others	EPA, 2002 “Preliminary Assessments and Site Inspections Report, Upper Columbia River Mines and Mills, Stevens County, Washington” TDD: 01-02-0028, START-2, Region 10, Seattle, Washington.
Potential Receptors / Degree of Hazard	Human health risks possible for recreational users. Risk to ecological receptors is likely.

2.0 INTRODUCTION

This report summarizes the results of the initial limited soil and surface water investigation at the Hubbard Mine site located near Northport, Washington (Figure 1). Hart Crowser performed this preliminary assessment (PA) for the Washington State 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 whether 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 fractions of waste rock, mine tailings, and/or natural soils that were 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 historical 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 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 July 15, October 31, and November 1, 2006.

3.0 SITE DESCRIPTION, OPERATIONAL HISTORY, AND WASTE CHARACTERISTICS

3.1 Site Location

The Hubbard Mine is located approximately on Colville National Forest property 4 miles west of Northport, Washington (Figure 1). Directions to the mine are as follows:

- From Northport, head north on Center Avenue/WA-25.
- Turn left onto Sheep Creek Road. Set odometer to zero.
- At 3.3 miles make a slight left onto NF-350.
- At 4.3 miles stay right at the fork, continuing on NF-350.
- At 6.0 miles NF-350 becomes NF-1500960.
- At 7.3 miles, there will be a small clearing on the right side, which leads to an overgrown road. Park here.
- Follow this road for several hundred feet to the lower portion of the Hubbard Mine. The road continues to the Upper Hubbard Mine, as described below.

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 Steven's County Parcel No 8008737.

3.2 Site Description

The Hubbard Mine is an inactive lead, zinc, silver, gold, and copper mine.

Lower Hubbard

Building 1 is the first feature encountered on the site. It is an open-topped building filled with waste rock that sits adjacent to the access road at the south corner of the site. It has two chutes that face the road and may have been used to load rail cars. The waste rock pile, WR-1, lies in and around Building 1 and is also adjacent to the access road, extending across the southeast boundary of the site (Photograph 1). WR-1 is approximately 660 cubic yards in size and is generally composed of a dry, gray, slightly silty, sandy Gravel with cobbles. A small trestle-like structure at the top of WR-1 may have been used to transport ore to Building 1. An ephemeral drainage channel runs over the top of WR-1 and connects with a natural break where the waste rock meets Building 1. The access road forks west near Building 1 and switches back, passing over Adit 1. A second building, potentially used as a dwelling, is located at the switchback.

A collapsed adit, Adit 2, is located at the north corner of WR-1. A pile of boards sits on top of the adit and small pieces of metal debris are scattered within the prospect (Photograph 2). Adit 1 is an open adit northwest of WR-1. There is water within the adit and an ephemeral drainage channel courses from the adit, through the prospect, and ends. Partially collapsed timbers support boards and metal that hang over the prospect of Adit 1 (Photograph 3). Boards and a small tank, about 2 by 2 by 1.5 feet in size, lie in front of the adit (Photograph 4). A cool breeze could be felt near Adit 1. This breeze may be due to airflow from the shaft above, or changing temperature gradients created by the shade inside the prospect.

East Adit

A road departs from the Lower Hubbard site in an eastern direction. A small trail is located near the first switchback, leading to the east adit, Adit 3. The east adit is a small prospect with about a 5- by 10-foot opening that extends approximately 12 feet into a rock face. The prospect is solid rock on all sides, and we did not observe any water or drainage channels (Photograph 5).

Upper Hubbard

Continuing on from Lower Hubbard, the road switches back several times before reaching the Upper Hubbard site. Prior to reaching Upper Hubbard, we encountered a cabin and debris pile. The cabin contains a bed frame and stove, and the roof is collapsed. An outhouse-like structure is located nearby, to the west, but no pit was identified (Photograph 6). A pile of metal debris and tires is located on the southwest side of the cabin. Glass bottles, rusted cans, a bed

frame, a stove, and an unidentified wood and metal structure (Photograph 7) were observed within the pile of debris.

The road into the Upper Hubbard Mine site leads past a building (Building 3) before reaching Adits 4 and 5 and WR-2 (Photographs 8 and 9). The building contains a stove and shelves and may have been used as housing. Adits 4 and 5 were filled with water, although Adit 4 appears to be shallow and may not extend more than approximately 15 feet into the rock face. The road cuts through WR-2 and continues east below the waste rock pile. WR-2 contains damp, tan, slightly silty, very sandy Gravel with cobbles and is approximately 1,275 cubic yards in volume.

A shaft and a third waste rock pile, WR-3, are located south of WR-2. The shaft is approximately 10 feet in diameter, but the depth could not be determined. A metal trashcan was observed near the shaft. WR-3 is 410 cubic yards in volume (Photograph 10). Wood debris (boards and timbers) lie at the top of the pile.

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 below in Table 3.

Table 3 – Ownership Timeline

Year	Owner	Source
Current Land Ownership	Colville National Forest	Parcel No. 8008737, Stevens County Tax Assessor
Current Claim Ownership	No patented claims located on site.	Stevens County Tax Assessor, BLM
1956	Mines Management	Huntting (1956)
1949	Hubbard Mining Corp.	Huntting (1956)
1945	Bruder Mining Co.	Huntting (1956)

4.0 SITE INVESTIGATION ACTIVITIES

The initial investigation of the Hubbard Mine site took place on July 15, 2006. A second visit was made on October 31 and November 1, 2006. Site sketches were created, GPS data and waste rock samples were collected, and site photos were taken. Sample locations, site photo locations and directions, and GPS waypoints are presented on Figures 3 and 4.

4.1 Soil and Waste Pile Sampling

During the initial site visit, three waste rock samples were collected from WR-1 and were sieved through an ASTM No. 10 sieve. On a second visit, four additional samples were collected from WR-2 and WR-3. Sample descriptions and locations are presented in Table 4 and on Figures 3 and 4.

4.2 Surface Water and Seep Sampling

Although water was present within Adit 1, a sample could not be collected due to the debris hanging over the prospect. Water was not draining from the adit at the time of observation. The water within Adits 4 and 5 was not collected because it was stagnant. Because of the configuration of the adit openings, it is unlikely that surface water discharges from these adits. No seeps were observed on the site.

4.3 Sediment Sampling

A sediment sample, Hubbard-Sed 1, was collected from the drainage pathway below Adit 1, since water could not be collected in this area as discussed above.

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

The sediment sample collected exceeded MTCA Method A criteria for cadmium, MTCA Method B criteria for arsenic, and ecologic protection criteria for aluminum, cadmium, mercury, selenium, and zinc.

5.2 Soil

Soil and waste rock sample analytical results (Table 5) 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 metals concentrations in the three samples collected from WR-1 exceeded MTCA Method A criteria for arsenic and cadmium. These samples also

exceeded MTCA Method B criteria for arsenic and ecological protection criteria for arsenic, lead, selenium, and zinc. Sample Hubbard-WR1-S1 exceeded ecological protection criteria for nickel. Samples Hubbard-WR1-S2 and Hubbard-WR1-S3 exceeded Method A criteria for arsenic and ecological protection criteria for silver. Sample Hubbard-WR1-S3 also exceeded ecological protection criteria for nickel.

The metals concentrations in the three samples collected from WR-2 exceeded MTCA Method A criteria for arsenic, cadmium, and lead; MTCA Method B criteria for arsenic; and ecological protection criteria for antimony, arsenic, cadmium, copper, lead, mercury, selenium, silver, and zinc. Samples Hubbard-WR2-S1 and Hubbard-WR2-S2 also exceeded the Method A criteria for mercury. Sample Hubbard-WR2-S3 exceeded the MTCA Method B criteria for cadmium.

One waste rock sample was collected from WR-3. The metals concentrations in the this sample exceeded MTCA Method A criteria for arsenic, cadmium, lead, and mercury, Method B criteria for arsenic; and ecological protection criteria for arsenic, cadmium, lead, mercury, silver, and zinc.

It should be noted that the Method A criterion for cadmium and mercury are based on groundwater protection. Cadmium concentrations in all but one of the collected samples (Hubbard-WR2-S3) and all mercury sample concentrations were below the Method B direct contact criterion.

5.3 Air

No air monitoring was conducted. The coarse, damp nature of the waste rock makes it unlikely that contaminated airborne dust is a concern at this site. In addition, no residences or cabins were observed in the vicinity.

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 Bonanza Mine. In addition, we contacted DNR and requested information on rare plants and high quality native wetland and terrestrial ecosystems within the vicinity of the Hubbard Mine.

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 Bonanza Mine 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

The Hubbard Mine site contains three waste rock piles totaling approximately 2,345 cubic yards. The three waste rock piles and some nearby sediments contain metals at concentrations above MTCA Method A, MTCA Method B, and/or the ecological protection screening criteria. The main contaminants of concern are arsenic, cadmium, lead, mercury, selenium, silver, and zinc. Although no toxicity characteristic leaching procedure (TCLP) analyses were conducted, the concentrations of arsenic, cadmium, lead, and silver have the potential to fail TCLP criteria for dangerous waste. Additional sampling and TCLP analysis are recommended.

No residences were observed on 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/.

EPA 2002. "Preliminary Assessments and Site Inspections Report, Upper Columbia River Mines and Mills, Stevens County, Washington" TDD: 01-02-0028, START-2, Region 10, Seattle, Washington.

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.

Henry Day, "The Records of the Aurum Mining Company" University of Idaho Special Collections, accessed on 6/26/06 by PLR, at http://www.lib.uidaho.edu/special-collections/Manuscripts/dmginv/mg235.htm

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

Stevens County Tax Assessor's Website:
http://www.co.stevens.wa.us/assessor/assessor.htm

J:\Jobs\1727400\Hubbard\Hubbard Report.doc

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 – Hubbard Mine Sample Inventory

Sample Name	Sample Location	Sample Description
Waste Rock Samples		
Hubbard-WR1-S1	At top of WR-1 on east end.	Dry, gray to dark gray, slightly silty, sandy Gravel with cobbles
Hubbard-WR1-S2	Center of WR-1, near trestle.	Dry, light gray to gray, slightly silty, sandy Gravel with cobbles
Hubbard-WR1-S3	Western portion of WR-1.	Dry, tan to light brown, slightly silty, sandy Gravel with cobbles
Hubbard-WR2-S1	Top center of WR-2	Damp, tan, slightly silty, very sandy Gravel with cobbles
Hubbard-WR2-S2	Center of WR-2	Damp, tan, slightly silty, very sandy Gravel with cobbles
Hubbard-WR2-S3	Bottom center of WR-2	Damp, tan, slightly silty, very sandy Gravel with cobbles
Hubbard-WR3-S1	Top center of WR-3	Damp (frozen), orange and gray, silty, sandy Gravel with cobbles up to 4 inches. Very soil-like with organic (decaying vegetation) odor.
Sediment Sample		
Hubbard – Sed 1	In drainage channel near Adit 1.	

Table 5 - Analytical Results for Soil and Sediment Samples - Hubbard Mine

SDG Sample ID Sampling Date	MTCA Method A (a)	MTCA Method B		Ecological Protection (c) Plant/Soil Biota/Wildlife	K0606045 Hubbard-Sed 1 7/15/2006	K0606045 Hubbard-WR1-S1 7/15/2006
		Soil Ingestion (b)	Soil Ingestion & Dermal Contact (b)			
Total Solids in %					51.1	99.7
Total Metals in mg/kg						
Aluminum	--	80,000	72,072	50 / -- / --	**1,910**	
Antimony	--	32	29	5 / -- / --	0.38	2.64
Arsenic	20	0.67	0.62	10[d] / 60 / 132	3.5	**48.6**
Beryllium	--	160	144	10 / -- / --	0.1	0.91
Cadmium	2	80	74	4 / 20 / 14	**23**	3.09
Chromium	2,000[e]	120,000[e]	44,571[e]	42 / 42 / 67	2.8	11.7
Copper	--	2,960	2,700	100 / 50 / 217	11.8	44.9
Iron	--	24,000	21,622	-- / -- / --	2710	
Lead	250	--	--	50 / 500 / 118	33.2	**84.4**
Manganese	--	11,200	10,090	1,100 / -- / 1,500	805	
Mercury	2	24	18	0.3 / 0.1 / 5.5	**0.18** J	0.07 J
Nickel	--	1,600	1,441	30 / 200 / 980	29.8	**46.2**
Selenium	--	400	360	1 / 70 / 0.3	**9.8**	**7.9**
Silver	--	400	360	2 / -- / --	0.08	1.96
Thallium	--	5.6	5.0	1 / -- / --	0.06	0.09
Zinc	--	24,000	22,000	86 / 200 / 360	**2,840**	**279**

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 Soil and Sediment Samples - Hubbard Mine

SDG	K0606045	K0606045	K0609838	K0609838	K0609838
Sample ID	Hubbard-WR1-S2	Hubbard-WR1-S3	Hubbard-WR2-S1	Hubbard-WR2-S2	Hubbard-WR2-S3
Sampling Date	7/15/2006	7/15/2006	10/31/2006	10/31/2006	10/31/2006
Total Solids in %	94.4	99.4	85.7	84.3	78.8
Total Metals in mg/kg					
Aluminum					
Antimony	**17.1**	0.66	**3240**	**623**	**166**
Arsenic	**91.8**	**48.7**	**2010**	**1310**	**614**
Beryllium	0.52	0.94	0.3	0.52	0.53
Cadmium	**35.4**	**4.25**	**32.8**	**18.8**	**313**
Chromium	38.2	2.7	10.1	12	9.26
Copper	44.3	13	**299**	**177**	**127**
Iron					
Lead	**1,880**	**461**	**75700**	**35000**	**21300**
Manganese					
Mercury	0.1 J	0.02 UJ	**3.85**	**2.28**	**1.85**
Nickel	**39.5**	12.6	7.65	9.71	22.4
Selenium	**3.4**	**4.8**	**6.4**	**5.4**	**10.1**
Silver	**4.63**	**5.04**	**238**	**112**	**48.7**
Thallium	0.22	0.06	0.29	0.27	0.15
Zinc	**4,950**	**419**	**4660**	**3220**	**41200**

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 Soil and Sediment Samples - Hubbard Mine

SDG	K0609838
Sample ID	Hubbard-WR3-S1
Sampling Date	11/01/2006
Total Solids in %	90.4
Total Metals in mg/kg	
Aluminum	
Antimony	2.07
Arsenic	**24.9**
Beryllium	0.31
Cadmium	**7.65**
Chromium	16.1
Copper	41.6
Iron	
Lead	**483**
Manganese	
Mercury	**2.25**
Nickel	16.1
Selenium	**1.4**
Silver	**4.04**
Thallium	0.17
Zinc	**582**

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)

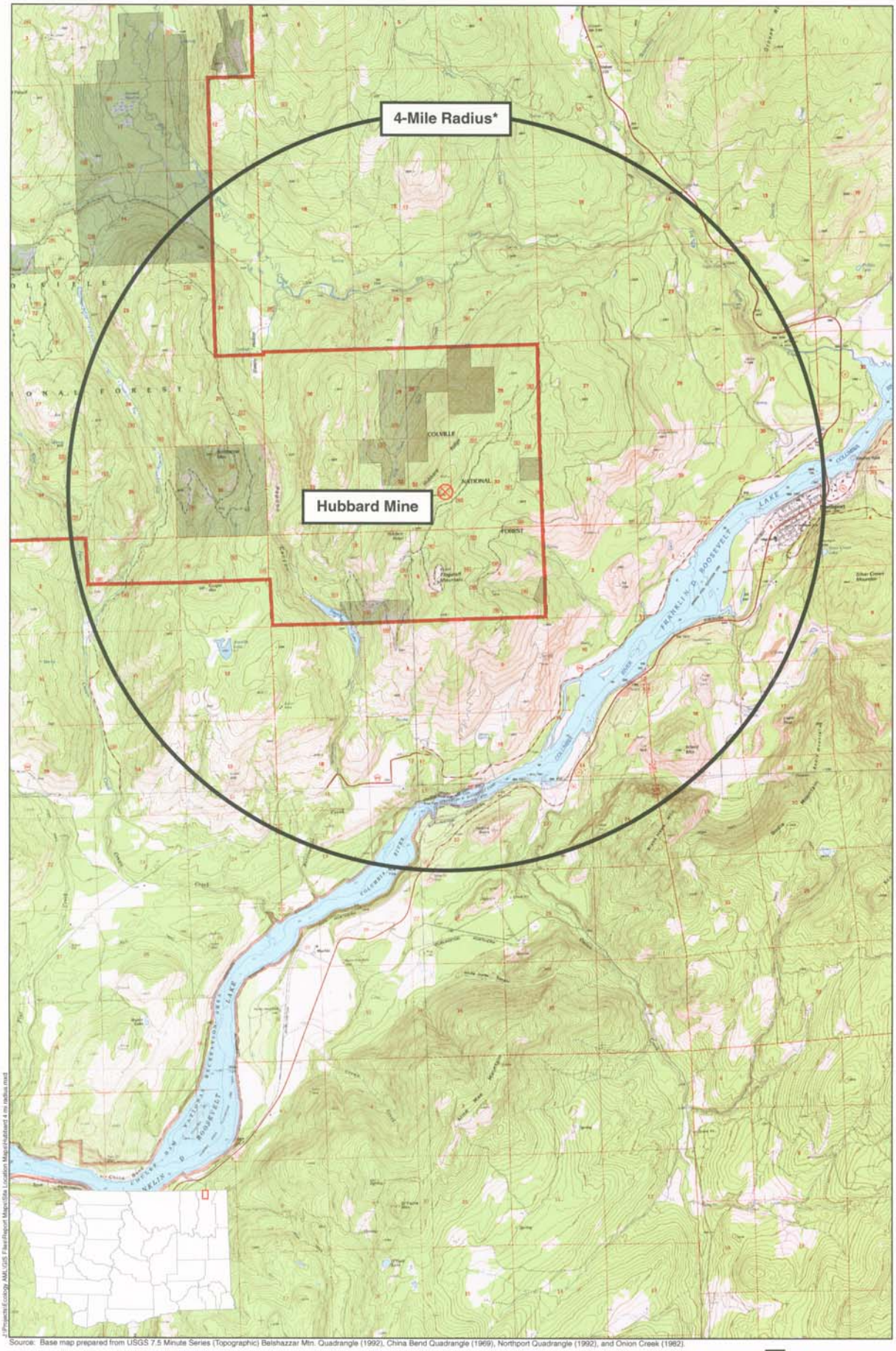
(e) Based on Chromium III

Table 6 - Threatened and Endangered Species

Species	Federal Status		State Status		Narrative
	T	E	T	E	
Bull trout (*Salvelinus confluentus*)	X				Lower reach of Onion Creek, lower reach of Boulder Creek, Deep Creek, and Big Sheep Creek
Lynx (*Lynx canadensis*)	X		X		Big Sheep Creek and American Fork

Site Location Map

Hubbard Mine



Source: Base map prepared from USGS 7.5 Minute Series (Topographic) Belshazzar Mtn. Quadrangle (1992), China Bend Quadrangle (1969), Northport Quadrangle (1992), and Onion Creek (1982).

0 0.5 1 2

Scale in Miles

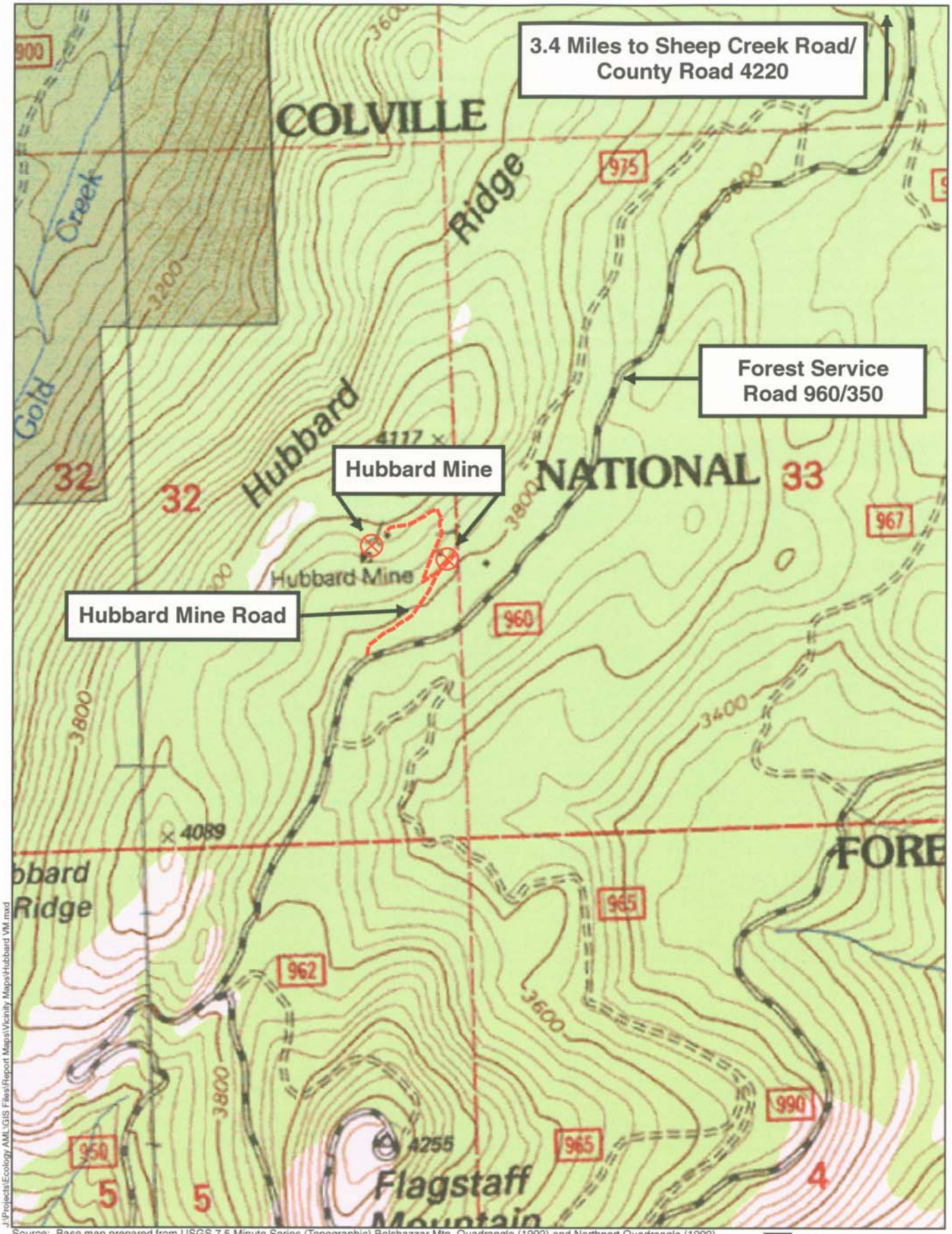
*Circle drawn encompasses a 4-mile radius from all mine areas and has radius slightly larger than 4 miles.

HARTCROWSER

17274-00 (HU) 1/07

Figure 1

Vicinity Map
Hubbard Mine



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

Source: Base map prepared from USGS 7.5 Minute Series (Topographic) Belshazzar Mtn. Quadrangle (1992) and Northport Quadrangle (1992).

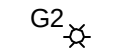
0 500 1,000
Scale in Feet

⊗ Mine Location Visited in Field

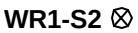
N

HARTCROWSER
17274-00 (HU) 1/07
Figure 2

Standard Key for Site Plan
Hubbard Mine



GPS Data Point Location and Number



Soil or Waste Rock Sample Location and Number
(Note: Site name prefix also part of sample number)

Water Sample Location and Number

Composite Sediment Sample Location
and Number


Adit


Shaft


Prospect/Pit


Building/Structure


Seep


Drainage Channel

Intermittent/Seasonal Drainage Channel

Fence


Debris, Predominantly Wood

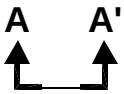

Debris, Predominantly Metal


Soil or Seep Staining


Other Feature


Groundwater Well

Photo Location, Number and Direction

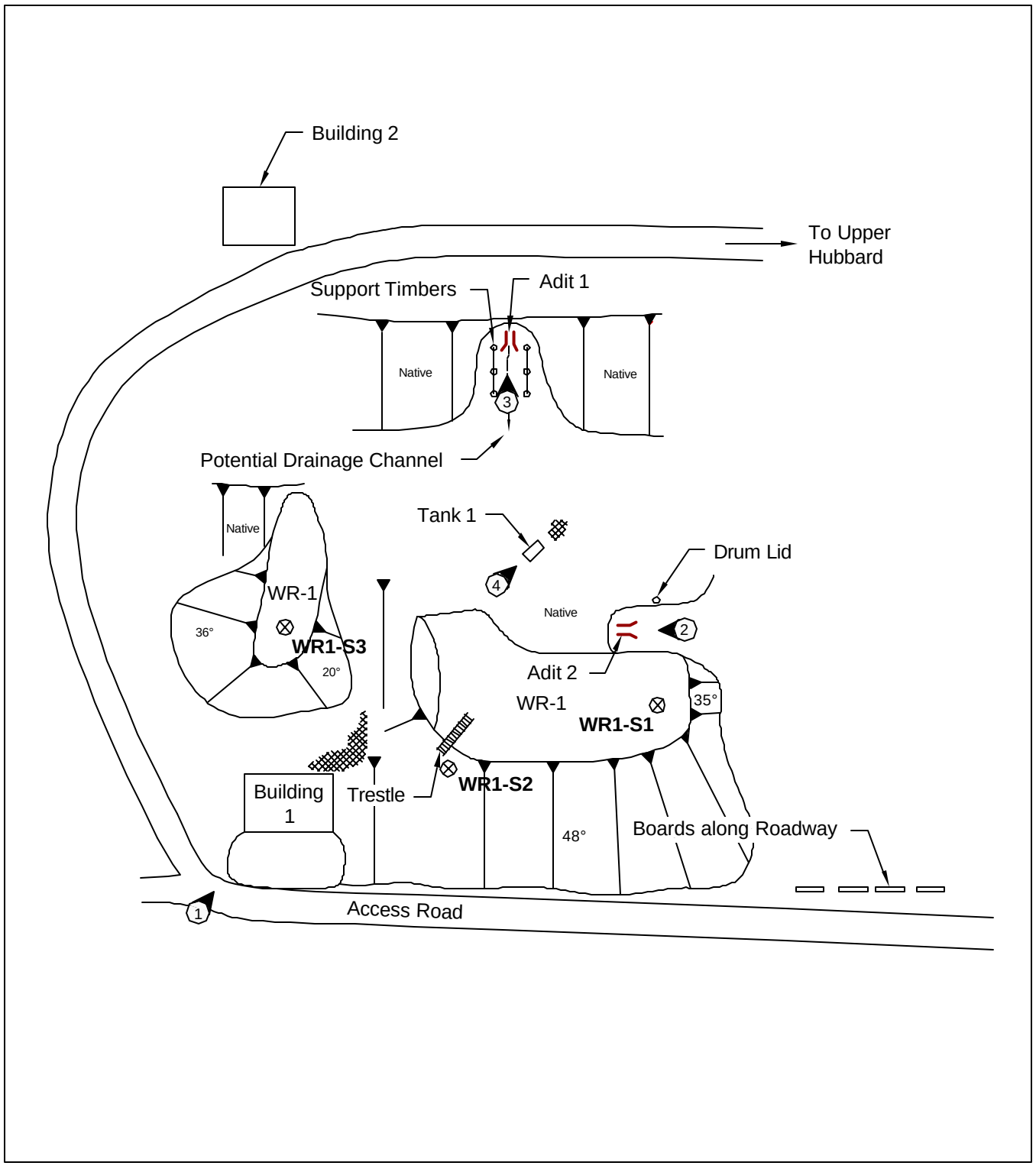


Approximate Cross Section Location and Designation

HARTCROWSER

17274-00 (HU) *12/06*

Site Plan
Lower Hubbard Mine



CAD 01/22/07 1727400-033.dwg

N

0 25 50

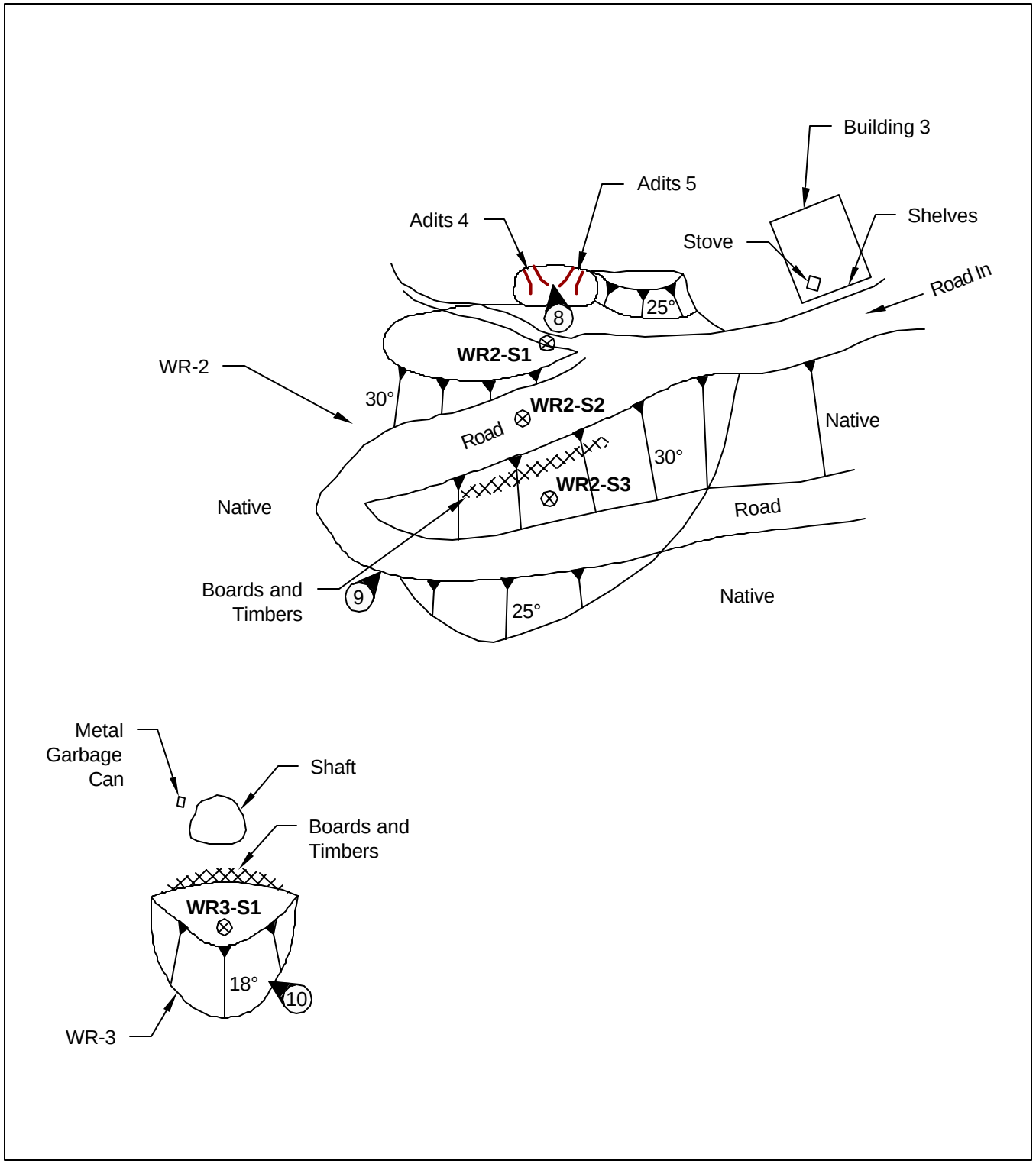
Scale in Feet

HARTCROWSER

17274-00 (HU) *1/07*

Figure 3

Site Plan
Upper Hubbard Mine



EAL 01/22/07 1727400-095.dwg

Source: **Base map prepared from field notes dated 10/31/06 and 11/01/06.**

Note: Location of Photographs 5, 6, and 7 are not shown.

N

0 30 60

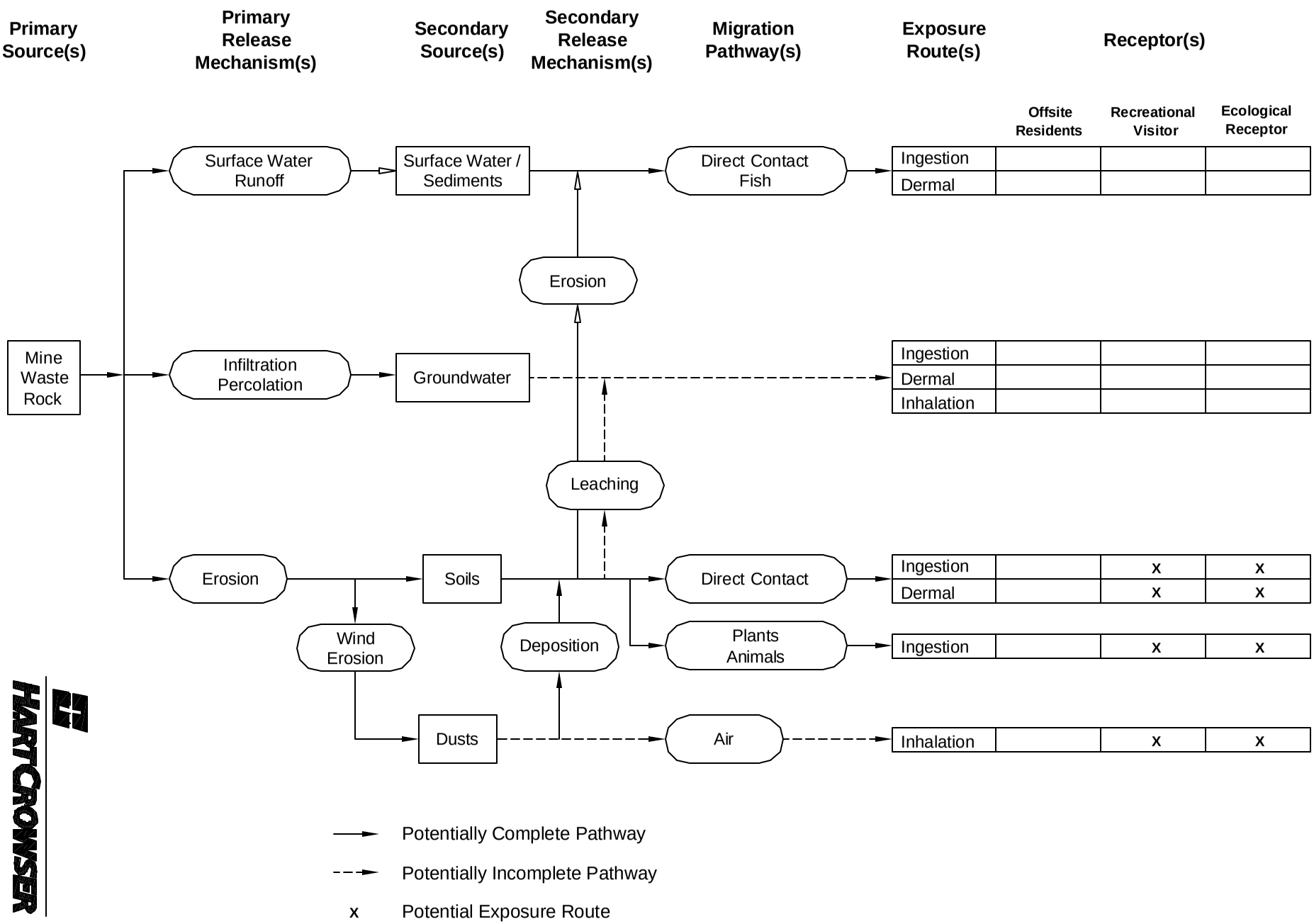
Scale in Feet

HARTCROWSER

17274-00 (HU) ***1/07***

Figure 4

Mine Waste Rock Conceptual Site Model for Human and Ecological Risk
Hubbard Mine



HARTCROWSER

17274-00 (HU) 12/06

Figure 5

EAI 01/22/07 17274-00-101.dwg

APPENDIX A
FIELD DOCUMENTATION

AML Feature Inventory

Feature ID: Hubbard
Surveyor(s): ASB, MJS
USGS Quad:
Survey Date: 7/15/06

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

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

Physical Features / Sources

Mine Openings: ☐ shaft(s) ☐ adit(s) ☐ pit(s) ☐ other (explain)

timber structures overhead may not be stable enough to allow movement below

Opening Type / Count ID	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	Description
(i.e.) Adit 1	open	5 x 10 x 8	Y	0.5 L/min	3.4	0.254	14.7		n	Butte - P3 - 6/15	G7: 1278956, 476985	Adit on northeast side of WR-2
Adit1	open	5x7	y	None	Cannot access	water			N			open adit w/ x-trench box " timbers. Water in adit & possibly drains though pathway not obvious
Adit2	covered	~4x5	N	None	—	—	—	—	N			boards & metal straps

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

Mining Activity-Related Piles: ☐ waste rock pile(s) ☐ tailings pile(s) ☐ ore / leach pile(s) ☐ debris pile(s) ☐ other (explain)

Pile Type / Count ID	Dimensions in ft (L X W X H)	Slope in degrees	Seepage Visible? (Y / N)	Seepage: Active / Inactive?	% Vegetative Cover (trees / brush / grass, moss)	Distressed Vegetation (Y / N)	Recent Human Activity (Y / N)	GPS	Sample Name(s)	Estimated Particle Gradation	Soils Classification:
(i.e.) WR-1	150 x 50 x 3	38	Y	Inactive	20% / 30% / 15%	N	bottles, footprints	G1:G4 (see below)	Butte - WR1 - S1:S4	0.5" - 4"	moist, gray, sl silty, v sandy, Gravel
WR-1	sketch	48	N	—	25/5/10						

Sample Inventory

Sample Name (Site - Feature - Sample Number)	Location	GPS Name	Northing/Easting	Soil Description	Sieved?
(i.e.) Butte - WR1-S1	Southern end of WR-1, top.	G9: Butte - WR1 - S1	G7: 1278965, 4796821	moist, gray, silty, v. gravelly, Sand	Y, ASTM #10
Hubbard - WR1 - S1					Y
Hubbard - WR1 - S2					Y
Hubbard - WR1 - S3					Y
Hubbard - SEEP1					N

Miscellaneous Notes:

Adit1 has a slight cool breeze flowing from it. No odor

AML Feature Inventory

Feature ID Hubbard

Survey Date 7/15/06

Surveyor(s) ASB MJS

Physical Features / Sources (Continued)

Mining Activity-Related Ponds or Liquid Containment Structures: ☐ leach pond(s) ☐ tailings pond(s ☐ tailings impoundment(s) ☐ other (explain)

Pond Type / Count ID	Dimensions in ft (L x W x D	Lined (Y / N)	Liquid Present (Y / N)	Parameters: pH	Cond in mS	Temp in C		Animals Present (e.g. bats, other)	Sample Name(s)	GPS
(i.e.) LP 1	50 x 30 x 4	N	N	-	-	-		N	Butte - LP1 - S1:S2	G5: 1278965, 476985

☐ Seep(s) ☐ Creek(s) ☐ Pond(s) ☐ Lake(s)

Type / Count ID	GPS	Location	Sample Name		Flowrate in GPM	Parameters: pH	Cond in mS	Temp in C		Odor, sheen, discoloration?
(i.e.) Flume Creek	G3: 1278496, 479865	southern site border	Butte - Flume Creek 1		0.1	6.2	0.153	10.9		None

☐ Soil Staining ☐ Seep Staining

Type / Count ID	Location	Color	Distance from Potential Contaminant Source to Receptor	Source & Receptor	Notes
(ie) Stain 1	soil downslope of Adit 1	orange/brown	100' upslope of Flume Creek	fish	ferricrete-like

Seasonal Flow Paths or Channels

Count / ID	Water Present (Y / N)	Sample Name	GPS	Flowrate in GPM	Parameters: pH	Cond in mS	Temp in C		Distance from Potential Contaminant Source to Receptor	Source & Receptor
(ie) Drainage 1	N	Butte - Sed 1	G1: 1279645, 476985	-	-	-	-		discharges into Flume Creek	fish
Drainage 1	~	Hubbard -S1-S1								

Drainage is likely although pathway once existing prospect is unkn

Wetlands

Count / ID	GPS	Flowrate in GPM	Parameters: pH	Cond in mS	Temp in C		Distance from Potential Contaminant Source to Receptor	Source & Receptor
(ie) Wetland 1	G7: 127856, 476985	1 L/min	5.9	0.2	12.1		50' N of Pend Oreille River	None

AML Feature Inventory

Feature ID: Hubbard

Survey Date: 7/15/06

Surveyor(s): ASB MJS

Physical Features / Sources (Continued)

Water Supply Structures: ☐ GW Well(s) ☐ SW Intake(s) ☐ Pit Toilet(s) ☐ Other (explain)

Type / ID	Inner Diameter	Depth	Soil Type	Population Served	Distance from Potential Contaminant Source	GPS	General Location

	Mill Present (Y / N)	Mill Footprint in ft.²	Waste Associated with Mill	Chemicals Assoc with Mill	GPS
Mill	N				

Buildings / Structures

	Count / ID	Bldg. Footprint in ft.²	Suspected Bldg. Use	Bldg. Condition	GPS	Comments
Other Buildings	Bldg 1	10x15	WR storage silo (to load rail cars)	partially collapsed		2 ore chutes facing roadway
	Bldg 2		house	intact but slanted		shelves & box spring inside

Liquid or Waste Containment Structures: ☐ drum(s) ☐ tank(s) ☐ other (explain)

Type / ID	Coun	Volume in Gal.	Condition	Suspected Contents
(ie) drums	1	55	dry, rusted, no lid	unkwn
Drum lid	1	~3-5	rusted. Lid only	
tank 1	1	2x2x1.5	rusted, small holes, leaks	scrap as stop-block / unkn

Debris / Refuse: ☐ assay equip & retorts ☐ drum(s) ☐ scrap lumber ☐ scrap metal ☐ machinery ☐ other (explain)

Type/ ID	Number	Size	Location	Description
(ie) scrap lumber & metal		5' x 10' x 1'	top of mill	timbers (some charred), rails, stakes, and sheet metal
timbers	1	25x5	near bldg 1	railway trestle section
boards	1	5x7	near adit 1	stack of boards, possibly part of trail line?

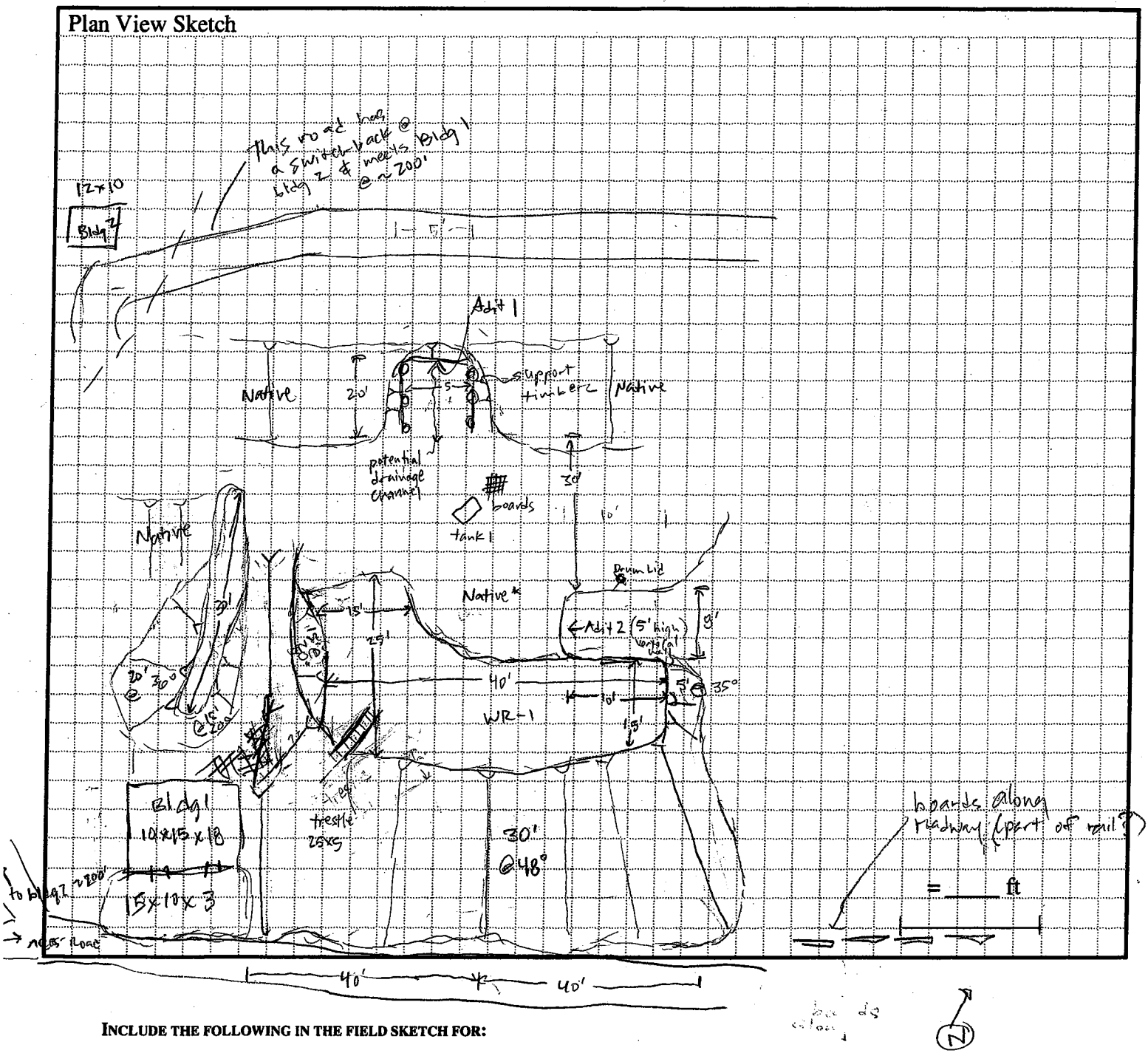
Other Observations:

	Description	Quantity	Endangered / Threatened ?	Distressed Vegetation?	Comments
Ground Cover					
Vegetation					
Evidence of Wildlife or Recent Human Activity	human footprints on tailings. Beer can(s)			N	

AML FEATURE INVENTORY/MONITORING FIELD FORM

Feature ID	Hubbard Lower
Date	7/15/06
Weather	

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

* WR-like material w/ 2-3" vegetative mat overlying

AML Feature Inventory

Feature ID: Hubbard
Surveyor(s): AGB, MJS

USGS Quad:

Survey Date: 10/21/06 - 11/1/06

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

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

Physical Features / Sources

Mine Openings: [X] shaft(s) [X] adit(s) [ ] pit(s) [ ] other (explain)

Opening Type / Count ID	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 # Photo#-Dp(s) (Site-	GPS	Description
(i.e.) Adit 1	open	5 x 10 x 8	Y	0.5 L/min	3.4	0.254	14.7		n	Butte - P3 - 6/15	G7: 1278956, 476985	Adit on northeast side of WR-2
Shaft 1	Y		N									
Adit 3	Y		N									
Adit 4	Y		Y									
Adit 5	Y		N									

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

Mining Activity-Related Piles: [ ] waste rock pile(s) [ ] tailings pile(s) [ ] ore / leach pile(s) [ ] debris pile(s) [ ] other (explain)

Pile Type / Count ID	Dimensions in ft (L X W X H)	Slope in degrees	Seepage Visible? (Y / N)	Seepage: Active / Inactive?	% Vegetative Cover (trees / brush / grass, moss)	Distressed Vegetation (Y / N)	Recent Human Activity (Y / N)	GPS	Sample Name(s)	Estimated Particle Gradation	Soils Classification:
(i.e.) WR-1	150 x 50 x 3	38	Y	inactive	20% / 30% / 15%	N	bottles, footprints	G1:G4 (see below)	Butte - WR1 - S1:S4	0.5" - 4"	moist, gray, sl silty, v sandy, Gravel
WR-2			N	-		N					
WR-3			N	-		N					

Sample Inventory

Sample Name (Site - Feature - Sample Number)	Location	GPS Name	Northing/Easting	Soil Description	Sieved?
(i.e.) Butte - WR1-S1	Southern end of WR-1, top.	G9: Butte - WR1 - S1	G7: 1278965, 4796821	moist, gray, silty, v. gravelly, Sand	Y, ASTM #10
Hubbard - WR2 - S1, S2, S3					
Hubbard - WR3 - S1					

Miscellaneous Notes:

AML Feature Inventory

Feature ID Hubbard

Survey Date 10/31 - 11/1/06

Surveyor(s) AGB, MJS

Physical Features / Sources (Continued)

Mining Activity-Related Ponds or Liquid Containment Structures: ☐ leach pond(s) ☐ tailings pond(s ☐ tailings impoundment(s) ☐ other (explain)

Pond Type / Count ID	Dimensions in ft (L x W x D	Lined (Y / N)	Liquid Present (Y / N)	Parameters: pH	Cond in mS	Temp in C		Animals Present (e.g. bats, other)	Sample Name(s)	GPS
(i.e.) LP 1	50 x 30 x 4	N	N	-	-	-		N	Butte - LP1 - S1:S2	G5: 1278965, 476985
—										

☐ Seep(s) ☐ Creek(s) ☐ Pond(s) ☐ Lake(s)

Type / Count ID	GPS	Location	Sample Name		Flowrate in GPM	Parameters: pH	Cond in mS	Temp in C		Odor, sheen, discoloration?
(i.e.) Flume Creek	G3: 1278498, 479865	southern site border	Butte - Flume Creek 1		0.1	6.2	0.153	10.9		None
—										

☐ Soil Staining ☐ Seep Staining

Type / Count ID	Location	Color	Distance from Potential Contaminant Source to Receptor	Source & Receptor	Notes
(ie) Stain 1	soil downslope of Adit 1	orange/brown	100' upslope of Flume Creek	fish	ferricrete-like
—					

Seasonal Flow Paths or Channels

Count / ID	Water Present (Y / N)	Sample Name	GPS	Flowrate in GPM	Parameters: pH	Cond in mS	Temp in C		Distance from Potential Contaminant Source to Receptor	Source & Receptor
(ie) Drainage 1	N	Butte - Sed 1	G1: 1279645, 476985	-	-	-	-		discharges into Flume Creek	fish
—										

Wetlands

Count / ID	GPS	Flowrate in GPM	Parameters: pH	Cond in mS	Temp in C		Distance from Potential Contaminant Source to Receptor	Source & Receptor
(ie) Wetland 1	G7: 127856, 476985	1 L/min	5.9	0.2	12.1		50' N of Pend Oreille River	None
—								

AML Feature Inventory

Feature ID Hubbard

Surveyor(s) ASB MJS

Survey Date 10/31 & 11/1/06

Physical Features / Sources (Continued)

Water Supply Structures: ☐ GW Well(s) ☐ SW Intake(s) ☐ Pit Toilet(s) ☐ Other (explain)

Type / ID	Inner Diameter	Depth	Soil Type	Population Served	Distance from Potential Contaminant Source	GPS	General Location
—							

	Mill Present (Y / N)	Mill Footprint in ft.²	Waste Associated with Mill	Chemicals Assoc with Mill	GPS
Mill	—				

Buildings / Structures

	Count / ID	Bldg. Footprint in ft.²	Suspected Bldg. Use	Bldg. Condition	GPS	Comments
Other Buildings	Bldg	15x20	Cabin	standing w/ roof portion & floor missing		

Liquid or Waste Containment Structures: ☐ drum(s) ☐ tank(s) ☐ other (explain)

Type / ID	Coun	Volume in Gal.	Condition	Suspected Contents
(e) drums	1	55	dry, rusted, no lid	unkwn
Drum	1	5	dry rusted w/holes	

Debris / Refuse: ☐ assay equip & retorts ☐ drum(s) ☐ scrap lumber ☐ scrap metal ☐ machinery ☐ other (explain)

Type/ ID	Number	Size	Location	Description
(e) scrap lumber & metal		5' x 10' x 1'	top of mill	timbers (some charred), rails, stakes, and sheet metal
Scrap lumber & metal	Scattered	—	in VR-2	

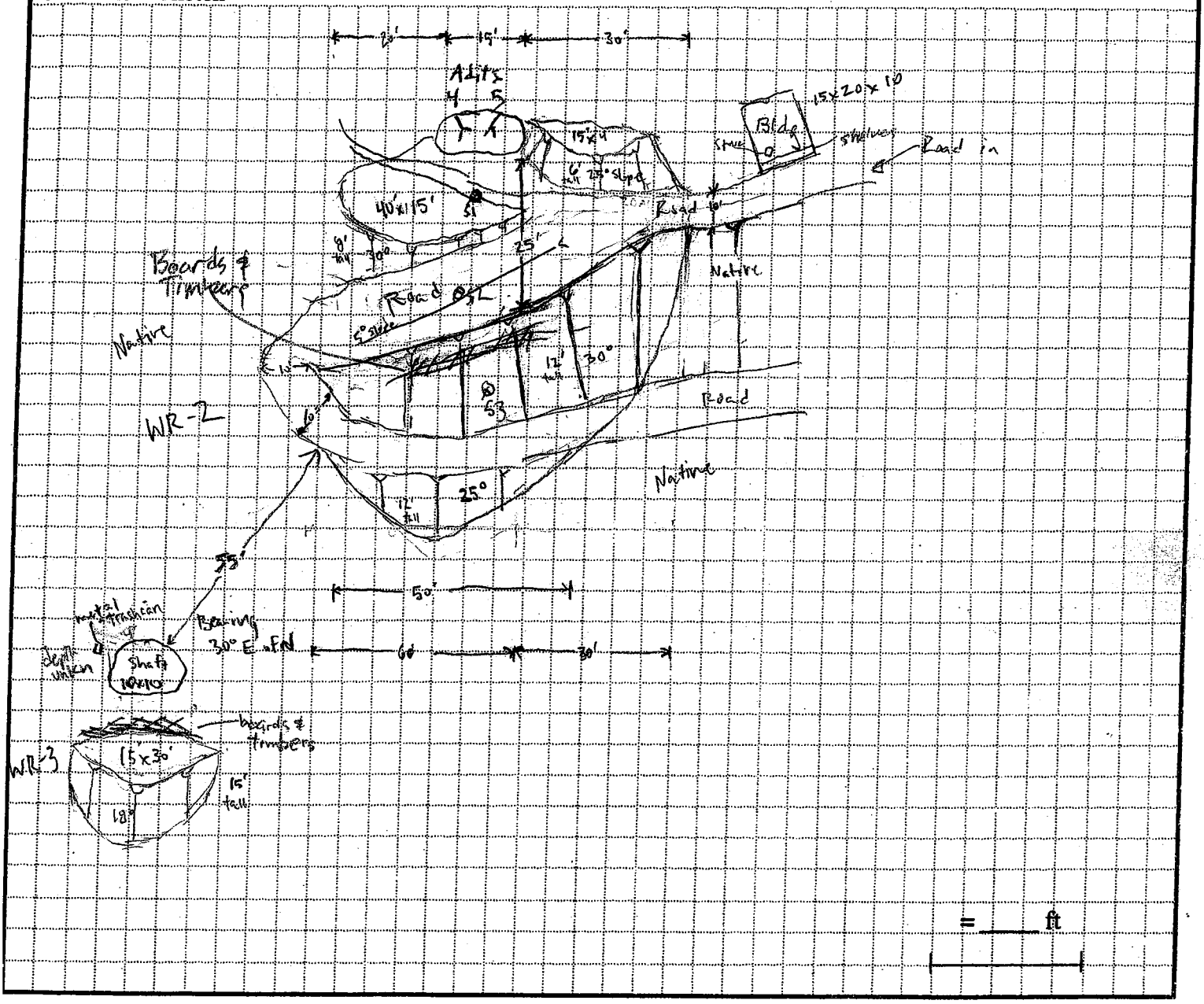
Other Observations:

	Description	Quantity	Endangered / Threatened ?	Distressed Vegetation?	Comments
Ground Cover					
Vegetation	5% trees / 5-10% brush / 90% grass				
Evidence of Wildlife or Recent Human Activity	squirrel-like animal @ portrance	to adit	(Bats?)		

AML FEATURE INVENTORY/MONITORING FIELD FORM

Feature ID	Hubbard
Date	10/31/06 & 11/1/06
Weather	

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

Ecology AML

Hubbard (Lower)

Coordinate Name	Northing	Easting	Altitude
HUBBARD-RD1+FS960	1318451	2273457	3711
HUBBARD-WR1-S1	1319200	2274058	3793
HUBBARD WR1 S2	1319341	2273532	3891
HUBBARD WR1 S3	1319325	2273515	3906
Average	**1319079**	**2273640**	**3825**

Hubbard (Upper)

Coordinate Name	Northing	Easting	Altitude
HUBBARD CABIN	1319040	2274227	3730
HUBBARD ADIT 3	1319531	2274132	3843
HUBBARD ADIT 4 + 5	1319379	2273531	3907
HUBBARD SHAFT 1	1319263	2273457	3878
HUBBARD WR3 S1	1319245	2273459	3873
Average	**1319291**	**2273761**	**3846**

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

Photograph 1 - View of Building 1 and WR-1 (note chutes on side of structure)

Photograph 2 - View of Adit 2.

Photograph 3 - View of Adit 1 and support timbers

Photograph 4 - Tank and boards in front of Adit 1.

Photograph 5 - View of Adit 3 ←Up

Photograph 6 - View of collapsed outhouse-like structure

Photograph 7 - Unidentified wood and metal structure.

Photograph 8 - View of Adits 4 and 5

Photograph 9 - View of WR-2

Photograph 10 - View of WR-3 ←Up