ABBREVIATED PRELIMINARY ASSESMENT

KROMONA MINE AND MILLSITE

Mt. Baker-Snoqualmie National Forest
Snohomish County, WA

August, 2003

TABLE OF CONTENTS

page

APPENDICES

EXECUTIVE SUMMARY

The Forest Service performed an Abbreviated Preliminary Assessment for the Kromona Mine and Millsite (Site) to determine the need for further site characterization. The Site is located on the Middle Fork of the South Fork of the Sultan River approximately 3.5 miles upstream of the Spada Lake Reservoir. The Spada Lake Reservoir is operated by the City of Everett and Snohomish County Public Utility District No. 1 as a municipal watershed and for hydroelectric power generation. The Sultan River is the primary source of drinking water for over 410,000 people in Snohomish County, Washington (Pacific Groundwater Group, 1995). The Site is situated on moderate to extreme side slopes with elevations ranging from 2,400 ft. above mean sea level (MSL) at the mill to 3,400 ft. above MSL at the upper mine workings.

A Niton XRF unit was used for In Situ field screening and bench testing of the samples collected around the foundation of the mill building and associated tailings impoundment as well as from a waste dump at the main underground mine workings for any potential contaminants. Water and sediment samples were not collected as part of this investigation. However, the Washington Department of Natural Resources (WA-DNR) collected water and soil samples from the Site in August, 2000; analytical results were reported in Phipps and others (2003).

Three elements exceeded EPA Region IX Preliminary Remediation Goals (PRG) as to acceptable industrial levels in soil. The elements were arsenic, copper, and iron. Water sampling conducted by WA-DNR indicates elevated metal concentrations at both the mill and mine, potentially adversely affecting surface water and groundwater quality. Exceedences of chronic surface water standards were identified at the millsite for copper, iron, and lead. Mine waters discharging from the two adits exceeded chronic surface water standards for copper.

Based on the proximity of the Site to the Spada Lake reservoir, it is recommended that a Site Inspection (SI) be performed.

1.0 INTRODUCTION

An Abbreviated Preliminary Assessment (APA) was performed by the US Forest Service in accordance with the EPA "Guidance for Performing Preliminary Assessments Under CERCLA", EPA "Improving Site Assessment: Abbreviated Preliminary Assessments" of 1999, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, the Superfund Amendments and Reauthorization Act (SARA) of 1986, and the National Contingency Plan as outlined in 40 CFR Parts 300.410(c)(1)(i-v).

The purpose of this assessment was to determine whether or not there is a potential for a release of contaminants to the environment and/or to human health. The purpose of an APA is to determine whether further site characterization is warranted. A Niton XRF 700 Series was utilized to help in the preliminary screening of this Site.

2.0 SITE DESCRIPTION, OPERATIONAL HISTORY, AND WASTE CHARACTERISTICS

The Kromona Mine and Millsite is located approximately 7 miles north of Index, WA on the Skykomish Ranger District of the Mount Baker-Snoqualmie National Forest. The Site is adjacent to the Middle Fork of the South Fork of the Sultan River and falls within the Sultan Mining District. The Culmback Dam, which impounds the Spada Lake Reservior, is a barrier to anadromous fish passage and there are known threatened and endangered fish species in the tributaries feeding Spada Lake (Washington State Conservation Commission, 2002).

Location information:

Lat./Long.:	Upper adit - N47.91609° W121.59375°
	Mill - N47.91820° W121.60259°
Legal:	Willamette Meridian, T 28 N, R 9 E, Section 13
USGS quadrangle:	Mt. Stickney

The area was originally prospected around 1900. The main development work commenced around 1940 culminating in 1952 and 1953 with the construction of a 120 ton-per-day floatation mill (Northwest Underground Explorations, 1997). The mine was sporadically active until the late 1960s when mining finally ceased.

The Site consists of a millsite and associated mine workings. The millsite comprises an 8-tiered concrete foundation upon which a 120-ton capacity floatation mill once operated. The mill was apparently constructed from 1952-1953 and produced copper and molybdenum concentrates. What is believed to be a tailings impoundment is located immediately adjacent to the landing at the base of the mill remains. Mining-related debris is abundant downslope of the millsite and one underground storage tank was identified near the mill. A 1,700 ft. aerial tramway, now in ruins, transported ore from the mine to the mill in the valley bottom (Northwest Underground Explorations, 1997). The mine is located approximately 1,000 vertical feet up steep sideslopes from the mill. Atop the waste dump at the main adit are the remains of the upper tram terminal, bunkhouse, cookhouse, and workshop. Adjacent to the main adit, in a gulley, is a short adit known as the Water Tunnel (Northwest Underground Explorations,1997) or upper (reservoir) adit (Phipps and others, 2003). Phipps and others (2003) reported a total of 2,700 feet of underground workings at the Kromona mine.

The property is heavily overgrown with vegetation in most places. There are remains of other structures in the area. Access to the Site can be accomplished from Olney Pass south of Spada Lake. Snohomish

County and the Washington State Department of Natural Resources have gated the 5-mile gravel access road to the mine site (formerly Forest Service Road 6110) at Olney Pass because of an embankment failure approximately 1 mile along the road.

Production records are limited but indicate that a 2-ton test shipment was made in 1952 and that 102 tons of concentrate were produced in 1954 (Derkey and others, 1990). The primary ore minerals at the site were chalcopyrite, pyrite, pyrrhotite, molybdenite, scheelite, powellite, marcasite, bornite, and malachite; gangue minerals include quartz, calcite, and shattered wall rock (Derkey and others, 1990). The host rock for the mineralization is granodiorite, tonalite, and gneiss.

Currently, the Site is inactive and unclaimed.

3.0 SITE SAMPLING AND TEST RESULTS

Water Samples

Water samples were collected by Washington State Department of Natural Resources (WA-DRN) personnel at the Site in August, 2000 as part of the State's Inactive and Abandoned Mine Lands (IAML) inventory. The State's surface water quality standards for most elements are hardness dependent (Washington Administrative Code, Chapter 173-201A) because metals toxicity generally decreases with increasing hardness. WA-DNR did not have samples analyzed for hardness. Table 1A shows chronic surface water standards for a hypothetical hardness of 100 mg/L for reference.

The standards for arsenic, copper, lead, and zinc, as well as the acute standard for mercury are for the dissolved fraction (Table 1A). There is no standard for iron but EPA guidance suggests total iron concentrations of less than 1,000 μg/L under continuous exposure to aquatic organisms (Table 1A) (EPA, 1986, 1999). Samples collected by WA-DNR were analyzed for total metal content and are hence conservative when compared to the State standards. Table 1B lists analytical results for the samples collected by WA-DNR. At the millsite, copper, iron, and lead concentrations exceed chronic surface water standards. Effluent discharging from the adits at the mine exceed state standards for copper.

Table 1A. State of Washington chronic surface water standards at a hypothetical hardness of 100 mg/L, metals concentrations are in μg/L.

	Arsenic	Copper	Iron	Lead	Zinc	Mercury
State Standard	190	11.4	1,000	2.5	104	.012

Table 1B. Analytical results from WA-DNR samples acquired at the Kromona Mine and Mill in 2000; metals concentrations are in μg/L (modified from Phipps and others, 2003).

Location	Discharge	pH	Arsenic	Copper	Iron	Lead	Zinc	Mercury
Main adit	~1 gpm	4	27	18	ND	ND	16	ND
Reservoir adit	2-5 gpm	5	ND	200	220	ND	21	ND
Below tramline	?	7.5	25	ND	ND	ND	22	ND
Millsite	Trickling, pooling	5	180	400	3,000	17	20	ND

Soil Samples

A Niton XRF, XL-722S was used to assess the material on and within the mill foundation, from what is believed to be a tailings impoundment adjacent to the mill foundation, and from the waste dump at the main adit for potential contamination. Soils onsite were too wet for accurate In Situ testing using the Niton XRF so soil samples were collected for bench testing per EPA Method 6200. Surface soils were removed to approximately 4 to 6 inches below grade in order to get below highly oxidized surface layers. Rocks, debris and other deleterious materials were removed. Samples were then collected, bagged, and labeled. Samples were later dried and prepared for bench testing using the Niton XRF. The results from this effort are provided below.

The following constituents exceeded EPA Region IX PRG industrial levels:

Location	Constituent	Result (mg/kg)	PRG (mg/kg)
Mill Foundation	Arsenic*	2,300-2,550	1.6
Tailings Impoundment	Arsenic*	526	1.6
Main adit waste dump	Arsenic*	825	1.6

*Arsenic – for noncancer endpoint, the PRG is 260 mg/kg. For cancer endpoints, the PRG is 1.6 mg/kg.

WA-DNR also collected soil/sediment samples from the Site in August, 2000 as part of their IAML survey (Phipps and others, 2003). Samples were obtained from the millsite and waste dump at the main adit. Samples were analyzed by ICP (EPA 6010) for arsenic, copper, iron, lead, and zinc and by CVAA (EPA 7471) for mercury. Those elements exceeding EPA Region IX PRGs are outlined below:

Location	Constituent	Result (mg/kg)	PRG (mg/kg)
Mill Foundation	Arsenic*	21,000	1.6
	Copper	63,000	41,000
	Iron	140,000	100,000
Main adit waste dump	Arsenic*	1,500	1.6

*Arsenic – for noncancer endpoint, the PRG is 260 mg/kg. For cancer endpoints, the PRG is 1.6 mg/kg.

4.0 SUMMARY

The remains of this facility are accessible to the public and promoted in Northwest Underground Exploration's *Discovering Washington's Historic Mines* (1997). The Site is located on the Middle Fork of the South Fork of the Sultan River approximately 3.5 miles upstream of the Spada Lake Reservoir which is a municipal water supply. The Sultan River is the primary source of drinking water for over 410,000 people in Snohomish County, Washington (Pacific Groundwater Group, 1995).

The constituents of concern that exceeded EPA Region IX industrial levels in soil were arsenic, copper, and iron. Analytical results from water sampling suggest exceedences of chronic surface water quality standards for copper, iron, and lead at the millsite and copper in mine effluent discharging from two adits.

5.0 RECOMMENDATION

Based on the In Situ screening and bench sampling of the material from the foundation of the millsite, probable tailings impoundment, and waste dump at the main adit with the Niton XRF unit, the proximity of Site to a municipal watershed , and EPA's APA Checklist (Appendix A), it is recommended that a Site Inspection (SI) be completed. As part of this inspection, a thorough study of the area to determine the extent of contamination is warranted as well as sampling water from pore spaces of the stream gravels immediately above and below the Site. Sampling of the benthic macroinvertebrates are also required. In addition to testing water samples from the pore spaces of the gravels for the presence of metallic elements, water parameters such as pH, conductivity, turbidity, dissolved oxygen, temperature, total dissolved solids, hardness, and oxygen reduction potential are required. The area should be sampled to determine the presence of waste material and tailings, and if present, the potential waste piles and tailings should be sampled at depth and a determination of volumes should be calculated. Acid base accounting (ABA) is required if waste material is present besides what had been observed during this assessment. Sediment samples are to be collected from transects of the stream and preferably at depth and analyzed for total as well as for available metals. Surface water samples are also required for analyses of both total and dissolved metal concentrations in the South Fork of the Middle Fork of the Sultan River as well as in any other seeps and/or tributaries that may be present in the vicinity of the Kromona mine and millsite.

Appendix B contains additional photos of the Site.

REFERENCES

Derkey, R.E., Joseph, N.L., and Lasmanis, R., 1990, Metal mines of Washington-preliminary report: Washington Department of Natural Resources, Division of Geology and Earth Resources Open File Report 90-18. 577 p.

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Pacific Groundwater Group, Inc. and associated firms, 1995, Initial watershed assessment, water resources inventory area 7, Snohomish River watershed; Draft: Washington Department of Ecology Open-File Technical Report 95-06, 1 v.

Phipps, R.W., McKay, D.T., Jr., Norman, D.K., and Wolff, F.E., 2003, Inactive and abandoned mine lands: Spada Lake and Cecile Creek watershed analysis units, Snohomish and Okanogan Counties, Washington: Washington Department of Natural Resources, Division of Geology and Earth Resources Open File Report 2003-3. 36 p.

Washington State Conservation Commission, 2002, Salmonid habitat limiting factors analysis, Snohomish River watershed, Water Resource Inventory Area 7, 331 p.

Appendix A

ABBREVIATED PRELIMINARY ASSESSMENT CHECKLIST

ABBREVIATED PRELIMINARY ASSESSMENT CHECKLIST

This checklist can be used to help the site investigator determine if an Abbreviated Preliminary Assessment (APA) is warranted. This checklist should document the rationale for the decision on whether further steps in the site assessment process are required under CERCLA. Use additional sheets, if necessary.

Checklist Preparer: Dennis Boles, Environmental Engineer (Name/Title) August 20, 2003 (Date)

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Site Name: Kromona Mine and Millsite

Previous Names (if any): Scriber/Jones prospect

Site Location: The Site is located approximately 7 miles north of Index, WA at the end of Forest Service Road 6110 southeast of the Spada Lake Reservoir.

Legal Description: Willamette Meridian, T28N, R9E, Section 13

Millsite:	Latitude: N47.91820°	Longitude: W121.60259°
Mine:	Latitude: N47.91609°	Longitude: W121.59375°

Describe the release (or potential release) and its probable nature: The material around the mill foundation, probable tailings impoundment, and mine waste dump is heavily contaminated. The following elements exceed industrial levels of the PRGs, and the results and relevant PRG industrial levels are listed in parentheses:

Iron – 140,000 (100,000 mg/kg), Arsenic – 526-21,000 (1.6 or 260 mg/kg), Copper – 63,000 (41,000 mg/kg).

Water sampling performed by WA-DNR indicates exceedences of chronic surface water quality standards for copper, iron, and lead at the millsite and copper in the mine effluent discharging from the adits at the Site.

Part 1 - Superfund Eligibility Evaluation

If All answers are "no" go on to Part 2, otherwise proceed to Part 3	YES	NO
1. Is the site currently in CERCLIS or an "alias" of another site?		X
2. Is the site being addressed by some other remedial program (Federal, State, or Tribal)?		X
3. Are the hazardous substances potentially released at the site regulated under a statutory exclusion (i.e., petroleum, natural gas, natural gas liquids, synthetic gas usable for fuel, normal application of fertilizer, release located in a workplace, naturally occurring, or regulated by the NRC, UMTRCA, or OSHA)?		X
4. Are the hazardous substances potentially released at the site excluded by policy considerations (i.e., deferred to RCRA corrective action)?		X
5. Is there sufficient documentation to demonstrate that no potential for a release that could cause adverse environmental or human health impacts exist (i.e., comprehensive remedial investigation equivalent data showing no release above ARAR's, completed removal action, documentation showing that no hazardous substance release have occurred, or an EPA approved risk assessment completed)?		X

Please explain all "yes" answer(s). _____

Part 2 - Initial Site Evaluation

For Part 2, if information is not available to make a "yes" or "no" response, further investigation may be needed. In these cases, determine whether an APA is appropriate. Exhibit 1 parallels the questions in Part 2. Use Exhibit 1 to make decisions in Part 3.

If the answer is "no" to any questions 1, 2, or 3, proceed directly to Part 3.	**YES**	**NO**
1. Does the site have a release or a potential to release?	X	
2. Does the site have uncontained sources containing CERCLA eligible substances?	X	
3. Does the site have documented on-site, adjacent, or nearby targets?	X	

If the answers to questions 1, 2, and 3 above were all "yes" then answer the questions below before proceeding to Part 3.	**YES**	**NO**
4. Does documentation indicate that a target (i.e., drinking water wells, drinking surface water intakes, etc.) has been exposed to a hazardous substance released from the site?		X
5. Is there an apparent release at the site with no documentation of exposed targets, but there are targets on site or immediately adjacent to the site?	X	
6. Is there an apparent release and no documented on-site targets or targets immediately adjacent to the site, but there are nearby targets (i.e., targets within 1 mile)?	X	
7. Is there no indication of a hazardous substance release, and there are uncontained sources containing CERCLA hazardous substances, but there is a potential to release with targets present on site or in proximity to the site?	X	

Notes:

EXHIBIT 1
SITE ASSESSMENT DECISION GUIDELINES FOR A SITE

Exhibit 1 identifies different types of site information and provides some possible recommendations for further site assessment activities based on that information. You will use Exhibit 1 in determining the need for further action at the site, based on the answers to the questions in Part 2. Please use your professional judgment when evaluating a site. Your judgment may be different from the general recommendations for a site given below.

Suspected/Documented Site Conditions		**APA**	**FULL PA**	**PA/SI**	**SI**
1. There are no releases or potential to release.		Yes	No	No	No
2. No uncontained sources with CERCLA-eligible substances are present on site.		Yes	No	No	No
3. There are no on-site, adjacent, or nearby targets		Yes	No	No	No
4. There is documentation indicating that a target (i.e., drinking water wells, drinking surface water intakes, etc.) has been exposed to a hazardous substance released from the site.	Option 1: APA SI	Yes	No	No	Yes
	Option 2: PA/SI	No	No	Yes	No
5. There is an apparent release at the site with no documentation of exposed targets, but there are targets on site or immediately adjacent to the site.	Option 1: APA SI	Yes	No	No	Yes
	Option 2: PA/SI	No	No	Yes	N/A
6. There is an apparent release and no documented on-site targets and no documented immediately adjacent to the site, but there are nearby targets. Nearby targets are those targets that are located within 1 mile of the site and have a relatively high likelihood of exposure to a hazardous substance migrating from the site.		No	Yes	No	No
7. There is no indication of a hazardous substance release, and there are uncontained sources containing CERCLA hazardous substances, but there is a potential to release with targets present on site or in proximity to the site.		No	Yes	No	No

Part 3 - EPA Site Assessment Decision

When completing Part 3, use Part 2 and Exhibit 1 to select the appropriate decision. For example, if the answer to question 1 in Part 2 was "no," then an APA may be performed and the "NFRAP" box below should be checked. Additionally, if the answer to question 4 in Part 2 is "yes," then you have two options (as indicated in Exhibit 1): Option 1 -- conduct an APA and check the "Lower Priority SI" or "Higher Priority SI" box below; or Option 2 -- proceed with a combined PA/SI assessment.

Check the box that applies based on the conclusions of the APA:

( ) NFRAP
(X) Higher Priority SI
( ) Lower Priority SI
( ) Defer to RCRA Subtitle C
( ) Defer to NRC
( ) Refer to Removal Program – further site assessment needed
( ) Refer to Removal Program – NFRAP
( ) Site is being addressed as part of another CERCLIS site
( ) Other: _____

Regional EPA Reviewer: N/A _____ _____
Print Name/Signature Date

PLEASE EXPLAIN THE RATIONALE FOR YOUR DECISION:

The Site is promoted in Northwest Underground Exploration's *Discovering Washington's Historical Mines (1997)* and trails at the Site suggest frequent visitation by the public for rock and mineral collecting. The Site is located on the Middle Fork of the South Fork of the Sultan River approximately 3.5 miles upstream of the Spada Lake Reservoir which is a municipal water supply. The Sultan River is the primary source of drinking water for over 410,000 people in Snohomish County, Washington (Pacific Groundwater Group, 1995). Based on these facts, it is recommended that an SI be implemented.

NOTES:

The City of Everett and Snohomish County PUD have gated the access road at Olney Pass due to an embankment failure along former FS Road 6110. Small equipment and vehicles could pass the failure in October of 2002. The remainder of the access road is in good condition. At the end of the access road, there is *no* bridge across the South Fork of the Middle Fork of the Sultan River to access the Site. Low flow conditions in the fall would be best for creek crossings.

Appendix B

ADDITIONAL SITE PHOTOS

Photo 1. Remains of mill foundation, view to the northeast (photo by G. Graham, 10/10/2002).

Photo 2. View of probable tailings impoundment from bottom of mill foundation, view to the northwest (photo by G. Graham 10/10/2002).

Photo 3. Close up of probable tailings impoundment adjacent to mill foundation, view to the north (photo by G. Graham, 10/10/2002).

Photo 4. Waste dump for main adit and upper tram station, view to the northeast (photo by G. Graham, 10/10/2002).

Photo 5. Refuse atop waste dump at main adit/upper tramway terminal where bunkhouse, cookhouse, and workshop were located, view to the northwest (photo by G. Graham, 10/10/2002).

Photo 6. Partially collapsed main adit, view to the northeast (photo by G. Graham, 10/10/2002).

Photo 7. Close-up of main adit at the Kromona mine (photo by G. Graham, 10/10/2002).