FIELD OPERATION PLAN
Site Inspection of the Oriole Mine
Pend Oreille County, Washington

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1.0 INTRODUCTION

The United States Forest Service (USFS) has retained Cascade Earth Sciences (CES) to perform a Site Inspection (SI) at the Oriole Mine (Site). The inspection will follow the US Environmental Protection Agency (USEPA) guidelines for performing a SI. The purpose of the SI is to determine the potential threat to human health and the environment from issues identified during the Preliminary Assessment and Site Investigation Report, Lower Pend Oreille River Mines and Mills (EPA, 2002) at the Site and a site reconnaissance conducted by Mr. Dustin Wasley and Robert Lambeth in July 2003. The scope is to 1) identify potentially hazardous substances pertaining to onsite mining related activities, and 2) collect samples of natural media including soil, sediment, surface water, and the biota to determine the magnitude and extent of migration (if any) of hazardous substances from the Site.

This document comprises the Field Operations Plan, and includes a generic Work Plan for the Site, a site-specific Sampling and Analysis Plan (SAP), and an Investigation Derived Waste Plan (IDWP). In addition, a stand-alone site-specific Health and Safety Plan (HASP) has also been prepared for planned field activities and is included in Appendix A.

2.0 BACKGROUND

The Site is located in the Colville National Forest (CNF) in Pend Oreille County approximately 2 miles northwest of the town of Metaline (Figure 1). According to the USGS Quadrangle Map – Metaline (1992), the Site is located in the southeast quarter of the southeast quarter of Section 19 Township 39 North, Range 43 East of the Willamette Meridian at Latitude: 48°51'38", Longitude: 117°24'46". The Site is 2,986 feet above mean sea level (AMSL) and is accessed from Forest Service Road 411-Oriole Road. Zinc, lead, silver, copper, and gold were historically mined at the Site, however; the mine is currently inactive. The Site is situated in the Linton Creek drainage, although Linton Creek was not flowing during Site reconnaissance activities.

Two adits are present at the Site. Adit 1 is located approximately 200 feet southwest and upgradient of Adit 2 and is open, but with a steel gate to prevent entry. A large waste rock pile (WR-1) is associated with Adit 1. Adit 2, which contains a corrugated metal vent pipe and steel gate, is collapsed and is located in the upper end of the lower mining area. One larger waste rock pile (WR-2), one small waste rock pile (WR-3), an ore pile, and debris pile are located in the vicinity of Adit 2. A dilapidated log structure is located adjacent to the ore pile. The ore pile spills over the log structure and down the slope. The debris pile contains wood, concrete, and steel processing equipment. The steel processing equipment appeared to be part of the ore feeder, which would indicate a crusher might have been used onsite.

Water was observed seeping from around the area of Adit 2 during the site reconnaissance in 2003. The seep water flowed over the top and down the face of WR-2, and eventually seeped into the subsurface below the lower mine workings. Adit 1 was dry during the initial site reconnaissance. In addition, numerous seeps were observed approximately 200 feet downgradient of the mine, which combine to reconstitute Linton Creek. The drinking water intake for the town of Metaline is located approximately one mile downstream of the Site along Linton Creek.

3.0 WORK PLAN

3.1 Preliminary Field Work

Field activities are scheduled to begin on Monday, July 12, 2004, and continue through the week until approximately Friday July 17, 2004. The CES field team scheduled to perform work during field operations include:

Dustin Wasley	Engineer, Project Manager
Robert Lambeth	Mining Engineer / Geologist
Rone Brewer	Wildlife and Fisheries Biologist
Ryan Tobias	Staff Wildlife Biologist

All personnel who will be performing work during the field investigation are trained to work in hazardous environments as defined by the Occupational Safety and Health Act (OSHA) 1910.120. Other personnel who will periodically be onsite may include:

Dennis Boles (USFS)	Contracting Officers Representative
Rod Lentz (USFS)	On-Scene Coordinator
Greg Graham (USFS)	Geologist

3.2 Planned Field Activities

3.2.1 Inventory Site Features

The CES field team will inspect the Site and inventory all mine-related features including: waste rock dumps, tailings dumps, mine pits, adits, mine drainages, and other potential sources of contamination or hazards. The inventory will include photographs, an assessment of condition, and a survey of each noted feature.

3.2.2 Waste Source, Soil, Sediment, Water, Benthic, and Tissue Sampling

Sampling activities at the Site will include collection of mining and milling waste; soil in the vicinity of mining and milling operations; soil in upgradient or background locations; surface water and sediment from Linton Creek; and surface water samples from the adit seep. In addition, tissue samples of vegetation from waste sources and undisturbed areas will be collected at the Oriole Mine. Benthic macroinvertebrates from Linton Creek will be collected, counted, and inventoried. Due to remoteness of the Site, it is assumed that the air pathway is incomplete; therefore, air samples will not be collected as part of this SI.

Samples will be collected according to the procedures outlined in the Sampling and Analysis Plan (SAP) in Section 4. Samples will be collected from the locations described in Table 1 and 2 and depicted on Figure 1. Proposed sampling locations are based on the specific sampling requirements as outlined in the Statement of Work (SOW). The location of all samples will be determined using a handheld GPS unit, with an uncertainty of less than 1 meter. The surface water Stations will be surveyed and permanently marked with rebar and aluminum caps so they can be located using a GPS unit. Each Station number will be clearly marked on the caps.

3.2.3 Site Survey

The spatial and vertical location of all source areas and significant mining-related features will be surveyed by a licensed surveyor in the state of Washington. The spatial location will also be measured to a common

datum. Vertical locations will be estimated by interpolation on USGS 7.5 minute quadrangle maps or a Trimble GPS unit. Important environmental features will also be surveyed.

A 5-foot contour map of the overall Site will be developed and a 2-foot contour map of the waste and tailings pile will be prepared. The survey will extend at least 100 feet beyond the perimeter of any visually disturbed areas in all directions of the Site or up to property lines if any exist less than 100 feet. The following features will be included on the map:

- The location of all springs, seeps, slumps, drainages, and any other relevant geographical features such as faults, avalanche chutes;
- The location of the stream course;
- The locations and areas of all floodplains for 100-year event, if feasible;
- The locations of all riparian and apparent wetland areas; and
- The locations for all facilities, whether standing or dilapidated.

The surface water Stations will be surveyed and permanently marked with rebar and aluminum caps so they can be located by use of a GPS unit, such as a Trimble. Each Station number shall be clearly marked on the caps.

3.3 Documentation

Field logbooks, documentation logs, and photographs will be used to document data collection activities. Information generated from field sampling activities will be documented on the appropriate forms, which include the following:

- field parameter log,
- chain-of-custody record,
- USFS Daily Field Report, and
- location sketches.

Some operations, such as selection of sampling locations, may be altered based on what is discovered during field activities. The field team leader is responsible for recording information including weather conditions, field crew members, visitors to the Site, samples collected, the date and time of sample collection, procedures used, any field data collected, and any deviations from this work plan.

3.4 Post Activities

Prior to leaving the Site, all disturbances to the environment will be minimized, and the Site will be left as close to its condition prior to performing SI field activities as possible. Trash, used equipment, and all other field materials will be removed. Prior to leaving the Site, the project team leader will be available to provide a briefing of the field activities to the client project manager.

4.0 SAMPLING AND ANALYSIS PLAN

The objective of the SI is to collect analytical and non-sampling data to identify hazardous substances at the Site and to determine whether hazardous substances have been released to the environment and whether substances have, or have the potential to, impact human health and the environment.

4.1 Collection Of Non-Sampling Data

Non-sampling data collection activities will include the verification of population and environmental information as well as reviewing and identifying new information. This will be accomplished by performing a thorough reconnaissance of the Site. Additional activities may be completed from the office; however, specific field activities include the following:

- Survey the spatial distribution and location, of all source areas and significant onsite features;
- Determine the approximate dimensions and volume of all potential onsite source areas and note containment features;
- Determine the apparent overland flow paths for surface water;
- Determine the approximate distance to the nearest individual regularly occupied structure and the approximate distance to the nearest drinking water well, if possible; and
- Conduct a survey of wildlife, fisheries, benthic macroinvertbrate, and plant species that may be affected by a release at the Site, which is further discussed in Section 4.1.1. This will include State and Federally listed Threatened and Endangered (T&E) Species, proposed T&E Species, Candidate Species, and Species of Concern (SOC).

4.1.1 Wildlife, Fisheries, Benthic Macroinvertebrate and Botany Survey

The following tasks will be completed to address potential mine impacts on T&E species and SOC occupying habitats near the Site. A reconnaissance-grade survey of wildlife, fisheries, benthic macroinvertebrates, and botany will be conducted in the area immediately around the Site. The survey will consist of the following subtasks:

- *Bird survey;*
- *Plant survey;*
- *Terrestrial macroinvertebrates, mammal, and herpetile survey;*
- *Stream assessment and fish survey; and*
- *Benthic macroinvertebrate survey and sampling (discussed in Section 4.2.4).*

Phone calls will be made to state (Washington Fish and Game) and federal (USF&W and USFS) fish and wildlife agencies to contact biologists familiar with the Site and region. These biologists will be questioned regarding the terrestrial and aquatic species known to be or likely to be present. If documentation of this information is available, copies will be requested. If documents are available, but cannot be shipped, part of the field effort may be to visit agency offices to obtain, copy, or otherwise document the available information. In addition, the Washington Natural Heritage Program (WNHP) databases of rare plants and animals will be reviewed to determine the distribution and status of T&E species and SOC in Pend Oreille County.

A search for rare, threatened, or endangered species will also be conducted. In addition, a list of SOC will also be requested from the USF&W and the USFS. Information obtained during the preliminary data gathering will be reviewed by field personnel prior to the field effort to provide an initial understanding of the ecology and species of concern.

4.1.1.1 Bird Survey

The afternoon prior to bird surveys, the Site will be visited to document and sketch the major habitat types (e.g., coniferous forest, mixed deciduous/coniferous forest, shrub, wetland/riparian, etc.) on and within approximately 100 meters of the Site. A maximum of four habitat types is predicted for the Site. If only two or three habitat types are identified, then the number of bird survey stations will be decreased appropriately, one in each habitat type. If more than four habitat types are documented, an attempt will

be made to place the four survey stations such that more than one habitat type can be surveyed from a single survey station. If this is not possible, additional stations will be established to assure that surveys account for each major habitat type. The stations will be preferentially established on the border of the Site, such that both onsite and offsite conditions can be surveyed during a single survey period. Survey stations will be placed with consideration of mine features to maximize visibility of the survey area while minimizing the surveyor's potential disturbance of the birds. If no natural cover is available to conceal the surveyor, a portable viewing blind may be used. Survey stations will be field-marked with numbered stakes and indicated on a Site map. Coordinates of each sample location will be documented using a Trimble Pro-XRS GPS unit.

Beginning at first light, a 15-minute bird survey will be conducted consecutively at each station. This will be repeated in the late afternoon/early evening after the Site has been unoccupied for at least an hour. If a second day of monitoring is needed, the bird surveys will be repeated in the morning and, if possible, the evening of the second day. Bird species will be identified using both visual and auditory cues, will be differentiated as onsite or offsite, and will be counted when possible. The results will be tallied on field data sheets and will include the species and number of individuals of each species noted onsite and offsite. Following a 15-minute survey from one location, the field biologist will walk to the next survey location and commence another 15-minute survey. An attempt will be made to conduct the surveys at a time and in areas (i.e., away from roadways) where human disturbances are minimal during the surveys.

Sampling activities are scheduled to take place within the nesting season of several raptor species that occur in the Colville National Forest. Of specific concern are Northern Goshawks and Bald Eagles. Northern Goshawks, a State of Washington listed SOC, are very susceptible to disturbance, and will occasionally attack humans in defense of their nests. Bald Eagles, a State of Washington listed Threatened Species, are also susceptible to disturbance, but will not attack humans. However, Bald Eagles have been known to abandon nests when disturbed by humans. Therefore, Colville National Forest personnel will be contacted prior to the SI to determine if any previous nesting locations are located within or near the Site. Furthermore, if any nest structures or raptor species are encountered during sampling activities, CES will notify the appropriate USFS personnel.

4.1.1.2 Plant Survey

First, a Site reconnaissance will be conducted to determine the plant communities present in upland, riparian, and wetland habitats, and to delineate the potentially impacted area. The area of each plant community will then be estimated and compared to the overall area of the Site. Sample plots will be established within each plant community to identify all plant species (including weeds and invasive species) present and quantify species by percent cover. The number of sample locations (maximum of four) established for each plant community will be determined based on the percentage of the mine covered by that community as follows:

- <25% covered by plant community: 1 sample plot
- 25% to <50%, covered by plant community: 2 sample plots
- 50% to <75% covered by plant community: 3 sample plots
- 75% to 100% covered by plant community: 4 sample plots

Sample plots will be located evenly across the area covered by the plant community where the vegetation is representative of that community. For each offsite (i.e., unimpacted) adjacent (within 50 meters of the Site boundary) plant community that is representative of historic onsite communities, the plant species will be identified for comparison to pre-disturbance onsite conditions. The number of offsite adjacent sample locations (maximum of four) for each plant community will be determined in the same manner as described above for onsite plants. Offsite sample plots will be located evenly across the area covered by the offsite adjacent plant community where the vegetation well represents the community.

Each sample location will be field-marked with a numbered stake and indicated on a Site map. Coordinates of each sample location will be documented using a Trimble Pro-XRS GPS unit. At each sample plot a determination of herbaceous (including weeds), shrub, and tree species will be made within a 5-meter radius. Plants will be identified using *Flora of the Pacific Northwest* (Hitchcock and Cronquist, 1990) nomenclature and documented on field forms for each sample plot. The results of this field effort will be a list of the plant species present on and adjacent to the Site and the percent cover represented by each species.

4.1.1.3 Terrestrial Macroinvertebrate, Mammal & Herpetile Survey

Three transects will be drawn on the Site map after an initial site reconnaissance. These transects will be placed to intersect as many as possible of the onsite plant communities and terrain types. One field biologist will walk slowly along the length of each transect observing the ground for indications of terrestrial macroinvertebrates, herpetiles, or mammals. Stones, logs, stumps, etc. along each transect will be moved when possible to thoroughly examine the ground surface. Care will be taken to replace any habitat structures or formations disturbed during the sample transects. Visual sightings of any animals or terrestrial invertebrates will be documented on field survey forms, as will indicators of the presence of these species such as small mammal tunnels in grass, tracks, animal trails, etc. Any additional indicators of mammal presence (i.e., burrows) observed during the other Site surveys, but not located along the transects, will also be noted. The results of this effort will provide documentation of the presence or likely presence of particular invertebrates, small mammals, and herpetiles.

Abandoned mines can provide roosting habitat for certain species of bats. However, sampling activities at the Site do not allow for entry into abandoned adits. Therefore, any potential bat roosting habitat located within the horizontal entry of a mine will not be disturbed during the SI investigation.

4.1.1.4 Stream Assessment and Fish Survey

The approach for the stream habitat survey is a modification of Phase II of the Urban Stream Baseline Assessment Methodology (USBEM) developed during the Tri-County Urban Issues Endangered Species Act Study (2000). Essentially, field biologists will walk a representative reach along each reach of the Linton Creek. The actual length of the reach will be determined in the field. The following characteristics will be documented on a field form for each reach: bankfull (i.e., ordinary high water [OHW]) width and depth, gradient (low, medium, high), bottom substrate characteristics (loose gravel, cobble, embedded gravel, mud, etc.), reach characteristics (pool, riffle, run, meandering, etc.), channel pattern/sinuosity, instream vegetation and debris, bank height, bank and riparian vegetation, and percent canopy cover. The presence of fish will be determined visually during the stream habitat survey, and by several stealthy perpendicular approaches to the stream with careful visual examination for fish movement. The locations of obvious input channels, connected wetlands, areas of runoff from the Site to the stream, or apparent Site related impacts will also be noted on field forms.

4.2 Sampling and Field Activities

Proposed field activities and sampling locations are based on the specific sampling requirements as outlined in the SOW and conversations with the USFS. Sampling will begin in the areas furthest downstream from the mine and will proceed upstream of the mine to minimize contamination from sampling activities. A summary of sample collection, preservation and holding times is presented in Table 3. CES will contract with ACZ Laboratory, in Steamboat Springs, Colorado, to perform a majority of the laboratory analysis. Low-level mercury, arsenic and chromium speciation will be performed at Brooks Rand Laboratory in Seattle, Washington. Table 1 and 2 outlines the analyses that will be conducted on water and solid media samples, as well as the number of samples from each media.

4.2.1 Waste Source and Soil Sampling

Many of the waste source (i.e. waste rock and tailings piles) and background soil samples will be collected using a backhoe to collect samples with depth. Backhoe pits will be continuously logged for depth, lithology, and other characteristics prior to collecting the sample. Soil, ore, and waste rock samples will be collected every 4 to 5 feet in depth until encountering the native material interface (if possible), where one additional sample will be collected. All trenches will be sloped or shored in accordance with 29 CFR 1926 (Subpart P) such that workers can easily enter and exit the trench in a safe manner to collect samples. When sloping and shoring is not feasible, samples will be collected directly from fresh material in the backhoe bucket, (after surface material has been removed, exposing the undisturbed material beneath). Where possible (i.e., small, easily accessible piles), soil and waste rock samples will be collected using a stainless steel hand augur or shovel.

CES proposes the following borings or trenches at the Site:

- Waste Rock Pile 1 (upper workings) – 2 to 3 borings/trenches.
- Waste Rock Pile 2 (lower workings) – 3 borings/trenches.
- Waste Rock Pile 3 (lower workings) – 2 borings/trenches.
- Ore Pile (lower workings) – 2 borings/trenches.
- Debris Pile (lower workings) – 2 borings/trenches.

CES will collect 14 waste and tailings samples and 3 background soil samples for laboratory analysis. Waste source sampling locations will be determined in the field. Background samples will be collected from native soils below the organic horizon at minimal depth of 12-inches, if possible. Samples will be collected in plastic zipper lock-type bags. Approximately ½ gallon of sample material will be collected. Soil and waste rock samples will be placed in an iced cooler and kept at approximately 4^{o}C until arrival at the laboratory. Analytical requirements are presented in Table 2.

All soil and waste source and ore samples will be analyzed for the following:

- pH, the 23 total metals target analyte list (TAL),
- arsenic (As) III and chromium (Cr) VI in 50% of the samples, and
- acid-based accounting (ABAs), and synthetic precipitation leaching procedure (SPLP) and toxicity precipitation leaching procedure (TCLP) for the RCRA 8 metals will be analyzed on 25% of the waste source samples.

4.2.2 Surface Water Sampling

Five surface water stations (Stations) will be established in Linton Creek. The Stations, depicted in Figure 1, will be located in the following areas:

- Station LC-1 will be located upstream of the Site to represent background conditions.
- Station LC-2 will be located approximately 200 feet downstream of the Site but upstream of the powerline corridor.
- Station LC-3 will be located downstream of the powerline corridor where Linton Creek reemerges as surface flow.
- Station LC-4 will be located at the drinking water intake in Linton Creek.
- Station LC-5 will be located downstream of the drinking water intake structure.

In addition, two surface water samples will be collected from the adit discharge on the Site. Station OM-AS-1 will be located at Adit 2. Station OM-AS-2 will be located in the adit discharge immediately downgradient of the waste rock pile (WR-2).

Surface water samples will be collected at each surface water Station and at the adit discharge Stations. Surface water samples will be collected near depositional areas where water current is slower and there is greater retention time for the surface water to accumulate contaminants from sediment. If the stream is deep enough, the sample will be collected directly into the laboratory-supplied containers, otherwise samples will be collected using a decontaminated sampling beaker and the water will subsequently be decanted into the appropriate sample container supplied by the laboratory.

Samples will be placed in an iced cooler and kept at approximately 4^{o}C until arrival at the laboratory. Surface water samples will be analyzed for:

- sulfate, pH, total dissolved solids (TDS);
- specific conductivity (SC), total suspended solids (TSS);
- hardness as calcium carbonate ($CaCO_3$);
- the 23 TAL metals for total recoverable and dissolved metals;
- low level mercury; and
- As III.

In addition, wet field parameters (SC, pH, temperature, dissolved oxygen [DO], oxidation/reduction potential [ORP], and turbidity) will be measured at each Station using a Horiba U-22. Chromium speciation will be conducted in the field using a colometric meter.

4.2.3 Sediment Sampling

Sediment samples will be collected from each surface water Station. Sediment will not be collected from the adit seep stations. Sediment samples will be collected from 0-18 inches, unless bedrock is encountered. Transects will be also be established in order to collect representative sediment samples across the entire reach. Sediment samples will be collected by scooping sediment from depositional areas with a decontaminated stainless steel trowel or Shelby core sampler. The sediment will then be placed in a stainless steel bowl and mixed thoroughly, which will separate large gravels and water from the finer sediment. Sediment will then be placed in laboratory-supplied clean 16-ounce glass jars with Teflon lids. Samples will be placed in an iced cooler and kept at approximately 4^{o}C until arrival at the laboratory.

At each sampling location, the following physical parameters will be analyzed and/or observed:

- stream depth, flowrate, ferricrete formation, and bedload size;
- grain size (sand, silt, clay and gravel), total organic carbon (TOC);
- total metals for the 23 TAL, As III; and
- clay mineralization in 3 of the 5 samples.

4.2.4 Benthic Macroinvertebrate Sampling and Survey

The biological community evaluation methods described herein represent the Stream Macroinvertebrate Protocols presented in the EPAs Rapid Bioassessment Protocol For Use in Streams and Wadeable Rivers (RBP; USEPA 1999). Due to the small size of Linton Creek, benthic macroinvertebrate samples will not be collected in both pool and riffle substations, but rather one sample will be collected from the same location as the surface water Stations. To collect the sample, a D-ring kick-net will be placed into the stream with the flat part of the hoop perpendicular to the stream flow and resting on the bottom. The invertebrates will be collected by disturbing a 30 by 60 centimeter (cm) area of stream bottom to a depth of approximately 10 cm, directly upstream of the net so that the current carries the macroinvertebrates and debris into the net. Depth permitting, all substrate larger than 5 cm will be rubbed by hand to dislodge any clinging macroinvertebrates. Each 30 by 60 cm area that is sampled will be considered a “jab”. The

contents of the jab will be placed into a sieve bucket and the sampling procedure repeated at additional locations within that habitat type until the appropriate number of jabs has been completed for a given sample. If the areas contain inadequate flow and current for this method, sediment core samples may be collected and screened with a 500-micron mesh to remove invertebrates. Each core will be considered a jab. Following the appropriate number of jabs, the contents of the sieve bucket will be cleared of large debris and placed into a labeled sample jar containing preservative. The sampling procedures will proceed from downstream to upstream to minimize influences of disturbance to downstream sample reaches.

Each of invertebrate samples will be sent to the laboratory for enumeration. The enumeration data from the laboratory will include all invertebrates in a sample up to approximately 300 individual invertebrates. The enumeration will be limited to this number to reduce unnecessary effort and provide similar sample sizes for each reach to promote effective comparisons between sample reaches. Identification will be to the genus and species level, if possible.

4.2.5 Tissue/Vegetation Sampling

Determination of potential ecological risks to the food chain will be conducted by collecting tissue samples of grasses/vegetation at the Site. CES will collect six samples to assure a limited degree of statistical integrity: three samples from waste rock piles and three samples in undisturbed areas. Also for statistical integrity, the inflorescence of the same species of vegetation will be sampled at each location. If the same species of vegetation are not present throughout the Site and background locations, CES will collect similar species for analysis. The samples will be collected into a pint size zipper lock type bags. Samples will be placed in an iced cooler and kept at approximately 4^{o}C until arrival at the laboratory. Vegetation samples will be analyzed for the 23 total metals.

4.3 Decontamination Methods

All sampling equipment (bowls, trowels, augers, etc.) will be stainless steel, and will be decontaminated before sampling. Equipment decontamination consists of a tap water rinse, a soap and tap water wash, a dilute HNO_3 rinse (10 parts de-ionized [DI] water to 1 part concentrated HNO_3) and a DI water rinse followed by air drying. Decontamination water will be discharge directly to soils at the Site.

4.4 Sampling Designation and Labeling

The following sample numbering system will be used to identify samples collected during field operations:

Waste, Soil and Vegetation Sample Number Example: OM-WR-1-5’

Where:

OM	=	Oriole Mine
WR	=	Waste Rock (OP = Ore Pile)
S	=	Soil
BGS	=	Background Soil
V	=	Vegetation
1	=	Sample Number
5’	=	Depth of sample from below ground surface

Water and Sediment Sample Number Example: LC-SW1

Where:

LC	=	Linton Creek
AS	=	Adit Seep
SW	=	Surface Water
SS	=	Stream Sediment
1	=	Sample Number

All sample identification labels will be engraved onto an aluminum cap attached to rebar. The rebar will be installed into the ground surface to a depth of at least 8 inches. At locations where this is not possible, the rebar will be secured by placing rocks around it. An orange survey flag will also be placed near the stake to facilitate future sighting of the markers.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL PLAN

The following standards will be maintained during sampling and analysis to ensure that the data generated for the assessment meets data quality objectives outlined in *Data Quality Objectives for Remedial Response Activities, Development Process* (EPA, 1987). All laboratory and field data will be subject to EPA Level II QA/QC standards. All values between the method detection limit (MDL) and the practical quantitation limit (PQL) will be noted on the laboratory analytical reports. Table 3 presents sampling information, analysis methods, preservation, and holding times.

5.1 Field QA/QC

According to USEPA Quality Assurance/ Quality Control Guidelines, one duplicate and one equipment rinsate blank should be analyzed for each ten samples collected. The intent of these guidelines is to assess the precision of field sampling, and assure that contamination has not occurred in the field and that decontamination procedures were followed. However, based on the number of samples being collected, the number of QA/QC samples has been decreased to two duplicates water samples and two equipment rinsate blanks in an effort to reduce analytical costs, while maintaining adequate QA/QC.

Equipment rinsate blank samples will be collected during sampling activities to test for cross-contamination between samples. The blanks will be prepared by passing distilled water over decontaminated sampling equipment and then directly into the appropriate sample containers. Two rinsate samples will be collected from the decontaminated auger used to bore into the waste piles. The rinsate samples will be collected in the cleaned sampling bucket and then poured into the appropriate sample containers. The rinsate samples will be given unique labels. The samples will be analyzed for the 23 total recoverable metals.

All samples will be collected in laboratory-supplied jars and bottles, labeled and transported according to the protocol described above. A chain-of-custody will be maintained from the time of sample collection until the time the samples are received by the analytical laboratory. The chain-of-custody will be signed by anyone who accepts responsibility for the samples, except the shipper. Shipping documents will represent custody of the samples by the shipper.

5.2 Laboratory QA/QC

The laboratory will follow all requirements for analysis and reporting under the EPA Level II protocols (USEPA, 1987), including, laboratory blanks, laboratory duplicates, matrix spikes and matrix spike duplicates. All samples will be analyzed within the holding times specified for the individual analytical procedure. All values between the MDL and the PQL will be noted on the laboratory analytical reports.

Any sample analysis completed after the specified holding time will be noted in the laboratory analytical report. All analytical reports will be reviewed to see that all spikes, duplicates and lab blanks are within acceptable limits.

6.0 HEALTH AND SAFETY PLAN

The health and safety plan has been prepared as a separate document, and is included as Appendix A.

7.0 INVESTIGATION-DERIVED WASTES PLAN

CES does not expect to generate any hazardous wastes during this field investigation. A minor amount of wastes generated from decontamination procedures will be left on-site. Cuttings from the drilling operations will also be left on the waste rock piles.

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TABLES

Table 1. Water Laboratory Analysis Summary
Oriole Mine

Sample I.D.	Sample Location	Total Recoverable Metals 23 TAL	Dissolved Metals 23 TAL, filtered with 0.45 um	Low Level Mercury - Total	Low Level Mercury - Dissolved	Arsenic III	Chromium VI (Field)	Hardness	pH	Sulfate	Total Dissolved Solids	Conductivity	Total Suspended Solids
Surface Water Samples													
OM-LC-SW-1	Upstream of Mine	1	1	1	1	1	1	1	1	1	1	1	1
LC-SW-2	200 ft.Downstream of Mine	1	1	1	1	1	1	1	1	1	1	1	1
LC-SW-3	Downstream of Power Corr	1	1	1	1	1	1	1	1	1	1	1	1
LC-SW-4	Drinking Water Intake	1	1	1	1	1	1	1	1	1	1	1	1
LC-SW-5	Downstream of Intake	1	1	1	1	1	1	1	1	1	1	1	1
OM-AS-6	Seep at Adit 2	1		1		1	1	1	1	1	1	1	1
OM-AS-7	Seep Downgradient of WR-2	1		1		1	1	1	1	1	1	1	1
QA/QA Samples													
OM-AS-8	Duplicate of AS-SW-7	1		1									
OM-SW-9	Rinsate Blank	1		1									
OM-SW-10	Background Air Blank			1									

Table 2. Solid Media Laboratory Analysis Summary
Oriole Mine

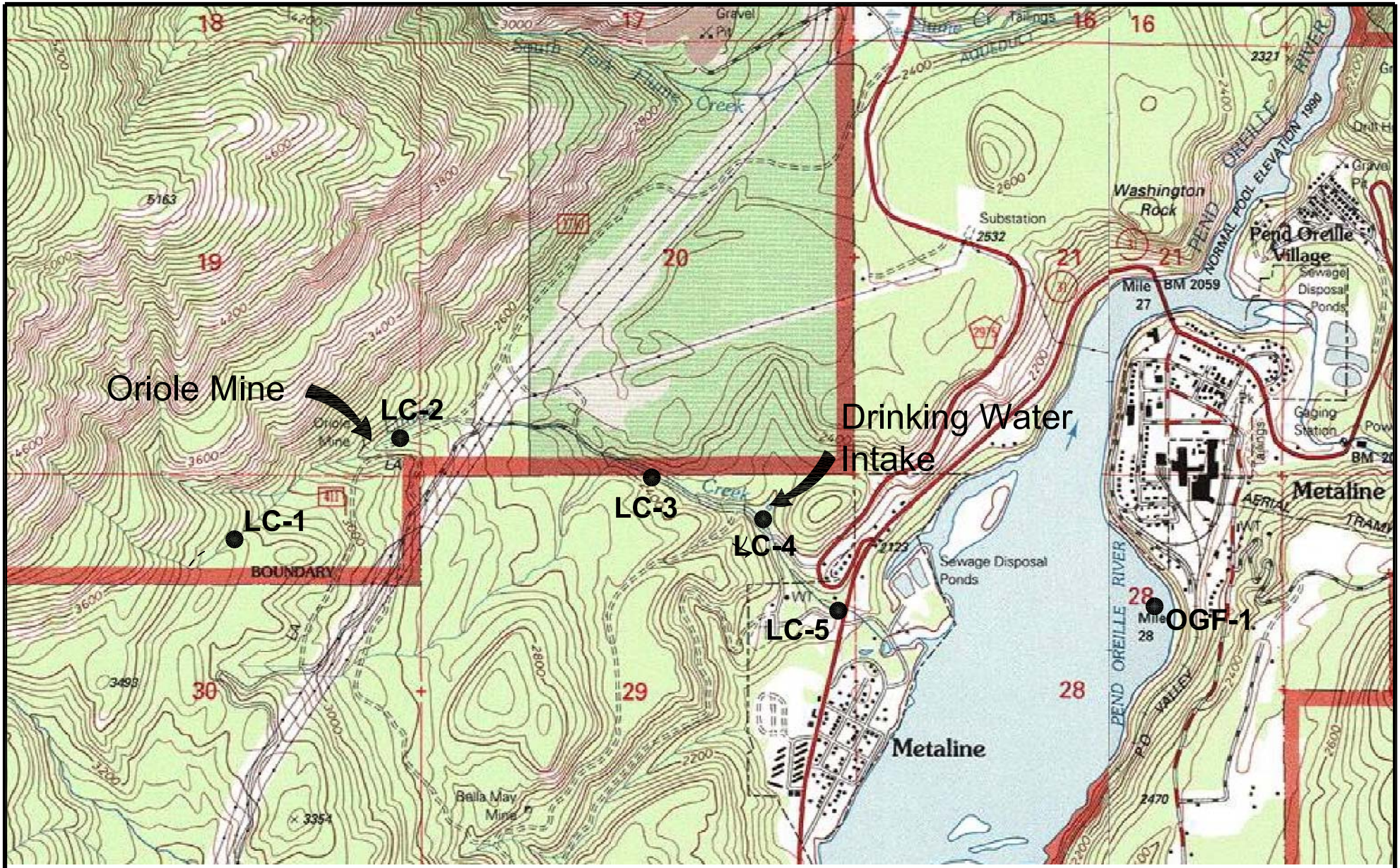
Sample I.D.	Sample Location	Total Metals 23 TAL	Plant 23 TAL	Arsenic III	Chromium VI	pH	Acid Based Accounting	SPLP & TCLPRCRA Metals	Total Organic Carbon	Grain Size (sand, silt, clay and gravel)	Clay Mineralization
Background Soil											
OM- BGS-1	To be determined	1		1	1	1	1				
OM- BGS-2	To be determined	1		1	1	1					
OM - BGS-3	To be determined	1		1	1	1					
Waste Rock											
OM-WR-1	To be determined	1		1	1	1	1	1			
OM-WR-2	To be determined	1				1					
OM-WR-3	To be determined	1		1	1	1					
OM-WR-4	To be determined	1				1					
OM-WR-5	To be determined	1		1	1	1	1	1			
OM-WR-6	To be determined	1				1					
OM-WR-7	To be determined	1		1	1	1					
OM-WR-8	To be determined	1				1					
OM-WR-9	To be determined	1		1	1	1	1	1			
OM-WR-10	To be determined	1				1					
OM-WR-11	To be determined	1		1	1	1					
OM-WR-12	To be determined	1				1					
OM-WR-13	To be determined	1		1	1	1	1	1			
OM-WR-14	To be determined	1				1					
Sediment											
OM-LC-SS-1	Upstream of Mine	1		1					1	1	1
LC-SS-2	200 ft. downstream of Mine	1		1					1	1	
LC-SS-3	Downstream of Power Corr	1		1					1	1	1
LC-SS-4	Drinking Water Intake	1		1					1	1	1
LC-SS-5	Downstream of Intake	1		1					1	1	
Vegetation											
V-BGS-1	Background		1								
V-BGS-2	Background		1								
V-BGS-3	Background		1								
V-OM-4	Onsite		1								
V-OM-5	Onsite		1								
V-OM-6	Onsite		1								
QA/QC Samples (Waste Rock/Tailings)											
OM-WR-15	Blind Duplicate TBD	1									
OM-WR-16	Blind Duplicate TBD	1									

Table 3. Laboratory Sample Collection, Preservation and Holding Times
Oriole Mine

Media	Laboratory Analysis	Analysis Method	Preservation	Holding Time	Sample Container (Dot Color for ACZ)	Minimum Volume Needed	Laboratory (ACZ or BrooksRand)
Water	TAL metals - Total Recoverable	EPA 200.7/200.8 EPA 245.7 (Hg)	HNO_3; Ice to 4 °C	180 days/Hg 28 days	250 ml HDPE (RED DOT)	200 mL	ACZ
Water	Hardness	SM 2340B	HNO3; Ice to 4 oC	180 days	250 ml HDPE (GREEN DOT)	150 mL	ACZ
Water	Low Level Mercury	EPA 1631	HCL to pH<2, Ice to 4 oC	90 days	250 mL Glass with teflon lined lid, double bagged	250 mL	BrooksRand
Water	Arsenic III	EPA 1632	HCL to pH<2, Ice to 4 °C	28 days			BrooksRand
Water	Total Dissolved Solids	EPA 160.1	Ice to 4 °C	28 days	250 mL HDPE (WHITE DOT)	200 mL	ACZ
Water	Sulfate	EPA 160.1	Ice to 4 °C	28 days			ACZ
Water	Conductivity, EC	EPA 120.1	Ice to 4 °C	Immediately	500 mL HDPE (RAW - NO DOT)	200 mL	ACZ
Water	Total Suspended Solids	EPA 160.2	Ice to 4 °C	Immediately			ACZ
Water	pH	EPA Method 150.1	Ice to 4 °C	Immediately			ACZ
Solid	Arsenic III	EPA 1632	Ice to 4 °C	1 year	4 oz glass jar with teflon lid		BrooksRand
Solid	Chromium VI	EPA SW3060a	Ice to 4 °C	30 days	4 oz glass jar with teflon lid		BrooksRand
Solid	TAL metals, soil and plant	EPA 6010B/ 7000 Series EPA 7471A (Hg)	Ice to 4 °C	180 days/Hg 28 days	1 gallon Ziploc Bag		ACZ
Solid	Acid based accounting	EPA 600/2-78-054	Ice to 4 °C	28 days			ACZ
Solid	Total Organic Carbon	EPA 600/2-78-054	Ice to 4 °C	28 days			ACZ
Solid	TCLP/SPLP RCRA 8	EPA 1312 and EPA 6010B	Ice to 4 °C	28 days			ACZ
Solid	Grain Size	ASTM D 422 Hydrometer	Ice to 4 °C	28 days			ACZ
Solid	Paste pH	ASA No.9 10-2.31	Ice to 4 °C	28 days			ACZ
Solid	Clay Mineralogy	x-ray diffraction	Ice to 4 °C	28 days	8 oz. Glass jar with teflon lid		ACZ

FIGURES

Figure 1. Surface Water Station Locations



LC-5 ● Surface Water Station

N

NOT TO SCALE
CONTOUR INTERVAL = 40 FEET

PROJECT NUMBER: 2323024	Figure 1. Surface Water Stations
DATE: April 2004	
DWG BY: DGW / DWG NO: FIG 1	ORIOLE MINE U.S. FOREST SERVICE
PROJECT MANAGER: DGW	
REVISED:	CASCADE EARTH SCIENCES A Valmont Industries Company

APPENDICES

Appendix A. Health and Safety Plan

Appendix A.

Site Specific Health and Safety Plan

Health and Safety Plan for the Oriole Mine Site Inspection Colville National Forest Pend Oreille County, Washington

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EMERGENCY PHONE NUMBERS

Fire	911
Police	911
Ambulance	911
Emergency	911
Mount Carmel Hospital	509-684-3028
982 E. Columbia Avenue Colville, Washington	
CES Corporate Safety Officer	541-812-6614

May 2004

Health and Safety Plan for
Oriole Mine Site Inspection

Colville National Forest
Pend Oreille County, Washington

Principal Authors: *Dustin G. Wasley, PE, Managing Engineer*

Reviewed by: *John D. Martin, RG, Principal Geologist*

Prepared For:

Dennis Boles, PE, COR
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2819 Dahlia Street
Klamath Falls, Oregon 97601

Site Address:

Oriole Mine
Colville National Forest
Pend Oreille County, Washington

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Spokane, Washington 99216
(509) 921-0290

PN: 2423004 / May 2004

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ATTACHMENTS

1.0 INTRODUCTION

The United States Forest Service (USFS) has requested that Cascade Earth Sciences (CES) perform a Site Inspection (SI) at the Oriole Mine (Site) located in the Colville National Forest, approximately 50 miles north of Colville, Washington. Field activities will be performed as part of the SI. This Health and Safety Plan (HASP) has been prepared for field activities scheduled to be performed at the Site.

The focus of this HASP is to identify, evaluate and minimize potential health and safety hazards, as well as to provide emergency response to accidents during field operations at the Site. Oriole is a former zinc, lead, silver, copper and gold mine and heavy metals have been identified in soil, surface water, and sediments at the Site. The objectives of this HASP include the following:

- Identification and evaluation of potential hazards
- Definition of levels of protection required for the activities
- Formulation of emergency action plans
- Assurance of medical monitoring
- Assurance of personnel Hazardous Materials (HAZMAT) training
- Implementation of appropriate record keeping.

This HASP covers CES personnel working at the Site who have the potential for exposure to hazardous waste, hazardous substances, or a combination of these materials. This HASP is intended to comply with the requirements of the Occupational Safety and Health Administration (OSHA) Standards as stated in 29 CFR 1910.120. Amendments to this HASP may be made as the contaminant profile is updated; a change in the work status or tasks is made, or as regulatory requirements dictate. Any changes will be brought to the attention of those covered under the plan through additional training.

This HASP addresses the procedures to be followed during the investigation of soil, stream sediment and surface water in the area near the Oriole Mine. Activities associated with this HASP include collecting waste material, soil, stream sediment and surface water samples. No other activities are covered by this HASP. All personnel working at this Site will follow the safety provisions outlined in this plan. The CES Corporate Health and Safety Officer, John Martin, is responsible for the implementation of this HASP, and all questions or concerns regarding site safety should be directed to him.

2.0 HAZARD ASSESSMENT

2.1 Chemical Hazards

The primary chemical hazards discovered at the Site during USFS Abbreviated Preliminary Site Assessment (APA) were arsenic, copper, iron, and lead. A summary of the potential hazards of these metals is presented below:

2.1.1 Arsenic

Arsenic is carcinogenic to humans. The concentration present in the waste rock piles at the Site exceeds applicable state and federal comparison standards for soil and surface water. In addition, the concentration of arsenic is substantially higher than the exposure limit for humans. Arsenic III is the most toxic form of arsenic and may be present at the Site. Arsenic ingestion is associated with skin cancer and may cause cancers of the lung, liver, bladder, kidney and colon. Chronic inhalation of arsenicals is closely linked with lung cancer. Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs. **Ingesting high levels of inorganic arsenic can result in death**. Lower levels of arsenic can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart

rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands. The principal risk for arsenic exposure to personnel at the Site is through inhalation of arsenic-bearing dusts.

2.1.2 Copper

Concentrations of copper such as those observed at the Site can have an adverse affect on human health. Chronic exposure to copper can discolor and irritate the skin, cause mild dermatitis, runny nose, and irritation of the mucous membranes. Repeated ingestion of copper can damage the liver and kidneys. The principal risk for copper exposure to personnel at the Site is through incidental ingestion of copper-contaminated water and inhalation of copper-bearing dusts.

2.1.3 Iron

Iron can be absorbed in the soluble reduced (ferrous) state by cells of the intestinal mucous. However, the ferrous form is easily converted to the insoluble oxidized iron (ferric) in surface waters. Hence, the ferrous form of iron should not be present in large quantities in surface water at the Site. As such, incidental ingestion of iron-contaminated surface water should not pose a major health risk to personnel at the Site.

The principal risk for iron exposure to personnel at the Site is inhalation of iron-bearing dusts. Overexposure to iron-bearing dusts can create a build up in the body and can cause such diseases as hemochromatosis and siderosis. In addition, complications such as damaged blood vessels, bloody vomitus and stools, damage to the liver and kidneys, and eventual death can occur.

2.1.4 Lead

Although children under the age of 6 are most susceptible to lead exposure, adults can also experience adverse affects. In adults, overexposure to lead can cause increased blood pressure, fertility issues, nerve disorders, muscle pain, and memory and concentration problems. Damage to adult kidneys from ingested or inhaled lead can occur at 40 micrograms per deciliter (µg/dL), while nerve damage and anemia can occur at 60 µg/dL. Ingestion or inhalation of high levels of lead can lead to convulsions, paralysis, and even death. The principal risk for lead exposure to personnel at the Site is through incidental ingestion of lead-contaminated surface water.

2.2 Physical Hazards

A checklist of physical hazards is provided as follows:

Description	Hazard		Comments
	Yes	No	
Overhead Power Lines		X	None present at Site.
Heavy Equipment – Backhoe		X	Will be used to excavate trenches
Buried Conduit		X	None present at Site.
Pinch Points on Rig	X		Caution should be taken when working around backhoe
Uneven Ground	X		Appropriate precautions will be taken while traversing the area.
Fall Hazards	X		Appropriate precautions will be taken while traversing the area.
Steep Slopes	X		Appropriate precautions will be taken while traversing the area.
Ice	X		Ice may be present IN EARLY MORNING HOURS depending on weather conditions. Refer to Section 9.2.
Slippery Conditions	X		Slippery conditions may be present depending on weather conditions. Appropriate precautions will be taken while traversing the area.

Rain	X		Rain may exacerbate hazardous conditions. Refer to Sections 4.2 and 9.2.
Confined Space Hazard		X	None present at Site.
Potential Adit Collapse	X		There is the potential for adits to collapse. Appropriate precautions will be taken while traversing the Site. No personnel will knowingly get near the vicinity of an adit.
Abandoned Structures	X		Several dilapidated log structures are present

As shown in the checklist, physical hazards at the Site are primarily due to steep slopes in the mountainous terrain, weather conditions and human error. These include hazards such as operating a field vehicle in steep terrain with poor roads, twisting an ankle while traversing the slopes, slipping or tripping on obstructions, falls into collapsed underground mine workings, and exposure to the heat or cold. Activities will follow standard operating procedures and will be conducted in a safe and prudent manner.

2.3 Biological Hazards

Biological hazards can include encounters wildlife species and/or exposure to disease-causing bacterial and viral pathogens. Exposure to these biological hazards is unlikely and will probably not occur during SI field activities. However, biological hazards can be dangerous, even deadly, and should be recognizable to prevent exposure during investigative field activities.

2.3.1 Black Bears

Black bears have a natural fear of humans and tend to avoid people or developed areas. However, Black Bears should be considered unpredictable and potentially dangerous. A Black Bear will usually detect the presence of humans and flee an area unless the bear has been conditioned to people and their foods. The best way to avoid a Black Bear encounter is to make your presence known by shouting or making loud noises and watching for bear signs such as scat, claw marks, diggings, and logs or stumps torn apart. The following steps should be taken in the event of an encounter with a Black Bear:

- If a bear is visible, but not close, alter your route to move away from the bear's area.
- If a Black Bear approaches, *do not* run. Remain calm, continue facing the bear and slowly back away. If the bear continues to approach, attempt to scare the bear away by shouting and acting aggressively.
- If a black bear attacks, fight back using fists, sticks, rocks, and EPA registered bear pepper spray (if available).

2.3.2 Cougars

Cougar sightings in northeastern Washington are rare. Cougars are active mainly at dusk and dawn, although they will roam and hunt at any time of the day or night in all seasons. During late-spring and summer, one and two-year old cougars become independent of their mothers and roam vast areas in search of a home range. It is during this time that cougars are most dangerous and most likely to come into contact with humans.

Cougars are predators, and their actions are unpredictable. Any cougar that approaches, follows, disappears then reappears, or displays other stalking behavior is acting in a predatory manner. The best way to prevent a cougar encounter is to avoid startling any cougar by making noise and traveling in groups. However, the following steps should be taken in the event of an encounter with a cougar:

- *Never* approach a cougar. Although most cougars will avoid a confrontation, all cougars are unpredictable.
- Always give a cougar an avenue of escape.

- Stay clam. Talk to the cougar in a confident voice.
- *Do not* run. Back away from the cougar slowly and always keep eye contact. Sudden movement may trigger an attack.
- Make yourself appear as large as possible with arms extended. *Do not* crouch or attempt to hide. If possible, pick up sticks or branches and wave them around.
- If a cougar attacks, fight back. Use rocks, sticks, fists, etc. to defend yourself.

2.3.3 Snakes

The only poisonous snake in Washington is the Western Rattlesnake. The Western Rattlesnake usually occupies warm, dry, habitats of desert, scrub-shrub, grassland, and open pine forests. As such, an encounter near the Site is possible.

Western Rattlesnakes have a defensive temperament, and avoid larger animals whenever possible. The most effective method of avoiding serious injury when encountering a rattlesnake is to remain motionless, since rattlesnakes rarely strike unmoving objects. In the event of a rattlesnake bite, the following steps should be taken to prevent serious complications or death:

- Try to remain calm and move away from the snake.
- Move as little as possible to prevent the venom from circulating through the body. If the victim must walk out, sit calmly for 20 to 30 minutes to allow the venom to localize. Proceed calmly to the nearest source of assistance and try to avoid any unnecessary exertion.
- If possible, have the victim lie down with the bitten limb elevated above the heart. Keep the limb immobilized.
- Treat for shock and preserve body heat.
- Remove rings, bracelets, boots, or any other restricting items from the bitten extremity.
- Apply a light, restricting band about 2 inches above and below the bite, however; never place bands above and below joints such as the knees or elbows.
- Wash the bite with soap and water if available.

The following actions should be avoided when a rattlesnake bite occurs:

- *Do not* cut the bite.
- *Do not* apply a tourniquet.
- *Do not* attempt to suck the venom out of the wound.
- *Do not* apply cold and/or ice packs.

2.3.4 Yellow Jackets

Insects rarely pose a threat to human life or health. However, several species of insects are considered dangerous and should be avoided when possible. The species most likely to be encountered during SI activities is the Yellow Jacket.

Yellow Jackets are members of the wasp family and are recognizable by the distinct alternating yellow and black markings on the abdomen. Yellow Jackets are social insects and will fiercely defend nests if threatened. Encounters with Yellow Jackets are difficult to avoid since they are small, extremely mobile, and numerous. Individuals can minimize encounters by not wearing perfumes, hair tonic, suntan lotion, aftershave lotion, shiny buckles, bright colored clothing (yellow, light blue, orange, fluorescent red), or flowered prints on clothing. Nevertheless, there is a possibility Yellow Jackets will be present during SI activities. The following steps should be taken in the event of an encounter with Yellow Jackets:

- Never swing or strike at Yellow Jackets since rapid movements often provoke painful stings.
- If a Yellow Jacket is nearby, slowly raise your hand to protect your face remaining calm and stationary and then move slowly (avoiding nests located in the ground).
- Yellow Jackets fly about seven to eight miles per hour, which is slower than the average pace for humans. However, running should be a last alternative since Yellow Jackets can produce up to a dozen stings before a human reaches full running speed.
- *Never* strike or crush a Yellow Jacket against your body. Wasp venom contains chemical "alarm pheromones", which, when released into the air, signals guard wasps to sting the perceived threat.

Despite peoples' best efforts, Yellow Jacket stings are inevitable. Insect sting kits should be carried when conducting field activities. In addition, antihistamines can be effective in reducing the pain and swelling caused from the biogenic amines released during a sting.

2.3.5 Spiders

Approximately 760 species of spiders occur in Washington State. All spiders are technically "venomous", however; the Black Widow and Hobo Spiders are the only species in Washington considered as being dangerously venomous to humans. The likelihood of encountering these two spiders is considered to be extremely low and the possibility of a bite resulting from an encounter is even lower. Spiders will often occupy dark, dry spaces such as firewood piles, old lumber, dry crawl spaces, barns, and sheds. Care should be taken in these environments not to disturb or agitate spiders located in these habitats.

2.3.6 Ticks

Ticks are obligate vertebrate parasites, which are closely related to spiders. Lyme disease is a tickborne illness known to cause muscle pain, arthritis, and neurological symptoms. In addition, ticks can cause relapsing fever and tick paralysis. Occurrences of these diseases in Washington are low, however; exposure to Lyme disease occurs primarily west of the Cascade Mountains. The only suspected carrier of Lyme disease in Washington is the Western Black-Legged Tick.

The risk of contracting Lyme disease can be reduced by the following appropriate preventative measures:

- Wear light colored, long-sleeved shirts and long sleeved pants.
- Pants should be tucked into socks and wear closed-toed boots.
- Check periodically for ticks on the body.
- Attempt to avoid grassy or brushy areas that may harbor ticks.
- Tick repellents such as N,N diethylmeta-toluamide (DEET) can be an effective deterrent.

If a tick is found on the body, the following measures should be taken:

- Ticks can be removed with forceps or tweezers by grasping the tick's body as close to the skin as possible.
- Apply gentle, steady pressure to the tick and pull the tick directly away from the skin. Care should be taken not to apply too much pressure to the tick's body because an engorged tick can release spirochetes into the skin.
- *Do not* twist or jerk the tick because mouthparts may break off in the skin.
- *Do not* apply a match or hot stick to the tick's body.
- *Do not* apply Vaseline in an attempt to suffocate the tick.

2.3.7 Hantavirus

Hantavirus is a virus that causes Hantavirus Pulmonary Syndrome (HPS), a form of adult respiratory disease syndrome. The infection caused by Hantavirus is a serious illness, with 38 percent of those infected dying from the disease. Deer Mice are the primary carriers of the hantavirus observed in the northwest United States. They can carry the disease without showing any outward signs of sickness. Deer Mice can shed the virus via urine, saliva, and droppings. Transmission of the disease can occur when fresh or dried materials contaminated with rodent excreta are disturbed and dust particles are breathed. In addition, direct introduction into broken skin, introduction into the eyes, ingestions, and bites from Deer Mice are believed to cause infection. The following steps can be taken to avoid exposure:

- Avoid contact with rodents or rodent nests.
- Avoid cabins and shelters unless they have been aired and disinfected.
- Avoid areas where burrows or droppings are present.
- Wear a HEPA filter mask (if available) when working in areas assumed to be infested with rodents.

2.4 Weather Hazards

2.4.1 Wind

Wind is the most hazardous weather element as it may cause dust particulates to become airborne. If wind is substantial enough to cause this to occur, all field personnel will don respirators with HEPA filters for the duration to prevent exposure of potentially high levels of arsenic bearing dust.

2.4.2 Hot Weather

In hot weather, heat stress can be a serious hazard for workers at waste sites. Heat stress usually is a result of protective clothing decreasing natural body ventilation, although it may occur at any time work is being performed at elevated temperatures.

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur. These reactions range from mild (fatigue, irritability, anxiety, and decreased dexterity) to fatal. Because heat stress is one of the most common and potentially serious illnesses that workers face, regular monitoring and other preventative measures are vital.

2.4.2.1 Heat Stroke

Heat stroke is an acute and dangerous reaction to heat stress caused by failure of heat regulating mechanisms of the body (i.e., the individual's temperature control system that causes sweating stops working correctly). If the victim is not cooled quickly, the body temperature will rise to a point at which brain damage and/or death may occur.

Symptoms – Red, hot, dry skin, although the person may have been sweating earlier; nausea, dizziness, confusion, extremely high body temperature, rapid respiratory and pulse rates, unconsciousness or coma.

Treatment – Cool the victim quickly. Call 911 for an ambulance. Soak the victim in cool but not cold water, sponge the body with cool water or pour water on the person to reduce the temperature to a safe level (102 °F).

2.4.2.2 Heat Exhaustion

Heat exhaustion is a state of very definite weakness or exhaustion caused by the loss of fluids from the body. This condition is much less dangerous than heat stroke, but it must be treated.

Symptoms – Pale, clammy, moist skin, profuse perspiration and extreme weakness. Body temperature is normal, pulse is weak and rapid, and breathing is shallow. The person may have a headache, vomit, and be dizzy.

Treatment – Remove the person to a cool, air conditioned place, loosen clothing, place in a head-low position and provide bed rest. Consult a physician, especially severe cases. The normal thirst mechanism is not sensitive enough to ensure body fluid replacement. Have patient drink 1 to 2 cups of water immediately, and every 20 minutes thereafter, until symptoms subside. Total water consumption should be 1 to 2 gallons per day.

2.4.3 Cold Weather

All field activities are anticipated to be completed in advance of snow. If unexpected snow coverage makes it difficult to conduct sampling, field activities will be rescheduled as appropriate. Because weather conditions in the area can be unpredictable, preventative measures are included in this Health and Safety Plan.

The conditions that promote cold-related illnesses are not always apparent. Therefore, it is essential that personnel wear appropriate clothing to protect against the elements. During extreme cold (<45 °F), raining or chilly wind conditions, personnel should wear appropriate clothing to protect hands, feet, and exposed body extremities, as well as the head and neck areas. If an employee becomes over-exhausted due to exertion during extreme weather conditions, curtailing of activities should be considered rather than shedding protective clothing. All indications of cold-related illnesses will be treated immediately by the designated on-site first aid responder. The physical health of all onsite personnel will be monitored closely throughout all remedial activities.

2.4.3.1 Frostnip

Frostnip occurs when cooling occurs in the tissues, cheeks, chin, fingers, toes, and ears.

Symptoms – Pale, white, grayish, glassy patches and tissues are soft and resilient.

Treatment – Use steady, firm pressure on the cooled area with a warm body part (e.g., put fingers in armpit, put toes against a friend's abdomen).

2.4.3.2 Frostbite

Frostbite occurs when there is freezing of body tissues. Frostbite most commonly affects the hands and feet.

Symptoms – Tissues pale, cold, solid; feels wood-like; tissues not resilient; grayish patches.

Treatment – Check breathing, airway, circulation. Protect frozen areas from further damage, but DO NOT thaw. If feet are frozen, they can be walked on if necessary. However, once they begin to thaw, DO NOT walk on them. Seek professional medical aid for re-warming. WARNING: Improper warming can increase tissue loss.

2.4.3.3 Hypothermia

Hypothermia is the lowering of body temperature to below normal levels. Hypothermia can occur in cool and wet or cold environments. Water, wet clothing, and wind accelerate heat loss.

Symptoms – Shivering, weakness, loss of coordination, difficulty performing tasks and making decisions, loss of consciousness, slow or absent breathing and heartbeat.

Treatment – Check breathing, airway, circulation. Protect from further heat loss by sheltering patient from wind and water. Replace wet clothing with dry attire if possible. Cover patient's head. WARNING: Jarring the patient can cause an abnormal heart rhythm. If mild signs/symptoms, add heat to the neck, armpits and groin. If moderate to severe signs and symptoms, prevent further heat loss and seek additional medical aid for re-warming.

2.4.4 Storms

Storms strong enough to endanger operations may require termination of sampling activities until the storm has passed. Storms are hazardous due to the potential for lightning strikes and falling trees. Electrical storms with high gusty winds are particularly hazardous to drilling towers. All activities involving this type of equipment should be halted until the risk to personnel has subsided. The possibility for being struck by lightning during a thunderstorm does exist. In order to minimize the possibility of this happening the following should be observed during storms:

- *Do not* make a human lightning rod of yourself by being the highest point around.
- *Do not* stand under solitary trees or other isolated objects in a filed.
- *Do not* hold metal objects in your hands, which may attract a strike.
- *Do not* take refuge near wire fences or overground pipes that could carry lightning currents to you from a strike, which has hit some distance away.
- Do get inside if possible, (but not in an isolated building in the middle of a field). Once you are inside, avoid open doors and windows.
- Do crouch or lie down if you are in an open field.
- Do stay away from open water.
- Do stay in your car with the windows rolled up. The car will provide a path around you for the current of the lightning bolt.

3.0 PERSONNEL

The Corporate Health and Safety Officer for this project is John Martin of CES. In this capacity, Mr. Martin will oversee compliance with all applicable health and safety regulations. The designated Site Safety Officer (SSO), Dustin Wasley, will oversee day-to-day site safety activities. Safety is affected by all involved parties or organizations. For this reason, the following key personnel and their organization have been identified:

Corporate H&S Officer	John Martin - CES	(541) 812-6614
Project Manager/ SSO	Dustin Wasley - CES	(509) 601-9097
Engineer / Geologist	Robert Lambeth - CES	(509) 467-4081
Wildlife Ecologist	Rone Brewer – Associate	(425) 329-0305
Wildlife Biologist	Ryan Tobias – CES	(541) 812-6625
USFS/COR	Dennis Boles - USFS	(541) 947-6336

All site personnel will receive copies of the HASP for review. After review, each person will sign the Acknowledgement form included as Attachment A. The signed Acknowledgments and copies of hazardous waste training certificates will be attached to the HASP or otherwise available at the Site.

4.0 PERSONAL PROTECTIVE EQUIPMENT (PPE) AND OTHER REQUIRED EQUIPMENT

The following basic safety equipment and PPE are required for level D operations at the Site.

4.1 Summary of Equipment Required for this Project

- First aid kit
- 1 – A, B, C Fire extinguisher
- Cellular telephone – cellular coverage may not be available at remote locations
- Hand-held radios – in case no cellular coverage available
- Wash station to rinse particulates from exposed skin
- Insect bite kit

4.2 Personal Protective Equipment (PPE) – Level D

- Work uniform with long pants and appropriate cold-weather gear (including rain protection)
- Steel-toed boots (leather or PVC)
- Outer gloves (green Viton or equivalent)
- Inner gloves, latex disposable
- Safety glasses
- Disposable Tyvek coveralls (optional)

4.3 Personal Protective Equipment – Level C

- Half-face air-purifying respirator with HEPA cartridges
- Level D PPE as described above
- Disposable coveralls - Tyvek or equivalent (total body)

5.0 OPERATIONAL PROCEDURES

These guidelines are primarily intended to address site work involving soil, rock or sediment sampling. Level C PPE is required during any activity that could generate dust. Invasive activities require Level D PPE. These guidelines are primarily intended to address site work involving drilling. Such activities will initially be approached under Level D conditions, and will incorporate designated exclusion zones (EZ). Other activities such as soil and groundwater sampling will be performed using appropriate PPE. The use of a hard hat and safety glasses may not be necessary for sampling. A formal exclusion area also may not be required for such routine monitoring. However, reasonable effort should be made to keep non-essential personnel away from sampling activities.

5.1 Physical Hazards

The physical hazards associated with the Site include traversing steep terrain and working within flowing water (Linton Creek). Equipment will need to be carried in the vicinity of the creek to access surface water sampling stations. Waders and non-slip soled boots will be necessary for any work performed in the Creek. Precaution will be needed in traversing the Site and sampling the waste piles due to steep terrain.

6.0 DECONTAMINATION / DISPOSAL PROCEDURES

Extensive decontamination procedures have been determined to be unnecessary for this project. However, should comprehensive decontamination become necessary due to Personal Protection Level upgrade, the SSO will devise a decontamination plan according to the table.

Personnel and equipment leaving the EZ shall be decontaminated. Level **D** decontamination protocol shall be used with the following decontamination stations:

LEVEL C DECONTAMINATION STEPS		LEVEL D DECONTAMINATION STEPS	
1	Equipment Drop	1	Equipment Drop
2	Outer Garment, Boots, and Glove Wash and Rinse	2	Glove Disposal and Boot Wash and Rinse
3	Disposable Garment, Boots, and Glove Removal	3	Outer Boot and Glove Removal
4	Cartridge Change (if necessary)	4	Field Wash
5	Remove Respiratory Protection		
6	Field Wash		

The following decontamination equipment is required when using a drill rig or backhoe.

DECONTAMINATION EQUIPMENT CHECKLIST			
X	Scrub Brushes	X	Garbage Bags
X	Waste Containers	X	Paper Towels
X	Soap		Isopropyl Alcohol
X	Plastic Tubs	X	Pump Spray Bottles
X	Plastic Drop Cloths	X	Pump Spray Bottles (water)

7.0 DISPOSAL OF DECONTAMINATION WASTES

All equipment and liquids used for decontamination shall be disposed properly according to local, state and federal regulations. Commercial laundries or cleaning establishments that decontaminate protective clothing or equipment shall be informed of the potentially harmful effects of exposures. Skin exposed to Site dust will be washed immediately with soap and water.

7.1 Standard Operating Procedures

The major pathway for the ingestion of arsenic at the Site is through inhalation of dust particles. Therefore, all activities should be performed with minimal disruption of the soils and sediments. No eating, drinking, smoking, gum or tobacco chewing, or application of cosmetics will occur in the field while investigative activities are conducted. Skin exposed to Site dust will be washed immediately with soap and water.

- The instructions of the Site Safety Officer will be followed.
- No horseplay will be tolerated.
- Work practices that minimize airborne release of contaminants will be used.
- Contact with waste material will be minimized.
- The hands and face of personnel must be thoroughly washed as soon as possible upon leaving the work area and before eating, drinking or other activities.

All involved personnel are responsible for reading and understanding the provisions of this plan and will agree to abide by it. Their signature at the end of the HASP signifies their personal review and acceptance of this plan.

8.0 HAZMAT TRAINING

All persons conducting field investigations at the Site must have at least 40 hours of hazardous waste operations training plus three (3) days of field experience, or be under the direct supervision of a trained experienced supervisor (29 CFR 1920.120). If initial training took place more than 12 months prior to the job, an 8-hour refresher course must be taken.

Copies of training certificates documenting the required training must be available at the Site. The Site Safety Officer is responsible for inspecting documentation to ensure the requirements of this section are met.

9.0 MEDICAL MONITORING

Employees are required by Occupational Safety and Health Administration (OSHA) to have a full hazardous materials physical if exposed to concentrations of toxic substances above permissible exposure limits (PEL) for 30 or more days per year. It is the policy of CES that any person exposed at or above the TEL of a toxic substance will receive an annual physical following exposure. The TEL for arsenic is 0.002 mg/m^3 as dust particles in a 15-minute interval. Sampling activities are not anticipated to disturb soils to the extent that wind-borne dust concentrations approaching the TEL will be of concern for field personnel. Medical monitoring for activities during the implementation of the Work Plan will not be required, although CES field staff are routinely managed under our medical monitoring program.

10.0 EMERGENCY RESPONSE PLAN AND SERVICES

In the unlikely event of a fire or explosion, proper action is required to safeguard personnel and the environment. In the event of a fire, emergency services will be immediately contacted (fire, police, etc.) by calling 911 and/or the Pend Oreille County Fire Department. In addition, CES will contact the Colville National Forest in Colville. Site personnel will be notified of the problem. Only small fires may be extinguished by workers at the Site. If the fire is too large, or if in doubt, the area will be evacuated. In the event of an accident or emergency during site work the following services are available:

Fire.....911
Police.....911
Ambulance.....911
Emergency.....911
Mount Carmel Hospital.....509-684-3028
982 E. Columbia Avenue
Colville, Washington
CES Corporate Safety Officer.....541-812-6610

Hand-held radios will be made available to field personnel during implementation of the Work Plan. Radio contact will be made to the Colville National Forest office in the event of an emergency. Directions to Mount Carmel Hospital facilities in Colville are included in Attachment B.

Prepared and Revised By:

CASCADE EARTH SCIENCES	**CASCADE EARTH SCIENCES**
Dustin G. Wasley, PE Managing Engineer	John Martin, RG Principal Geologist

ATTACHMENTS

Attachment A. **Acknowledgement Form**
Attachment B. **Hospital Route Maps**

Attachment A.

Acknowledgement Form

ACKNOWLEDGEMENT

To Be Signed and Returned To

Cascade Earth Sciences (CES) Health and Safety Officer

I have received and carefully read the Site Health and Safety Plan (HASP) for the Site Inspection at the Oriole Mine (Site). I agree to abide by these safety rules, regulations, and guidelines while working at the Site. I understand that any violation of these rules may result in my removal from the work area.

I have had a 40-Hour Health and Safety Training course and an annual refresher course(s), and I have provided certificates of these courses to the Site Safety Officer.

Signature _____

Print Name _____

Signature _____ Date _____

Print Name _____

Signature _____ Date _____

Print Name _____

Signature _____ Date _____

Print Name _____

Signature _____ Date _____

Print Name _____

Safety Officer

Signature _____ Date _____

Print Name _____

Attachment B.

Hospital Route Map

Directions	Distance
1: Travel from the Oriole Mine to WA-31	1.5 miles
2: Turn LEFT onto WA-31	12.2 miles
3: Turn RIGHT onto COLVILLE CUTOFF RD.	0.3 miles
4: Turn RIGHT onto WA-20.	35.2 miles
5: Turn LEFT onto N ALDER ST.	0.3 miles
6: Turn LEFT onto E COLUMBIA AVE.	<0.1 miles
7: End at 982 E COLUMBIA AVE COLVILLE WA	Arrive