APPENDIX B

Field Sampling Procedures

This appendix provides the Field Sampling Procedures (FSP), prepared to guide the 2011 Upper Coeur d’Alene Basin Focused Characterization, to be conducted in the Upper Basin (Operable Unit 3) of the Bunker Hill Superfund Site in Shoshone County, Idaho. A project location map is presented on Figure 2-3 of the Quality Assurance Project Plan (QAPP).

As discussed in Section 2.2.1 of the main QAPP text, during the 1990s the Bureau of Land Management (BLM) cataloged over 1,000 mining-impacted sites and sub-areas within the Upper Basin. This catalog was used and updated by EPA during preparation of the OU-3 remedial investigation (RI) and feasibility study (FS) during the late 1990’s and early 2000’s and subsequent 2002 OU 3 Interim Record of Decision.

EPA is in the process of updating the Upper Basin cleanup plan with the issuance of a Proposed Plan in July 2010. In response to comments on the Proposed Plan, EPA is working with the Upper Basin Project Focus Team (PFT) on potential modifications to the Proposed Plan. This group has discussed opportunities to evaluate a number of sites for potential removal from the cleanup plan prior to issuance of the ROD Amendment. The 2011 field effort covered by this FSP is a pilot scale characterization effort to identify sites that may not require cleanup. These findings may also necessitate a large scale, Upper Basin-wide, characterization effort at other sites with limited information. This evaluation process would continue to be applied post-ROD Amendment to continue identification of sites or areas where no further action is required. This FSP provides guidance to field teams for the characterization of select mine and mill sites to determine if cleanup action is required. The FSP guides the following field activities:

- Physical site characterization
- Collection of soil samples from waste piles
- Collection of surface water samples from flowing adits

The rationale for the field investigation approach is described in the QAPP and associated DQOs (Appendix A).

1.0 Mine and Mill Site Locations

The Upper Basin mine and mill sites selected for review and potential characterization are located within five specific watersheds of the South Fork Coeur d’Alene River Basin. These watersheds include:

- Upper South Fork Coeur d’Alene River (SFCDR)
- Canyon Creek
- Ninemile Creek
- Mid-gradient SFCDR including Placer Creek
- Big Creek
- Moon Creek
- Pine Creek (East and West Forks)

A total of 95 mine and mill sites will be evaluated for inclusion into the focused characterization program. The evaluation process is discussed further in Section 2.0 below. These sites are presented by watershed in Table 1, and shown in Figures 1 through 8. The coordinates and known mining features associated with each site is also presented in Table 1.

2.0 Historical Review and Site Selection Process

A review of historical information will be conducted using various resources (BLM and IGS surveys, historical reports, and the Wallace District Mining Museum located in Wallace, Idaho) to provide a basis of knowledge of the mining history (i.e., ore production and mining activities) for each site. A review of each site will be conducted using decision criteria to establish a list of sites that will be included in the field characterized program. This decision criterion is shown in the flowchart below.

The site information is also necessary for the field teams to verify locations, to identify any changes in features from the previous record, and to identify features that may not be apparent due to vegetation growth, anthropogenic disturbance, or caving. Many years have elapsed since most sites have been systematically assessed or compared, so current information on their condition is undocumented. This information will be prepared concurrent with this FSP and provided to the field teams prior to mobilization to the field. It is anticipated that information contained in available historical records for many sites will be limited.
3.0 Schedule, Logistics, and Site Access

The focused characterization effort is anticipated to commence in early June 2011 for up to ten field days; however, the actual period of performance is uncertain and will be based on the quantity of snow remaining at these sites and general logistics for the nature of this effort.

The BLM, IDEQ, CH2M HILL, and the Coeur d’Alene Trust will staff the field effort with up to four field teams. Each team will consist of two people; one team member will be designated as field team leader (FTL). The FTL will be in charge of each team and responsible for making field decisions concerning collection of site information. The number of sites and specific locations for each field team will be identified prior to commencement of the field work and will be available following completion of the site selection process presented in Section 2.0.

Logistics of the field effort will be coordinated by EPA with the assistance of BLM, IDEQ, and CH2M HILL. Key logistical issues consist of access to the sites, including physical constraints and private property, availability and schedules of the field staff, laboratory coordination, and decision making for any deviations encountered.

Of the 95 total sites listed on Table 1, xx are on public property with public access, xx are on public property but require access through private property, and xx are on private property. Difficulty obtaining access to sites located on private property is anticipated. In the event that access is not obtained to a site, the site will be removed from the field characterization program.

4.0 Field Methods and Procedures

This section describes the methods and procedures that will be used to collect and document the physical site characterization and field sampling information.

4.1 Physical Site Characterization

The physical site characterization checklist is adapted from a U.S. Forest Service Field Questionnaire used to describe sites on National Forest lands and the IDEQ preliminary assessment checklist (REFERENCES). Physical site characterization will be conducted to document the general physical condition and characteristic of each site to identify any evidence of ore and/or mine development. The site characterization will also record features pertinent to determination of risk and the release (or threatened release) of hazardous substances from historic mining activities. Available historical information for each site will be used as a tool to verify the site locations as well as for identifying and evaluating mining related features. It is anticipated that many features may not be easily recognizable due to vegetation growth, anthropogenic disturbance, or caving.

Information that will be systematically documented at each site includes a general site description, evidence of past mining, exposure pathways, and receptors. Examples of each are provided below.
• **General site description**: current activity at site, access, proximity to road, proximity of residences, evidence of recreational use, vegetation, distance to water, etc.

• **Evidence of Mining Activity**: openings (adits, shafts, caved stopes), access restrictions (plugs, cages, fencing, caved ground), structures and process components, mine drainage (adit discharge or tailings pond outfall), volume and characteristics of mine/mill wastes (country rock, low grade ore piles, high grade ore piles, jig tailings, etc), and erosional or water management features (rills, gullies sediment basins, dams, etc.)

• **Exposure pathways**:
  - **Soil types**: evidence of country rock and/or mine-impacted soils
  - **Water features**: adit discharge, seeps, ponds, springs, proximity to streams (perennial and ephemeral), tailings pond outfall, groundwater wells and wetlands.

• **Receptors**: residents, workers, recreational users, downstream/downwind communities, and ecological.

This information will be documented using a combination of GPS, digital camera, and field notebooks/forms. Electronic documentation will be primary means of information collection. Trimble GPS units will be programmed with a project specific data dictionary. The physical characteristics of each site (both mining and non-mining) will be logged with the GPS. The type of GPS feature measure will depend on the characteristic. Adits or sampling locations will be logged as points, while the circumference of a waste pile will be logged using the area function. Additional information or notes (i.e., pile height, pile material, adit dimensions, etc.) can be entered into the GPS unit. It is anticipated that the GPS satellite signal may not be available at all sites. If this occurs, information will be collected in the field logbook and/or field forms. The standard field form is provided in Attachment 1. Example photographs of the Trimble GPS unit are also provided in Attachment 1.

Extensive color digital photographs will be taken during field activities to document all site information listed above. Pertinent observations related to each photo will be recorded in the field notebook.

### 4.2 Sample Collection and Field Measured Parameters

Sample collection will be determined following the physical site characterization. As stated above, the sites included in the scope of this characterization effort are currently in the preferred alternative of the Proposed Plan (USEPA, 2010) with a designated remedial action. Although source areas and subsequent remedial action have been identified for each site and documented in the FFS and Proposed Plan, available information for these sites is limited and does not fully support inclusion in the preferred alternative. Therefore, the purpose for this sampling program is to fill data gaps for these sites to provide rationale to retain or remove these sites from the preferred alternative.

Sources at each site are documented in the Proposed Plan and will be available to the field teams. However, due to the limited basis of knowledge for many of the sites, additional source areas should be anticipated. The following source materials may be sampled during implementation of this field effort:
• Mine water from adits.
• Mine waste piles.

4.2.1 Surface Water Sample Collection

Surface water samples will be collected to evaluate metal concentrations and subsequent ambient water quality criteria (AWQC) in mine water (adit or tailings pond flow) or water bodies that are impacted from mining wastes. The number of samples and locations are uncertain due to the lack of information for these sites. Samples will be submitted for laboratory analysis of total and dissolved CLP TAL metals and hardness.

Water samples will be collected using a non-metallic grab sampler and emptied into a churn sample splitter prior to containerization. Unfiltered samples should be transferred directly into a preserved sample container from the churn sample splitter. Filtered samples may be field-filtered using an inline or vacuum filter prior to containerization in a preserved sample container; or submitted to the analytical laboratory in a non-preserved container for filtration by the laboratory prior to analysis. Samples will be delivered to the TerraGraphics office in Kellogg, Idaho by the field team at the end of each day.

Flow measurement of each adit or stream will be conducted immediately following sample collection. Surface water sampling, streamflow measurements, computation of streamflow, and quality assurance procedures will follow the standardized USGS methods.

4.2.2 Soil Sample Collection

Soil samples will be collected to evaluate metal concentrations in waste piles. Varying sizes of waste piles consisting of varying types and sizes of material is expected. The condition and physical characteristics of each pile are uncertain. However, based on the decision criterion presented in Section 2.0, sites with piles are likely to consist of country rock and limited to no metaliferous rock.

Soil samples will be collected from all waste piles and submitted for laboratory analysis for CLP TAL metals. The number of samples and locations are uncertain until a determination is made for the sites to be included for field characterization (Section 2.0).

One composite sample consisting of 30 subsamples of equal volume will be collected from each waste pile using a stainless steel or plastic sampling implement. Subsamples will be uniformly spaced across the pile to maintain representativeness and will be collected from the waste pile surface to a maximum depth of one foot. Piles are expected to consist of a significant amount of coarse gravel and cobble. The size of material will determine whether a sample will be collected for laboratory analysis since analysis cannot be conducted with material greater than XX. Removal of material from the sample greater than xx in diameter will occur following collection of all subsamples. Subsamples will be thoroughly homogenized prior to containerization.

In the event that a coarse armoring layer is present on the surface of piles, the field team will remove this surface layer to potential identify smaller diameter material to sample. No samples will be collected if a pile consists of material greater than XX in diameter. Each
sample location will be located by GPS and photo-documented. Samples will be delivered to the TerraGraphics office in Kellogg, Idaho by the field team at the end of each day.

4.2.3 Use of Sample Containers and Preservatives

Sample container requirements for each requested analysis are summarized in Table 2. Sample containers will be purchased new by CH2M HILL and quality control-checked by the supplier. CH2M HILL will be responsible for obtaining the appropriate sampling containers prior to initiating sampling activities.

Sample preservation types are listed in Table 2. All surface water samples will be placed in a 1-L polyethylene sample bottle containing nitric acid. The pH of each sample bottle will be checked with pH paper to ensure that the pH is less than 2. If necessary, additional nitric acid will be added to bring the pH down to less than 2. Soil samples will be placed in an unpreserved 8-ounce glass jar. All samples will be cooled to 4 C.

4.3 Decontamination

Dedicated field equipment used during sampling activities will be decontaminated using the following procedure:

- Wash with non-phosphate detergent
- Rinse with deionized water
- Air dry

4.4 Investigation-Derived Wastes

Decontamination water is expected to be generated during this field effort. Decontamination water will be containerized and disposed of at the central treatment plant (CTP) located in Kellogg, Idaho at the conclusion of the field effort.

4.5 Documentation

The following subsections provide detail with respect to field forms, project notebooks, and chain of custody forms.

4.5.1 Sample Designation

A sample numbering scheme was developed to allow each sample to be uniquely identified and provides a means of tracking the sample from collection through analysis. The numbering scheme indicates the location and sample type. The unique sample number will be entered in the field notebook, GPS and or field sheet, COC forms, and other records documenting sampling activities.

The following field identification for sample numbering will have two components as follows:

ID-XX

Where:
ID = BLM ID (e.g., LOK017)

XX = Media (SS = soil sample, SW = surface water)

If multiple samples are collected at a single site, then the samples should be labeled in numerical order (e.g., LOK017-SS1, LOK017-SS2, etc.). Separate sample identification will be used for quality control (QC) samples and will have three components as follows:

QCZ-XX

Where:

QC = QC type (FD = field duplicate, EB = equipment blank)

Z = QC number in numerical order

XX = media (SS = soil sample, SW = surface water)

The location where the QC samples were collected will be documented in the field logbook and GPS.

4.5.2 Project Notebooks

Additional information will be recorded at the discretion of each FTL in field notebooks following the procedures listed in Section 3.1 of the QAPP. Each team will have a dedicated field notebook. Field notebook entry and custody procedures follow National Enforcement Investigation Center policies and procedures of the USEPA. The field notebook will be water-resistant, and all entries will be made in indelible ink. The field notebook will be used to document information not specific to the electronic documentation and/or which complements it. Language used shall be objective, factual, and free of personal opinions. Hypotheses for observed phenomena may be recorded; however, they must be clearly identified as such and only relate to the subject of observation. Field notebooks will become part of the permanent project record. Examples of typical field notebook entries include the following:

- Names of all field personnel onsite, including names and affiliation of any visitors
- Log of daily activities and significant events, including discussions resulting in pertinent field decisions
- General description of weather conditions
- Sample location, type, and depth
- Sample methodology and sample number
- Date and time of sample collection
- Sample collector
- Reference to photographs taken
- Field observations and descriptions of problems encountered or changes made to the original sampling plan
• QC sample (duplicate or blank) sample location and sampling method
• Field instrument calibration information
• Documentation of equipment decontamination
• Name, address, and telephone number of the contracted analytical laboratory
• Time arrived at and left site
• Signature of person making log entries and date, including initials on each page of the log book.

The FTL or designee will be responsible for the daily maintenance of all field records. Each page of the field notebook will be sequentially numbered, dated, and signed by the person making the entry. Corrections to the field notebook will be made by using a single strike mark through the entry to be corrected, then recording and initialing the correct entry. For corrections made later, the date of the correction will be noted. Unused portions of the pages will be crossed out, signed, and dated at the end of each day.

4.5.3 Chain-of-Custody Forms

Forms II Lite sample tracking will be utilized to manage sample documentation and tracking for all samples collected as part of the Upper Coeur d’Alene Basin Focused Characterization effort. Forms II Lite sample tracking will be executed in accordance with USEPA’s protocols. TerraGraphics will prepare the chain of custody forms using Forms II Lite.

Completed field quality assurance/quality control summary forms will be sent to the RSCC at USEPA’s Region X QAO at the conclusion of each sampling event.

4.6 Sample Management

The following section discusses various sample management procedures that will be followed during the performance of field activities. Included in these sections are procedures for sample packaging and transportation, sample labeling and sample documentation. TerraGraphics will perform all sample management activities.

4.6.1 Sample Containers

Immediately following sample collection, the filled sample bottles will be placed in plastic resealable bags, and placed in a cooler containing ice. All glass bottles will be bubble-wrapped prior to placement into the plastic bags.

4.6.2 Preparation of Sample Coolers

The following steps will be followed for preparation of sample coolers:

• Remove all previous labels from the cooler.
• Seal all drain plugs with tape (inside and outside).
• Place a cushioning layer of recyclable cornstarch popcorn or bubble wrap at the bottom of the cooler.
• Prepare double-bagged ice in resealable plastic bags.

### 4.6.3 Packing Samples in Coolers

The following steps will be followed for packing samples in coolers:

- Place the chain-of-custody form in a resealable plastic bag.
- Place samples in an upright position in the cooler.
- Fill the void space between samples with recyclable cornstarch popcorn (or equivalent), double-bagged ice, or bubble wrap.
- Place ice on top of and between the samples.
- Fill the remaining voids with recyclable cornstarch popcorn (or equivalent) or double-bagged ice.

### 4.6.4 Sealing the Cooler

Coolers will be packed with packing material surrounding the bottles to prevent breakage during transport. Ice will be sealed in plastic bags to prevent melting ice from soaking the packing material. Sample documentation will be enclosed in sealed plastic bags taped to the underside of the cooler lid. Coolers will be secured with packing tape and custody seals as described below.

- Tape the cooler lid with strapping tape, encircling the cooler several times.
- Place custody seals on two sides of the lid (one in front, and one on the side) and cover with tape to prevent inadvertent breaking of the seals.
- Place "This Side Up" arrows on the sides of the cooler.

### 4.6.5 Shipping the Cooler

The coolers will be shipped to the appropriate laboratory by overnight courier. If possible, samples will be shipped on the day of sample collection. Samples collected late in the day may be shipped on the following day.

If laboratory services are arranged through the USEPA’s QAO, the Region X Regional Sample Control Coordinator (RSCC) must be contacted at 206-553-4323 within 24 hours of sample shipment and be provided the following information:

- Sampling contractor’s name
- Site name
- Case number
- Total number(s) by concentration and matrix of samples shipped to each laboratory
- Carrier, air bill number(s), method of shipment (priority next day)
- Shipment date and intended laboratory receipt date
- Irregularities or anticipated problems associated with the samples
• Whether the current shipment is the final shipment or if additional samples will be shipped under the same case number

For Friday shipments, the RSCC or subcontract laboratory must be contacted prior to 12 noon Friday to coordinate sample shipments that will arrive on Saturday. Samples will only be shipped on Friday if the laboratory provides assurance that analytical holding times will not be exceeded.

4.6.6 Sample Labeling

Each sample container will be labeled using Forms II Lite produced labels. One label will be attached to each sample directly to the sample container. The following information will be included on each sample container label. Sample labels will be covered with clear plastic tape:

• Sample number
• Case number (if applicable)
• Type of analysis requested
• Preservative used
• Date and time collected

All sample numbers and locations (including blanks and duplicates) will be recorded in the field notebook.

4.7 Quality Control Sample Collection

QC samples will be collected or prepared to assist in determining data reliability. These QC samples include field duplicates, blank samples, and laboratory QC samples (for matrix spike [MS] and matrix spike duplicate [MSD] analyses). QC samples will be collected concurrent with and using the same procedures as the collection of the target or “normal” sample.

4.7.1 Field Duplicate Samples

The field duplicate is an independent sample collected as close as possible to the original sample from the same source and is used to document sampling precision. Duplicates will be labeled and packaged in the same manner as normal samples so that the laboratory cannot distinguish between normal samples and duplicates. Field duplicates for water samples will be collected by alternately filling sample and sample duplicate containers at a location of known or suspected contamination. Each duplicate will be taken using the same sampling and preservation method as other samples.

Field duplicates will be collected at minimum frequency of one in every 10 samples. Table 2 presents the number of field duplicate samples expected to be collected during the Bunker Creek Study.

4.7.2 Equipment Blank

An equipment blank is collected by pouring the appropriate water into the decontaminated sampling equipment or vessel, then transferring the water to the sample bottles. The same preservation methods, packaging, and sealing procedures as those used during collection of
normal samples will be used (including field-filtering if appropriate). Table 2 presents the number of equipment blank samples expected to be collected during the Mine and Mill Site Characterization effort. Equipment blanks will be collected daily at the end of the day where equipment is not dedicated. If dedicated equipment is being used, equipment blanks will not be collected.

4.7.3 Laboratory QC Samples

Laboratory QC samples will be collected to perform MS and MSD analyses. A matrix spike is an aliquot of a sample spiked with a known concentration of target analyte(s). An MS analysis provides a measure of the method accuracy. The MSD is a laboratory split sample of the MS and is used to determine the precision of the method.

Twice the normal sample volume will be collected for laboratory QC samples. Laboratory QC samples will be labeled as such on sample bottles and paperwork, and will be collected at a frequency of 1 in every 20 samples (or one per week, whichever is greater) collected. Table 3 presents the number of laboratory QC (MS/MSD) samples expected to be collected during the Bunker Creek Study.

4.7.4 Temperature Blanks

Temperature blanks will be included with each cooler shipment containing samples (regardless of targeted analysis) sent to the laboratory. A temperature blank consists of a sample vial filled in the field with de-ionized water, handled like an environmental sample, and returned to the laboratory for analysis. The temperature blank provides a means of verifying that samples have been maintained at the proper temperature (4 °C) following collection and during transport to the laboratory.

4.0 References
Tables
Figures