WORK PLAN FOR
REMOVAL OF ASBESTOS-CONTAINING VERMICULITE WASTE NEAR THE "AMPHITHEATER" AT LIBBY ASBESTOS SUPERFUND SITE OU3

PART B

SAMPLING AND ANALYSIS PLAN/

QUALITY ASSURANCE PROJECT PLAN

PREPARED FOR AND WITH OVERSIGHT BY:

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION 8

SEPTEMBER 14, 2012

PREPARED BY:

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SAP/QAPP FOR OU3, LIBBY ASBESTOS SUPERFUND SITE

REMOVAL OF ASBESTOS-CONTAINING VERMICULITE WASTE NEAR THE "AMPHITHEATER" AT LIBBY ASBESTOS SUPERFUND SITE OU3

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The SAP/QAPP for Removal of Asbestos-Containing Vermiculite Waste near the "Amphitheater" at Libby Asbestos Superfund Site OU3 is approved for implementation without conditions.

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Appendix B Record of Modification Forms

Appendix C Field Sample Data Sheets (FSDS) Forms **

Appendix D Chain of Custody (COC) Form **

Appendix E Analytical Requirements Sheet [OU3AMP-0912]

**The most recent versions of field SOPs, FSDS forms, and COC forms are provided electronically in the OU3 eRoom (*https://team.cdm.com/eRoom/mt/LibbyOU3*). The most recent versions of laboratory and data verification SOPs are provided electronically in the Libby Lab eRoom (*https://team.cdm.com/eRoom/mt/LibbyLab*).

LIST OF ABBREVIATIONS AND ACRONYMS

Ago	area of a grid opening
AOC	Administrative Order on Consent
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHISQ	chi-squared
CI	confidence interval
COC	chain-of-custody
DQO	data quality objective
ED	exposure duration
EDD	electronic data deliverable
EDS	energy dispersive spectroscopy
EF	exposure frequency
EPC	exposure point concentration
EPA	U.S. Environmental Protection Agency
ET	exposure time
F	fibers
f	indirect preparation dilution factor
FSDS	field sample data sheet
FTL	field team leader
GPS	global positioning system
GOx	number of grid openings examined
H&S	health and safety
HASP	health and safety plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	high-efficiency particulate air
HQ	hazard quotient
HV	high volume
ID	identification
IDW	investigation derived waste
ISO	International Organization for Standardization
KDC	Kootenai Development Corporation
L/cc	liters per cubic centimeter
LA	Libby amphibole
LC	laboratory coordinator
MCL	maximum contaminant level

MDEQ	Montana Department of Environmental Quality
mm	millimeter
MWH	MWH Americas, Inc.
N	number of asbestos structures counted
NIOSH	National Institute of Occupational Safety and Health
NIST	National Institute of Standards and Technology
NVLAP	National Voluntary Laboratory Accreditation Program
NYSDOH	New York State Department of Health
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OU	operable unit
PCM	phase contrast microscopy
PCME	PCM-equivalent
PDF	portable document format
PE	performance evaluation
PLM	polarized light microscopy
PLM-VE	polarized light microscopy visual estimation
PLM-Grav	polarized light microscopy gravimetric
PPE	personal protective equipment
PRI-ER	Project Resources, Inc. - Environmental Restoration
QA	quality assurance
QAM	quality assurance manager
QAPP	quality assurance project plan
QA/QC	quality assurance/quality control
QATS	Quality Assurance Technical Support
QC	quality control
RBC	risk-based concentration
RfC	reference concentration
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
ROM	record of modification
RPM	remedial project manager
SAP	sampling and analysis plan
s/cc	structures per cubic centimeter
SOP	standard operating procedure
SPF	sample preparation facility
SRM	standard reference material
TAS	target analytical sensitivity

TWFc	cancer time weighting factor
TWFnc	non-cancer time weighting factor
µm	microns
USGS	United States Geological Survey
V	volume
%	percent
±	plus or minus
95UCL	95% upper confidence limit

SECTION 1 PROJECT OVERVIEW

1.1 PURPOSE OF THIS DOCUMENT

Part A of the *Work Plan for Removal of Asbestos-Containing Vermiculite Waste near the "Amphitheater" at the Libby Asbestos Superfund Site, OU3* (the Work Plan) covers site preparation, removal and disposal of wastes, characterization sampling and site restoration. Part B of the Work Plan (this document) contains the elements required for both a sampling and analysis plan (SAP) and quality assurance project plan (QAPP). This SAP/QAPP describes data collection efforts that will be conducted during removal of asbestos-containing vermiculite waste near the "Amphitheater" at Operable Unit 3 (OU3) of the Libby Asbestos Superfund Site (the Site).

This SAP/QAPP has been developed in basic accordance with the U.S. Environmental Protection Agency (EPA) *Requirements for Quality Assurance Project Plans, EPA QA/R-5* (EPA 2001) and the *Guidance on Systematic Planning Using the Data Quality Objectives Process – EPA QA/G4* (EPA 2006). While this SAP/QAPP is organized differently than the recommended structure in the QA/R-5 guidance, all the required QAPP elements are presented. **Table 1-1** provides a cross-reference where information for each QA/R-5 element is located in this SAP/QAPP. This document is organized as follows:

Section 1 – Project Overview

Section 2 – Background and Problem Definition

Section 3 – Data Quality Objectives

Section 4 – Sampling Program

Section 5 – Sample Preparation and Analysis Requirements

Section 6 – Quality Assurance/Quality Control

Section 7 – Data Management

Section 8 – Assessment and Oversight

Section 9 – Data Validation and Usability

Section 10 – References

All cited tables, figures, and appendices are located at the end of this document, or are provided electronically in the Site eRooms. This SAP/QAPP has been adapted from the previously-issued SAP/QAPP for Phase V remedial investigation activities at OU3 (EPA 2012d).

1.2 PROJECT MANAGEMENT AND ORGANIZATION

Figure 1-1 presents an organizational chart that illustrates the lines of authority and communication between the agencies and contractors for this project. The following sections summarize the entities and individuals that will be responsible for providing project management, Work Plan development, field sampling support, on-site field coordination, laboratory support, data management, and quality assurance for this project.

1.2.1 Project Management

The EPA is the lead regulatory agency for Superfund activities within OU3. The EPA Remedial Project Manager (RPM) for OU3 is Christina Progess, EPA Region 8. Ms. Progess is a principal data user and decision-maker for Superfund activities within OU3.

The Montana Department of Environmental Quality (MDEQ) is the support regulatory agency for Superfund activities within OU3. The MDEQ Project Manager for OU3 is John Podolinsky. The EPA will consult with MDEQ as provided for by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the National Contingency Plan, and applicable guidance in conducting Superfund activities within OU3.

The EPA has entered into an Administrative Settlement Agreement and Order on Consent (AOC) with Respondents W.R. Grace & Co.-Conn. and Kootenai Development Corporation (collectively Grace) for the removal of asbestos-containing vermiculite waste near the "Amphitheater" at OU3 of the Libby Asbestos Site. Under the terms of the AOC, Grace will implement this Work Plan. The designated Project Coordinator for Grace is Robert Medler of Remedium Group, Inc. (Remedium). Remedium has chosen the following subcontractors to implement this Work Plan:

- MWH Americas, Inc. (MWH)
- Chapman Construction, Inc.

1.2.2 SAP/QAPP Development

This SAP/QAPP was developed by MWH Americas, Inc. (MWH) at the direction of Remedium and with oversight by the EPA. As noted, the copies of the entire Work Plan will be distributed by MWH (or their designee), either in hard copy or in electronic format, as indicated in the distribution list. MWH (or their designee) will distribute updated copies or addenda each time a Work Plan revision occurs. A copy of the final, signed Work Plan (and any subsequent revisions) will also be posted to the OU3 website[a] and the OU3 eRoom[b].

1.2.3 Field Sampling Support

All field sampling activities described in this SAP/QAPP will be performed by Grace, in strict accordance with the sampling plans contained herein. Grace will be supported in this field work by MWH and by their subcontractor Chapman Construction, Inc. Individuals responsible for implementation of field sampling activities in this SAP/QAPP are listed below:

- MWH Project Manager: John Garr
- MWH Field Team Leaders: Joan Kester/Bill Bragdon
- MWH Field Data Quality Control Officer: Betty Van Pelt

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[a] http://cbec.srcinc.com/libby/
[b] https://team.cdm.com/eRoom/mt/LibbyOU3

- MWH Quality Control Officer: Mike DeDen

1.2.4 On-Site Field Coordination

Access to the mine and other areas of OU3 via Rainy Creek Road is currently restricted and is controlled by the EPA. The on-site point of contact for access to the mine is Rob Burton of Project Resources, Inc. - Environmental Restoration (PRI-ER):

Rob.burton@priworld.com

(406) 293-3690

1.2.5 Laboratory Support

Soil characterization samples for asbestos analysis will be prepared (dried, sieved, ground) at the Sample Preparation Facility (SPF) in Troy, Montana. The SPF is managed by the EPA Environmental Services Assistance Team contractor, TechLaw, Inc. After preparation, the samples will be shipped to Materials Analytical Services, LLC (MAS) in Suwanee, Georgia for LA analysis by polarized light microscopy (PLM) using visual area estimation (PLM-VE) according to the Libby-specific analysis methods.

1.2.6 Data Management

Administration of the master database for OU3 will be performed by EPA contractors. The primary database administrator will be Lynn Woodbury (CDM Smith). The database administrator (or their designee) will be responsible for sample tracking, uploading new data, performing data verification and error checks to identify incorrect, inconsistent or missing data, and ensuring that all questionable data are checked and corrected as needed. When the OU3 database has been populated, checked, and validated, relevant asbestos data will be transferred into a Libby Asbestos Site database as directed by the EPA for final storage.

1.2.7 Quality Assurance

There is no individual designated as the EPA Quality Assurance Manager for the Libby project. Rather, the Region 8 quality assurance (QA) program has delegated authority to the EPA RPMs. This means that the EPA RPMs have the ability to review and approve governing investigation documents developed by Site contractors. Thus, it is the responsibility of the EPA RPM for OU3, who is independent of the entities planning and obtaining the data, to ensure that this SAP/QAPP has been prepared in accordance with the EPA QA guidelines and requirements. The EPA RPM is also responsible for managing and overseeing all aspects of the quality assurance/quality control (QA/QC) program for OU3. In this regard, the EPA RPM is supported by the EPA Quality Assurance Technical Support (QATS) contractor, Shaw Environmental, Inc. (Shaw). The QATS contractor will evaluate and monitor QA/QC sampling and is responsible for performing annual audits of each analytical laboratory. In addition, HDR Engineering, Inc. has been contracted by the EPA to provide oversight of field sampling and data collection activities.

SECTION 2 BACKGROUND AND PROBLEM FORMULATION

2.1 SITE DESCRIPTION

Libby is a community in northwestern Montana that is located near a large open-pit vermiculite mine. Vermiculite from the mine at Libby is known to contain amphibole asbestos that includes several different mineralogical classifications. For the purposes of the EPA investigations at the Libby Asbestos Superfund Site, this mixture is referred to as Libby amphibole (LA).

Historic mining, milling, and processing of vermiculite at the site are known to have caused releases of vermiculite and LA to the environment. Inhalation of LA associated with the vermiculite is known to have caused a range of adverse health effects in exposed humans, including workers at the mine and processing facilities (Amandus and Wheeler 1987, McDonald *et al.* 1986, McDonald *et al.* 2004, Sullivan 2007, Rohs *et al.* 2007), as well as some residents of Libby (Peipins *et al.* 2003). Based on these adverse effects, the EPA listed the Libby Asbestos Site on the National Priorities List in October 2002.

Starting in 2000, the EPA began conducting a range of cleanup actions at the site to eliminate sources of LA exposure to area residents and workers using CERCLA (or Superfund) authority. Given the size and complexity of the Libby Asbestos Site, the EPA designated a number of OUs. This document focuses on investigations at OU3. OU3 includes the property in and around the former vermiculite mine and the forested areas surrounding the mine that have been affected by releases and subsequent migration of hazardous substances and/or pollutants or contaminants from the mine, including ponds, Rainy Creek, Carney Creek, Fleetwood Creek, and the Kootenai River. Rainy Creek Road is also included in OU3.

Figure 2-1 shows the location of the mine and a preliminary study area boundary for OU3. The EPA established the preliminary study area boundary for the purpose of planning and developing the scope of the RI/FS for OU3. This study area boundary may be revised as data are obtained during the RI for OU3 on the nature and extent of environmental contamination associated with releases that may have occurred from the mine site. The final boundary of OU3 will be defined by the final EPA-approved RI/FS.

2.2 BASIS FOR CONCERN AT OU3

The EPA is concerned with environmental contamination in OU3 because the area is used by humans for a variety of recreational and occupational activities, and also because the area is habitat for a wide range of ecological receptors (both aquatic and terrestrial).

2.3 SCOPE AND STRATEGY OF THE REMOVAL OF ASBESTOS-CONTAINING VERMICULITE WASTE NEAR THE "AMPHITHEATER" AT LIBBY ASBESTOS SUPERFUND SITE OU3

Grace will perform a removal action in OU3 under EPA oversight to remove recently-discovered asbestos-containing vermiculite waste below the "Amphitheater" and in the vicinity of a portion of Rainy Creek (see **Figure 3-2**).

The removal action will be performed in a single phase of work, contingent on timing of approvals for project documents and as weather permits. The removal action is expected to be complete within 60 to 90 days of notice to proceed.

2.4 SUMMARY OF EXISTING DATA

While considering various alignments for re-routing Rainy Creek as part of a preliminary evaluation of potential site remediation scenarios, asbestos-containing vermiculite waste was discovered in October 2011 south of the "Amphitheater" at OU3. The Amphitheater is a portion of the site used by EPA for staging soil removed from OU4 (the town of Libby) before it is transported to the top of the former mine for disposal.

As discovered during subsequent investigation in October 2011, the size of the waste material ranges up to 7 mm in diameter and is covered by vegetation. The material is present over approximately five acres below the Amphitheater, north and south of the Rainy Creek channel. Based on a few widely-spaced shovel-dug potholes, the estimated average thickness of the vermiculite is about 12 inches. Assuming these estimates, the volume of the vermiculite waste material is about 8,100 cubic yards.

The waste-covered area is outside the naturally-occurring vermiculite mine deposit and it is obvious the material has been crushed and screened. The material is purported to be sediments dredged from the bottom of nearby Mill Pond (see **Figure 3-2**) that were periodically spread out on the area below the current Amphitheater area.

Laboratory analysis (by PLM in accordance with National Institute of Occupational Safety and Health [NIOSH] Method 9002, Issue 2) of three grab samples of the vermiculite waste revealed it contains 3% to 4 % LA. Analysis was performed by EMSL Analytical, Inc. in Libby. Sample chain-of-custody and laboratory analytical reports are in Attachment 1 of Part A of the Work Plan for Removal of Asbestos-Containing Vermiculite Waste near the "Amphitheater" at Libby Asbestos Superfund Site OU3.

Further investigation of the nature, thickness, and extent of the vermiculite waste was performed in July 2012. A tire-mounted backhoe was used to excavate 19 test pits across the affected area. Two basic types of waste were found in the test pits: a coarse-grained, greenish-black material (primarily located north of Rainy Creek), and a fine, powdery bronze material most prevalent south of Rainy Creek. Waste thickness ranges from less than one inch near the margins to more than 3 feet in berms and piles on the area south of Rainy Creek.

SECTION 3 DATA QUALITY OBJECTIVES

3.1 OVERVIEW OF THE PROCESS

Data quality objectives (DQOs) define the type, quality, quantity, purpose, and intended uses of data to be collected (EPA 2006). The design of a study is closely tied to its DQOs, which serve as the basis for important decisions regarding key design features such as the number and location of samples to be collected and the analyses to be performed. In brief, the DQO process typically follows a seven-step procedure, as follows:

1. State the problem that the study is designed to address
2. Identify the decisions to be made with the data obtained
3. Identify the types of data inputs needed to make the decision
4. Define the bounds (in space and time) of the study
5. Define the decision rule which will be used to make decisions
6. Define the acceptable limits on decision errors
7. Optimize the design using information identified in Steps 1-6

Following these seven steps helps ensure that the project plan is carefully thought out and that the data collected will provide sufficient information to support the key decisions which must be made.

3.2 DATA QUALITY OBJECTIVES FOR SAMPLE COLLECTION

3.2.1 State the Problem

Vermiculite is spread across approximately 5 acres of flat canyon floor immediately south of the Amphitheater. Because the vermiculite waste contains LA, it is possible the material may enter Rainy Creek (which bisects the waste-covered area) and increase the concentration of LA in lower Rainy Creek water. Because there are no current controls in-place to contain the waste material and prevent its transport through erosion or wind, removal of the vermiculite waste will eliminate this potential source of LA contamination in lower Rainy Creek. Data are needed to document the nature and extent of post-removal LA concentrations in the soil beneath the vermiculite waste after removal has been completed.

3.2.2 Identify the Goal of the Removal Action

The goal of the removal action is to remove the vermiculite waste from the defined work area and to restore the area such that drainage and erosion are controlled by topography and vegetation. Removal of the vermiculite waste will eliminate a potential ongoing source of LA contamination to lower Rainy Creek; the removal and site restoration will also protect Rainy Creek from uncontrolled erosion and siltation and will thus improve and protect the environmental quality of the creek. The goal of this sampling effort is to provide data on LA concentrations in soil following the removal effort to document the levels of LA that may remain in soils post-removal.

3.2.3 Identify the Types of Data Needed

Soil Data

Reliable and representative measurements of LA concentrations are needed to document post-removal LA concentrations in the underlying soil beneath the vermiculite waste.

Target Analyte

Samples of underlying soil will be collected after waste removal and will be analyzed for LA using PLM according to the Libby-specific analytical SOPs, under standard turn-around time.

3.2.4 Define the Bounds of the Removal Action

Spatial Bounds

Figure 1 of the Work Plan, Part A depicts the estimated bounds of the removal action which was determined based on field observation and examination of test pits. The boundaries may change based on field findings during waste removal. The work will be completed in 30-60 days.

3.2.5 Define the Analytic Approach

Reliable and representative measurements of LA concentrations are needed to document post-removal LA concentrations in the underlying soil beneath the vermiculite waste. Because the contrasting characteristics of the vermiculite waste and the underlying soil are obvious and clear guides to waste removal, the results will not be used as confirmation samples. Rather, the characterization samples will document the LA concentration in the underlying soil, if any.

3.2.6 Define the Acceptable Limits on Decision Errors

No acceptable limits on decision errors is necessary because the concentrations of LA in underlying soil at the waste removal site are for characterization and documentation only and will not be used for decision-making. Sample collection will be one 30-point composite sample per gridded cell of approximately 15,000 sq. ft.

3.2.7 Optimize the Design

Sampling design considerations needed to optimize the characterization of LA concentrations in underlying soil at the waste removal site are provided in Section 4.

SECTION 4 SAMPLING PROGRAM

Soil collection activities within OU3 described in this SAP/QAPP will be performed by personnel who are properly trained in the field methods and the experimental sampling design details presented below. The field sampling teams will follow procedures in the OU3-specific Health and Safety Plan (HASP) prepared by MWH.

4.1 SOIL SAMPLING STUDY DESIGN

4.1.1 Sampling Locations

Once the removal action has been completed, the area will be gridded into cells approximately 125 feet square (15,625 square feet; about one-third of an acre). Soil characterization samples will be 30-point composites collected at approximately equidistant from each other and representative of each cell.

4.1.2 Sampling Frequency

One 30-point composite characterization soil sample will be collected from each of approximately 15 cells.

4.1.3 Study Variables

Levels of LA in soil will likely vary across the area of underlying soil that is exposed. Soil samples will be collected as 30-point composite samples to ensure that the soil results will account for spatial variability in LA concentrations in the cells.

4.1.4 Critical Measurements

A critical measurement associated with this project is the measurement of the concentration of LA in soil, as determined by the Libby-specific PLM methods. In addition, at the Site, the visual presence of vermiculite has been shown to be an effective tool for determining the presence of LA in soil. Thus, visual estimates of vermiculite content of soil will be performed using Libby-specific SOP CDM-LIBBY-06.

A memorandum by Mark Nelson, P.G. from CDM, summarizes his field observations of test pits in the waste area on August 8, 2012 and describes the contrast between waste material and underlying soil which will be used to delineate the depth to which the excavation will extend. Photo documentation of this boundary will be provided.

4.1.5 Data Reduction and Interpretation

LA concentrations in soil samples collected as part of the removal action will be used to document the underlying soil conditions in the area beneath the waste and serve as final bounds of the removal. As-built maps will be provided showing concentrations and locations where samples were taken. Maps will include actual lateral extent of excavation.

4.2 SOIL SAMPLE COLLECTION METHODS

Soil samples will be collected, handled, and documented in basic accordance with the procedures specified in OU3-specific SOP No. 1, *Soil Sampling for Non-Volatile Organic Compound Analysis* (see **Appendix A**), with the following project-specific modifications:

- It is recognized that this SOP is for soil sampling, but the basic sampling methods are applicable to the collection of exposed soils.
- Each composite soil sample will comprise 30 individual sampling points that are approximately equidistant from each other and representative of the 15,000 sq. ft. cell.
- At each sampling point, collect approximately 50 grams of material. The total mass of soil material for the composite sample should fill about 1/3 of a gallon-sized zip-top bag.
- The amount of visible vermiculite at each of the 30 sub-locations should be recorded on the field sample data sheet (FSDS) form by field sampling personnel using the principles outlined in SOP CDM-LIBBY-06, *Semi-Quantitative Visual Estimation of Vermiculite in Soils at Residential and Commercial Properties* (see **Appendix A)**. Visible vermiculite will be noted as a presence or absence (number of visible inspection points with vermiculite present and the number of visible inspection points without vermiculite) rather than as the number of points with low, medium, and high amounts of vermiculite in each inspection point as required by SOP CDM-LIBBY-06.

4.3 GLOBAL POSITIONING SYSTEM COORDINATE COLLECTION

The global positioning system (GPS) coordinates will be recorded for each sampling station/cell center point in basic accordance with the procedures specified in OU3-specific SOP No. 11, *GPS Data Collection* (see **Appendix A**). If necessary, any changes in existing sampling stations should be documented in the field logbook and new GPS coordinates should recorded. If any sampling stations become inaccessible, this information should be documented in the field logbook.

4.4 EQUIPMENT DECONTAMINATION

Dedicated sampling equipment will be used to collect the soil characterization samples, thus, no decontamination will be required. Spent sampling equipment will be disposed as investigation-derived waste (IDW).

4.5 HANDLING INVESTIGATION-DERIVED WASTE

Any disposable equipment or other IDW will be handled in basic accordance with the procedures specified in OU3-specific SOP No. 12, *IDW Management* (see **Appendix A**).

4.6 INVENTORY AND PROCUREMENT OF EQUIPMENT AND SUPPLIES

Prior to initiation of any sampling activities, it is the responsibility of the field team leader (FTL) to review the respective SOPs (see **Appendix A**) and determine the equipment and supplies that

are necessary to conduct sampling activities. The FTL will check the field equipment/supply inventory and procure any additional equipment and supplies that are not already contained in the field equipment supply inventory.

The following list summarizes the general equipment and supplies that will be required for most of the studies:

- *Sampling equipment* – See Section 4.4 for sample collection SOPs and sampling equipment lists.
- *Field logbook* – Used to document field sampling activities and any problems in sample collection or deviations from this SAP/QAPP. See Section 4.7.1 for standard procedures for field logbooks.
- *Field sample data sheets (FSDSs)* – FSDSs are medium-specific forms that are used to document sample details (i.e., sampling location, sample number, medium, field QC type, etc.). See Section 4.7.1 for standard procedures for the completion of FSDSs. Libby Soil-Like Sample & Location FSDS will be used.
- *Sample number labels*– Sample numbers are sequential numbers with investigation-specific prefixes. Sample number labels are pre-printed and checked out to the field teams by the FTL (or their designee). To avoid potential transcription errors in the field, multiple labels of the same sample number are prepared – one label is affixed to the collected sample, one label is affixed to the FSDS. Labels may also be affixed to the field logbook or other field documentation forms. See Section 4.7.1 for standard procedures for the completion of FSDSs.
- *Indelible ink pen, permanent marker* – Indelible ink pens are used to complete required manual data entry of information on the FSDS and in the field logbook (pencil may not be used). Permanent markers may be used to write sample numbers on the sample container if pre-printed labels are not available.
- *Personal protective equipment (PPE)* - As required by the HASP.
- *Digital camera* – Used to document sampling locations and conditions.
- *Global positioning system (GPS) unit, measuring wheel, stakes* – Used to identify and mark sampling locations. See Section 4.3 for standard procedures in GPS documentation.

4.7 SAMPLE HANDLING AND CUSTODY

4.7.1 Sample Identification and Documentation

Sample Labels

Samples will be labeled with sample identification (ID) numbers supplied by field administrative staff and will be signed out by the sampling teams. Labels will be affixed on the outside of both the inner and outer zip-top bags for soil samples.

Sample ID numbers will identify the samples collected during this sampling investigation using the following format:

VW-1####

where:

VW-1 = Prefix that designates samples collected under this Vermiculite Waste Removal Action

= A sequential four-digit number

Field Documentation

Field teams will record sample information on the most current version of the OU3-specific field sample data sheet (FSDS) for each collected soil sample (see **Appendix C**) in accordance with the procedures specified in OU3-specific SOP No. 9, *Field Documentation* (see **Appendix A**).

The field logbook is an accounting of activities at the Site and will duly note problems or deviations from the governing SAP/QAPP or SOPs. Separate field logbooks will be kept for each study and the cover of each field logbook will clearly indicate the name of the associated study. Field logbooks will be completed prior to leaving a sampling location. Field logbooks will be checked for completeness on a daily basis by the FTL (or their designee) for the first week of each study. When incorrect field logbook completion procedures are discovered during these checks, the errors will be discussed with the author of the entry and corrected. Erroneous information recorded in a field logbook will be corrected with a single line strikeout, initial, and date. The correct information will be entered in close proximity to the erroneous entry.

4.7.2 Field Sample Custody

Field sample custody will follow the requirements specified in OU3-specific SOP No. 9 (see **Appendix A**). In brief, all teams will ensure that samples, while in their possession, are maintained in a secure manner to prevent tampering, damage, or loss. All samples and FSDSs will be relinquished by field staff to the field sample coordinator or a designated secure sample storage location at the end of each day.

4.7.3 Chain-of-Custody Requirements

The chain-of-custody (COC) record is employed as physical evidence of sample custody and control. This record system provides the means to identify, track, and monitor each individual sample from the point of collection through final data reporting. A completed COC record is required to accompany each shipment of samples. Sample custody will be maintained until final disposition of the samples by the laboratory and acceptance of analytical results by the EPA.

The field sample coordinator will prepare a hard copy COC form using the 3-page carbon copy forms developed specifically for use in this investigation (see **Appendix D**). The bottom copy of the COC will be retained by the field sample coordinator and the other two copies of the COC will accompany the sample shipment.

If any errors are found on a COC after shipment, the hard copy of the COC retained by the field sample coordinator will be corrected and a corrected COC will be provided to the laboratory coordinator (LC) for distribution to the appropriate laboratory.

4.7.4 Sample Packaging and Shipping

Samples will be packaged and shipped in basic accordance with the procedures specified in OU3-specific SOP No. 8, *Sample Handling and Shipping* (see **Appendix A**). In brief, samples

will be hand-delivered to the facility or laboratory, picked up by a delivery service courier, or shipped by a delivery service to the designated facility or laboratory, as applicable. For samples requiring shipment, prior to sealing the shipping container, the field sample coordinator will complete the bottom of the COC record and retain the bottom copy of the COC record for the project record. The LC will instruct the field sample coordinator as to the appropriate laboratory for each sample shipment.

4.7.5 Holding Times

In general, there are no holding time requirements for asbestos and the soil characterization samples will not require special preservation prior to delivery to the laboratory.

SECTION 5 SAMPLE PREPARATION AND ANALYSIS REQUIREMENTS

5.1 SOIL METHODS AND REQUIREMENTS

5.1.1 Sample Preparation

All soil samples collected for asbestos analysis will be transmitted to the SPF located in Troy, MT. Samples will be prepared in accordance with Libby-specific SOP ISSI-LIBBY-01. In brief, the raw soil sample is dried and then split into two aliquots. One aliquot is placed into archive, and the other aliquot is sieved into coarse (> ¼ inch) and fine fractions. The fine fraction is ground to reduce particles to a diameter of 250 µm or less and this fine-ground portion is split into 4 aliquots.

5.1.2 Sample Analysis

Each soil sample will be analyzed for LA in accordance with Libby-specific SOPs. The coarse fraction (if any) will be examined using stereomicroscopy, and any particles of LA will be removed and weighed in accordance with SOP SRC-LIBBY-01, referred to as "PLM-Grav". One of the fine ground fraction aliquots will be analyzed by PLM using the visual estimation method in accordance with SOP SRC-LIBBY-03, referred to as "PLM-VE". Mass fraction estimates of LA and optical property details will be recorded on the Libby site-specific laboratory bench sheets and electronic data deliverable (EDD) spreadsheets.

5.2 DATA REPORTING

5.2.1 Soil Preparation Facility

Samples will be prepared at the Troy SPF. At the SPF, a local SPF Scribe database is used to track specific information associated with the soil sample preparation process. SPF personnel perform data entry of preparation information from the sample drying and preparation log sheets into an Excel spreadsheet. Preparation data are then uploaded from this spreadsheet into the local SPF Scribe database. Soil sample preparation information will be published to Scribe.NET regularly from the local SPF Scribe project database by the SPF sample coordinator.

5.2.2 Analytical Laboratories

Analytical results will be recorded and results transmitted using the Libby-specific EDD spreadsheets for PLM-VE and PLM-Grav results. Standard project data reporting requirements will be met for this dataset. Upon completion of the appropriate analyses, EDDs will be posted to the Libby OU3 eRoom within the appropriate turn-around time. Hard copies of all analytical laboratory data packages will be scanned and posted as a portable document format (PDF) to the Libby OU3 eRoom. File names for scanned analytical laboratory data packages will include the laboratory name and the job number to facilitate document organization (e.g., LabX_12345-A.pdf).

5.3 ANALYTICAL TURNAROUND TIME

Analytical turnaround time will be negotiated between the LC and the laboratory, with direction from the EPA RPM. It is anticipated that a turnaround time of 2-3 weeks is acceptable for most samples. This may be revised as determined necessary by the EPA.

5.4 CUSTODY PROCEDURES

5.4.1 Soil Preparation Facility

Samples will be prepared at the Troy SPF. At the SPF, the local SPF Scribe project database is used by the SPF sample coordinator or the ESAT project data manager to prepare an electronic COC. One hard copy of the COC will be generated from the electronic COC and will accompany the sample shipment. The SPF sample coordinator will note the analytical priority level for the samples (based on consultation with the LC) at the top of the COC. The SPF will sign and date the COC and make a copy for the SPF project file. Information on the COC number and analytical laboratory to which the soil samples were shipped is managed in a spreadsheet maintained by the SPF sample coordinator (or their designee). A copy of this spreadsheet is posted regularly to the Libby Laboratory eRoom.

If any errors are found on a COC after shipment to the analytical laboratory, the hard copy of the COC retained by the SPF sample coordinator will be corrected with a single strikeout, initial, and date. A copy of the corrected COC will be provided to the LC for distribution to the appropriate laboratory. It is the responsibility of the SPF sample coordinator to make any corrections to the local SPF Scribe project database and publish the corrected data to Scribe.NET.

5.4.2 Analytical Laboratories

Specific laboratory custody procedures are provided in each laboratory's *Quality Assurance Management Plan*, which have been independently reviewed at the time of laboratory procurement. While specific laboratory sample custody procedures may differ between laboratories, the basic laboratory sample custody process is described briefly below.

Upon receipt at the laboratory, each sample shipment will be inspected to assess the condition of the shipment and the individual samples. This inspection will include verifying sample integrity. The accompanying COC record will be cross-referenced with all of the samples in the shipment. The laboratory sample coordinator will sign the COC record, email a copy of the final signed COC to the SPF sample coordinator and the appropriate project data manager, and maintain a copy for their project files.

Depending upon the laboratory-specific tracking procedures, the laboratory sample coordinator may assign a unique laboratory identification number to each sample on the COC. This number, if assigned, will identify the sample through all further handling at the laboratory. It is the responsibility of the laboratory manager to ensure that internal logbooks and records are maintained throughout sample preparation, analysis, and data reporting.

5.5 ARCHIVING AND FINAL DISPOSITION

All samples and grids will be maintained in storage at the analytical laboratory unless otherwise directed by the EPA. When authorized by the EPA, the laboratory will be responsible for proper disposal of any remaining samples, sample containers, shipping containers, and packing materials in accordance with sound environmental practice, based on the sample analytical results. The laboratory will maintain proper records of waste disposal methods, and will have disposal company contracts on file for inspection.

SECTION 6 QUALITY ASSURANCE/QUALITY CONTROL

6.1 FIELD

Field quality assurance/quality control (QA/QC) activities include all processes and procedures that have been designed to ensure that field samples are collected and documented properly, and that any issues/deficiencies associated with field data collection or sample processing are quickly identified and rectified. The following sections describe each of the components of the field QA/QC program implemented at the Site.

6.1.1 Field Team Training

Asbestos is a hazardous substance that can increase the risk of cancer and serious non-cancer effects in people who are exposed by inhalation. Therefore, all individuals involved in the collection, packaging, and shipment of samples must have appropriate training. Prior to starting any field work, any new field team member must complete the following, at a minimum:

Training Requirement	Location of Documentation Specifying Training Requirement Completion
Read and understand the governing Health and Safety Plan (HASP)	HASP signature sheet
Attend an orientation session with the field Health and Safety (H&S) manager	Orientation session attendance sheet
Occupational Safety and Health Administration (OSHA) 40-Hour Hazardous Waste Operations and Emergency Response (HAZWOPER) and relevant 8-hour refreshers	OSHA training certificates
Current 40-hour HAZWOPER medical clearance	Physician letter in the field personnel files
Respiratory protection training, as required by 29 CFR 1910.134	Training certificate
Asbestos awareness training, as required by 29 CFR 1910.1001	Training certificate
Sample collection techniques	Orientation session attendance sheet

It is the responsibility of the field H&S manager to ensure that all training documentation is up-to-date and on-file for each field team member.

A field readiness review meeting will be conducted prior to beginning field sampling activities, to discuss and clarify the following:

- Objectives and scope of the fieldwork
- Equipment and training needs

- Field operating procedures, schedules of events, and individual assignments
- Required QC measures
- Health and safety requirements

It is the responsibility of each field team member to review and understand all applicable governing documents associated with this sampling program, including this SAP/QAPP, all associated SOPs (see **Appendix A**), and the applicable HASP. The FTL will oversee all sample collection activities to ensure that governing documents are implemented appropriately.

6.1.2 Modification Documentation

Minor deviations (i.e., those that will not impact data quality or usability) encountered in day-to-day field work will be noted in the field logbook. Major deviations from this SAP/QAPP that modify the sampling approach and associated guidance documents will be recorded on a field record of modification (ROM) form (see **Appendix B**). Field ROMs will be completed by the FTL, or by assigned field or technical staff. Each completed ROM is assigned a unique number that is specific to each investigation (e.g., VWR-OU3-01) by the EPA RPM or their delegate. Once a form is prepared, it is submitted to the EPA RPM for review and approval. Copies of approved field ROMs are available in the OU3 eRoom and are posted to the OU3 website.

6.1.3 Field Quality Control Samples

Field-based QC samples are those samples which are prepared in the field and submitted to the laboratory in a blind fashion. That is, the laboratory is not aware the sample is a QC sample, and should be treated in the same way as a field sample.

Soil

Field duplicate samples will be collected as part of the soil sampling for this investigation. Field duplicates for soil are collected from the same area as the parent sample but from different individual sampling points. These samples are collected independent of the original field sample with separate sampling equipment and submitted for analysis along with the collected field samples. The field duplicate contains the same number of subsamples as the parent sample (i.e., if the parent sample is a 30-point composite, the field duplicate sample is also a 30-point composite).

Soil field duplicate samples will be collected at a rate of 1 field duplicate per 10 field samples (10%). It is the responsibility of the FTL to ensure that the appropriate number of field duplicates is collected. Each field duplicate is given a unique sample number, and field personnel record the sample number of the associated co-located sample in the parent sample number field of the FSDS. The same station location is assigned to the field duplicate sample as the parent field sample. Field duplicates will be sent for analysis by the same method as field samples and are blind to the laboratories (i.e., the laboratory cannot distinguish between field samples and field duplicates).

Field duplicate results analyzed by PLM will be considered concordant if the reported semi-quantitative bin result for the field duplicate is within one bin of the original parent field sample. The variability between the field duplicate and the associated parent field sample reflects the combined variation in sample heterogeneity and the variation due to measurement error. Because

field duplicate samples are expected to have inherent variability that is random and may be either small or large, typically, there is no quantitative requirement for the agreement of field duplicates. Rather, results are used to determine the magnitude of this variability to evaluate data usability. In general, if the concordance rate for field duplicate samples is less than 20% for the investigation, the data usability assessment should alert data users to this inherent variability.

Equipment Rinsates

Because only dedicated sampling equipment will be used to collect soil characterization samples during the removal action, no equipment rinsate samples will be collected or analyzed.

6.2 PREPARATION FACILITY

All soil samples submitted for analysis by the Libby-specific PLM methods (i.e., PLM-Grav and PLM-VE) are first processed in accordance with SOP ISSI-LIBBY-01. This processing includes drying, splitting, sieving, grinding, and archiving. These sample processing activities will be completed at the SPF located in Troy, Montana, referred to as the "Troy SPF".

The QA/QC of the soil preparation process is maintained by adherence to standard preparation procedures, submission of preparation QC samples, facilities monitoring, and audits. These procedures and requirements are summarized below. Detailed information regarding soil preparation procedures and requirements for the Troy SPF can be found in SOP ISSI-LIBBY-01, the *Soil Sample Preparation Work Plan*, and the *ESAT Site Safety Plan*.

6.2.1 Training and Personnel Requirements

Personnel performing sample preparation activities must have read and understood the *Soil Sample Preparation Work Plan*, the SPF HASP, and all associated SOPs and governing documents for soil preparation (e.g., SOP ISSI-LIBBY-01). In addition, all personnel must have completed 40-hour OSHA HAZWOPER training, annual updates, annual respirator fit tests, and annual or semi-annual physicals, as required.

Prior to performing activities at the Troy SPF, new personnel will be instructed by an experienced member of the SPF staff and training sessions will be documented in the SPF project files. It is the responsibility of the SPF quality assurance manager (QAM) to ensure that all personnel have completed the required training requirements.

6.2.2 Modification Documentation

When changes or revisions are needed to improve or document specifics about sample preparation procedures used by the Troy SPF, these changes are documented using a laboratory ROM form (see **Appendix B**). The SPF ROM form provides a standardized format for tracking procedural changes in sample preparation and allows project managers to assess potential impacts on the quality of the data being collected. SPF ROMs will be completed by the appropriate SPF or technical staff. Once a form is prepared, it is submitted to the ESAT QAM (or their designee) for review. Final review and approval is provided by the appropriate EPA RPM. Copies of approved SPF ROMs are available in the Libby Laboratory eRoom.

6.2.3 Preparation QC Samples

Four types of preparation QC samples are collected during the soil preparation process: sand blanks, drying blanks, grinding blanks, and preparation duplicates. Each type of preparation QC sample is described in more detail below.

Sand Blank

A sand blank is a sample of store-bought quartz sand that is analyzed to ensure that the quartz sand matrix used for drying and grinding blanks is asbestos-free. Detailed procedures for this certification process are provided in ESAT SOP PLM-02.00, *Blank Sand Certification by Polarized Light Microscopy*. In brief, for each bag of sand, about 800 grams of sand are removed and split into 40 sand blank aliquots of roughly equal size. Each sand blank is evaluated using stereomicroscopic examination and analyzed by PLM-VE. If a sand blank has detected asbestos, it is re-analyzed by a second PLM analyst to verify the presence of asbestos. The sand is certified as asbestos-free if all 40 sand blanks are non-detect for asbestos. The entire bag of sand is rejected for use if any asbestos is detected in the sand blanks. Only sand bags that are certified as asbestos-free will be utilized in the SPF.

Drying Blank

A drying blank consists of approximately 100 to 200 grams of asbestos-free quartz sand that is processed with each batch of field samples that are dried together (usually this is approximately 125 samples per batch). The drying blank is then processed identically to field samples. Drying blanks determine if cross-contamination between samples is occurring during sample drying. One drying blank will be processed with each drying batch per oven. It is the responsibility of the SPF QAM to ensure that the appropriate number of drying blanks is collected. Each drying blank is given a unique sample number that is investigation-specific, as provided by the field sample coordinator (i.e., a subset of sample numbers for each investigation will be provided for use by the SPF). SPF personnel will record the sample number of the drying blank on the sample drying log sheet.

It is the responsibility of the QATS contractor to review the drying blank results and notify the SPF QAM immediately if drying blank results do not meet acceptance criteria and if corrective actions are necessary. If asbestos is detected by PLM-VE in the drying blank (i.e., result is not Bin A), a qualifier of “DB” will be added to the related field sample results in the project database that were dried at the same time as the detected drying blank to denote that the associated drying blank had detected asbestos. In addition, the drying oven will be thoroughly cleaned. If asbestos continues to be detected in drying blanks after cleaning occurs, sample processing must stop and the drying method and decontamination procedures will be evaluated to rectify any cross-contamination issues.

Grinding Blank

A grinding blank consists of asbestos-free quartz sand and is processed along with the field samples on days that field samples are ground. Grinding blanks determine if decontamination procedures of laboratory soil processing equipment used for sample grinding and splitting are adequate to prevent cross-contamination. Grinding blanks are prepared at a frequency of one per grinding batch per grinder per day. It is the responsibility of the SPF QAM to ensure that the appropriate number of grinding blanks is collected. Each grinding blank is given a unique sample

number that is investigation-specific, as provided by the field sample coordinator. SPF personnel will record the sample number of the grinding blank on the sample preparation log sheet.

It is the responsibility of the QATS contractor to review the grinding blank results and notify the SPF QAM immediately if drying blank results do not meet acceptance criteria and if corrective actions are necessary. If any asbestos is detected by PLM-VE in the grinding blank (i.e., result is not Bin A), a qualifier of "GB" will be added to the related field sample results in the project database that were ground at the same time as the detected grinding blank to denote that the associated grinding blank had detected asbestos. In addition, the grinder will be thoroughly cleaned. If asbestos continues to be detected in grinding blanks after cleaning occurs, sample processing must stop and the grinding method and decontamination procedures will be evaluated to rectify any cross-contamination issues.

Preparation Duplicate

Preparation duplicates are splits of field samples submitted for sample preparation. The preparation duplicates are used to evaluate the variability that arises during the soil preparation and analysis steps. After drying, but prior to sieving, a preparation duplicate is prepared by using a riffle splitter to divide the field sample (after an archive split has been created) into two approximately equal portions, creating a parent and duplicate sample.

Preparation duplicate samples are prepared at a rate of 1 per 20 samples (5%) of samples prepared. It is the responsibility of the SPF QAM to ensure that the appropriate number of preparation duplicates is prepared. Each preparation duplicate is given a unique sample number that is investigation-specific, as provided by the field sample coordinator. SPF personnel will record the sample number of the preparation duplicate and its associated parent field sample on the sample preparation log sheet. Preparation duplicates are submitted blind to the laboratory for analysis by the same analytical method as the parent sample.

Preparation duplicate results will be considered concordant if the reported PLM bin for the preparation duplicate is within one bin of the original parent field sample. The variability between the preparation duplicate and the associated field sample reflects the combined variation due to sample preparation and due to measurement error. Results for preparation duplicate samples are evaluated by the QATS contractor (or their designee). If the concordance rate for preparation duplicate samples is less than 10%, the QATS contractor will notify the SPF QAM to determine if corrective action is needed.

6.2.4 Performance Evaluation Standards

The USGS has prepared several Site-specific reference materials for LA in soil that are utilized as performance evaluation (PE) standards to evaluate PLM-VE laboratory accuracy and precision. These PE standards are kept in storage at the Troy SPF and are inserted into the sample train during soil sample processing. In accordance with SOP ISSI-LIBBY-01, PE standards are inserted both pre- and post-processing. PE standards of varying nominal levels will be inserted at a rate of at least one per month per PLM laboratory when soil processing is occurring.

It is the responsibility of the SPF QAM to ensure that the appropriate number of PE standards is inserted. Each PE standard is given a unique sample number that is investigation-specific, as provided by the field sample coordinator. SPF personnel will record the sample number of the

PE standard, the nominal level of the PE standard, and whether it was inserted pre- or post-processing on the sample preparation log sheet. PE standards are submitted blind to the laboratory for analysis by the same analytical method as the field samples.

Results for PE standards will be evaluated by the QATS contractor (or their designee). PE standard results are ranked as acceptable if the correct semi-quantitative bin is reported, as determined by the nominal concentration of the PE standard. The LC should be notified if PE standard results do not meet acceptance criteria. Corrective action will be taken if the PE standards demonstrate issues with accuracy and/or bias in PLM-VE results reporting. Examples of corrective actions that may be taken include reanalysis and/or re-preparation, collaboration between and among laboratories to address potential differences in analysis methods, and analyst re-training.

6.3 ANALYTICAL LABORATORY

Laboratories selected for analysis of samples for asbestos are part of the Libby analytical team. These laboratories have all demonstrated experience and expertise in analysis of LA in environmental media, and all are part of an on-going site-specific QA program designed to ensure accuracy of analytical and consistency of reported analytical results between laboratories. These laboratories are audited by the EPA QATS contractor (see Section 8.1.2) and the National Voluntary Laboratory Accreditation Program (NVLAP) on a regular basis.

Laboratory QA/QC activities include all processes and procedures that have been designed to ensure that data generated by an analytical laboratory are of high quality and that any problems in sample preparation or analysis that may occur are quickly identified and rectified. Laboratories handling samples collected as part of this sampling investigation will be provided a copy of and will adhere to the requirements of this SAP/QAPP. This section describes the laboratory QA/QC procedures that are required of each laboratory that analyzes field samples from OU3.

6.3.1 Laboratory Quality Assurance Management Plan

Each analytical laboratory has developed a laboratory-specific *QA Management Plan* that provides a detailed description of the procedures and policies that are in place at their laboratory to ensure laboratory quality. This laboratory *QA Management Plan* will include information on standard laboratory methods and SOPs, instrument testing, inspection, maintenance, and calibration requirements, procedures for inspection of supplies and consumables, analyst training, facility contamination monitoring, and internal auditing. These laboratory *QA Management Plans* are reviewed and approved by the LC when the subcontracting agreement is established. Copies of all laboratory *QA Management Plans* for each project laboratory are maintained by the LC. The QATS contractor will also review the laboratory *QA Management Plan* during the annual EPA laboratory audit (see Section 8.1.2).

6.3.2 Certifications

All analytical laboratories participating in the analysis of samples for the Libby project are subject to national, local, and project-specific certifications and requirements. Each laboratory is accredited by the National Institute of Standards and Technology (NIST)/NVLAP for the analysis of bulk asbestos by PLM. This includes the analysis of NIST/NVLAP standard

reference materials (SRMs), or other verified quantitative standards, and successful participation in two proficiency rounds per year each of bulk asbestos by PLM.

Copies of recent proficiency examinations from NVLAP or an equivalent program are maintained by each participating analytical laboratory. Many of the laboratories also maintain certifications from other state and local agencies. Copies of all proficiency examinations and certifications are also maintained by the LC.

Each laboratory working on the Libby project is also required to pass an on-site EPA laboratory audit. The details of this EPA audit are discussed in Section 8.1.2. The LC also reserves the right to conduct any additional investigations deemed necessary to determine the ability of each laboratory to perform the work. Each laboratory also maintains appropriate certifications from the state and possibly other certifying bodies (e.g., New York State Department of Health (NYSDOH)) for methods and parameters that may also be of interest to the Libby project. These certifications require that each laboratory has all applicable state licenses and employs only qualified personnel. Laboratory personnel working on the Libby project are reviewed for requisite experience and technical competence to perform asbestos analyses. Copies of personnel resumes are maintained for each participating laboratory by the LC in the Libby project file.

6.3.3 Laboratory Team Training/Mentoring Program

Initial Mentoring

The orientation program to help new laboratories gain the skills needed to perform reliable analyses at the Site involves successful completion of a training/mentoring program that was developed for new laboratories prior to their analysis of Libby field samples. All new laboratories are required to participate in this program. The program includes training provided by the QATS contractor and/or senior personnel from other Libby team laboratories. The training/mentoring process includes a review of morphological, optical, chemical, and electron diffraction characteristics of LA, as well as training on project-specific analytical methodology, documentation, and administrative procedures used on the Libby site. The mentoring process also includes a general EPA audit, which is performed by the QATS contractor, to determine the general capabilities of the laboratory, the adequacy of facilities and instrumentation, and evaluate of the laboratory quality management system. The mentor will also review the analysis of at least one sample by each type of analytical method with the trainee laboratory.

Once the laboratory has satisfactorily completed the training/mentoring program, they can begin to support the analysis of Libby field samples. Initially, all submitted analytical results will undergo a detailed data verification and validation review (see Section D2). The frequency of these reviews can be reduced if no issues are identified. The QATS contractor may also perform a subsequent EPA audit to evaluate analyses of Libby field samples.

Site-Specific Reference Materials

USGS has also prepared site-specific reference materials for LA in soil to be utilized during PLM visual estimation analysis (EPA 2008f). These reference materials were prepared by adding aliquots of LA spiking material to uncontaminated Libby soils to obtain nominal LA concentrations of 0.2% and 1.0% (by weight). Each laboratory was provided with samples of

these reference materials for use in training PLM analysts in the visual estimation of LA levels in soil. In addition, aliquots of these reference materials (as well as other spiked soils) are also utilized as PE standards to evaluate PLM laboratory accuracy.

Regular Technical Discussions

On-going training and communication is an essential component of QA for the Libby project. To ensure that all laboratories are aware of any technical or procedural issues that may arise, a regular teleconference is held between the EPA, their contractors, and each of the participating laboratories. Other experts (e.g., USGS) are invited to participate when needed. These calls cover all aspects of the analytical process, including sample flow, information processing, technical issues, analytical method procedures and development, documentation issues, project-specific laboratory modifications, and pertinent asbestos publications.

Professional/Technical Meetings

Another important aspect of laboratory team training has been the participation in technical conferences. The first of these technical conferences was hosted by USGS in Denver, Colorado, in February 2001, and was followed by another held in December 2002. The Libby laboratory team has also convened on multiple occasions at the ASTM Johnston Conference in Burlington, Vermont, including in July 2002, July 2005, July 2008, and July 2011, and at the Michael E. Beard Asbestos Conference in San Antonio, Texas in January 2010. In addition, members of the Libby laboratory team attended an EPA workshop to develop a method to determine whether LA is present in a sample of vermiculite attic insulation held in February 2004 in Alexandria, Virginia. These conferences enable the Libby laboratory and technical team members to have an on-going exchange of information regarding all analytical and technical aspects of the project, including the benefits of learning about developments by others.

6.3.4 Analyst Training

All PLM analysts for the Libby project are expected to be familiar with routine chemical laboratory procedures, principles of optical mineralogy, and proficient in EPA Method 600/R-93/116, NIOSH Method 9002, CARB Method 435, and Site-specific SOPs SRC-LIBBY-01 and SRC-LIBBY-03. Analysts with less than one year of experience specific to the Libby project are required to participate in the laboratory mentoring program to obtain additional guidance and instruction. This training is provided by the laboratory managers and/or senior PLM analysts that are familiar with the types of asbestos and analytical challenges encountered at the Site. Before performing any Site analyses, the analyst must demonstrate the ability to generate acceptable accuracy and precision for the LA-specific reference materials.

Satisfactory completion of each of these training tasks must be approved by a senior PLM analyst. A training checklist or logbook is used to ensure that the analyst has satisfactorily completed each specific training requirement. It is the responsibility of the laboratory QAM to ensure that all analysts have completed the required training requirements.

6.3.5 Modification Documentation

When changes or revisions are needed to improve or document specifics about analytical methods or procedures used by the laboratory, these changes are documented using a laboratory ROM form (see **Appendix B**). The laboratory ROM form provides a standardized format for

tracking procedural changes in sample analysis and allows project managers to assess potential impacts on the quality of the data being collected. Laboratory ROMs will be completed by the appropriate laboratory or technical staff. Once a form is prepared, it is submitted to the EPA RPM for review and approval. Copies of approved laboratory ROMs are available in the Libby Laboratory eRoom.

6.3.6 Analytical Laboratory QC Analyses

Laboratory QC for PLM-Grav is ensured through compliance with laboratory-based QC requirements for the NIOSH Method 9002, as specified by NVLAP. No additional project-specific QC requirements have been established for PLM-Grav.

Laboratory-based QC requirements for PLM-VE are specified in SOP SRC-LIBBY-03. Three types of laboratory-based QC analyses are performed for PLM-VE, including laboratory duplicates, inter-laboratory analyses, and PE standards. Detailed information on the Libby-specific requirements for each type of PLM-VE QC analysis, including the minimum frequency rates, selection procedures, acceptance criteria, and corrective actions are provided in SOP SRC-LIBBY-03, with the following investigation-specific modifications:

- Laboratory QC sample frequency requirements should be applied on an OU3-specific basis.

With the exception of inter-laboratory analyses, it is the responsibility of the laboratory manager to ensure that the proper number of PLM-VE QC analyses is completed. Inter-laboratory analyses for PLM-VE will be selected post hoc by the QATS contractor (or their designee) in accordance with the selection procedures presented in SOP SRC-LIBBY-03. The LC will provide the list of selected inter-laboratory analyses to the laboratory manager and will facilitate the exchange of samples between the analytical laboratories.

6.4 INSTRUMENT MAINTENANCE AND CALIBRATION

6.4.1 Field Equipment

All field equipment should be maintained and calibrated in basic accordance with manufacturer specifications. When a piece of equipment is found to be operating incorrectly, the piece of equipment will be labeled “out of order” and placed in a separate area from the rest of the sampling equipment. The person who identified the equipment as “out of order” will notify the FTL overseeing the investigation activities. It is the responsibility of the FTL to facilitate repair of the out-of-order equipment. This may include having appropriately trained field team members complete the repair or shipping the malfunctioning equipment to the manufacturer. Field team members will have access to basic tools required to make field acceptable repairs. This will ensure timely repair of any “out of order” equipment.

6.4.2 Sample Preparation Equipment

Soil processing instrumentation requiring calibration or routine function checks include sample grinders, drying ovens, ventilation hood, high-efficiency particulate air (HEPA) vacuum, hood anemometer, and the analytical balance. A detailed description of the calibration and maintenance procedures for each type of equipment is provided in the *Soil Sample Preparation Work Plan*.

Calibration and maintenance checks are documented on equipment-specific calibration and maintenance log sheets, as provided in SOP ISSI-LIBBY-01, Attachments 4 through 6. These calibration and maintenance log sheets are kept in a ringed binder, pre-numbered with the equipment number and arranged according to equipment type. It is the responsibility of the SPF QAM (or their designee) to verify that the calibration of each piece of equipment is checked daily and is operating within normal parameters.

6.4.3 Laboratory Instruments

The laboratory manager is responsible for ensuring that all laboratory instruments used for this project are maintained and calibrated in accordance with the manufacturer's instructions. If any deficiencies in instrument function are identified, all analyses shall be halted until the deficiency is corrected. The laboratory shall maintain a log that documents all routine maintenance and calibration activities, as well as any significant repair events, including documentation that the deficiency has been corrected.

6.5 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

6.5.1 Field

In advance of field activities, the FTL will check the field equipment/supply inventory and procure any additional equipment and supplies that are needed. The FTL will also ensure any in-house measurement and test equipment used to collect data/samples as part of this SAP/QAPP is in good, working order, and any procured equipment is acceptance tested prior to use. Any items that the FTL determines unacceptable will be removed from inventory and repaired or replaced as necessary.

6.5.2 Laboratory

The laboratory managers are responsible for ensuring that all reagents and disposable equipment used in this project are free of asbestos contamination. This is demonstrated by the collection of blank samples.

SECTION 7 DATA MANAGEMENT

All data generated as part of the Vermiculite Waste Removal Action will be maintained in an OU3-specific Microsoft Access® database. This will be a relational database with tables designed to store information on station location, sample collection details, preparation and analysis details, and analytical results.

7.1 ROLES AND RESPONSIBILITIES FOR DATA FLOW

7.1.1 Field Personnel

Remedium contractors (MWH and Chapman Construction Inc.) will perform all sample collection in accordance with this SAP/QAPP. In the field, sample details will be documented on hard copy media-specific FSDS forms and in field log books. COC information will be documented on hard copy forms. FSDS and COC information will be manually entered by Remedium's field data manager (or their designee) into a field-specific[c] OU3 database using electronic data entry forms. Use of electronic data entry forms ensures the accuracy of data entry and helps maintain data integrity. For example, data entry forms utilize drop-down menus and check boxes whenever possible. These features allow the data entry personnel to select from a set of standard inputs, thereby preventing duplication and transcription errors and limiting the number of available selections (e.g., media types). In addition, entry into a database allows for the incorporation of data entry checks. For example, the database will allow a unique sample ID to only be entered once, thus ensuring that duplicate records cannot be created.

Entry of FSDS forms and COC information will be completed weekly, or more frequently as conditions permit. Copies of all FSDS forms, COC forms, and field log books will be scanned and posted in portable document format (PDF) to the OU3 eRoom[d] site on a weekly basis. This eRoom will have controlled access (i.e., user name and password are required) to ensure data access is limited to appropriate project-related personnel. File names for scanned FSDS forms, COC forms, and field log books will include the sample date in the format YYYYMMDD to facilitate document organization (e.g., FSDS_20110412.pdf). Electronic copies of all digital photographs will also be posted weekly to the Libby OU3 eRoom. File names for digital photographs will include the station identifier, the sample date, and photograph identifier (e.g., ST-1_20110412_12345.tif).

After FSDS data entry is completed, a copy of the field-specific OU3 database will be posted by the field data manager to the Libby OU3 eRoom weekly, or more frequently as conditions

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[c] The field-specific OU3 database is a simplified version of the master OU3 database. This simplified database includes only the station and sample recording and tracking tables, as well as the FSDS and COC data entry forms.

[d] https://team.cdm.com/eRoom/mt/LibbyOU3

permit. The field-specific OU3 database posted to the eRoom site will include the post date in the file name (e.g., FieldOU3DB_20110516.mdb).

7.1.2 Troy SPF Personnel

All soil sample preparation will be performed by the Troy SPF. The Troy SPF utilizes a local SPF Scribe project database to maintain soil sample preparation information. Soil preparation information from the preparation log sheets is entered into the local SPF Scribe project database by SPF personnel. After the data entry is checked against the original forms, it is the responsibility of the SPF manager (or their designee) to publish soil sample preparation information from the local SPF Scribe database to Scribe.NET.

It is the responsibility of the OU3 data manager (CDM Smith) to subscribe to the SPF Scribe project database and upload relevant information on soil sample preparation (e.g., mass associated with each sample fraction) and COC tracking details for OU3 samples into the master OU3 project database.

7.1.3 Analytical Laboratory Personnel

As described in Section 5.2, each of the laboratories performing asbestos analyses for the sampling investigation are required to utilize all applicable OU3-specific Microsoft Excel® spreadsheets for asbestos data recording and electronic submittals. Upon completion of the appropriate analyses, EDDs along with scanned copies of all analytical laboratory data packages will be posted to the Libby OU3 eRoom.

7.1.4 Database Administrators

Day-to-day operations of the master OU3 database will be under the control of EPA contractors. The primary database administrator (CDM Smith) will be responsible for sample tracking, uploading new data, performing error checks, and making any necessary data corrections. New records will be added to the master OU3 database within an appropriate time period of FSDS and/or EDD receipt.

7.2 MASTER OU3 PROJECT DATABASE

The master OU3 project database is a relational Microsoft Access® database developed specifically for OU3. The *Libby OU3 Database User's Guide* provides an overview of the master OU3 project database structure and content. The most recent version of this User's Guide is provided on the OU3 website.

The master OU3 project database is kept on the CDM Smith server in Denver, Colorado. Incremental backups of the master OU3 project database are performed daily Monday through Friday, and a full backup is performed each Saturday.

7.3 DATA REPORTING

Field summary reports are prepared by MWH. Analytical results summaries are included in the OU3 investigation-specific SAPs and will be provided in the Data Summary Report (in preparation), which are available on the OU3 website. Specialized requests for data summaries may be submitted to the EPA RPM.

7.4 DATA STORAGE

All original data records (both hard copy and electronic) will be cataloged and stored in their original form until otherwise directed by the EPA RPM. At the termination of this project, all original data records will be provided to the EPA RPM for incorporation into the Site project files.

SECTION 8 ASSESSMENT AND OVERSIGHT

Assessments and oversight reports to management are necessary to ensure that procedures are followed as required and that any deviations from procedures are documented. These reports also serve to keep management current on field activities.

8.1 ASSESSMENTS

8.1.1 Field Oversight

The EPA field oversight contractor (HDR Engineering) will perform field audits of sampling collection activities as part of the soil collection efforts. The EPA field auditor has the authority to direct changes in field activities, or to halt field activities if needed until a remedy to an unexpected problem can be identified. Field audit findings are documented in audit reports issued by the entity performing the audit, and are often discussed with the project management team before the auditors leave the Site. Corrective actions will be immediately implemented, as appropriate. A copy of the field audit report will be provided to the EPA RPM and the QATS contractor.

8.1.2 SPF Audits

Internal audits of the SPF are conducted by the SPF QAM periodically to evaluate personnel in their day-to-day activities and to ensure that all processes and procedures are performed in accordance with governing documents and SOPs. All aspects of sample preparation, as well as sample handling, custody, and shipping are evaluated. If any issues are identified, SPF personnel are notified and retrained as appropriate. Audit reports will be completed following each laboratory audit. A copy of the internal audit report, as well as any corrective action reports, will be provided to the LC and the QATS contractor.

Internal audits will be conducted following any significant procedural changes to the soil preparation processes or other SPF governing documents, to ensure the new methods are implemented and followed appropriately.

The Troy SPF is also required to participate in an annual on-site laboratory audit carried out by the EPA through the QATS contract. Audits consist of an evaluation of facility practices and procedures associated with the preparation of soil samples. A checklist of requirements, as derived from the applicable governing documents and SOPs, is prepared by the auditor prior to the audit, and used during the on-site evaluation. Evaluation of the facility is made by reviewing SPF documentation, observing sample processing, and interviewing personnel.

It is the responsibility of the QATS contractor to prepare an On-site Audit Report following the SPF audit. The On-site Audit Report includes both a summary of the audit results and completed checklist(s), as well as recommendations for corrective actions, as appropriate. Responses from each SPF to any deficiencies noted in the On-site Audit Report are also maintained with the respective reports.

It is the responsibility of the QATS contractor to prepare an On-Site Audit Trend Analysis Report on an annual basis. This report shall include a compilation and trend analysis of the on-

site audit findings and recommendations. The purpose of this reported is to identify SPF performance problems and isolate the potential causes.

8.1.3 Laboratory Audits

Each laboratory working on the Libby project is required to participate in an annual on-site laboratory audit carried out by the EPA through the QATS contract. These audits are performed by EPA personnel (and their contractors), that are external to and independent of, the Libby laboratory team members. These audits ensure that each analytical laboratory meets the basic capability and quality standards associated with analytical methods for asbestos used at the Libby site. They also provide information on the availability of sufficient laboratory capacity to meet potential testing needs associated with the Site.

External Audits

Audits consist of several days of technical and evidentiary review of each laboratory. The technical portion of the audit involves an evaluation of laboratory practices and procedures associated with the preparation and analysis of samples for the identification of asbestos. The evidentiary portion of the audit involves an evaluation of data packages, record keeping, SOPs, and the laboratory QA manual. A checklist of method-specific requirements for the commonly used methods for asbestos analysis is prepared by the auditor prior to the audit, and used during the on-site laboratory evaluation.

Evaluation of the capability for a laboratory to analyze a sample by a specific method is made by observing analysts performing actual sample analyses and interviewing each analyst responsible for the analyses. Observations and responses to questions concerning items on each method-specific checklist are noted. The determination as to whether the laboratory has the capability to analyze a sample by a specific method depends on how well the analysts follow the protocols detailed in the formal method, how well the analysts follow the laboratory-specific method SOPs, and how the analysts respond to method-specific questions.

Evaluation of the laboratory to be sufficient in the evidentiary aspect of the audit is made by reviewing laboratory documentation and interviewing laboratory personnel responsible for maintaining laboratory documentation. This includes personnel responsible for sample check-in, data review, QA procedures, document control, and record archiving. Certain analysts responsible for method quality control, instrument calibration, and document control are also interviewed in this aspect of the audit. Determination as to the capability to be sufficient in this aspect is made based on staff responses to questions and a review of archived data packages and QC documents.

It is the responsibility of the QATS contractor to prepare an On-site Audit Report for each analytical laboratory participating in the Libby program. These reports are handled as business confidential items. The On-site Audit Report includes both a summary of the audit results and completed checklist(s), as well as recommendations for corrective actions, as appropriate. Responses from each laboratory to any deficiencies noted in the On-site Audit Report are also maintained with the respective reports.

It is the responsibility of the QATS contractor to prepare an On-Site Audit Trend Analysis Report on an annual basis. This report shall include a compilation and trend analysis of the on-

site audit findings and recommendations. The purpose of this reported is to identify common asbestos laboratory performance problems and isolate the potential causes.

Internal Audits

Each laboratory will also conduct periodic internal audits of their specific operations. Details on these internal audits are provided in the laboratory QA Management Plan. The laboratory QAM should immediately contact the LC and the QATS contractor if any issues are identified during internal audits that may impact data quality for OU3 samples.

8.2 RESPONSE ACTIONS

Corrective response actions will be implemented on a case-by-case basis to address quality problems. Minor actions taken to immediately correct a quality problem will be documented in the applicable field or laboratory logbooks and a verbal report will be provided to the appropriate manager (e.g., the FTL or LC). Major corrective actions will be approved by the EPA RPM and the appropriate manager prior to implementation of the change. Major response actions are those that address problems that may affect the quality or objective of the investigation, this includes, but is not limited to, quality control issues; missing, broken, or compromised samples; station accessibility issues; and changes in field schedules or analytical deliverable dates. The EPA RPM for OU3 will be notified when quality problems arise that cannot be corrected quickly through routine procedures (contact information is provided below):

Christina Progess
U.S. EPA Region 8
1595 Wynkoop Street
Denver, CO 80202
Tel: (303) 312-6009
Fax: (303) 312-7151
E-mail: progess.christina@epa.gov

In addition, when modifications to this SAP/QAPP are required, either for field or laboratory activities, a ROM must be completed and approved by the EPA RPM prior to implementation.

8.3 REPORTS TO MANAGEMENT

No regularly-scheduled written reports to management are planned as part of this project. However, reports will be provided to management for routine audits and whenever quality problems are encountered. Field and analytical staff will promptly communicate any difficulties or problems in implementation of the SAP/QAPP to the EPA, and may recommend changes as needed. If any revisions to this SAP/QAPP are needed, the EPA RPM will approve these revisions before implementation by field or analytical staff.

SECTION 9 DATA VALIDATION AND USABILITY

9.1 DATA REVIEW, VERIFICATION AND VALIDATION

9.1.1 Data Review

Data review of project data typically occurs at the time of data reporting by the data users and includes cross-checking that sample IDs and sample dates have been reported correctly and that calculated analytical sensitivities or reported values are as expected. If discrepancies are found, the data user will contact the database administrator (CDM Smith), who will then notify the appropriate entity (field, preparation facility, or laboratory) in order to correct the issue.

9.1.2 Criteria for LA Measurement Acceptability

For PLM analyses, the following factors will be considered in determining the acceptability of LA measurements soil samples:

- *Results of performance evaluation (PE) standard analyses.* PLM accuracy of visual estimation results is evaluated using LA-specific PE standards. If the results for these PE standards are not within the project-specific acceptance criteria, results should be given low confidence.
- *Results of QC samples.* This includes field, preparation, and laboratory QC samples. If agreement between original and repeat analyses (i.e., duplicate analyses, inter-laboratory analyses) is strongly discordant, results for those samples should be given low confidence. If significant LA contamination is detected in preparation blanks, all samples prepared on that day should be considered to be potentially biased high.

9.1.3 Data Verification Method

Data verification includes checking that results have been transferred correctly from the original hand-written, hard copy field and analytical laboratory documentation to the OU3 project database. The goal of data verification is to identify and correct data reporting errors.

For analytical laboratories that utilize the OU3-specific EDD spreadsheets, data checking of reported analytical results begins with automatic QC checks that have been built into the spreadsheets. In addition to these automated checks, a detailed manual data verification effort will be performed for 100% of all soil samples and analysis results. This data verification process utilizes Site-specific SOPs developed to ensure PLM results and field sample information in the OU3 database are accurate and reliable:

- EPA-LIBBY-10 – *SOP for PLM Data Review and Data Entry Verification* – This Site-specific SOP describes the steps for the verification of PLM analyses, based on a review of the laboratory bench sheets, and verification of the transfer of results from the bench sheets into the project database.
- EPA-LIBBY-11 – *SOP for FSDS Data Review and Data Entry Verification* – This Site-specific SOP describes the steps for the verification of field sample information, based on a review of the FSDS form, and verification of the transfer of results from the FSDS

forms into the project database. An FSDS review is performed on all samples selected for PLM data verification.

The data verification review ensures that any data reporting issues are identified and rectified to limit any impact on overall data quality. If issues are identified during the data verification, the frequency of these checks may be increased as appropriate.

Data verification will be performed by appropriate CDM Smith staff who are familiar with project-specific data reporting, analytical methods, and investigation requirements. The data verifier will prepare a data verification report (template reports are included in the SOPs) to summarize any issues identified and necessary corrections. A copy of this report will be provided to the appropriate project data manager, LC, and the EPA RPM. It is the responsibility of the OU3 database manager (CDM Smith) to coordinate with the FTL and/or LC to resolve any OU3 project database corrections and address any recommended field or laboratory procedural changes from the data verifier. The OU3 database manager is also responsible for electronically tracking in the project database which data have been verified, who performed the verification, and when.

9.1.4 Data Validation Method

Unlike data verification, where the goal is to identify and correct data reporting errors, the goal of data validation is to evaluate overall data quality and to assign data qualifiers, as appropriate, to alert data users to any potential data quality issues. Data validation will be performed by the QATS contractor (or their designee), with support from technical support staff that are familiar with project-specific data reporting, analytical methods, and investigation requirements.

Data validation for asbestos should be performed in basic accordance with the *National Functional Guidelines (NFG) for Asbestos Data Review* (EPA 2011d), and should include an assessment of the following:

- Internal and external field audit/surveillance reports
- Field ROMs
- Field QC sample results
- Internal and external laboratory audit reports
- Laboratory contamination monitoring results
- Laboratory ROMs
- Internal laboratory QC analysis results
- Inter-laboratory analysis results
- Performance evaluation results
- Instrument checks and calibration results
- Data verification results (i.e., in the event that the verification effort identifies a larger data quality issue)

A comprehensive data validation effort for OU3 should be completed quarterly and results should be reported as a technical memorandum. This technical memorandum shall detail the

validation procedures performed and provide a narrative on the quality assessment for each type of asbestos analysis, including the data qualifiers assigned, and the reason(s) for these qualifiers. The technical memorandum shall detail any deficiencies and required corrective actions.

Electronic files summarizing the records that have been validated, the date they were validated, any recommended data qualifiers and their associated reason codes should be posted to the OU3 eRoom. It is the responsibility of the OU3 data manager (CDM Smith) to ensure that the appropriate data qualifiers and reason codes recommended by the data validator are added to the project database, and to electronically track in the project database which data have been validated, who performed the validation, and when. For this project, 100% of all soil samples and analyses will need to be validated.

In addition to performing quarterly data validation efforts, it is the responsibility of the QATS contractor to perform a "real-time" evaluation of all blanks, to ensure that any potential contamination issues are quickly identified and resolved. If any blank results are outside the acceptable limits, the QATS contractor should immediately contact the EPA RPM to ensure that appropriate corrective actions are made.

9.2 RECONCILIATION WITH USER REQUIREMENTS

Once all samples have been collected and analytical data has been generated, data will be evaluated to determine if study objectives were achieved. It is the responsibility of data users to perform a data usability assessment to ensure that DQOs have been met, and reported investigation results are adequate and appropriate for their intended use. This data usability assessment should utilize results of the data verification and data validation efforts to provide information on overall data quality specific to each investigation.

The data usability assessment should evaluate results with regard to several data usability indicators, including precision, accuracy and bias, representativeness, comparability, completeness, and whether specified analytic requirements (e.g., sensitivity) were achieved. **Table 9-1** provides detailed information for how each of these indicators may be evaluated for the reported asbestos data. The data usability assessment results and conclusions should be included in any investigation-specific data summary reports.

Non-attainment of project requirements may result in additional sample collection or field observations in order to achieve project needs.

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FIGURES

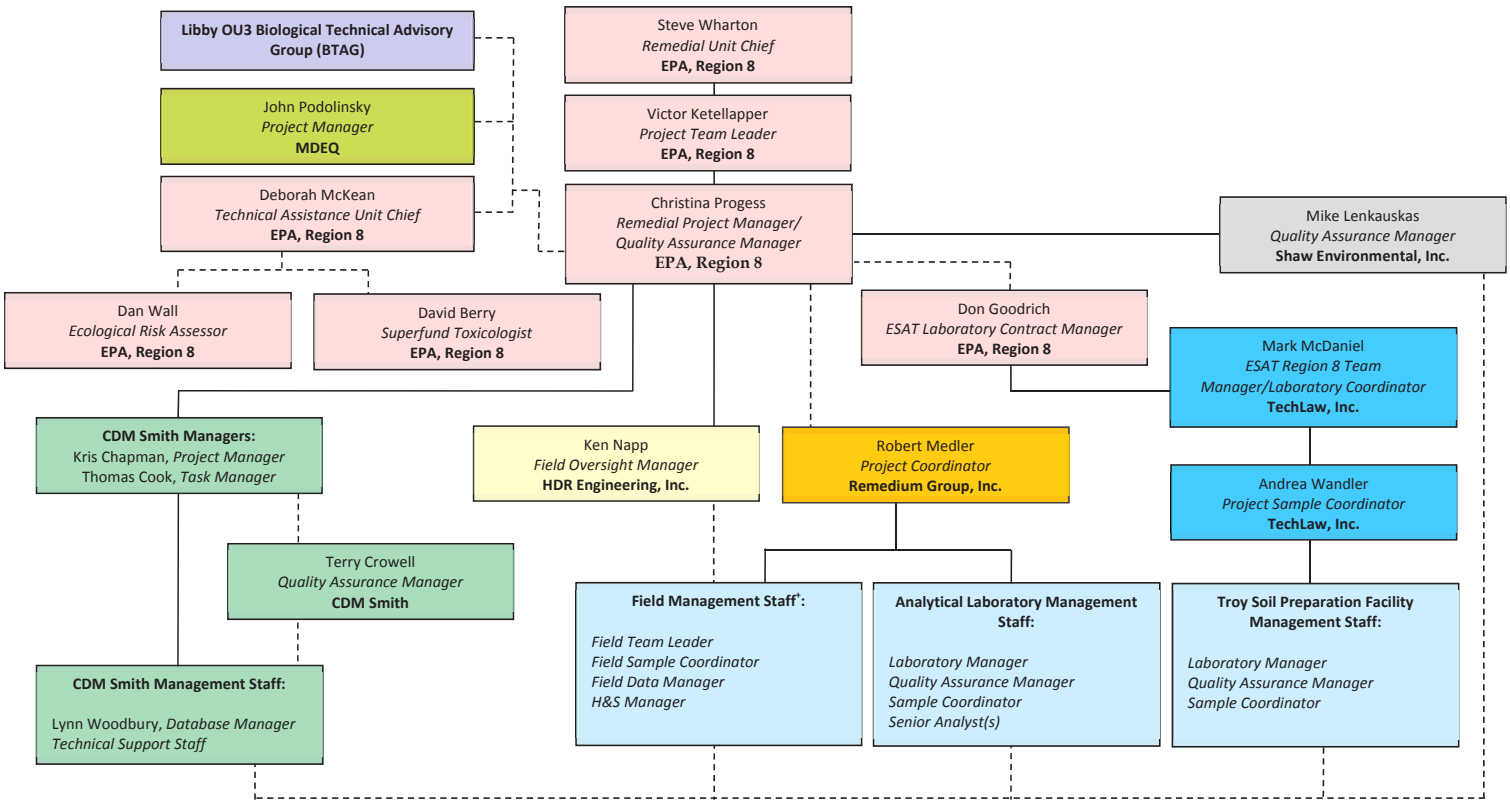

FIGURE 1-1. OU3 ORGANIZATIONAL CHART FOR WASTE REMOVAL ACTION

EPA Region 8 Staff
CDM Smith Staff
HDR Staff
Lines of authority
Lines of communication
Remedium Staff
Remedium Subcontractors
OU3 BTAG
MDEQ Staff
Shaw Staff
TechLaw Staff

+ Individuals are named in the Phase V Part A Sampling and Analysis Plan.

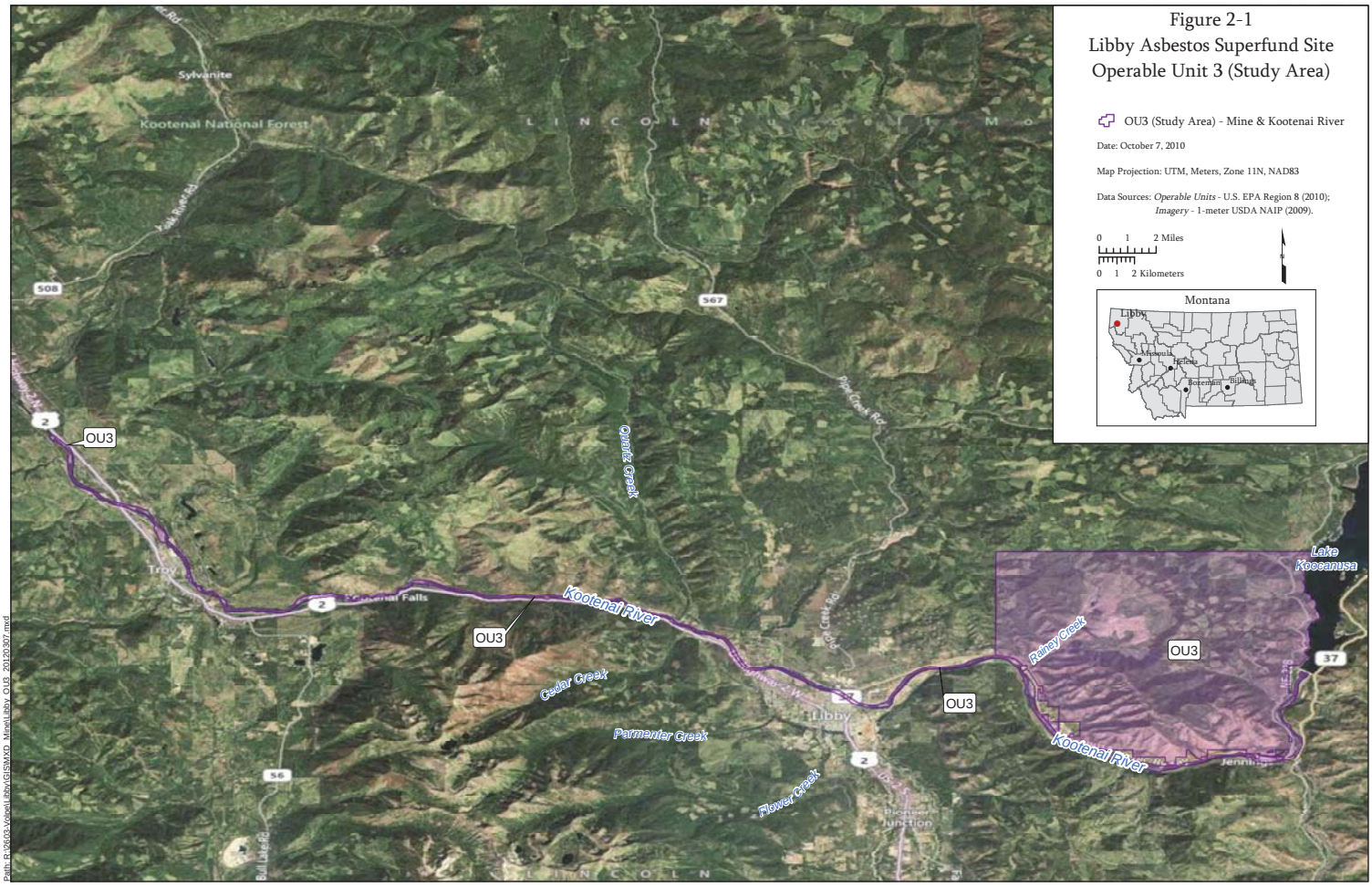

Figure 2-1
Libby Asbestos Superfund Site
Operable Unit 3 (Study Area)

OU3 (Study Area) - Mine & Kootenai River

Date: October 7, 2010

Map Projection: UTM, Meters, Zone 11N, NAD83

Data Sources: *Operable Units* - U.S. EPA Region 8 (2010);
Imagery - 1-meter USDA NAIP (2009).

0 1 2 Miles
0 1 2 Kilometers

Path: R:\0603-Vermiculite\Libby\GIS\MXD_Maps\Libby_OU3_20120307.mxd

LEGEND

- Asbestos sampling location
- Test pit
- Contours 10 ft
- Contours 2 ft
- Estimated margin of waste vermiculite
- Margin concealed, inferred or otherwise not confirmed by excavation

N
W E
S

0 50 100 150 200
Feet

TITLE:
Waste Removal Project Location

PROJECT:
Libby, MT

REFERENCE(S): Coordinate System: NAD 1983 HARN StatePlane Montana FIPS 2500 Feet Intl
Projection: Lambert Conformal Conic
Datum: North American 1983 HARN
Units: Foot

MWH

Remedium

FIGURE
3-2

TABLES

TABLE 1-1. QA/R5 QAPP ELEMENT CROSS-REFERENCE

QA/R-5 QAPP Element	Phase V Part A SAP/QAPP Document Location
Group A. Project Management	
A1. Title & Approval Sheet	Approval Page (pg. 3)
A2. Table of Contents	Table of Contents (pg. 7-10)
A3. Distribution List	Distribution List (pg. 5)
A4. Project/Task Organization	Section 1, Figure 1-1
A5. Problem Definition & Background	Section 2, Section 2.1 to 2.4
A6. Project/Task Description	Section 4, Section 3.2.4, Section 3.3.4
A7. Quality Objectives & Criteria	Section 3.2 to 3.3, Table 9-1
A8. Special Training/Certifications	Field – Section 6.1.1 Analytical Laboratory – Section 6.3.2 to 6.3.4 Troy SPF – Section 6.2.1
A9. Documentation & Records	Field – Section 4.5, Section 4.9.1, Section 6.1.2 Analytical Laboratory – Section 5.2, Section 6.3.5 Troy SPF – Section 5.2, Section 6.2.2
Group B. Data Generation & Acquisition	
B1. Sampling Process Design (Experimental Design)	Section 4.1 to 4.3
B2. Sampling Methods	Section 4.2 to 4.4
B3. Sample Handling & Custody	Field – Section 4.9 Analytical Laboratory – Section 5.4 Troy SPF – 5.4
B4. Analytical Methods	Section 5.1, Section 5.3, Section 5.5, Appendix G
B5. Quality Control	Field – Section 6.1 Analytical Laboratory – Section 6.3 Troy SPF – Section 6.2
B6. Instrument/Equipment Testing, Inspection, & Maintenance	Field – Section 6.4.1 Analytical Laboratory – Section 6.4 Troy SPF – Section 6.4.2
B7. Instrument/Equipment Calibration & Frequency	Field – Section 4.4.2, Section 6.4.1 Analytical Laboratory – Section 6.3.1, Section 6.4.3 Troy SPF – Section 6.4.2
B8. Inspection/Acceptance of Supplies & Consumables	Field – Section 6.5.1 Analytical Laboratory – Section 6.5.2 Troy SPF – Section 6.5.2
B9. Non-direct Measurements	NA
B10. Data Management	Section 7.1 to 7.4
Group C. Assessment & Oversight	
C1. Assessments & Response Actions	Field – Section 8.1.1 Analytical Laboratory – Section 8.1.3 Troy SPF – Section 8.1.2
C2. Reports to Management	Section 8.3, Section 9.1.4
Group D. Data Validation & Usability	
D1. Data Review, Verification, & Validation	Section 9.1
D2. Verification & Validation Methods	Section 9.1.3 to 9.1.4
D3. Reconciliation with User Requirements	Section 9.2

NA – not applicable
QAPP – quality assurance project plan
SAP – sampling and analysis plan
SPF – sample preparation facility

TABLE 9-1. GENERAL EVALUATION METHODS FOR ASSESSING ASBESTOS DATA USABILITY

Data Usability Indicator	General Evaluation Method
Precision	Sampling – Review results for co-located samples and field duplicates to provide information on variability arising from medium spatial heterogeneity and sampling and analysis methods. Soil Preparation – Review results for preparation duplicates to provide information on variability arising from sample preparation and analysis methods. Analysis – Review results for PLM laboratory duplicates, TEM recounts, and TEM repreparations to provide information on variability arising from analysis methods. Review results for inter-laboratory analyses to provide information on variability and potential bias between laboratories.
Accuracy/Bias	TEM – Calculate the background filter loading rate and use results to assign detect/non-detect in basic accordance with ASTM 6620-00. For air samples, determine the frequency of indirect preparation. PLM – Review results for LA-specific performance evaluation standards to provide information on direction/magnitude of potential bias. Review results for blanks to provide information on potential contamination.
Representativeness	Review relevant field audit report findings and any field/laboratory ROMs for potential data quality issues.
Comparability	Compare the sample collection SOPs, preparation techniques, and analysis methods to previous investigations.
Completeness	Determine the percent of samples that were able to be successfully collected and analyzed in accordance with the investigation-specific SAP requirements (e.g., 99 of 100 samples, 99%).
Sensitivity	TEM – Determine the fraction of all analyses that stopped based on the area examined stopping rule (i.e., did not achieve the target sensitivity).

ASTM = American Society of Testing and Materials
LA = Libby amphibole
PLM = polarized light microscopy
QATS = Quality Assurance Technical Support
ROM = record of modification
SAP = sampling and analysis plan
SOP = standard operating procedure
TEM = transmission electron microscopy

APPENDICES

APPENDIX A

Standard Operating Procedures (SOPs)**

**The most recent versions of field SOPs, FSDS forms, and COC forms are provided electronically in the OU3 eRoom (*https://team.cdm.com/eRoom/mt/LibbyOU3*). The most recent versions of laboratory and data verification SOPs are provided electronically in the Libby Lab eRoom (*https://team.cdm.com/eRoom/mt/LibbyLab*).

APPENDIX B

Record of Modification Forms

FIELD MODIFICATION APPROVAL FORM
LFM-OU3-01
Libby OU3 Phase V SAP/QAPP (Rev. 0)

Requested by: _____ Date: _____

Description of Deviation:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

☐ EPA Region 8 has reviewed this field modification approves as proposed.

☐ EPA Region 8 has reviewed this field modification and approves with the following exceptions:

_____
_____
_____
_____
_____
_____
_____

☐ EPA Region 8 has reviewed this field modification and does not agree with the proposed approach for the following reasons:

_____
_____
_____
_____
_____
_____

_____ _____
Christina Progess, EPA RPM Date

Request for Modification
to
Laboratory Activities
LB-0000XX

Instructions to Requester: E-mail form to contacts at bottom of form for review and approval.

All Labs Applicable Forms – copies to: EPA LC, QATS contractor, All Project Labs

Individual Labs Applicable Forms – copies to: EPA LC, QATS contractor, Initiating Lab

Method (circle all applicable): TEM-AHERA TEM-ISO 10312 PCM-NIOSH 7400
EPA/600/R-93/116 ASTM 5755 TEM 100.2 SRC-LIBBY-03
SRC-LIBBY-01 NIOSH 9002 Other:_____

Requester:_____ Title: _____
Company: _____ Date: _____

Original Requester: _____ Original Request Date: _____
[only applicable if modification is a revision of an earlier modification]

Description of Modification:
_____

Reason for Modification:
_____

Potential Implications of this Modification:
_____

Laboratory Applicability (circle one): **All** **Individual(s)** _____

This laboratory modification is (circle one): **NEW** **APPENDS to** _____ **SUPERCEDES** _____

Duration of Modification (circle one):

Temporary Date(s): _____
Analytical Batch ID: _____

Temporary Modification Forms – Attach legible copies of approved form with all associated raw data packages

Permanent (Complete Proposed Modification Section) Effective Date: _____

Permanent Modification Forms – Maintain legible copies of approved form in a binder that can be accessed by analysts.

Proposed Modification to Method (attach additional sheets if necessary; state section and page numbers of method when applicable):
_____

EFERENCES

Data Quality Indicator (circle one) – Please reference definitions below for direction on selecting data quality indicators:

Not Applicable **Reject** **Low Bias** **Estimate** **High Bias** **No Bias**

DATA QUALITY INDICATOR DEFINITIONS:

Reject - Samples associated with this modification form are not useable. The conditions outlined in the modification form adversely affect the associated sample to such a degree that the data are not reliable.

Low Bias - Samples associated with this modification form are useable, but results are likely to be biased low. The conditions outlined in the modification form suggest that associated sample data are reliable, but estimated low.

Estimate - Samples associated with this modification form are useable, but results should be considered approximations. The conditions outlined in the modification form suggest that associated sample data are reliable, but estimates.

High Bias - Samples associated with this modification form are useable, but results are likely to be biased high. The conditions outlined in the modification form suggest that associated sample data are reliable, but estimated high.

No Bias - Samples associated with this modification form are useable as reported. The conditions outlined in the modification form suggest that associated sample data are reliable as reported.

Technical Review: _____ Date: _____
(Laboratory Manager or designate)

Project Review and Approval: _____ Date: _____
(USEPA: Project Manager or designate)

Approved By: _____ Date: _____
(USEPA: Technical Assistance Unit Chief or designate)

MOD No.: SPF-_____

Request for Modification
To
Soil Sample Preparation Activities

Instructions to Requester: E-mail form to contacts at bottom of form for review and approval.

File approved copy at the Sample Preparation Facility (SPF).

Requester:_____ Title: _____

Company: _____ Date: _____

Effective Date: _____

Description of Modification:

_____

_____

Reason for Modification:

_____

_____

Potential Implications of this Modification:

_____

_____

Duration of Modification (circle one):

Temporary Date(s): _____

Preparation Batch ID:_____

- Temporary Modification Forms – Attach legible copies of approved form with all associated chain-of-custody forms. Also, maintain legible copies of approved form in a binder that can be accessed by SPF personnel.

Permanent (complete Proposed Modification to Method)

- Permanent Modification Forms – Maintain legible copies of approved form in a binder that can be accessed by CSF personnel.

Proposed Modification to Method (attach additional sheets if necessary; state section and page numbers of Method when applicable):

_____

_____

_____

_____

Technical Review: _____ Date: _____
(SPF Manager or designate)

Approved By:_____ Title: _____ Date: _____
(USEPA: Project Chemist or designate)

APPENDIX C

Field Sample Data Sheets (FSDS) Forms**

**The most recent versions of field SOPs, FSDS forms, and COC forms are provided electronically in the OU3 eRoom (*https://team.cdm.com/eRoom/mt/LibbyOU3*). The most recent versions of laboratory and data verification SOPs are provided electronically in the Libby Lab eRoom (*https://team.cdm.com/eRoom/mt/LibbyLab*).

Event ID

Libby Soil-like Sample & Location Field Sample Data Sheet

FSDS # **S - «seq»**

Address _____ Date _____

Property ID: AD- _____ Logbook #_____ Pgs_____ Sampler(s)**_____

	Data Item	1	2	3
*	**Location ID**			
*	**Is this a new Location**	Yes No Revised *If No, "Z" through location section*	Yes No Revised *If No, "Z" through location section*	Yes No Revised *If No, "Z" through location section*
*	**Location Type**			
*	**Location Description**			
	Location Area (ft^2)			
	Location Comment			
	Location Comment2			
*	**Visible Vermiculite**	N ___ L ___ M ___ H___	N ___ L ___ M ___ H___	N ___ L ___ M ___ H___
*	**Soil Depth Top**	Inches	Inches	Inches
*	**Soil Depth Bottom**	Inches	Inches	Inches
	Visible Vermiculite SubLocation			
	Visible Vermiculite Comments			
*	**Sample Collected**	Yes No *If No, "Z" through sample section*	Yes No *If No, "Z" through sample section*	Yes No *If No, "Z" through sample section*
*	**Sample ID**			
*	**Sample Time**			
*	**ABS**	N Y	N Y	N Y
*	**Sample Venue**	Indoor Outdoor NA	Indoor Outdoor NA	Indoor Outdoor NA
*	**Sample PrePostClear**	NA Pre Post Clear: 1st 2nd 3rd 4th 5th 6th 7th	NA Pre Post Clear: 1st 2nd 3rd 4th 5th 6th 7th	NA Pre Post Clear: 1st 2nd 3rd 4th 5th 6th 7th
*	**Sample Type**	FS FD Other_____	FS FD Other_____	FS FD Other_____
	Sample Parent ID			
*	**Composite**	Y N	Y N	Y N
*	**Sample/Inspection Aliquots**	30 Other _____ 0	30 Other _____ 0	30 Other _____ 0
	Sample Location Description			
	Sample Field Comments			

V 120120 ***Required Field** **List company after Sampler(s) if not "CDM Smith" "Soil Depth Top" & "Soil Depth Bottom" refer to VV &/or sample

For Field Team Completion: Completed by: _____ QC by:_____	For Data Entry: Entered by:_____ QC by:_____

APPENDIX D

Chain-of-Custody (COC) Form**

**The most recent versions of field SOPs, FSDS forms, and COC forms are provided electronically in the OU3 eRoom (*https://team.cdm.com/eRoom/mt/LibbyOU3*). The most recent versions of laboratory and data verification SOPs are provided electronically in the Libby Lab eRoom (*https://team.cdm.com/eRoom/mt/LibbyLab*).

INTERNAL CHAIN OF CUSTODY

10/27/2011 2:47:07 PM

Order ID: 271101481

Attn: Robert Marriam
Remedium Group, Inc.
Subsidiary of W.R. Grace
6401 Poplar Avenue, Suite 301
Memphis, TN 38119
Fax: (901) 820-2061 Phone: (901) 820-2023
Project: **Sample Retrieval Below Amphitheater**

Customer ID: REME44
Customer PO:
Received: 10/27/11 1:07 PM

EMSL Order: 271101481
EMSL Proj ID: OU3 Mine, Libby, MT
Cust COC ID

Test: PLM NIOSH 9002 **Matrix** Soils **TAT:** 6 Hour **Qty:** 3

Acct Sts: N30 **Slsprsn:** rdemalo **Logged:** rmahoney **Date:** 10/27/2011

Sample Condition: ☒ Acceptable ☐ Unacceptable

Comments

Inter- Lab Sample Transfer

Samples Relinquished: _____ Date _____
Samples Received: _____ Date _____
Package Mailed to Westmont: _____ Date _____
Method of Delivery: _____
Includes: (Circle)
Benchsheets Sample Slides Sample filters
Micrographs GridBox Other _____

Final Package Received: _____ Date: _____

Initial Prep (Initials/Lab): KC **Date:** 10/27/11
Filter Prep (Initials/Lab): _____ **Date:** _____
Grid Prep (Initials/Lab): _____ **Date:** _____

For Special Projects Use Only:

QC Selection: _____ **Date:** _____
Date Package Review: _____ **Date:** _____
Date Package Mailed: _____ **Date:** _____

Special Instructions

Order ID	Lab Sample #	Cust. Sample #	Location	Due Date
271101481	271101481-0001	1	N.W. Corner	10/27/2011 7:07:00 PM
271101481	271101481-0002	2	Next to ISCO	10/27/2011 7:07:00 PM
271101481	271101481-0003	3	S.E. Corner	10/27/2011 7:07:00 PM

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Chain of Custody

EMSL Order Number *(Lab Use Only)*: 271101481

REME44

EMSL ANALYTICAL, INC.
107 W. FOURTH ST.
LIBBY, MT 59923
PHONE: (406) 293-9066
FAX: (406) 293-7016

Company: CHAPMAN CONSTRUCTION
Street: P.O. BOX 516
City: LIBBY, MONTANA State/Province: MT
Report To (Name): MIKE CHAPMAN
Telephone #: 406-293-1983

EMSL-Bill to: ☐ Same ☐ Different
If Bill to is Different note instructions in Comments**
Third Party Billing requires written authorization from third party
Zip/Postal Code: 59923 Country: USA
Fax #: 406-293-8305
Email Address: chapman@montanasky.net

Project Name/Number: SAMPLE REGIONAL BELOW AMPHITHEATER
Please Provide Results: ☐ Fax ☒ Email Purchase Order: U.S. State Samples Taken:

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour ☒ 6 Hour ☐ 24 Hour ☐ 48 Hour ☐ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

*For TEM Air 3 hours/6 hours, please call ahead to schedule. *There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.

PCM - Air
☐ NIOSH 7400
☐ w/ OSHA 8hr. TWA

PLM - Bulk (reporting limit)
☐ PLM EPA 600/R-93/116 (<1%)
☐ PLM EPA NOB (<1%)
Point Count
☐ 400 (<0.25%) ☐ 1000 (<0.1%)
Point Count w/Gravimetric
☐ 400 (<0.25%) ☐ 1000 (<0.1%)
☐ NYS 198.1 (friable in NY)
☐ NYS 198.6 NOB (non-friable-NY)
☐ NIOSH 9002 (<1%)

TEM – Air ☐ 4-4.5hr TAT (AHERA only)
☐ AHERA 40 CFR, Part 763
☐ NIOSH 7402
☐ EPA Level II
☐ ISO 10312

TEM - Bulk
☐ TEM EPA NOB
☐ NYS NOB 198.4 (non-friable-NY)
☐ Chatfield SOP
☐ TEM Mass Analysis-EPA 600 sec. 2.5

TEM – Water: EPA 100.2
Fibers >10µm ☐ Waste ☐ Drinking
All Fiber Sizes ☐ Waste ☐ Drinking

TEM- Dust
☐ Microvac - ASTM D 5755
☐ Wipe - ASTM D6480
☐ Carpet Sonication (EPA 600/J-93/167)

Soil/Rock/Vermiculite
☐ PLM CARB 435 - A (0.25% sensitivity)
☐ PLM CARB 435 - B (0.1% sensitivity)
☐ TEM CARB 435 - B (0.1% sensitivity)
☐ TEM CARB 435 - C (0.01% sensitivity)
☐ EPA Protocol (Semi-Quantitative)
☐ EPA Protocol (Quantitative)

Other:
☐

KC 10/27/11

☐ **Check For Positive Stop – Clearly Identify Homogenous Group**

Samplers Name: MIKE CHAPMAN Samplers Signature:

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
#1	N.W. Corner		10/27/11 - 12:15 p.m.
#2	Next to ISCO		10/27/11 - 12:20 p.m.
#3	South East Corner		10/27/11 - 12:25 p.m.

Client Sample # (s): Total # of Samples: 3
Relinquished (Client): Date: 10-27-11 Time: 1:07
Received (Lab): R.K. Mahoney Date: 10/27/11 Time: 1307
Comments/Special Instructions:

APPENDIX E

Analytical Requirements Sheet

SAP ANALYTICAL SUMMARY # OU3AMP-0912
SUMMARY OF PREPARATION AND ANALYTICAL REQUIREMENTS

SAP Title: Work Plan for Removal of Asbestos-Containing Vermiculite Waste Near the "Amphitheater" at Libby Asbestos Superfund Site OU3; Part B SAP/QAPP

SAP Date/Revision: September 2012 (Rev. 0)

EPA Technical Advisor: Christina Progess (303-312-6009, progess.christina@epa.gov)
(contact to advise on DQOs of SAP related to preparation/analytical requirements)

Sampling Program Overview: This SAP/QAPP describes soil sample collection efforts that will be conducted during the removal of asbestos-containing vermiculite waste near the "Amphitheater" at OU3 to characterize LA concentrations in soil post-removal.

Estimated number and timing of field samples:
>> Soil sampling (September) = 15 samples + field and preparation QC samples

Index ID Prefix: VW-1xxxx

PLM Preparation and Analytical Requirements for Soil Samples:

Medium Code	Medium	Preparation Method[a]	Analysis Method[b]	Applicable Laboratory Modifications
A	Soil	ISSI-LIBBY-01 Rev. 11	PLM-Grav: SRC-LIBBY-01 Rev. 3 PLM-VE: SRC-LIBBY-03 Rev. 3	N/A

[a] Sample preparation to be performed at the Troy sample preparation facility and shipped to the PLM analytical laboratory.
[b] After sample preparation, multiple aliquots will be generated for each sample. The analytical laboratory should do the following for each aliquot:
A (archive) – place sample in archive
C (coarse) – analyze sample by PLM-Grav
FG1 (fine ground aliquot #1) – analyze sample by PLM-VE
FG2-4 (fine ground aliquots #2 to #4) – place samples in archive

---

Laboratory Quality Control Sample Frequencies:
PLM [c]:
Lab Duplicates – 10% (cross-check 8%; self-check 2%)
Inter-laboratory – 1% [d]

[c] See SRC-LIBBY-03 for selection procedure and QC acceptance criteria.
[d] *Post hoc* selection to be performed by the QATS contractor.

Requirements Revision:

Revision #:	Effective Date:	Revision Description
0	9/5/12	--

Asbestos Analytical Laboratory Review Sign-off:

☐ ESAT [sign & date:_____] ☐ MAS [sign & date:_____]

[Checking the box and signing (electronically) above indicates that the laboratory has reviewed and acknowledged the preparation and analytical requirements associated with the specified SAP.]