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# INDOOR ACTIVITY-BASED SAMPLING SAMPLING AND ANALYSIS PLAN

**FOR**

**OPERABLE UNIT 7 OF THE LIBBY ASBESTOS SUPERFUND SITE**

***Revision 0 – August 24, 2012***

Prepared for:

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY**
Remediation Division
P.O. Box 200901
Helena, Montana 59620

Contract Number 407026
Contract Task Order Number 99

Prepared by:

**TETRA TECH EM INC.**
Power Block Building, Suite 612
7 West 6th Avenue
Helena, Montana 59601
(406) 442-5588

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**REVIEWS AND APPROVALS**

| | | |
|---|---|---|
| Tetra Tech Project Manager: | J. Edward Surbrugg<br>J. Edward Surbrugg, Ph.D. | Date: August 24, 2012 |
| DEQ Project Officer: | John Podolinsky<br>John Podolinsky | Date: August 29, 2012 |
| EPA Quality Assurance Reviewer: | Dania Zinner<br>Dania Zinner | Date: August 27, 2012 |
| EPA Remedial Project Manager: | Victor Ketellapper | Date: August 27, 2012 |

## DISTRIBUTION LIST

| Name | Responsibility | Affiliation |
|---|---|---|
| John Podolinsky | DEQ Project Officer | Montana Department of Environmental Quality – Helena, Montana |
| J. Edward Surbrugg | Tetra Tech Project Manager | Tetra Tech EM Inc. – Helena, Montana |
| Victor Ketellapper | EPA Remedial Project Manager | Environmental Protection Agency |
| Elizabeth Fagen | EPA Remedial Project Manager | Environmental Protection Agency |
| Dania Zinner | EPA Quality Assurance Reviewer | Environmental Protection Agency |
| Mike Noble | EPA Technical Advisory Group | Environmental Protection Agency |
| Michelle Carlson | DEQ Troy Info Center | Tetra Tech EM Inc. – Troy, Montana |

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| µm | Micrometer |
| % | Percent |
| ABS | Activity-Based Sampling |
| ASTM | ASTM International (formerly the American) Society for Testing and Materials) |
| CDM | Camp Dresser & McKee |
| COC | Chain of custody |
| CSM | Conceptual site model |
| DEQ | Montana Department of Environmental Quality |
| DQO | Data quality objective |
| EDD | Electronic data deliverable |
| EPA | U.S. Environmental Protection Agency |
| ESAT | Environmental Services Assistant Team |
| f/cc | Fibers per cubic centimeter |
| FSP | Field Sampling Plan |
| HASP | Health and safety plan |
| HHRA | Human health risk assessment |
| HQ | Hazard Quotient |
| ISO | International Organization for Standardization |
| IRIS | Integrated Risk Information System |
| IUR | Inhalation unit risk |
| LA | Libby Amphibole |
| L/min | Liters per minute |
| MARCH | Document Management Archive |
| MCE | Mixed-cellulose ester |
| MET | Meteorological |
| mph | Miles per hour |
| ND | Non-detect |

## ACRONYMS AND ABBREVIATIONS
## (Continued)

| | |
|---|---|
| OU7 | Operable Unit 7 |
| PCM | Phase contrast microscopy |
| PCME | Phase contrast microscope equivalent |
| PDF | Portable document format |
| PEL | Permissible exposure limit |
| PPE | Personal protective equipment |
| QA | Quality Assurance |
| QAM | Quality Assurance Manager |
| QA/QC | Quality assurance/quality control |
| QAPP | Quality assurance project plan |
| QC | Quality control |
| RDI | Removal Design Investigation |
| RPD | Relative percent difference |
| SAP | Sampling and analysis plan |
| sf | Square feet |
| SOP | Standard operating procedure |
| s/cc | Structures per cubic centimeter |
| SRC | Syracuse Research Corporation |
| STEL | Short term exposure limit |
| TAPE | Troy Asbestos Property Evaluation |
| TEM | Transmission Electron Microscopy |
| Tetra Tech | Tetra Tech EM Inc. |
| TFO | Troy field office |
| TWA | Time weighted average |
| TWF | Time Weighting Factor |
| UCL | Upper Confidence Limit |
| USACE | U.S. Army Corps of Engineers |
| VV | Visible vermiculite |
| WP | Work Plan |

# 1.0 INTRODUCTION

Tetra Tech EM Inc. (Tetra Tech) received Task Order 99 from the Montana Department of Environmental Quality, Remediation Division (DEQ), under DEQ Contract No. 407026, to complete an indoor activity-based sampling (ABS) sampling and analysis plan (SAP) for Operable Unit 7 (OU7) of the Libby Asbestos Superfund Site. The United States Environmental Protection Agency (EPA) is the lead agency for the Libby Asbestos Superfund Site. The United States Army Corp of Engineers (USACE) is supporting EPA with the removal activities in OU7 and DEQ is the lead agency for OU7 through a cooperative agreement with EPA. There is no individual designated as the EPA Quality Assurance Manager (QAM) for the Libby project. Rather, the Region 8 Quality Assurance (QA) program has delegated authority to an EPA RPM. This means that the EPA RPM has the ability to review and approve governing investigation documents developed by Site contractors. Thus, it is the responsibility of the EPA RPM, who is independent of the entities planning and obtaining the data, to ensure that this SAP has been prepared in accordance with the EPA QA guidelines and requirements.

The primary objective of this document is to define indoor air data collection efforts needed to support development of the Human Health Risk Assessment (HHRA) for OU7 (Tetra Tech 2011). This SAP will guide Tetra Tech Indoor ABS activities during the ABS scenarios identified in the OU7 HHRA Work Plan (WP). These activities include collection and analysis of indoor air samples at residential properties and community-based recreational areas in OU7. Similar tasks are being done concurrently in OU4 of the Libby Asbestos Superfund Site. This document includes many of the methods and procedures used to collect OU4 indoor ABS data which were published by Camp Dresser & McKee (Camp Dresser & McKee [CDM] 2007).

This SAP includes all required elements for a field sampling plan (FSP) and a quality assurance project plan (QAPP), and was developed in accordance with EPA guidance documents Environmental Protection Agency Requirements for Quality Assurance Project Plans, EPA QA/R-5 (EPA 2001) and Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G4 (EPA 2006).

This SAP describes the sampling objectives, data quality objectives (DQO), locations, and measurement methods to support the ABS project in OU7.

The SAP organization is:

Section 1.0 – Introduction
Section 2.0 – Project Background
Section 3.0 – Data Quality Objectives
Section 4.0 – Sampling Program
Section 5.0 – Laboratory Operations
Section 6.0 – Data Management
Section 7.0 – QA/QC Procedures
Section 8.0 – References

Tables and figures in this document follow the first reference in the text. Appendix A has the site-specific health and safety plan (HASP) and HASP Addendum, Appendix B the field forms anticipated for use during the Indoor ABS project, and Appendix C the project-specific standard operating procedures (SOP) that will be followed during the ABS project.

## 1.1 INDOOR ACTIVITY-BASED SAMPLING PROJECT OBJECTIVES

The primary objective of the OU7 Indoor ABS project is to obtain the data needed to allow DEQ to complete an HHRA for OU7. The HHRA will be used to help evaluate whether the interim removals designed for OU7 were effective in reducing the threat to human health from exposure to Libby Amphibole (LA) in air at OU7 residential properties and whether additional removal actions are needed. The HHRA will evaluate threats to human health from community-wide exposures to LA in air at OU7. The residential specific indoor ABS data will support the community-wide HHRA. The residential properties fall into two categories:

- Properties for which indoor or outdoor removal is not required based on removal criteria described in EPA (2003) and DEQ (2009).

- Properties for which indoor or outdoor removal has been completed.

The air data needed to complete the HHRA were identified in the HHRA work plan for OU7 (Tetra Tech 2011), and consist of ABS data for outdoor air, ABS data for indoor air, and ambient air data. ABS data for outdoor air, including residential and community wide activity scenarios, and ambient air are available and usable for the HHRA; ABS data for indoor air for the two residential property categories remains as a data gap. The OU7 Indoor ABS project will obtain the indoor air ABS data needed to complete the HHRA.

## 1.2 PROJECT ORGANIZATION

This SAP was developed by Tetra Tech (DEQ's contractor) at the direction of, and with oversight by the DEQ, with input from EPA. Tetra Tech will also be responsible for conducting all field sampling activities in support of the sampling programs described in this SAP. Key Tetra Tech personnel who will be involved in these sampling programs include:

- J. Edward Surbrugg, Project Manager
- Mark Stockwell, Field Team Leader
- Randy Dorian, Sample Coordinator and Data Manager
- Debbie Kutsal, QA Manager
- Mark Stockwell, Health and Safety Manager

Figure 1-1 identifies the general organizational structure for the OU7 team.

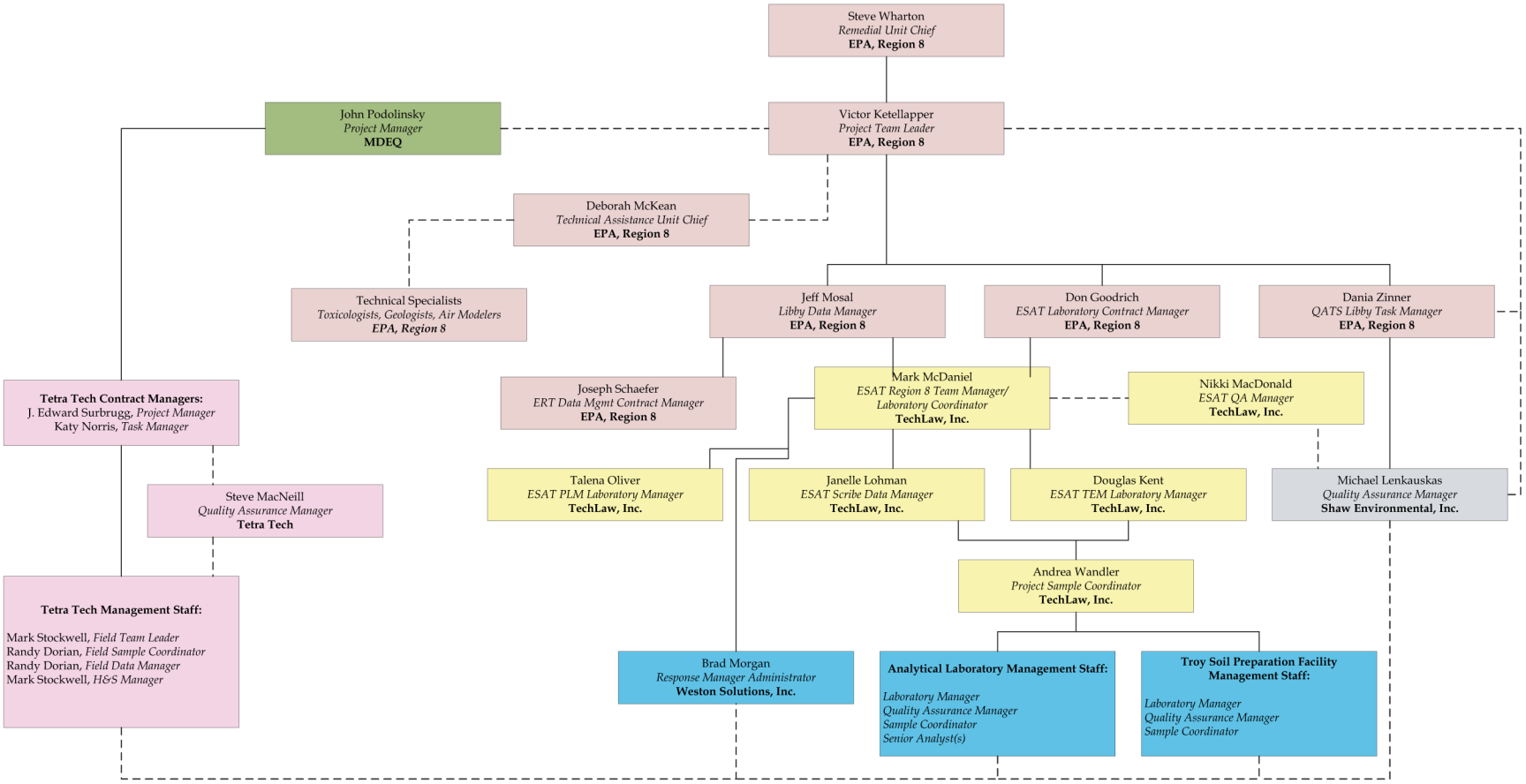



**Figure 1-1. General Organizational Chart for Libby OU7**

EPA Region 8 Staff
USACE Staff
MDEQ Staff
Tetra Tech Staff
TechLaw Staff
TechLaw Subcontractors
Shaw Staff
Lines of authority
Lines of communication

The EPA's Environmental Response Team is responsible for all data management aspects of this project. The EPA's Environmental Services Assistance Team (ESAT) is responsible for procuring all analytical and preparation laboratory services requires as part of these sampling programs.

### 1.3 PROJECT SCHEDULE AND DELIVERABLES

The first phase of ABS field activities is expected to occur during September of 2012 and the second field phase is anticipated to occur during January 2013. A draft report summarizing the findings from ABS efforts will be completed later in 2013.

# 2.0 PROJECT BACKGROUND

From the 1920s until 1990, there was an active vermiculite mine and associated processing operations in Libby, Montana. While in operation, the mine may have produced 80 percent of the world's supply of vermiculite (EPA 2005). The processed and exfoliated vermiculite was primarily used for insulation in buildings and as a soil amendment. The Libby vermiculite deposit includes amphibole asbestos. For decades, the processing of vermiculite ore and generation and disposal of waste materials resulted in the widespread presence of amphibole asbestos throughout the Libby community. In 1999, EPA Region 8 dispatched an emergency response team to investigate media reports of abundant amphibole asbestos and high rates of asbestos-related disease in Libby. Subsequent environmental investigations found asbestos throughout many areas in and around Libby that included a form of amphibole asbestos known as Libby Amphibole (LA).

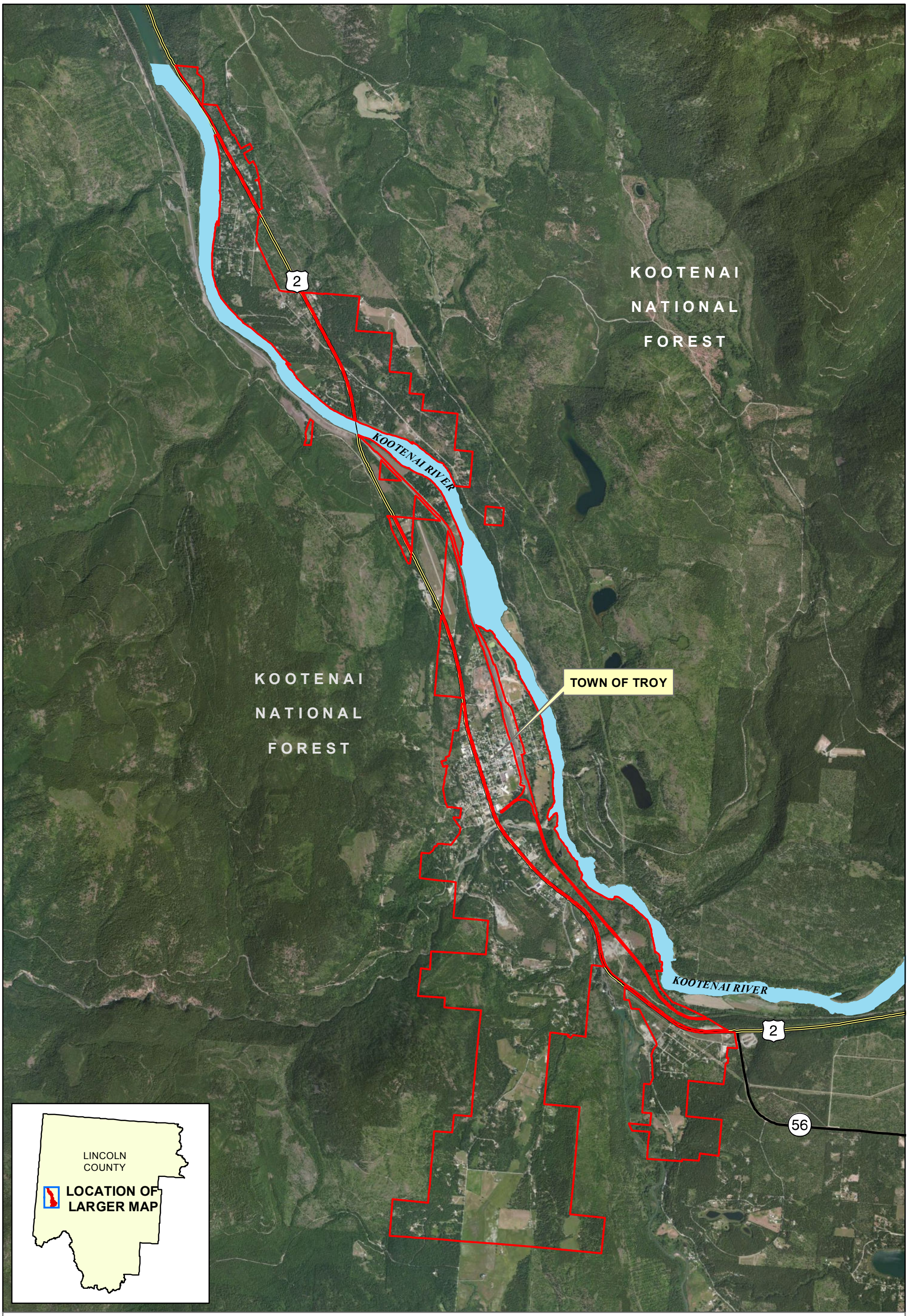
## 2.1 SITE LOCATION

Troy, Montana is 18 miles northwest of Libby, Montana and was designated as OU7 of the Libby Asbestos Superfund Site. OU7 is in the Kootenai River valley at elevations from 1,850 feet above mean sea level at the northern end to 2,500 feet above mean sea level on the mountain slopes surrounding the valley. OU7 is approximately 8 miles long and up to 1.8 miles wide. Topography of OU7 consists of relatively flat river valley terraces on both sides of the gently graded Kootenai River. Several tributaries flow into the Kootenai River along the 8-mile stretch of the river in OU7.

The OU7 boundary (Figure 2-1) was selected to ensure that investigations captured most of the older homes in and around Troy that are more likely to contain LA or LA source materials.

## 2.2 SITE HISTORY

Some of the vermiculite mine workers lived in Troy and commuted daily to work at the mine in Libby. The mine workers were exposed to asbestos-containing materials at the mine and processing facilities, and they transported asbestos-containing dust to their homes on clothes and equipment. Residents of Troy traveled to Libby for everyday activities such as shopping, working (other than at the mine), and attending school sporting events. They likely came into contact with LA in Libby during these visits. The asbestos-containing vermiculite ore and waste materials in varying forms may have been used for amending soils (as fill or as a conditioner), building materials (plaster, concrete, or chinking amendment), wood burning, and for insulating buildings in and around Troy. The ore and waste may also have been spilled or placed in transportation corridors.




**Legend**

OU7 BOUNDARY

0 1 Miles

N

Indoor ABS Sampling and Analysis Plan

**FIGURE 2-1**
**LIBBY ASBESTOS SITE**
**OPERABLE UNIT 7**
**BOUNDARY**

TETRA TECH EM INC.

GIS map by Ed Madej TTEMI-HE
FIG2-1_OU7_BOUNDARIES_071612.mxd

## 2.3 OCCURRENCE OF LIBBY AMPHIBOLE

Typically, the LA found in southern Lincoln County comes from one, or some combination of, primary sources outside of OU7 including vermiculite mining waste, vermiculite ore, vermiculite processing waste, bulk residuals from vermiculite processing, LA-containing rock, or LA-containing vermiculite insulation. Although there are no major sources of LA in OU7, residential use of vermiculite from the Libby mine, primarily as building insulation and as a soil amendment, was common. In some cases, vermiculite insulation was found after it sifted from the attic into interior and exterior walls. In rare cases, vermiculite was found as an additive in building materials such as plaster, mortar, and concrete.

The LA-containing soil is generally from vermiculite used as a soil amendment in flowerbeds and gardens, for leveling of low spots, and for backfilling of utilities.

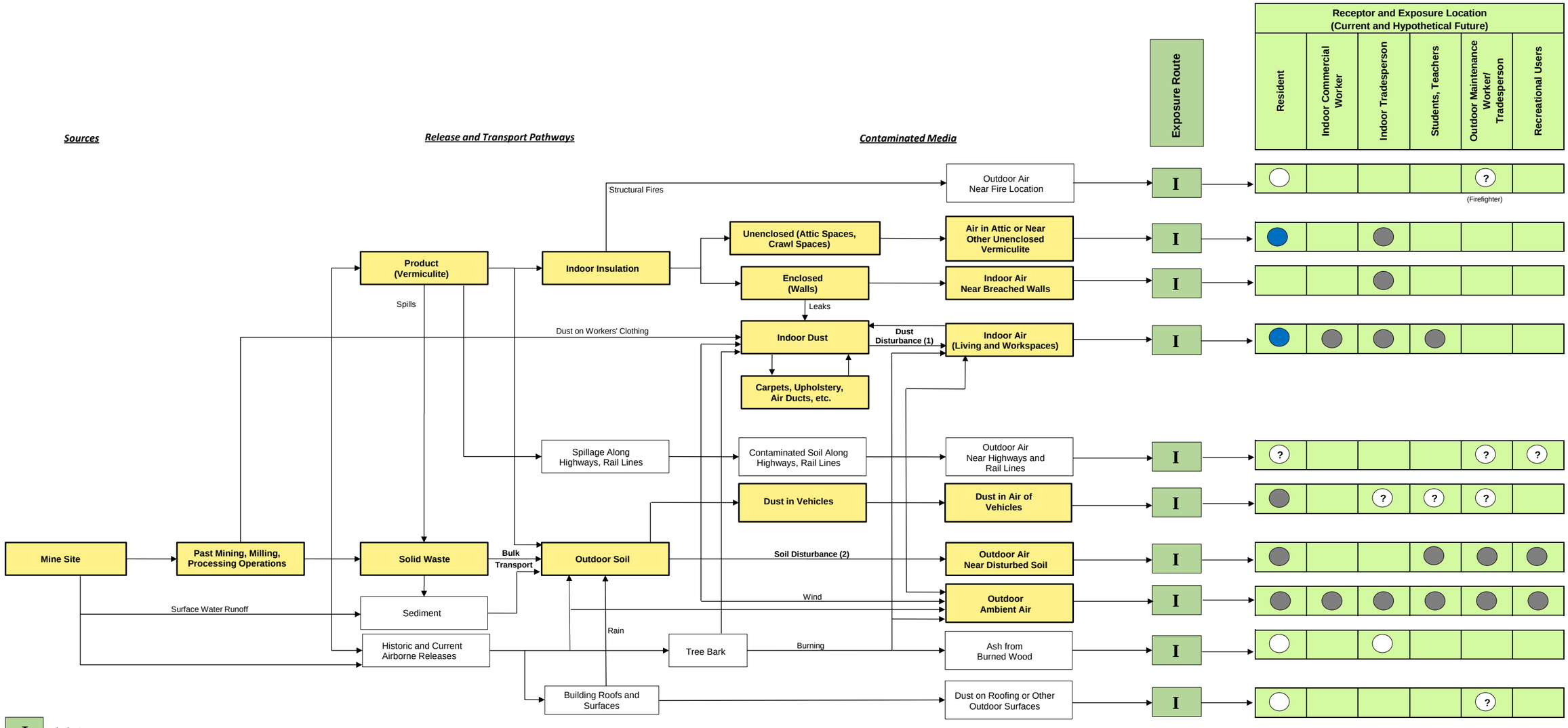
## 2.4 DEVELOPMENT OF HHRA DATA GAPS

Since the nature of LA and associated exposure pathways in OU7 are similar to those observed in Libby, and the vermiculite insulation found in Troy is similar in morphology and mineralogy to that found in Libby, a systematic screening of interiors and exteriors of Troy area residences, public areas, schools, and businesses was done to gather information to determine how many Troy area properties have LA present. This systematic screening is referred to as the Troy Asbestos Property Evaluation (TAPE) (Tetra Tech 2007).

Potentially complete and significant inhalation exposure pathways for LA and the data needed to quantify human health risks for exposure pathways were identified during development of the HHRA Work Plan (Tetra Tech 2011) and from available data compiled from ongoing investigations in OU7 and OU4. The HHRA will be used to help confirm that the TAPE investigation and interim removals in OU7 were effective in reducing or removing the threat to human health from exposure to LA and whether additional removals are necessary. A conceptual site model (CSM) for potential human inhalation exposure pathways to LA was prepared as part of the HHRA work plan development. Figure 2-2 has the CSM. This SAP addresses only indoor residential activities in OU7 because outdoor and community-based ABS scenarios have already been done in OU7. Some data from OU4 (interior and exterior) may also be used to characterize human health risk in OU7.

Based on exterior findings from the TAPE investigation and the Removal Design Investigation (RDI) from 2007 through 2011, DEQ concluded the following:

- Exterior removals or demolitions were required for 35 parcels at OU7;
- Exterior removals for 22 of the parcels were completed in 2010 and 1 was completed in 2011;
- Exterior removals for the remaining 12 parcels are proposed for 2012 or later;




I Inhalation exposure route

Pathway is complete and exposure may be significant; will be quantitatively evaluated in the Human Health Risk Assessment (HHRA).

Pathway is complete but is believed to be minor in comparison to other pathways; will be qualitatively evaluated in the HHRA.

? Pathway may be complete but magnitude of exposure is uncertain; will be qualitatively evaluated in the HHRA. Further investigation may be necessary.

Pathway is incomplete or believed to be negligible; Further evaluation is not warranted.

Medium investigated by the Troy Asbestos Property Evaluation (TAPE), Outdoor Ambient Air (AA), and the Activity Based Sampling (ABS) programs.

Receptor and exposure locations evaluated by the Indoor ABS program for inclusion in the HHRA.

(1) Indoor dust disturbance may result from active behaviors (e.g., vacuuming, dusting, walking from room to room) and passive behaviors (e.g., reading, watching television, sleeping).

(2) Soil disturbance activities identified as representative of potential exposures are yard work, gardening, bicycling and playing on an unpaved driveway, driving and bicycling around town, and recreational activities at parks and school yards.

Indoor ABS Sampling and Analysis Plan

**FIGURE 2-2**
**Conceptual Site Model for**
**Potential Human Inhalation Exposure Pathways to Libby Asbestos**
**ABS Receptor and Exposure Locations**
**Operable Unit 7**

TETRA TECH EM INC.

TAPE and the RDI findings from 2007 through 2011 concluded the following interior findings:

- Interior removals were required for 86 parcels at OU7;
- Interior removals for 62 of the parcels were completed in 2010 and 7 were completed in 2011;
- Interior removals for the remaining 17 parcels are pending for 2012 or later.

The HHRA will evaluate potential human health inhalation exposure pathways for LA to evaluate (1) if there are acceptable risks to human health for parcels for which interim removals (interior and exterior) were not required, and (2) if the interim removals (interior and exterior) were effective in reducing the threat to human health to acceptable levels at parcels with removals. The HHRA data gaps addressed by the indoor ABS program include receptor and exposure locations within the boundaries identified in Figure 2-1 that include:

1. Residential exposure to indoor air near unenclosed vermiculite
2. Residential exposure to indoor air in the living area and workspace

The receptors and exposure locations to be evaluated and addressed through indoor ABS activities are associated with two indoor ABS scenarios. Although a wide variety of activities may result in indoor disturbances of LA, it is not feasible to evaluate every type of disturbance. The two scenarios are considered realistic and representative examples of potential indoor LA disturbances in OU7.

1. Active residential scenario (vacuuming, dusting, general sweeping and cleaning, simulated play with children and pets, walking from room to room)
2. Passive residential scenario (reading, watching TV, walking from room to room, sitting)

For each scenario, recommendations were developed regarding the sampling needed to obtain data for quantitative evaluation in the HHRA. Property removal status categories of LA, potential receptors and age groups, and temporal factors were considered for the recommended sampling. The descriptions and recommendations for sampling for the two indoor scenarios are largely based on the indoor ABS program conducted for OU4 (CDM 2007). Each of these scenarios, including sampling recommendations and procedures, are described further in Section 4.0.

# 3.0 DATA QUALITY OBJECTIVES

The DQO process is a series of planning steps designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended purpose. The DQOs were developed in accordance with EPA guidance (EPA 2006).

DQOs help to clarify the study objectives, define the most appropriate data to collect and the conditions under which to collect the data, and specify tolerable limits on decision errors that will be used as the basis for establishing the quantity and quality of data needed to support decision-making. The DQOs are used to develop a scientific and resource-effective design for data collection.

The DQO process consists of seven steps; output from each step influences the choices that will be made later in the process. These steps are:

1. State the problem
2. Identify the decision
3. Identify the inputs to the decision
4. Define the study boundaries
5. Develop decision rules
6. Specify tolerable limits on decision errors
7. Optimize the investigation design

## 3.1 STEP 1 – STATE THE PROBLEM

This step describes the problem to be addressed. One issue of high priority to DEQ and EPA is an evaluation of the efficacy of the current removal strategy – answers are needed for these questions:

- Are there acceptable risks to residents in OU7 at properties that DEQ and EPA has characterized as having no triggers sufficient to warrant removal actions under the approach described in EPA 2003 and DEQ 2009?
- Are there acceptable risks to residents in OU7 after an interior, exterior, or combined interior and exterior removal action is completed?

In this document, the phrase "post-removal property" is used to indicate any property where DEQ and EPA investigated sources and has taken removal action. The term “non-removal property” indicates any property where DEQ and EPA investigated sources and determined that the current removal criteria was not met. EPA and the USACE have been working to remove both indoor and outdoor sources of vermiculite insulation, soil containing vermiculite, and LA at properties in OU7. To help evaluate the efficacy and protectiveness of these removals, information is needed to complete characterization of risk from indoor exposures that may currently exist at post-removal and non-removal properties. The objective of this SAP is to

specify how to obtain specific ABS indoor air receptor and exposure location data (see Section 2.4 and Figure 2-2) to be used in the HHRA.

## 3.2 STEP 2 – IDENTIFY THE DECISION

This step identifies what questions the indoor ABS project is designed to answer and what actions may result. The principal questions and possible alternative actions are in Table 3-1:

**TABLE 3-1**
**PRINCIPAL STUDY QUESTIONS AND ALTERNATIVE ACTIONS**

| Response Item Evaluated | Principal Study Question | Alternative Actions |
|---|---|---|
| Quantify airborne LA exposures during various indoor activities involving simulated residential receptor categories where data gaps have been identified. | Is the current strategy for interior and exterior removal in OU7 adequate to provide health protection from indoor exposures to LA? | ▪ Collect ABS indoor air samples during various simulated passive and active activities at OU7 properties that have undergone interior or exterior removals.<br>▪ Take no action |
| | At properties that underwent TAPE inspections and did not meet the interior or exterior removal criteria, (no removal was required) was this decision adequate to provide health protection from indoor exposures to LA? | ▪ Collect ABS indoor air samples during various simulated passive and active activities at OU7 properties that have not undergone interior or exterior removals.<br>▪ Take no action |

Notes: The method EPA currently recommends for estimating excess risk of lung cancer and mesothelioma from inhalation exposure to asbestos in air is described in EPA's Integrated Risk Information System (IRIS) (EPA 2012). This method is currently undergoing review, and the approach may be revised as new methods are developed and as new toxicity data on asbestos are obtained. The EPA has not developed a method for assessing non-cancer risks from inhalation exposure to asbestos, so all evaluations of protectiveness that are based on currently available risk assessment methods should be viewed as interim; these interim decisions may be revised in the future as methods and data for assessing the cancer and non-cancer risks of asbestos are improved.

ABS Activity-based sampling
LA Libby Amphibole
OU7 Operable unit 7
TAPE Troy Asbestos Property Evaluation

## 3.3 STEP 3 – IDENTIFY THE INPUTS TO THE DECISION

This step identifies the information and measurements needed to resolve the decision statements. The information needed to resolve the principal study questions is summarized in Table 3-2.

**TABLE 3-2**
**SUMMARY OF INPUTS TO RESOLVE STUDY QUESTIONS AND USE OF INFORMATION ACQUIRED FROM INPUTS**

| Principal Study Question | Input to Resolve Question | Use of Input to Resolve Question |
|---|---|---|
| Is the current strategy for interior and exterior removals in OU7 adequate to provide health protection from indoor exposures to LA? | Samples in the breathing zone | At representative OU7 properties that underwent interior or exterior removals, ABS indoor air samples will be collected during various simulated passive and active activities. The results of the sampling will be used to determine adequacy of health protection resulting from removals. |
| At properties that underwent TAPE inspections and did not meet the interior or exterior removal criteria (no removal was required), was this decision adequate to provide health protection from indoor exposures to LA? | Samples in the breathing zone | At representative OU7 properties that did not meet the interior or exterior removal criteria, ABS indoor air samples will be collected during various simulated passive and active activities. The results of the sampling will be used to determine the adequacy of the health protection decision to not perform interior or exterior removals at these properties. |

Notes:

LA Libby Amphibole
ABS Activity-based sampling
OU7 Operable Unit 7
TAPE Troy Asbestos Property valuation

The data needed to achieve the objectives of this effort consist of accurate and reliable measures of LA in indoor air during ABS activities at different locations. The following sections identify key attributes of the data needed for this effort.

### 3.3.1 Sampling Locations

The indoor ABS sampling for OU7 is designed to characterize LA concentrations associated with indoor ABS activities and inhalation exposure pathways. The locations for these activities will consist of interior areas of residences involving both passive (watching TV, reading, writing, sitting) and active (vacuuming, dusting, cleaning, walking from room to room) activities.

### 3.3.2 Types of Air Samples

Experience at Troy and Libby sites demonstrated that, in general, air samples collected from the breathing zone of a person tend to have higher concentrations of LA than air samples collected by stationary monitors, especially if the person is engaged in an activity that disturbs an asbestos

source such as contaminated carpeting. Therefore, this SAP will focus on collecting air samples from the breathing zone during simulated active and passive interior activities that may disturb interior surfaces.

### 3.3.3 Target Analyte List

Each air sample must be analyzed for asbestos particles. Specific methods and counting rules are in Section 5. Analytical results will include the size (length, width) of each particle and mineral classification (LA, other amphibole, chrysotile).

### 3.3.4 Types of Interior Surface Disturbances

The data gaps targeted during the ABS project are associated with two indoor ABS scenarios. Although a wide variety of activities may result in indoor disturbances of LA, it is not feasible to evaluate every type of disturbance. The scenarios are considered realistic and representative examples of indoor LA disturbances in OU7.

1. Active scenario (vacuuming, dusting, general cleaning, walking from room to room)
2. Passive scenario (reading, watching TV, walking from room to room, sitting)

### 3.3.5 Residence Interior Condition Data

It is expected that the amount of dust (and asbestos) released from an ABS event may depend in part on the interior conditions of the residence at the time of the sampling. To help characterize this source of variability, and potentially allow for some degree of normalization between locations, the following data are needed for each indoor ABS test area:

- Type (carpet, linoleum, hardwood, etc.) and extent of floor coverings in each room
- Type (tile, Formica, natural stone, wood, etc.) and extent of counter tops and elevated horizontal surfaces in each room
- Type (vinyl, wood, cloth, etc.) and extent of furniture and window treatments in each room.

## 3.4 STEP 4 – DEFINE THE BOUNDARIES OF THE STUDY

This step specifies the spatial and temporal boundaries of the ABS.

### 3.4.1 Spatial Bounds

The spatial bounds of this study are restricted to selected properties in OU7. OU7 includes most of the current residential, public, and commercial properties in the community of Troy and surrounding area.

### 3.4.2 Temporal Bounds

Estimation of human health risk from exposure to LA in indoor air following a series of passive and active indoor activities is based on the average concentration that occurs across the series of events. Because the level of LA in indoor ABS samples may depend on factors that vary seasonally (weather, e.g., wind speed, humidity, etc.), the data set needed for this effort should ideally consist of multiple samples from each area spanning a range of time and meteorological conditions. This will help ensure that reliable estimates of the long-term average concentrations may be computed from the individual short-term measurements. The exact dates of ABS field events are not important and may be randomly selected (since the goal is to capture temporal variability). One round of sampling will be done during dry (summer) conditions and another during wet winter conditions.

During days when indoor ABS activities are scheduled, meteorological (MET) weather station data will be downloaded from the weather station at the DEQ Information Office in Troy. Weather data will include temperature, relative humidity, wind speed and direction, and any precipitation type and accumulation.

## 3.5 STEP 5 – DEVELOP DECISION RULES

This step describes the method to determine whether the data collected indicate acceptance and the resulting decision applied when acceptance is not obtained. The principal study questions, inputs to resolve study questions, action levels, and decision rules are summarized in Table 3-3.

The EPA has recently proposed draft LA-specific toxicity values for use in estimating non-cancer hazard quotients (HQs) and cancer risks from exposures to LA in air (McKean 2011). The proposed draft reference concentration (RfC) value is 0.00002 structures per cubic centimeter of air (s/cc) and the proposed draft inhalation unit risk (IUR) value is 0.17 $(s/cc)^{-1}$. It is important to note that calculations of human exposure and risk from asbestos in air are expressed in terms of phase contrast microscopy (PCM) in units of s/cc. When analysis is performed by TEM, structures that satisfy PCM counting rules are referred to as phase contrast microscope equivalent (PCME) structures. The PCM counting rules include structures with a length greater than (>) 5 um, a width greater than or equal to (≥) 0.25 um, and an aspect ratio ≥ 3:1.

Basic methods for estimating human health risk from LA in air are provided below.

## TABLE 3-3
## DECISION RULES

| Principal Study Question | Input to Resolve Question | Input Requirements | Action Level | Decision Rule |
|---|---|---|---|---|
| Is the current strategy for interior and exterior removals in OU7 adequate to provide health protection from indoor exposures to LA? | Air samples in the breathing zone | ISO TEM Method 10312, also known as ISO 10312:1995(E) (CDM 2003b) | To be determined | If indoor air sample results from the breathing zone exceed a specified level (yet to be determined), additional removal will be required. |
| At properties that underwent TAPE inspections and did not meet the interior or exterior removal criteria (no removal was required), was this decision adequate to provide health protection from indoor exposures to LA? | Air samples in the breathing zone | ISO TEM Method 10312, also known as ISO 10312:1995(E) (CDM 2003b) | To be determined | If indoor air sample results from the breathing zone exceed a specified level (yet to be determined), additional removal will be required. |

Notes:

| | |
|---|---|
| ISO | International Organization for Standardization |
| LA | Libby Amphibole |
| TAPE | Troy Asbestos Property Evaluation |
| TEM | Transmission Electron Microscopy |

**Estimation of Cancer Risk**

The basic equation for estimating cancer risk from LA using the EPA's LA-specific IUR value is as follows:

$$Risk = EPC * TWF * IUR_{LA}$$

where:

Risk = Lifetime excess risk of developing cancer (lung cancer or mesothelioma) as a consequence of site-related LA exposure.

EPC = Exposure point concentration of LA in air (LA PCM or PCME s/cc). The EPC is an estimate of the long-term average concentration of LA in inhaled air for the specific activity being assessed.

TWF = Time-weighting factor. The value of the TWF term ranges from zero to one, and describes the average fraction of a lifetime during which exposure occurs from the specific activity being assessed. Because the LA-specific IUR incorporates a lag of 10 years, the duration of a lifetime is assumed to be 60 rather than the usual 70 years:

$$TWF = ET/24 * EF/365 * ED/60$$

where:

ET = Average exposure time (hrs/day)
EF = Average exposure frequency (days/year)
ED = Exposure duration (years)

$IUR_{LA}$= Proposed draft LA-specific lifetime inhalation unit risk (LA PCM s/cc)$^{-1}$ (McKean 2011)

**Estimation of Non-Cancer Hazard Quotient**

The basic equation for characterizing non-cancer hazards from LA using the EPA's LA-specific RfC value is as follows:

$$HQ = EPC * TWF / RfC_{LA}$$

where:

HQ = Hazard quotient for non-cancer effects from site-related LA exposure
EPC = Exposure point concentration of LA in air (PCM or PCME s/cc)
TWF = Time-weighting factor
$RFC_{LA}$ = Proposed LA-specific lifetime reference concentration (LA PCM s/cc) (McKean 2011)

**Decision Rule**

The EPA guidance provided in Office of Solid Waste and Emergency Response (OSWER) Directive #9355.0-30, "Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions" (EPA 1991) indicates that where the cumulative cancer risk to an individual based on reasonable maximum exposure is less than 1E-04 and the non-cancer HQ is less than 1, remedial action is generally not warranted unless there are adverse environmental impacts. The decision rule for evaluating residual risks from disturbance of indoor sources at post-removal or non-removal properties is:

> If the level of risk to humans from exposure to ABS indoor air at a post-removal or non-removal location, when combined with the level of risk that applies to the same individuals from other applicable exposure pathways does not exceed a cancer risk of 1E-04 or a non-cancer Hazard Quotient (HQ) of 1.0, then risks at that location will be considered acceptable. If the total risk exceeds a cancer risk of 1E-04 or an HQ of 1.0, then the feasibility of further reducing exposure from all applicable exposure pathways at that location shall be assessed.

**Target Analytical Sensitivity**

The level of analytical sensitivity needed to ensure that analysis of ABS air samples will be adequate is derived by finding the concentration of LA in ABS air that might be of potential concern, and then ensuring that if an ABS sample were encountered that had a true concentration equal to that level of concern, it would be quantified with reasonable accuracy. This process is implemented below:

<u>Step 1. Calculation of Risk-Based Concentrations</u>

**Cancer.** The basic equation for calculating the risk-based concentration (RBC) for cancer is:

RBC(cancer) = Maximum Acceptable Cancer Risk / (TWF * IUR)

For cancer, the maximum acceptable risk is a risk management decision. For the purposes of calculating an adequate target sensitivity, a value of 1E-05 is assumed which is consistent with the value used for OU4 (CDM Federal Programs 2012).

The exposure parameters needed to calculate TWF are not known with certainty. For a conservative estimation, the TWF is assumed for exposure to indoor air to be 1.0. This value corresponds to continuous exposure (24 hours per day, 365 days per year) for a lifetime. Most Troy residents will have indoor air exposures less than this assumption.

The proposed LA-specific IUR is 0.17 $(\text{PCM s/cc})^{-1}$ (McKean 2011). Based on these values, the RBC for cancer is 0.00006 LA PCME s/cc.

**Non-Cancer.** The basic equation for calculating the RBC for non-cancer effects is:

RBC(non-cancer) = (Maximum Acceptable HQ * RfC) / TWF

For non-cancer, the maximum acceptable HQ is 1. The TWF is the same as derived above (1.0). The proposed LA-specific RfC is 0.00002 LA PCM s/cc (McKean 2011). Based on these values, the RBC for non-cancer is 0.00002 LA PCME s/cc.

Because the non-cancer RBC is lower than the cancer RBC, the non-cancer RBC will be used to derive the target analytical sensitivity, as follows.

Step 2: Determining the Target Analytical Sensitivity

The target analytical sensitivity is determined by dividing the RBC by the target number of structures to be observed during the analysis of a sample with a true concentration equal to the RBC (CDM Federal Programs 2012):

Target Analytical Sensitivity = RBC / Target Count

The target count is determined by specifying a minimum detection frequency required during the analysis of samples at the RBC. This probability of detection is given by:

Probability of detection = 1 - Poisson(0,Target Count)

Using the methodology described in the SAP for the 2011 Miscellaneous Activity-Based Sampling, Libby Asbestos Site, Operable Unit 4 (CDM Federal Programs 2012), an assumed minimum detection frequency of 95 percent equates to a target count of 3 structures. Based on this, the target analytical sensitivity is:

Target Analytical Sensitivity = (0.00002 s/cc) / (3 s) = 0.0000067 $cc^{-1}$

The 2011 OU4 residential ABS study (EPA 2010) specified a target analytical sensitivity of 0.00022 $cc^{-1}$ for all outdoor ABS air samples. Thus, a target analytical sensitivity of 0.0000067 $cc^{-1}$is much more conservative than previous values, but may not be achievable for this study as about 4,789 grid openings would need to be examined. In order to limit the maximum effort expended on any one sample, the maximum number of grid openings examined for any one sample will be 2,000. This document is focused on methods for collecting data on the concentration of asbestos in the breathing zone of people who are engaged in activities that disturb indoor sources. These data will be used to evaluate the risk from the indoor source-disturbance pathway. This risk estimate will be combined with risk estimates for other pathways to estimate total exposure. Because of limitations in the current methods for assessing risks from asbestos, all decisions regarding residual risk levels are considered interim and may be revisited as new methods and data become available.

## 3.6 STEP 6 – SPECIFY TOLERABLE LIMITS ON DECISION ERRORS

This step specifies the tolerable limits on decision errors used to establish performance goals for the data collection design.

In making decisions about the long-term average concentration of LA in ABS indoor air and the level of health risk associated with that exposure, two types of decision errors are possible:

- A false negative decision error would occur if a risk manager decides that exposure to ABS indoor air is not of significant health concern when in fact it is of concern.
- A false positive decision error would occur if a risk manager decides that exposure to ABS indoor air is above a level of concern when in fact it is not.

EPA and DEQ are most concerned about guarding against the occurrence of false negative decision errors because this error type may leave humans exposed to unacceptable levels of LA in indoor air.

For this reason, it is anticipated that decisions regarding this pathway will be based not only on the best estimate of the long term average concentration, but will also consider the 95 percent upper confidence limit (UCL) of the long-term average concentration. Use of the UCL to estimate exposure and risk helps account for limitations in the data, and provides a margin of safety in the risk calculations, ensuring that risk estimates are unlikely to be too low.

EPA and DEQ are also concerned with the probability of making false positive decision errors. Although this type of decision error does not result in unacceptable human exposure, it may cause unnecessary expenditure of resources. For this effort, the strategy for controlling false positive errors is to set a goal that, if the exposure estimate based on the 95 percent UCL is above EPA's level of concern for this pathway, then the UCL is not larger than three times the best estimate of the mean. If the 95 percent UCL is at or above the range of potential concern, and the UCL is greater than three times the best estimate of the mean, then it will be concluded that there is a substantial probability of a false positive decision error and that more data may be needed to strengthen decision-making.

For completing all seven steps of the DQO process, the null hypotheses and consequences of making an incorrect decision are summarized in Table 3-4. The gray region and tolerable limits on decision errors are not proposed because they are not applicable in this case.

## 3.7 STEP 7 – OPTIMIZE THE INVESTIGATION DESIGN

This step identifies a resource-effective data collection design for generating data to satisfy the DQOs. The data collection design is described in detail in the remaining sections of this SAP and other site documents referenced in Section 4.0.

## TABLE 3-4
## LIMITS ON DECISION ERRORS

| Principal Study Question | Null Hypothesis | Type I Error Will Result in: | Type II Error Will Result in: |
|---|---|---|---|
| Is the current strategy for interior and exterior removals in OU7 adequate to provide health protection from indoor exposures to LA? | Disturbance of indoor sources at post-removal properties exceeds a specified level | Determining that ABS indoor air samples do not exceed a specified level when airborne LA actually does exceed this level would lead to an increased risk to human health. | Determining that ABS indoor air samples do exceed a specified level when airborne LA does not exceed this level would lead to unnecessarily performing additional removals or inefficiency during removal that adds to removal costs. |
| At properties that underwent TAPE inspections and did not meet the interior or exterior removal criteria(no removal was required), was this decision adequate to provide health protection from indoor exposures to LA? | Disturbance of indoor sources at non-removal properties exceeds a specified level | Determining that ABS indoor air samples do not exceed a specified level when airborne LA actually does exceed this level would lead to an increased risk to human health. | Determining that ABS indoor air samples do exceed a specified level when airborne LA does not exceed this level would lead to unnecessarily performing initial removals or inefficiency during removal that adds to removal costs. |

Notes:
ABS Activity-based sampling
LA Libby Amphibole
OU7 Operable Unit 7
TAPE Troy Asbestos Property Evaluation

# 4.0 SAMPLING PROGRAM

This section summarizes the indoor ABS scenarios developed for incorporation into the HHRA and field activities in support of the Indoor ABS program in OU7. This section provides brief summaries of SOPs, including project-specific modifications and project-specific details not discussed in the SOPs.

The site-specific HASP (Appendix A) will be consulted to determine health and safety protocols for doing the Indoor ABS project tasks. Tetra Tech's field team leader and site safety coordinator (Mark Stockwell) will oversee and direct field activities and has day-to-day responsibility for implementing the HASP. Mr. Stockwell has the appropriate level of training and advanced level of field work experience to be familiar with health and safety requirements specific to the project. The field team leader will report any health and safety-related issues directly to the project manager (J. Edward Surbrugg) who will communicate these issues to the Regional Health and Safety Officer for resolution. All Tetra Tech employees working on the Indoor ABS project are expected to fully participate in implementing the site HASP by obtaining necessary training, attending site safety meetings, always wearing designated PPE, complying with site safety and health rules, and advising the SSC of health and safety concerns at the site. Field forms and project-specific SOPs are in Appendices B and C.

All sampling activities will be done in accordance with this SAP. The SOPs and project-specific procedures to be employed are outlined in:

- 2009 Ambient Air WP for OU7 (Tetra Tech 2009)
- EPA-Libby-2012-10 Libby Asbestos Superfund Site SOP: Air Sample Collection (CDM Federal Programs Corporation 2012).

Analytical methods for all samples collected in accordance with this SAP are discussed in detail in Section 5.0.

## 4.1 INDOOR ABS SCENARIOS

The following sections provide a general summary of the two indoor ABS scenarios to be evaluated with additional information related to receptors, duration of sampling, number of samples, and temporal considerations. Specific indoor ABS details begin in Section 4.2. Table 4-1 has a summary of the two indoor ABS scenarios and sampling requirements.

Because risk is related to long-term average exposure of all resident activities, indoor ABS samples will be collected to represent a composite of various activities. These activities fall into two general scenarios: (1) Active indoor residential activities, and (2) Passive indoor residential activities.

**Table 4-1**
**Exposure Scenarios, Locations, Activities, and Number of Samples for Indoor Activity-Based Sampling at OU7**

| ABS Scenario | | Location | Property Category | Property Sub-Category | Receptor | Age Group | Sample Height | Activity | Activity Time | Samples per Scenario and Category | Events per Location (a) | Total Samples per Scenario, Property Group |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Description | | | | | | | | | | | |
| 1 | Active Resident | Inside Residence | Removal Not Required | No V V / ND | Resident | Adult | Breathing Zone for Adult | Vacuuming / Dusting / Cleaning / Walking From Room to Room | 238.5 Minutes of Total Combined Activities | 5 | 2 | 10 |
| | | | | V V / ND | | | | | | 5 | 2 | 10 |
| | | | | No V V / Trace (0.2 to <1) | | | | | | 5 | 2 | 10 |
| | | | | V V / Trace (0.2 to <1) | | | | | | 5 | 2 | 10 |
| 2 | Active Resident | Inside Residence | Removal Completed | Interior Removal Only | Resident | Adult | Breathing Zone for Adult | Vacuuming / Dusting / Cleaning / Walking From Room to Room | 238.5 Minutes of Total Combined Activities | 7 | 2 | 14 |
| | | | | Exterior Removal Only | | | | | | 7 | 2 | 14 |
| | | | | Interior / Exterior Combination Removal | | | | | | 6 | 2 | 12 |
| 3 | Passive Resident | Inside Residence | Removal Not Required | No V V / ND | Resident | Adult | Breathing Zone for Adult | Sitting / Reading / Watching Television/ Writing | 243 Minutes of Total Combined Activities | 5 | 2 | 10 |
| | | | | V V / ND | | | | | | 5 | 2 | 10 |
| | | | | No V V / Trace (0.2 to <1) | | | | | | 5 | 2 | 10 |
| | | | | V V / Trace (0.2 to <1) | | | | | | 5 | 2 | 10 |
| 4 | Passive Resident | Inside Residence | Removal Completed | Interior Removal Only | Resident | Adult | Breathing Zone for Adult | Sitting / Reading / Watching Television/ Writing | 243 Minutes of Total Combined Activities | 7 | 2 | 14 |
| | | | | Exterior Removal Only | | | | | | 7 | 2 | 14 |
| | | | | Interior / Exterior Combination Removal | | | | | | 6 | 2 | 12 |

Notes

V V Visible Vermiculite

ND Non-Detect

< Less Than

(a) One event for the wet winter season and one event for the dry late summer/early fall season are recommended.

**Property Categories** – To complete this evaluation, collection of indoor ABS samples during active and passive activities is needed from the following property categories:

- Property Category A: Residential post-removal properties
- Property Category B: Residential non-removal properties

**Receptors and Age Groups** – Adult residents are the most likely receptors and age group for the active indoor ABS scenarios, so samples will be collected at the adult breathing height during all active ABS sampling. Although teenagers may participate in housecleaning work, the breathing height of teenagers does not differ enough from that of adults to warrant collection of additional samples for teenager breathing height. Similarly, child exposures during active ABS scenarios will be represented by activities that include simulated playing with children and pets, such as rolling, crawling, and sitting on the floor surfaces. All air samples will be collected as the adult actor; however, multiple breathing heights will be involved with the up and down movements of the actor during the simulated play tasks.

Breathing heights of adults, teens, and most children during the passive ABS scenarios, will not differ significantly, so only samples from an adult breathing zone height will be collected during the passive scenarios.

**Duration of Sampling** – Each of the two scenarios will consist of 4 hours of continuous sampling on a single filter cartridge with specific time spent in each room determined by the number of rooms in the house (see Section 4.2).

**Number of Samples –** A minimum of 20 samples will be collected for each of the two property categories providing 40 samples per sampling event. This number of samples is expected to sufficiently represent all of the property variables found in both post removal and non-removal residences. Evaluation of the TAPE, RDI, and removal results for OU7 identified 20 likely parcels for Property Category B. Identification and inclusion of 20 parcels for Property Category B is probable, but this sampling objective may not be achieved because of limited homeowner participation. The anticipated 20 sample locations for Property Category A will provide 20 samples for each property category. When temporal factors are accounted for and two sampling events are completed, a total of 80 samples will be collected.

**Temporal Considerations** – Seasonal variables, such as soil moisture, and atmospheric humidity, may influence LA levels from soil disturbance (EPA 2007, CDM Federal Programs Corporation 2010). It is anticipated that the majority of exposures to LA from active interior disturbances are more likely to occur from late summer to early fall, when the weather is dry and humidity is low. To account for seasonal factors and to provide indoor ABS samples representative of potential exposures over multiple seasons, there will be two samplings: one for the wet winter season and one for the dry late summer or early fall season.

## 4.2 PRE-SAMPLING ACTIVITIES

Before beginning field activities, a field kickoff meeting will be held, required training will be done, and appropriate site specific instructions will be given to the field team.

Potential residential sampling locations will be identified through a query of the OU7 database using requirements identified in Table 4-1. To the extent possible, the residential locations will be selected to provide a geographically representative distribution across OU7. Once the properties are identified, property owner coordination will begin. The property owner of each location will be contacted to determine willingness to participate before starting sample collections. This process will continue until the desired numbers of sampling locations have been identified. Property-specific information will be collected for each sampling location and recorded on the Indoor OU7 ABS Field Form (Appendix C).

Each residential structure will be assessed to determine the number of rooms on each "living floor" of the main structure where sampling will be done. A "living floor" is defined as a regularly occupied area, and excludes unfinished basements and attics. The total sampling time for each period (passive and active) will be divided evenly among the all the rooms where routine living activities occur. Areas such as bathrooms and closets will not be included.

For example, if the home is composed of one floor with 6 rooms (living room, study, kitchen, and three bedrooms the total time of the passive sampling period (4 hours) would be divided evenly among the 6 rooms (240 minutes / 6 rooms = 40 minutes per room).

In another example, the home described above could contain two floors where one floor is an unfinished basement that is not part of the functional living space. In this case, the time per room would remain the same (unfinished basement would not be included).

### 4.2.1 ABS Scenario 1: Active Resident

The active sampling period will involve various levels of dust generating activities, including walking, continuously standing up and sitting down on upholstered chairs or cushions, sweeping non-carpeted floors, dusting, simulated play with children and pets, and vacuuming carpeted floors. Brooms and HEPA vacuums used during active disturbance activities will be provided by the home owners as agreed upon in the access agreements. If HEPA vacuums are used by the owners, the filters will be removed prior to sampling to simulate worst case exposures.

When there is carpeted and non-carpeted flooring in the same room, sweeping or vacuuming will be conducted on both flooring types.

These activities should be done for equal periods of time in each room. For example, if the time required per room is 40 minutes, each of the three activities should be conducted for

approximately 13 minutes. In the home described above, Table 4-2 shows an example of how the active period sampling would be done (assuming no upholstered furniture is in rooms 2 or 5):

**TABLE 4-2**
**ACTIVE PERIOD EXECUTION EXAMPLE**

| Location | Minutes Elapsed Since Start | Activity | Total Time of Activity in Location (minutes) |
|---|---|---|---|
| Room 1 | 0 to 13.0 | Walk on flooring | 13 |
| | 13.0 to 26.0 | Sit on upholstered furniture | 13 |
| | 26.0 to 39.0 | Sweep non-carpeted flooring | 13 |
| Room 2 | 39.0 to 39.5 | Transition to room 2 | 0.5 |
| | 39.5 to 59.5 | Walk on flooring | 20 |
| | 59.5 to 79.5 | Vacuum carpeted flooring | 20 |
| Room 3 | 79.5 to 80.0 | Transition to room 3 | 0.5 |
| | 80.0 to 93.0 | Walk on flooring | 13 |
| | 93.0 to 106.0 | Sit on upholstered furniture | 13 |
| | 106.0 to 119.0 | Sweep non-carpeted flooring | 13 |
| Room 4 | 119.0 to 119.5 | Transition to room 4 | 0.5 |
| | 119.5 to 132.5 | Walk on flooring | 13 |
| | 132.5 to 145.5 | Sit on upholstered furniture | 13 |
| | 145.5 to 158.5 | Vacuum carpeted flooring | 13 |
| Room 5 | 158.5 to 159.0 | Transition to room 5 | 0.5 |
| | 159.0 to 179.0 | Walk on flooring in room 5 | 20 |
| | 179.0 to 199.0 | Vacuum carpeted flooring | 20 |
| Room 6 | 199.0 to 199.5 | Transition to room 6 | 0.5 |
| | 199.5 to 212.5 | Walk on flooring in room 6 | 13 |
| | 212.5 to 225.5 | Sit on upholstered furniture | 13 |
| | 225.5 to 238.5 | Sweep carpeted flooring | 13 |
| **Total Active ABS Scenario Time (minutes & hours)** | | | **238.5 minutes (3 hours 58.5 minutes)** |

### 4.2.2 ABS Scenario 2: Passive Resident

Activities in the passive sampling period will be mostly sedentary with little movement. Movement will be restricted to walking between rooms and sitting on upholstered chairs or cushions. While seated the actor may read, watch television, play video games or complete required paperwork.

The actor should transition to each room when required, walk around the perimeter of the room once upon initial entry and then remain seated for the duration of the time required in the room.

In the home described above, Table 4-3 shows an example of what the passive sampling would be:

**TABLE 4-3**
**PASSIVE PERIOD EXECUTION EXAMPLE**

| Location | Minutes Elapsed Since Start | Activity | Total Time of Activity in Location (minutes) |
|---|---|---|---|
| Room 1 | 0 to 0.5 | Walk around perimeter of room 1 | 0.5 |
| | 0.5 to 40.5 | Sit in room | 40 |
| Room 2 | 40.5 to 41.0 | Transition to room 2 and walk around perimeter | 0.5 |
| | 41.0 to 81.0 | Sit in room | 40 |
| Room 3 | 81.0 to 81.5 | Transition to room 3 and walk around perimeter | 0.5 |
| | 81.5 to 101.5 | Sit in room | 40 |
| Room 4 | 101.5 to 102.0 | Transition to room 4 and walk around perimeter | 0.5 |
| | 102.0 to 142.0 | Sit in room | 40 |
| Room 5 | 142.0 to 142.5 | Transition to room 5 and walk around perimeter | 0.5 |
| | 142.5 to 182.5 | Sit in room | 40 |
| Room 6 | 182.5 to 222.5 | Transition to room 6 and walk around perimeter | 0.5 |
| | 222.5 to 242.5 | Sit in room | 40 |
| **Total Passive ABS Scenario Time (minutes & hours)** | | | **243 minutes (4 hours 3 minutes)** |

### 4.2.3 Field Planning and Required Equipment and Supplies

Before field crews mobilize, Tetra Tech will prepare detailed property maps identifying the OU7 properties to be included. The indoor ABS activities schedule will be refined as Tetra Tech schedules the inspections at dates and times convenient to the property owners.

The Tetra Tech field manager will do an inventory of project-procured equipment and supplies before beginning and obtain any additional required equipment or supplies. The following equipment is required for sampling:

- Field logbooks
- Indelible ink pens
- Digital camera with memory card
- Sample paperwork and sample tags and labels
- Custody seals
- Plastic zip-lock bags
- Personal protective equipment (PPE) as required by site-specific HASP (Appendix A)
- Personal air sampling pumps ( 5 L/min)
- Sample filter cassettes (0.8micrometers [µm])
- Rotometer
- Activity-specific equipment: vacuum cleaner, broom, dusting rag, miscellaneous. cleaning supplies
- Location-specific site diagrams
- Standard hand tools (screwdrivers, hammer, wrenches, etc.)
- Measuring tape

## 4.3 INDOOR ACTIVITY-BASED SAMPLING INVESTIGATION

This section describes the sampling methods and procedures to do indoor ABS to evaluate OU7 removal decisions and to capture additional information in support of the OU7 HHRA. Residential indoor ABS will be done at two general property categories: (Category A) Post Removal Properties that have had a TAPE or RDI inspection and subsequently undergone interior or exterior removal, and (Category B) Non-Removal Properties that have had a TAPE inspection but were not designated for interior or exterior removal.

During the ABS, Tetra Tech will do:

- ABS sampling scheduling
- Visual inspections to determine number of living space rooms requiring sampling
- Pump calibration
- Air sample collection
- Health and safety air monitoring
- ABS activities documentation

### 4.3.1 Scheduling Indoor ABS Visits

Before mobilization to each property where signed access agreements have been obtained, each property owner or tenant will be contacted by phone to determine a specific time for the sampling. The activities will be scheduled for a time convenient for the property owner or tenant. In general, it will not be necessary for the property owner or tenant to be present unless the property owner or tenant needs to be present to allow access or wants to be there during sampling; arrangements will be made to accommodate their schedule.

### 4.3.2 Assessment of Floor and Elevated Horizontal Surfaces Cover

The extent of porous and non-porous surface cover in each room will be estimated for each sampling and will be recorded on the field forms and in the field logbook using the following example method:

**Room 1/Living room (200 square feet [sf])**

**Porous Surfaces– carpeted throughout 200 sf, cloth furniture 40 sf,**

**Non-Porous Surfaces – furniture 20 sf**

After approval from the home owner or tenant, digital photographs will be used to document porous and non-porous surfaces in each room. One photo will be taken in each room.

### 4.3.3 Visual Inspection

Each room will be visually inspected to document the presence or absence of visible vermiculite and note the relative level of dust. Dust levels in each room will be categorized as low, medium, or high and noted in the field form and logbook.

### 4.3.4 Pump Calibration

Each air sampling pump will be calibrated at the start of each day's sampling period using a primary calibration source. The primary calibration standard used is a Bios DryCal® DC-Lite. Calibration will be considered complete when ±5 percent of the desired flow rate is attained, as determined by three measurements with the calibrator using a cassette reserved for calibration (from the same lot of the sample cassettes to be used in the field). Pump flow rates will be verified at 60-minute intervals or when actors are relieved from an activity by a backup actor. Field calibrations, taken between the pre and post-calibrations, may be taken using a rotometer that has been calibrated using a primary calibration source. If at any time the observed flow rates are ±10 percent of the target rate, the sampling pump should be re-calibrated, if possible. If at any time an air sampling pump is found to have faulted or the observed flow rates are 25 percent below (due to heavy particulate loading or a pump malfunction) or 50 percent above the target rate, the pump will be replaced or the activity will be terminated. Collection of air samples will continue, regardless of the amount of particulate loading on the filters, unless the flow rate is affected.

At the beginning of the sampling program, flow rates and particulate loading may be checked more frequently as conditions require, establishing expected conditions. For post-sampling calibration, three separate constant flow calibration readings will be obtained using the Bios DryCal® DC-Lite primary calibration source. The sampling cassette will remain inline during calibration and those flow readings will be averaged. If the flow rate changes by more than 5 percent during the sampling period, the average of the pre- and post-sampling rates will be used to calculate the total sample volume. Samples for which there is more than a 30 percent difference from initial calibration to end calibration will be invalidated. For invalidated samples the sample collector will record the pump serial number, sample number, initial flow rate, sample start and end times, sample locations, and final flow rate, and will mark the sample "void," in the field logbook and OU7 Indoor Activity-Based Sampling Form (OU7 ABS Form). The invalidated samples will not be submitted for analysis and will be properly disposed of. The activity scenario will be completed a second time and the air sample will be recollected. To prevent potential cross-contamination, each rotometer used for field calibration will be transported to and from each sampling location in a sealed zip-lock plastic bag. The cap and calibration cassette used at the end of the rotometer tubing will be replaced each morning after it is used.

### 4.3.5 Air Sample Collection

Indoor ABS air sampling will occur over 4-hours for each scenario and will be repeated two times at each sample location (wet season and dry season). Each time interval will be subdivided by the number of representative activities as detailed in Table 4-1. Indoor ABS air samples will be collected by actors performing activities in accordance with the scenarios in Section 4.2. At each location, one or two actors will engage in the prescribed activities in each of the scenario areas. No more than one activity will be done at any given time on one property, or on adjacent properties. The order of activities will begin with the scenario of least disturbance (passive) and will finish with the active scenario that will likely create the most disturbance. All indoor ABS air samples will be collected using cassettes that contain a 25-millimeter diameter mixed cellulose ester (MCE) filter with a pore size of 0.8 µm. One or two participant actors will do the scripted activities and will wear an air sample pump calibrated at 5 liters per minute (L/min) during two scenarios. The air sample will be collected using battery-powered sampling pumps capable of operating for extended period at 5 L/min. The specific model selected for this sampling is the SKC AirChek 5000 personal air sampling pump. The pump flow rate will be adjusted to 5 L/min to obtain sample volumes of at least 1,200 L over the 4-hour sample period.

The monitoring cassette will be affixed to the shoulder of the actor performing adult scenario activities so that the cassette is in the proper breathing zone. The breathing zone can be visualized as a hemisphere approximately 6 to 9 inches around an individual's face. The top cover from the cowl extension on the sampling cassette will be removed (i.e., open-face) and the cassette will be oriented face down. The actors will monitor the cassette throughout the scenario to ensure it remains directed toward the activity and is free of obstructions. If it is necessary to relieve an actor in a scenario, a relief actor will be properly suited in time to make the exchange.

When the relief actor is ready, the active actor will stop, remove the sample pump, pass it to the relief actor, and assist with donning and adjusting the sample pump and cassette placement. The exchange is anticipated to take less than 60 seconds, so the sampling pumps and event time clock will not be halted during the exchange. If the exchange takes more than 60 seconds, the pump and event clock will be stopped until the activity is re-initiated. If the personnel exchange coincides with scheduled flow rate verification, the total exchange time must not exceed 120 seconds.

### 4.3.6 Health and Safety Air Monitoring

As part of this investigation, personal air samples will be collected on the first three days of sampling for ongoing health and safety monitoring. The health and safety samples will be collected using an additional low volume sampling pump and are not intended for use in the ABS sampling or with the risk assessment. To differentiate these samples from the other air samples, "PCM" will be used in the Sample Location Description field of the OU7 ABS Form. These samples will be collected and analyzed in accordance with the 2012 OU7 HASP and will represent both the 8-hour time-weighted average (TWA) and 30-minute short-term exposure limit (STEL) for each employee work category. The permissible exposure limit (PEL) is 0.1 f/cc for the 8-hour TWA, and the STEL is 1.0 f/cc over 30 minutes as specified in 29 CFR Part 1910.1001 (j)(2)(iii).

### 4.3.7 Indoor ABS Activities Documentation

Logbooks and field forms will be completed for each residence sampled. Sample information and visual inspection results will be recorded on sketches in the logbook. They may be combined on one sketch if quality and clarity can be maintained. Sketches will include a basic home floor plan, visual inspection locations and findings, and a summary of surface types and materials in the rooms.

## 4.4 FIELD QUALITY CONTROL SAMPLES

Field quality control (QC) samples will be collected in association with air samples and will include lot blanks and field blanks. These are described below and summarized in Table 4-4.

### 4.4.1 Lot Blanks (Air)

Before any air sampling cassette is used, a cassette from each filter lot will be randomly selected and submitted for analysis. The lot blanks will be analyzed for asbestos fibers by the same method used for field sample analysis. The entire batch of cassettes will be rejected if any asbestos fiber is detected on a lot blank.

**TABLE 4-4**
**FIELD QUALITY CONTROL SAMPLES**

| Sample Type | Associated QC Sample | Collection Frequency | Analysis Frequency | Analysis Request | Acceptance Criteria |
|---|---|---|---|---|---|
| Air | Lot Blank | 1 per case (50 cassettes) | 100% | TEM | ND for all asbestos fibers |
| Air | Field Blank | 1 per day | 100% | TEM | ND for all asbestos fibers |

Notes:

| | |
|---|---|
| % | Percent |
| TEM | Transmission Electron Microscopy |
| ND | Non detect |

### 4.4.2 Field blanks (Air)

One field air blank will be collected each day for the duration of this sampling program. The field blanks will be analyzed for asbestos fibers by the same TEM method used for field sample analysis. The field blanks will be collected by opening the sample cassette package and exposing the cassette to the full range of field efforts including sample handling, car travel, attaching to the air sample pump for ten seconds (not turned on), retrieving the sample cassette, returning to the office, packaging, and transporting to the laboratory.

## 4.5 GENERAL PROCESSES

This section describes the general field processes used to support the sampling and includes references to the general and project-specific SOPs where applicable. Field equipment maintenance will be conducted and documented on a routine basis. If any equipment is found to be operating incorrectly, that 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 Field Team Leader. The Field Team Leader will be responsible for the equipment repair which may include having appropriately trained field team members complete the repair or ship the equipment to the manufacturer.

### 4.5.1 Equipment and Personnel Decontamination

Air monitoring pumps, tubing and calibration equipment will be wet wiped with moistened, disposable, paper towels before and after each ABS sampling. Personnel decontamination procedures, including requirements for decontamination zones, are described in Section 10.1 of the HASP (Appendix A). PPE will consist of disposable gloves, disposable protective outerwear, work boots, disposable boot covers, and respirators. The respirators will be cleaned and decontaminated as discussed in Section 10.2.1 of the ABS HASP (Appendix A).

### 4.5.2 Investigation-Derived Waste

Investigation-derived waste will include used wet wipes, paper towels, disposable gloves, used respirator cartridges, used plastic tubing, disposable protective outerwear, plastic coverings, and other minimal waste. Because it is possible, but not likely, that these investigation-derived waste materials may contain some asbestos, all investigation-derived waste will be double-bagged in appropriate asbestos bags, labeled with asbestos labels, and stored in an approved containment area at the DEQ Troy Information Center until it can be properly disposed of at an approved landfill. Non-sampling waste from the ABS field teams, such as food containers and waste paper, will be separately bagged and properly disposed of as solid waste.

### 4.5.3 Recordkeeping and Chain of Custody

At the end of each day, or more often if required, the ABS field teams will return to the DEQ Troy Information Center to download and transfer data recorded on the OU7 Indoor ABS Forms. The field teams will transfer the air samples and any QC samples, provide copies of the appropriate logbook pages to the field sample coordinator (or the coordinator's designee) and download digital photographs. Photographs will be electronically labeled and entered into the OU7 Document Management Archive (MARCH). MARCH is a Microsoft Access database used to manage electronic documents and associated metadata in accordance with EPA Appendix C requirements (EPA 2010). Individual photographs will not be routinely printed. Data from the field forms will be downloaded or entered on a daily basis into a local field Scribe database. Once all data have been processed, the Scribe project will be informally published to Scribe.NET. The field database will be incorporated into the primary OU7 Scribe database, LibbyTTOU7Field, and will be formally published to Scribe.NET.

An individual file (paper and electronic) will be maintained for each indoor ABS property and building where ABS was done. Originals of all field forms will be kept in each individual property file in the DEQ Troy Information Center for the duration of the project. Scanned Portable Document Format (PDF) copies of all field forms and appropriate logbook pages, and digital photographs will be stored in each individual electronic property file. A backup electronic copy of the files will be stored away from the DEQ Troy Information Center, and will be updated periodically for the duration of the sampling, and reporting phases of the project. Copies of all quality assurance/quality control (QA/QC) records, forms, and field logbooks will be available to DEQ, EPA, or to the Troy property owners at any time during the ABS project.

After the OU7 ABS Form electronic information and data are entered in the local field Scribe database, the field sample coordinator will check all property, building, and sample ID numbers for accuracy. The field sample coordinator will print a hard copy of the chain-of-custody (COC) form and store these records with the associated samples. The COC report will be transferred to the Environmental Services Assistant Team (ESAT) Laboratory Coordinator.

Until samples have been transferred to the ESAT Laboratory Coordinator, they will be securely held by Tetra Tech. Samples may be stored in storage bins in locked vehicles or in a secured (locked) area of the DEQ Troy Information Center. All ABS samples collected from the OU7 properties, including QC samples, will be regularly transferred to the ESAT Laboratory Coordinator. The ESAT Laboratory Coordinator will provide Tetra Tech with a copy of the released COC. The ESAT Laboratory Coordinator will transfer the samples to the on-site laboratory for preparation, the off-site laboratory for analysis, or to the storage archive.

### 4.5.4 Field Logbooks

Documentation of field activities will be recorded in field logbooks maintained specifically for this sampling program. Logbooks are controlled documentation (i.e., sequentially numbered) and maintained by DEQ and EPA.

The logbook is an accounting of activities at the site and will note problems or deviations from the governing plans and observations relating to the sampling and analysis program. A new logbook page will be completed for each indoor ABS property visited. The header information will include the address, and the property owner's name. When closing out a logbook page with lineout and signature, the author will print their name underneath the signature. Original logbooks will be maintained in the DEQ Troy Information Center.

### 4.5.5 Sample Labeling and Identification

A unique alphanumeric code, or sample ID number, will identify each sample. The coding system will provide a tracking record to allow retrieval of information about a particular sample and to ensure that each sample is uniquely identified. Sample IDs will be sequential and not be representative of any particular ABS scenario or building. Sample IDs will correlate with sample location IDs that will be identified in the field logbooks.

The sample labeling scheme will follow the format:

TB-XXXXX

where:

> TB identifies that a sample is collected in accordance with this indoor ABS SAP and XXXXX represents a 5-digit numeric code.

Preprinted adhesive sample labels will be signed out to sampling personnel by the sample database manager. The labels are controlled to prevent duplication in assigning sample IDs. The labels will be affixed to the inner and outer sample bags for ABS air samples.

### 4.5.6 Photographic Documentation

Photographs will be taken with a digital camera at sampling locations and during each sampling event. Photos will generally include an overview of the room, close up shots of flooring materials, equipment, actors, and any other notable photos to support later health risk assessments that the sampler might identify. A description of each photograph will be recorded in the field logbook in accordance with photographic log protocol (Appendix I of TAPE work plan [Tetra Tech 2007]). A list of photographs in the field logbook will clearly state where each photograph was taken (e.g., ABS scenario or ABS room). Electronic photograph files will be saved each day to a project-designated computer at the DEQ Troy Information Center and assigned appropriate metadata in MARCH so that photographs for a particular ABS property or scenario can easily be retrieved.

# 5.0 LABORATORY OPERATIONS

This section discusses the analytical methods, custody and documentation procedures, QA/QC requirements, and data management requirements to be followed by the laboratory.

EPA's ESAT will be responsible for all sample analysis, including any sample processing prior to analysis. Tetra Tech will transfer the ABS samples to ESAT under COC protocol. The Sample Coordinator will be responsible for communicating with the ESAT Laboratory Coordinator to relay pertinent sample and analysis information including sample quantities; special sample handling requirements, processing, or analysis concerns; and requested turn-around times.

## 5.1 ANALYTICAL METHODS AND TURNAROUND TIMES

This section describes the analytical methods to be used for ABS samples. The Sample Coordinator will provide the EPA with requested turn-around times for all samples. In general, it is expected that analysis the samples will be completed in 2 months from the time the laboratory receives them.

### 5.1.1 Air Samples

All ABS indoor air samples will be submitted to the ESAT sample coordinator for distribution to a subcontracted analytical laboratory. Analysis will be done using the International Organization for Standardization (ISO) Method 10312, with all applicable project specific modifications, including LB-000016h, LB-000019, LB-000028, LB-000029c, , LB-000030, LB-000053, and LB-000066d (CDM 2003b). All asbestos structures (including LA and all other asbestos types) that have appropriate diffraction patterns and EDS spectra, and length greater than or equal to 0.5 µm and an aspect ratio greater than or equal to 3:1, will be counted.

The target analytical sensitivity for ABS air samples will be 0.0000067 $cc^{-1}$ unless directed otherwise by EPA or DEQ. This target analytical sensitivity value is based on non-cancer risk-based concentrations currently used for the Libby Asbestos superfund site (see Section 3.5 for detailed calculations). The methodology used to determine this target analytical sensitivity is based on the analytical requirements and counting rules used for ABS air samples collected at other Operable Units of the Libby Asbestos Superfund site (CDM Federal Programs 2012). It is expected that this will require the counting of as many as 2,000 (Stopping Rule maximum) grid openings for sample volumes of 1,200 L (5 L/min samples collected over a 4 hour period). Because of the high number of grid openings needed to achieve the target analytical sensitivity, indoor ABS samples will be examined using counting protocols for recording PCME structures only (per ISO 10312 Annex E). That is, filters will be examined at a magnification of 5,000x, and all amphibole structures (including LA and all other amphibole asbestos types) that have appropriate selective area electron diffraction (SAED) patterns and energy dispersive x-ray analysis (EDXA) spectra, and having length > 5 µm, width >0.25 µm, and aspect ratio > 3:1 will

be recorded on the site-specific TEM laboratory bench sheets and electronic data deliverable (EDD) spreadsheets.

As described in the latest version of laboratory modification LB-000029c, the frequency for laboratory-based QC samples for TEM analysis is:

Lab blank = 4%
Recount same = 1%
Recount different = 2.5%
Re-preparation = 1%
Verified analysis = 1%
Inter-laboratory = 0.5%

#### *5.1.1.1 Analytical Sensitivity and Counting Rules for TEM Analyses*

The target analytical sensitivity for indoor ABS air samples will be 0.0000067 $cc^{-2}$ (Section 3.5). If there are sample loading or other issues where an analytical sensitivity cannot be achieved, the laboratory may report a sample result with a higher (poorer) sensitivity only after consultation with EPA project personnel and preparation of a temporary modification form.

The TEM stopping rules for all indoor ABS samples from this study will be:

1. Examine a minimum of two grid openings from each of two grids.
2. Continue examining grid openings until one of the following is achieved:
   a. The target analytical sensitivity (0.0000067 $cc^{-1}$) is achieved.
   b. 25 PCME LA structures have been recorded.
   c. A total filter area of 20 $mm^2$ has been examined (this is approximately 2,000 grid openings).

The specific stopping rules for each indoor ABS scenario are in Table 5-1. When one of these criteria has been satisfied, the analyst will complete the examination of the final grid opening and stop. For lot blanks and field blanks, the TEM analyst will examine an area of 1.0 $mm^2$ (approximately 100 grid openings). It is possible the number of grid openings needed to be examined to achieve the target analytical sensitivity may be cost or time prohibitive. In order to limit the maximum effort expended on any one sample, a maximum area examined of 20 $mm^2$ is identified for this sampling program. Assuming that each grid opening has an area of about 0.01 mm2, this would correspond to about 2,000 grid openings.

**TABLE 5-1**
**TEM STOPPING RULES FOR INDOOR ABS AIR SAMPLES**

| Indoor ABS Sampling Scenario | Target Sensitivity ($cc^{-1}$) | Maximum Structures | Maximum Filter Area Examined ($mm^2$) |
|---|---|---|---|
| Active Indoor ABS | 0.0000067 | 25 PCME LA | 20 |
| Passive Indoor ABS | 0.0000067 | 25 PCME LA | 20 |

ABS = activity-based sampling
cc = cubic centimeter
PCME = phase contrast microscope equivalent
LA = Libby amphibole
$mm^2$ = square millimeters

#### *5.1.1.2 Sample Archival*

All indoor ABS air samples will be submitted to ESAT and may be distributed to a contracted laboratory for analysis. The initial 5 L/min air samples will be submitted for quick turn-around analysis, and if found to be overloaded, adjustments to sampling protocol may be required. Once analyzed, all samples will be stored (archived) at the laboratory under COC until further notice.

## 5.2 HOLDING TIMES

There will be no holding time requirements for samples.

## 5.3 LABORATORY CUSTODY PROCEDURES

Laboratory custody procedures are described in the laboratory's QA management plan.

In the basic laboratory sample custody process each sample, upon receipt at the laboratory, will be inspected to assess the condition of the shipment and the individual samples. This inspection will include verifying sample integrity. The accompanying COC will be cross-referenced with all the samples in the shipment. The laboratory sample custodian will sign the COC and maintain a copy for their project files; the original COC will be appended to the hard copy data report. Next, the sample custodian may assign a unique laboratory number to each sample. This number will identify the sample through all further handling at the laboratory. It is the laboratory's responsibility to maintain internal logbooks and records throughout sample preparation, analysis, data reporting, and sample archiving.

## 5.4 LABORATORY QA/QC

The Libby Asbestos Project laboratory QA program consists of laboratory certifications, team training and mentoring, analyst training, and laboratory audits. Subcontracted laboratories that analyze field samples from any portion of the Libby Superfund project area must maintain particular certifications and must satisfactorily complete project-specific training to ensure proper QA/QC practices are followed during sample analysis.

Each laboratory is required to participate in an on-site, laboratory audit by the EPA Superfund Analytical Services Branch that is independent from the Troy team members.

Analytical laboratories will be provided a copy of this SAP. Samples collected under this SAP will be analyzed in accordance with standard EPA or nationally-recognized analytical procedures to provide analytical data of known quality and consistency.

## 5.5 LABORATORY DOCUMENTATION AND REPORTING

All deviations from project-specific and method analytical guidance documents, or this SAP, will be recorded on a Troy Field Office (TFO) Record of Modification Form (Appendix C). Any deviations that impact, or have the potential to impact, investigation objectives will be discussed with the DEQ prior to preparing the TFO. When completed, the TFO will be signed by DEQ. The Record of Modification Form will be used to document any information of interest as requested by DEQ. As modifications are approved by DEQ and implemented, the ESAT Laboratory Coordinator will communicate the changes to the ESAT laboratories.

Sample results data will be delivered to the EPA in accordance with the current version of the EPA Data Management Plan (EPA 2010).

## 5.6 LABORATORY NONCONFORMANCE

Laboratories will immediately notify the ESAT Laboratory Coordinator if major problems occur (e.g., catastrophic equipment failure). The ESAT Laboratory Coordinator will then notify the ABS Sample Coordinator of potential impacts to turn-around times. Other nonconformance issues, such as those found during performance evaluations or audits, will be addressed on a case-by-case basis by the EPA's laboratory audit team.

# 6.0 DATA MANAGEMENT

Data management will be under the supervision of the Tetra Tech Database Manager in the DEQ Troy Information Center. Field crews will generate field data on paper copies and digital photographs. All field data will be managed according to EPA reporting requirements specified in the EPA Data Management Plan (EPA 2012).

These reporting requirements were developed to help satisfy EPA's removal objectives at the Libby Asbestos Superfund Site. The reporting requirements guide data collection processes and data reporting procedures for spatial information, tabular data, and documents (EPA 2012).

## 6.1 TABULAR DATA

The Tetra Tech Database Manager will be required to format and submit all tabular data in accordance with EPA reporting requirements (EPA 2012). Operational electronic data will be QC reviewed, entered into a local field Scribe database, and informally published to Scribe.Net within one day of data collection; and, after data auditor checks, formally published to Scribe.NET as part of the primary OU7 Scribe database, LibbyTTOU7Field. This will ensure that EPA has consistent and up-to-date information.

## 6.2 DOCUMENTS AND RECORDS

The Tetra Tech Database Manager will be required to format and submit all operations documents and records in accordance with EPA reporting requirements (EPA 2012). Hard copy documents will be stored in file cabinets at the DEQ Troy Information Center. Electronic copies will be barcoded and assigned the appropriate metadata in the MARCH database. When requested, these records and associated metadata will be delivered to EPA.

# 7.0 QA/QC PROCEDURES

The QA/QC objectives, internal QC checks, and audits completed for the project are described in this section. Field QC control procedures are described in Sections 4.3 and 4.4.

## 7.1 QA/QC OBJECTIVES

The QA/QC objectives of the OU7 Indoor ABS project are to obtain 100 percent usable and accurate data. This will be achieved through inspection and sampling using standardized PDA data entry procedures, auditing field operations, observing COC procedures, analyzing field quality control samples and laboratory quality control samples, and analytical data review, verification, and validation. The DQOs are described in detail in Section 3.0.

## 7.2 DATA VERIFICATION AND VALIDATION

### 7.2.1 Data Verification

Tetra Tech's Analytical Coordinator will conduct data verification of the sample analytical data generated under this SAP. One hundred percent of the field and laboratory QC sample data will undergo verification.

Data verification includes checking that results have been transferred correctly from the original hand-written field and analytical laboratory documentation to the project database. The goal of data verification is to identify and correct data reporting errors. Data verification of reported analytical results begins with automated QC checks that are built into the project-specific EDDs.

In addition to these automated checks, more detailed manual data verification efforts will be performed for 100 percent of the all analytical results uploaded to the project database. This data verification process utilizes site-specific SOPs EPA-LIBBY-09, *TEM Data Review and Data Entry Verification* and EPA-LIBBY-11, *FSDS Data Review and Data Entry Verification,* developed to ensure TEM and field sample information in the project database are accurate and reliable. If issues are identified during the data verification, the frequency of verification may be increased as appropriate.

Tetra Tech's Analytical Coordinator will document issues identified on a verification tracking spreadsheet and provide the spreadsheet to the ESAT project data manager for resolution. It is the responsibility of the Tetra Tech Database Manager to coordinate with the field team leader and/or laboratory coordinator to resolve any project database corrections and address any recommended field or laboratory procedural charges form the data verifier. The Tetra Tech database manager is also responsible for electronically tracking in the project database which data have been verified and who performed the verification.

### 7.2.2 Data Validation

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, with support from technical support staff that are familiar with project-specific data reporting, analytical methods, and investigation requirements.

Data validation will be performed in basic accordance with the *National Functional Guidelines for Asbestos Data Review* (EPA 2011) and the site-wide QARD (USACE 2012) 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 the verification effort identifies a larger data quality issue)

## 7.3 DATA QUALITY EVALUATION

The DQOs in Section 3 will be reconciled during the data verification process. This entails comparing the reported results to the project-specific action levels in Section 3. Attainment of project-specific DQOs is necessary to accurately determine HHRA goals including: (1) determining if acceptable risk to human health exists for parcels where interim exterior removals were not required, and (2) determining if the interim exterior removals were effective in reducing the threat to human health from exposure to LA. Non-attainment of project DQOs may result in potential risks to human health.

## 7.4 AUDITS, CORRECTIVE ACTIONS, AND QA REPORTS

Field audits will be an integral part of Tetra Tech's field operations for the duration of the project. Field audits and corrective actions will be the responsibility of DEQ, EPA and the Tetra Tech QA/QC manager. The field audit forms will be kept in the DEQ Troy Information Center for the duration of the project.

### 7.4.1 Field Inspections and Sampling Procedures Audits

The Tetra Tech QA/QC manager will be responsible for audits of field activities and sampling procedures. Audits will be done every two weeks. Audits will consist of the QA/QC manager or his designee attending a sampling event and observing the field teams' activities. The field teams will not be warned of the audit. The auditor will compare the field teams' activities with the protocols in this SAP and the attached project-specific guidance and evaluate compliance with the protocols using the audit form in Appendix C. After the audit, the auditor will provide the completed audit form to the DEQ and EPA project managers.

### 7.4.2 Corrective Action Procedures

The QA/QC auditor may use their discretion to provide immediate verbal feedback to the ABS field team, to ensure that discrepancies are corrected as quickly as possible. The field team leader and QA/QC manager will review the report with the ABS field team within 48 hours of the audit to correct any deviations or deficiencies. If any deviations or deficiencies were noted, the field team will be audited again within one week of the original audit to ensure that any deficiencies have been corrected. If a field team member is rotated off the project after deviations or deficiencies were noted, the field team members will be audited again within one week of returning to Troy.

If gross deficiencies are noted, the Tetra Tech QA/QC manager will determine whether any additional activities are required. Re-sampling will be required only if the field team failed to correctly complete the indoor ABS, or collected samples incorrectly.

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# APPENDIX A

## TETRA TECH
## SITE-SPECIFIC HEALTH AND SAFETY PLAN
## OU7 INDOOR ACTIVITY-BASED SAMPLING

**(Available to Agencies upon Request)**

# APPENDIX B

# FIELD FORMS AND LABORATORY FORMS

F- 12 _____ B _____
MM DD X X

# OU7 INDOOR ACTIVITY-BASED SAMPLING FORM
# AIR SAMPLING DATA

**Tetra Tech EM, Inc.**
Activity-Based Sampling Project (ABS)

**Date:**_____

**Cassette Lot No:**_____

| | | |
|---|---|---|
| ABS Category (check one): | ☐ Residential | ☐ Commercial |
| AD Number: | | |
| Collected By: | Log Book No: | |

**Page /**

| Air Sample # | Pump I.D.# | Rotometer I.D. # | Sample Type [1] | ABS Scenario [2] | Time On<br>Time Off<br>Total Minutes | Flow Rate-Start<br>Flow Rate-Stop<br>Total Volume (Liters) | Building ID/ Description/ Work Zone Size (square feet)[3] | Initials of Personnel Sampled | ABS Activity[4] |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | / | / | | | |
| | | | | | / | / | | | |
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| | | | | | | | | | |

**NOTES:** All ABS samples will be collected on 25 mm diameter mixed cellulose ester (MCE) filter cassettes with a pore size of 0.8µm

**1) Sample Type**

FS = Field Sample
FB = Field Blank
FD = Field Duplicate
EB = Equipment Blank
LB = Lot Blank

**2) ABS Scenario**

1) Active
2) Passive

**3) Building ID/ Description/ Work Zone Size**

Use AD-OU7NA for multiple locations

**4) ABS Activity**

a) Vacuuming
b) Dusting
c) General Clean
d) Reading
e) Watching TV
f) Sitting
g) Walking room to room
h) Simulated play

F- 12 _____ B _____
MM DD X X

# OU7 INDOOR ACTIVITY-BASED SAMPLING FORM
# SURFACE POROSITY / DUST DATA

**Tetra Tech EM, Inc.**
Activity-Based Sampling Project (ABS)

**Date:**_____

| | | |
|---|---|---|
| ABS Category (check one): | ☐ Residential | ☐ Commercial |
| AD Number: | | |
| Collected By: | Log Book No: | |

**Page /**

| Room Number | Room Square Footage | Floor | Room Surface Cover Porosity / Square Footage[6] | | | | | | Surface Dust Category[7] | Photo Numbers |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | a) | b) | c) | d) | e) | f) | | |
| | | | a) | b) | c) | d) | e) | f) | | |
| | | | a) | b) | c) | d) | e) | f) | | |
| | | | a) | b) | c) | d) | e) | f) | | |
| | | | a) | b) | c) | d) | e) | f) | | |
| | | | a) | b) | c) | d) | e) | f) | | |
| | | | a) | b) | c) | d) | e) | f) | | |
| | | | a) | b) | c) | d) | e) | f) | | |

| 6) Room Surface Cover Porosity | 7) Surface Dust Category |
|---|---|
| *** multiple designations may be used, follow letter with square footage:** | a) High dust level |
| a) Carpeted floors | b) Medium dust level |
| b) Smooth surfaced floors | c) Low dust level |
| c) Cloth covered furniture | |
| d) Smooth surfaced furniture | |
| e) Cloth window treatments | |
| f) Smooth surfaced window treatments | |

**SAP REQUIREMENTS SUMMARY # OU7_TB_R0_082412**

## SUMMARY OF PREPARATION AND ANALYTICAL REQUIREMENTS FOR ASBESTOS

**SAP Title:** Indoor Activity-Based Sampling, Sampling and Analysis Plan for Operable Unit 7 of the Libby Asbestos Superfund Site

**SAP Date (Revision):** 08/24/2012

**EPA Technical Advisor:** David Berry (303-312-6358 or Berry.David@epa.gov)
**(contact to advise on DQOs of SAP related to preparation/analytical requirements)**

**Sampling Program Overview:** The primary objective of indoor activity-based sampling (ABS) at OU7 is to acquire data needed to support development of the human health risk assessment (HHRA) for OU7. The HHRA will be used to help evaluate whether interim removals designed for OU7 were effective in reducing the threat to human health from exposure to Libby Amphibole (LA) asbestos in air at residential properties in OU7 and whether additional removal actions are needed. Activities covered by this SAP include collection and analysis of indoor air samples at residential properties and community-based recreational areas in OU7. ABS air samples will be collected and analyzed for LA asbestos by TEM. Personal air samples will also be collected for health and safety monitoring and analyzed by PCM.

**Sample ID Prefix:** TB-

**TEM/PCM Preparation and Analytical Requirements:**

| Medium Code | Medium, Sample Type | Preparation Details | | | | Analysis Details | | | Applicable Laboratory Modifications (current version of) |
|---|---|---|---|---|---|---|---|---|---|
| | | Investi-gative? | Indirect Prep? | | Filter Archive? | Method | Counting/ Recording Rules | Analytical Sensitivity/ Stopping Rules | |
| | | | With Ashing | Without Ashing | | | | | |

| Medium Code | Medium, Sample Type | Preparation Details | | | | Analysis Details | | | Applicable Laboratory Modifications (current version of) |
|---|---|---|---|---|---|---|---|---|---|
| | | Investi-gative? | Indirect Prep? | | Filter Archive? | Method | Counting/ Recording Rules | Analytical Sensitivity/ Stopping Rules | |
| | | | With Ashing | Without Ashing | | | | | |
| A | Air, ABS | Yes | Yes, if material is overloaded (>25%) or unevenly loaded on filter [(a)] | No | Yes | TEM – Modified ISO 10312, Annex E (*low mag.*) | PCME asbestos; L: >5 µm W: ≥ 0.25 µm AR: ≥ 3:1 | Examine a minimum of 2 grid openings in 2 grids, then continue counting until one of the following has been met:<br>i) a target sensitivity of 0.0000067 $cc^{-1}$ is achieved.<br>ii) A total filter area of 20 $mm^2$ has been examined (approximately 2,000 grid openings)<br>iii) 25 PCME LA structures have been recorded | LB-000016, LB-000029, LB-000031, LB-000066, LB-000067 LB-000085 |

| Medium Code | Medium, Sample Type | Preparation Details | | | Analysis Details | | | Applicable Laboratory Modifications (current version of) |
|---|---|---|---|---|---|---|---|---|
| | | Indirect Prep? | | Archive? | Method | Recording Rules | Stopping Rules | |
| | | With Ashing | Without Ashing | | | | | |
| B | Air, lot blank | No | No | Yes | TEM – Modified ISO 10312, Annex E (*low mag.*) | PCME asbestos; L: >5 µm W: ≥ 0.25 µm AR: ≥ 3:1 | Examine 1.0 $mm^2$ of filter | LB-000016, LB-000029, LB-000031, LB-000066, LB-000067, LB-000085 |
| C | Air, field blank | | | | | | | |

(a) See most current version of EPA-LIBBY 08 for preparation details.

**Soil Preparation and Analysis Requirements:**

| Preparation Method | Analysis Method | Applicable Laboratory Modifications (current version of) |
|---|---|---|
| NA | NA | NA |

**Laboratory Quality Control Sample Frequencies:**

TEM: Lab Blank – 4% (i)
Recount Same – 1% (i)
Recount Different – 2.5% (i)
Verified Analysis – 1% (i)
Repreparation – 1% (i)
Interlab – 0.5% (i)

PCM: Blind Recounts – 10% (ii)

PLM: Lab Duplicate (self check) – 2% (iii)
Lab Duplicate (cross check) – 8% (iii)

(i) See current version of LB-000029 for selection procedure and QC acceptance criteria
(ii) See NIOSH 7400 for QC acceptance criteria
(iii) See SRC-LIBBY-03 for QC acceptance criteria

**Requirements Revision:**

| Revision #: | Effective Date: | Revision Description |
|---|---|---|
| 0 | August 24, 2012 | |

Analytical Laboratory Review Sign-off:

- ☐ EMSL – Libby [sign & date: _____]
- ☐ EMSL – Cinnaminson [sign & date: _____]
- ☐ EMSL – Beltsville [sign & date: _____]
- ☐ EMSL – Denver [sign & date: _____]
- ☐ ESAT [sign & date: _____]
- ☐ Hygeia [sign & date: _____]
- ☐ RESI [sign & date: _____]

*[Checking the box and initialing above indicates that the laboratory has reviewed and acknowledged the preparation and analytical requirements associated with the specified SAP.]*

# APPENDIX C

# STANDARD OPERATING PROCEDURES

# Libby Asbestos Superfund Site
# Standard Operating Procedure
# Field Logbook Content and Control

**Prepared by:** _____ Date: 4/12/12
CDM Smith

**Approved by:** _____ Date: 4/12/12
EPA Region 8

| Revision No. | Date | Reason for Revision |
|---|---|---|
| 0 | 4/12/12 | -- |

## 1.0 Objective

Logbooks are an essential tool to document field activities conducted by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for the content and control of Libby Site field logbooks. Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

## 2.0 Background

### 2.1 Definitions

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Ruler or similar scale – Used with a property-specific drawing or plan to measure distance and sizes of objects, buildings, and zones.

Site – All buildings (if applicable) and land within the boundaries of the EPA's designated geounits, which may represent individual properties within the Libby Site, a collection of properties, or a larger geographical area.

### 2.2 Discussion

Field logbooks are an accounting of observations and/or activities occurring at or associated with the Libby Site. Field logbooks are also used to duly document changes to or deviations from governing documents referencing this SOP. Information recorded in field logbooks includes date/time, site personnel, observations, calculations, weather, locations of field activities, and a description of the field activity, methods, instruments, and results. Additionally, the logbook may contain descriptions of waste, biota, geologic material, and site features including sketches, maps, or drawings as appropriate.

## 3.0 Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for documenting activities in

field logbooks will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this SOP.

Team Leader (TL) – The TL is responsible for ensuring that the format and content of data entries are in accordance with this procedure. It is also the responsibility of the TL to communicate the need for any changes to/deviations from the SOP with the appropriate personnel, and document the change/deviation using a Libby Field Record of Modification Form.

Field Team Members – Field team members who make entries in field logbooks are required to read this procedure before engaging in this activity. Field team members will be assigned a field logbook prior to field activities and will be responsible for the care and maintenance of the logbook. Field team members will return field logbooks to the project file at the end of the assignment.

# 4.0 Equipment

The following is required for the proper completion of field logbooks:

- Logbook
- Indelible black or blue ink pen
- Ruler or similar scale

# 5.0 Procedures

## 5.1 Preparation

Commercially available, bound field logbooks with waterproof paper and lined, consecutively numbered pages will be used. Separate field logbooks will be kept for each field activity and the cover (some items may be recorded on the inside cover) of each field logbook shall clearly indicate:

- Field logbook sequence number
- Start date and end date of entries
- Title of document governing field activities
- Activity (if the logbook is to be activity-specific), site name, and location
- Contact name and phone number (typically the Project Manager)

For ongoing field activities that may span months or years, designated staff (e.g., field administrative staff) shall manage the field logbooks by tracking to whom and the date each field logbook was assigned, the general activities recorded in each field logbook, and the date the field logbook was returned to the project file.

The first two pages of the logbook will be reserved for a table of contents (TOC), and the third page will be reserved for abbreviations, acronyms, and definitions.

## 5.2 Operation

The following general requirements will apply when completing logbook entries for the Libby Site:

- Record equipment calibrations, work, observations, and quantities of materials, calculations, drawings, and related information directly in the logbook. If data collection forms are required by the governing document referencing this SOP, the information collected on the

form does not need to be duplicated in the logbook. However, any forms used to record site information must be referenced in the logbook.

- Correct erroneous information recorded in a field logbook with a single line strikeout, initial, and date. The correct information will be entered in close proximity to the erroneous entry.
- Do not start a new page until the previous one is full or has been marked with a single diagonal line so that additional entries cannot be made. Use both sides of each page.
- Do not remove any pages from the logbook.
- Document relinquishment of the logbook from one author to another (both parties must sign and date the transfer).
- Sign and date the final entry each day.
- When columns are used to organize information recorded on laboratory documents, the information recorded in the columns shall be identified in a column heading.
- If any self-adhesive labels are used in the logbook (e.g., sample identification labels, equipment tags), strike through one corner of the label and sign and date the strike-through.

Entries into the field logbook shall be preceded with the time (written in military units) of the observation. The time should be recorded frequently and at the point of events or measurements that are critical to the activity being logged. All measurements made and samples collected must be recorded unless they are documented by automatic methods (e.g., data logger) or on a separate form required by an operating procedure. In these cases, the logbook must reference the automatic data record or form.

At each location where a sample is collected or an observation or measurement made, a detailed description of the location is required and a sketch of the location may be warranted. All maps or sketches made in the logbook should have descriptions of the features shown and a direction indicator. It is preferred that maps and sketches be oriented so that north is toward the top of the page. Any maps, sketches, figures, or data that will not fit on a logbook page, or any separate forms or drawings (e.g., FSDS sheets, drawing markups) required by the governing document referencing this SOP should be referenced in the logbook.

Other events and observations that should be recorded include:

- Changes in weather or site conditions that impact field activities or have the potential to impact data collection (e.g., rain impacting air samples, upwind disturbances)
- Deviations from procedures outlined in any governing documents referencing this SOP, including the rationale and authorization for the deviation as appropriate
- Problems, downtime, or delays
- Visitors to the site

## 5.3 Post-operation

To guard against loss of data as a result of damage or disappearance of logbooks, completed pages and any supporting attachments shall be periodically photocopied (weekly, at a minimum) and maintained in the project file.

At the conclusion of each field activity or phase of site work, the individual responsible for the logbook will ensure that all entries have been appropriately signed and dated, that corrections were made properly, and that the cover information and TOC are complete. As field logbooks are completed, electronic copies may need to be posted to a project eRoom – refer to the governing document referencing this SOP for requirements. All original logbooks will be catalogued and maintained in the project file.

# 6.0 Restrictions/Limitations

Field logbooks constitute the official record of onsite technical work, investigations, and data collection activities. Their use, control, and ownership are restricted to activities pertaining to specific field operations carried out by governing agency personnel and their subcontractors. They are documents that may be used in court to indicate dates, personnel, procedures, and techniques employed during site activities. Entries made in these logbooks should be factual, clear, precise, and non-subjective. Field logbooks, and entries within, are not intended for personal use.

# 7.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

## 7.1 Training

Every effort will be made to ensure consistency in recording information in field logbooks for Libby Site activities. Consistency will be achieved to the extent possible through proper training, use of designated field staff, and provision of TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require re-training of the field team members.

## 7.2 Field Checks

Field logbooks may be checked for completeness and adherence to SOP requirements on a daily basis by the TL for the first week of each field activity. These checks can be extended to once per month as field activities continue, and any errors noticed during the checks will be discussed with the author and corrected. If field activities continue beyond six months, the frequency of assessing field logbook entries will be established by the field Quality Assurance Manager.

# 8.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 4-1, Field Logbook Content and Control, January 2012.

# Libby Asbestos Superfund Site
# Standard Operating Procedure
# Photographic Documentation of Field Activities

**Prepared by:** _____ Date: 4/12/12
CDM Smith

**Approved by:** _____ Date: 4/12/12
EPA Region 8

| Revision No. | Date | Reason for Revision |
|---|---|---|
| 0 | 4/12/12 | -- |

## 1.0 Objective

Photographic documentation, which includes still and digital photography and videotape or digital versatile/video disc (DVD) recordings, is an essential tool to document field activities conducted by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for photographic documentation. Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

## 2.0 Background

### 2.1 Definitions

Arrows and Pointers – Used to indicate and/or draw attention to a special feature within the photograph.

Contrasting Backgrounds – Backdrops used to lay soil samples, cores, or other objects on for clearer viewing and to delineate features.

Data Recording Camera Back – A camera attachment or built-in feature that will record, at the very least, frame numbers and dates directly on the film. Digital cameras and recorders may also be equipped with a date stamping feature.

Identifier Component – Visual components used within a photograph such as visual slates, reference markers, and pointers.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Photographer – The camera operator (professional or amateur) for still photography, including digital photography, or videotape or DVD recording, whose primary function with regard to this SOP is to produce documentary or data-oriented visual media.

Reference Marker – A reference marker used to indicate a feature size in the photograph and is a standard length of measure, such as a ruler, meter stick, etc. In limited instances, if a ruled

marker is not available or its use is not feasible, it can be a common object of known size placed within the visual field and used for scale.

Site – All buildings (if applicable) and land within the boundaries of the EPA's designated geounits, which may represent individual properties within the Libby Site, a collection of properties, or a larger geographical area.

Slates – Blank white index cards, paper, or a dry-erase board used to present information pertaining to the subject/procedure being photographed. Letters and numbers on the slate will be bold and written with black indelible marking pens.

### 2.2 Discussion

Photographs and videotape or DVD recordings made during field activities are used as an aid in documenting and describing site features, sample collection activities, equipment used, and conditions during the field activity being performed. This SOP is designed to illustrate the format and desired placement of identifier components, such as visual slates, standard reference markers, and pointers. These items shall become an integral part of the "visual media" that, for the purpose of this document, shall encompass still photographs, digital photographs, videotape recordings (or video footage), and recordings on DVDs. The use of a photographic logbook and standardized entry procedures are also outlined. These procedures and guidelines will minimize potential ambiguities that may arise when viewing the visual media and ensure the representative nature of the photographic documentation.

## 3.0 Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for photographic documentation will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this SOP.

Team Leader (TL) – The TL is responsible for ensuring that the format and content of photographic documentation are in accordance with this procedure. The TL is responsible for directing the photographer to specific situations, site features, or operations that the photographer will be responsible for documenting.

Photographer – The photographer shall seek direction from the TL and regularly discuss the visual documentation requirements and schedule. The photographer may be responsible for maintaining a logbook or itemization of photos/recordings or providing captions. Specific requirements will be defined in the governing document referencing this SOP.

## 4.0 Equipment

The following equipment may be used for photographic documentation:

- 35-millimeter (mm) camera and appropriate film (e.g., medium speed or multi-purpose fine-grain color)
- Disposable, single-use camera (35mm or panoramic use)
- Digital camera
- Video camera and appropriate storage media (e.g., videotapes, DVDs)
- Extra batteries
- Standard reference markers
- Slates

- Arrows or pointers
- Contrasting backgrounds
- Logbook
- Data recording camera back (if available)
- Indelible black or blue ink pen
- Storage medium for digital camera

# 5.0 Procedures

## 5.1 Preparation

In addition to this SOP, photographers must be familiar with all procedures applicable to the field activity being performed. These procedures should be consulted as necessary to obtain specific information about equipment and supplies, health and safety (including requirements for personal protective equipment at a site), sample collection, equipment and personnel decontamination, documentation, etc. These procedures should be maintained on site by field staff at all times for easy reference.

The photographer should also be aware of any potential physical hazards while photographing the subject (e.g., traffic, operating equipment, low overhead hazard, edge of excavation area).

If required, a commercially available, bound logbook will be used to log and document photographic activities. Alternatively, a portion of the field logbook may be designated as the photographic log and documentation section.

Because digital cameras and DVD recorders have multiple photographic quality settings, if not specified in the governing document referencing this SOP, the TL shall specify the resolution (quality) at which photographic documentation should be collected. It should be noted that a camera or DVD recorder that obtains a higher resolution (quality) has a higher number of pixels and will store a fewer number of photographs per digital storage medium.

## 5.2 Operation

The following sections provide general guidelines that should be followed to visually document field activities and site features using still/digital cameras and video equipment. Slate and caption information will not be required at the Libby Site unless specified in the governing document referencing this SOP.

### 5.2.1 Still Photography

***Slate Information***

Each new roll of film or digital storage medium will contain on the first usable frame (for film) a slate with consecutively assigned control numbers (a unique, consecutive number that is assigned by the photographer).

***Caption Information***

Still photographs will have a full caption permanently attached to the back or permanently attached to a photo log sheet. Digital photographs should have a caption added after the photographs are downloaded. Unless modified by the governing document referencing this SOP, captions should contain the following information:

- Film roll control number (if required) and photograph sequence number
- Site name or location

- Description of activity/item shown
- Date and time
- Direction (if applicable)
- Photographer

***Close-up and Feature Photography***
Close-up photographs should include a standard reference marker of appropriate size as an indication of the feature size.

Feature samples, core pieces, and other lithologic media should be photographed as soon as possible after they have been removed from their *in situ* locations to enable a more accurate record of their initial condition and color for formal lithologic observations and interpretations.

***Site Photography***
Site photography, in general, consists predominantly of medium- and wide-angle shots. A standard reference marker should be placed adjacent to the feature or, when this is not possible, within the same focal plane. While it is encouraged that a standard reference marker and caption/slate be included in the scene, it is understood that situations will arise that preclude their inclusion within the scene. This will be especially true of wide-angle shots. In such a case, the logbook (field or photographic), photographic caption, or digital file name shall specify all information pertinent to the scene.

### 5.2.2 Photographic Documentation Using Video Cameras
As a reminder, it is not within the scope of this document to set appropriate guidelines for presentation or “show” videotape or DVD recording. The following guidelines are set for documentary videotape or DVD recordings only and should be implemented at the discretion of the site personnel.

Documentary videotape or DVD recordings of field activities may include an audio slate for all scenes, as directed by the governing document referencing this SOP. At the beginning of each video session, an announcer will recite the following information: date, time (in military units), photographer, site ID number, and site location. This oral account may include any additional information clarifying the subject matter being recorded.

A standard reference marker may be used when taking close-up shots of site features with a video camera. The scene may also include a caption/slate. It should be placed adjacent and parallel to the feature being photographed.

A standard reference marker and caption/slate may be included in all scenes, as directed by the governing document referencing this SOP. The caption information is vital to the value of the documentary visual media and should be included. If it is not included within the scene, it should be placed before the scene.

Original video recordings will not be edited. This will maintain the integrity of the information contained on the videotape or DVD. If editing is desired, a working copy of the original video recording can be made.

A label should be placed on the videotape or DVD with the appropriate identifying information (project name, project number, date, location, etc.).

#### 5.2.3 Photographic Logs

Photographic activities shall be documented in a photographic log or in a section of the field logbook, as directed by the governing document referencing this SOP. The photographer will be responsible for making proper entries.

The following information shall be maintained in the appropriate logbook:

- Photographer name
- Roll/tape/DVD control number (as appropriate)
- Sequential tracking number for each photograph taken (for digital cameras, the camera-generated number may be used)
- Date and time (military time)
- Location
- Description of the activity/item photographed
- Description of the general setup, including approximate distance between the camera and the subject
- Other pertinent information to assist in the identification of the subject matter

### 5.3 Post-operation

#### 5.3.1 Processing

All film will be sent for development and printing to a photographic laboratory (to be determined by the photographer). The photographer will be responsible for arranging transport of the film from the field to the photographic laboratory. The photographer will also be responsible for arranging delivery of the negatives and photographs, digital storage medium, or videotape or DVD to the TL to be placed in the project file.

Digital media should be downloaded daily to a personal computer or secure server; the files should be in either “JPEG” or “TIFF” format. Files should be renamed at the time of download in accordance with any file-naming conventions required by the governing document referencing this SOP, or to correspond to the logbook. At a minimum, the file name should include the corresponding sampling location and/or sample number and the photograph date (e.g., “123 Elm St_2-15-2011”, “AA-12345_3-18-2009”).

#### 5.3.2 Documentation

At the end of each day’s photographic session, the photographer(s) will ensure that all photographic documentation has been maintained in accordance with this SOP.

#### 5.3.2 Archive

Unless otherwise specified in Libby Site data management requirements or the governing document referencing this SOP, digital photographs will be stored on a secure server (with a nightly backup) or posted to a web-based location (e.g., an eRoom or SharePoint portal). These files will be archived until project closeout, at which time project management will determine a long-term electronic file storage system.

# 6.0 Restrictions/Limitations

This document is designed to provide a set of guidelines for the field personnel to ensure that an effective and standardized program of visual documentation is maintained.

The procedures outlined herein are general by nature. The photographer is responsible for specific operational activity or procedure. Questions concerning specific procedures or requirements should be directed to the TL.

# 7.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

## 7.1 Training

Every effort will be made to ensure quality photographic documentation is gathered to support site activities. Consistency will be achieved to the extent possible through proper training, use of designated field staff, and provision of TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require re-training of the field team members.

## 7.2 Field Checks

Photographic documentation processes may be checked for completeness and adherence to SOP requirements on a daily basis by the TL for the first week of each field activity. These checks can be extended to once per month as field activities continue, and any errors noticed during the checks will be discussed with the photographer and corrected. If field activities continue beyond six months, the frequency of assessing photographic documentation will be established by the Quality Assurance Manager.

# 8.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 4-2, Photographic Documentation of Field Activities, January 2012.

# Libby Asbestos Superfund Site
# Standard Operating Procedure
# Control of Measurement and Test Equipment

**Prepared by:** _____ Date: 4/12/12
CDM Smith

**Approved by:** _____ Date: 4/12/12
EPA Region 8

| Revision No. | Date | Reason for Revision |
|---|---|---|
| 0 | 4/12/12 | -- |

## 1.0 Objective

The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for the control of measurement and test equipment (M&TE) used by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

## 2.0 Background

### 2.1 Definitions

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Traceability – The ability to trace the history, application, or location of an item and like items or activities by means of recorded identification.

### 2.2 Discussion

M&TE may be government furnished (GF), rented or leased from an outside vendor, or purchased. It is essential that measurements and tests resulting from the use of equipment be of the highest accountability and integrity. To facilitate that, the equipment shall be used in full understanding and compliance with the instructions and specifications included in the manufacturer's operations and maintenance and calibration procedures, and in accordance with any other related requirements specified in the governing document referencing this SOP.

## 3.0 Responsibilities

All staff with responsibility for the direct control and/or use of M&TE is responsible for being knowledgeable of, and understanding and implementing the requirements contained herein, as well as any additional related requirements.

Team Leader (TL) – Responsible for identifying the technical specifications (e.g., precision, accuracy) for M&TE needed to meet project data collection objectives, and determining any

additional applicable Libby Site-specific requirements (e.g., periodic calibration of primary calibration sources) for M&TE.

Requisitioner – Responsible for ensuring M&TE is obtained or procured that meets the technical specifications identified by the TL, and facilitates obtaining the manufacturer's operations and maintenance and calibration procedures prior to field work.

Receiver – Responsible for receipt and/or unpackaging of M&TE and notifying the TL that the item has been received.

User – Responsible for the proper preparation and use of M&TE to collect the quality and quantity of data needed to meet project objectives. Users are typically field team members.

# 4.0 Equipment

Required M&TE will be specified in the governing document referencing this SOP.

# 5.0 Procedures

The following general requirements apply to M&TE at the Libby Site. Additional details and responsibilities are described later in this section.

- Manufacturer maintenance and calibration procedures must be followed when using M&TE
- Obtain the maintenance and calibration procedures if they are missing or incomplete
- Attach or include the maintenance and calibration procedures with the M&TE
- Prepare and record maintenance and calibration in an equipment or field log according to requirements stated in the governing document referencing this SOP
- Maintain M&TE records
- Label M&TE requiring routine or scheduled calibration (when required)
- Perform maintenance and calibration using the appropriate procedure and calibration standards
- Identify and take action on nonconforming M&TE

## 5.1 Preparation

### 5.1.1 Obtain the Operating, Maintenance, and Calibration Documents

***For Procured M&TE***

Requisitioner – Specify that the maintenance and calibration procedures be included.

***For GF M&TE Acquired as a Result of Property Transfer***

TL – Inspect the M&TE to determine whether maintenance and calibration procedures are included with the item. If missing or incomplete, obtain the appropriate documentation from the manufacturer.

***For Rented or Leased M&TE***

Requisitioner – Specify that the maintenance and calibration procedures, the latest calibration record, and the calibration standards certification be included. If this information is not delivered with the M&TE, request it from the vendor.

### 5.1.2 Prepare and Record Maintenance and Calibration Records

***For All M&TE***

Receiver – Upon receipt of an item of M&TE, notify the TL for the overall property control of the equipment.

TL and User – Record all maintenance and calibration events in an equipment or field log. The log must have sequentially-numbered pages.

## 5.2 Operation

TL and User – Operate, maintain, and calibrate M&TE in accordance with the maintenance and calibration procedures. Record maintenance and calibration actions in the equipment log or field log.

### 5.2.2 Traceability of Calibration Standards

***For All M&TE***

TL and User –

- When ordering calibration standards, request nationally recognized standards as specified or required. Request commercially available standards when not otherwise specified or required. Or, request standards in accordance with other related project-specific requirements.
- Require certifications for standards that clearly state the traceability.
- Require Material Safety Data Sheets to be provided with standards.
- Note standards that are perishable and consume or dispose of them on or before the expiration date.

### 5.2.3 M&TE That Fails Calibration

For any M&TE item that cannot be calibrated or adjusted to perform accurately:

User – Immediately discontinue use and segregate the item from other equipment.

TL – Review the current and previous maintenance and calibration records to determine if the validity of current or previous measurement and test results could have been affected and notify the appropriate authorities (typically the Project Manager) of the results. Any test results that are known to impact or have the potential to impact project data will be documented using a Libby Field Record of Modification Form.

## 5.3 Post-operation

M&TE shall be promptly returned to the owner at the end of field activities. All operations, maintenance, and calibration procedures shall be retained with the M&TE. Project M&TE records (e.g., equipment logs) will be retained in the project file.

# 6.0 Restrictions/Limitations

On an item-by-item basis, exemptions from the requirements of this SOP may be granted by the Health and Safety Manager and/or Quality Assurance Manager. All exemptions shall be documented by the grantor and included in the equipment records as appropriate.

## 7.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes. Every effort will be made to ensure the appropriate and functional M&TE are used to support site activities. This will be achieved to the extent possible through proper training, use of qualified procurement and designated field staff, and provision of TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require discussion with appropriate management and, as appropriate, re-training of the field team members. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

## 8.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 5-1, Control of Measurement and Test Equipment, January 2012.

# Libby Asbestos Superfund Site
# Standard Operating Procedure
# Field Equipment Decontamination

**Prepared by:** _____ Date: 4/12/12
CDM Smith

**Approved by:** _____ Date: 4/12/12
EPA Region 8

| Revision No. | Date | Reason for Revision |
|---|---|---|
| 0 | 4/12/12 | -- |

## 1.0 Objective

Decontamination of field equipment is necessary to ensure acceptable quality of samples by preventing cross contamination. Further, decontamination reduces health hazards and prevents the spread of contaminants off site. The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for the decontamination of field equipment used by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

## 2.0 Definitions

Clean – Free of contamination and when decontamination has been completed in accordance with this SOP.

Cross contamination – The transfer of contaminants through equipment or personnel from the contamination source to less contaminated or non-contaminated samples or areas.

Decontamination – The process of rinsing or otherwise cleaning the surfaces of equipment to rid them of contaminants and to minimize the potential for cross contamination of samples or exposure of personnel.

De-mineralized water – Water that has had most to all minerals removed from it. De-mineralized water shall only be stored in clean glass, stainless steel, or plastic containers that can be closed when not in use.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Material Safety Data Sheet (MSDS) – Document that discusses the proper storage and physical and toxicological characteristics of a particular substance used during field operations. MSDSs are to be maintained on site at all times during field operations.

Potable water – Tap water may be obtained from any municipal system. Chemical analysis of the water source may be required before it is used.

Sampling equipment – Equipment that comes into direct contact with the sample media. Such equipment includes split spoon samplers, well casing and screens, and trowels or bowls used to collect and/or homogenize samples.

Soap – Low-sudsing, non-phosphate detergent (e.g., Liquinox®).

Solvent rinse – Pesticide-grade (or better) isopropanol, acetone, or methanol.

## 3.0 Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for field equipment decontamination will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this SOP.

Team Leader - The TL is responsible for ensuring that field personnel are properly trained and that decontamination is conducted in accordance with this procedure and any other pertinent Libby Site decontamination processes cited in the governing document referencing this SOP.

Field Team Members – Field team members performing operations on the Libby Site are responsible for adhering to the procedures contained in this SOP and any other decontamination processes specified in the governing document referencing this SOP. If required, field team members will collect and document rinsate samples (also known as equipment blanks) to provide quantitative verification that these procedures have been correctly implemented. Field team members are also responsible for communicating any problems pertaining to the decontamination of field equipment to the TL.

## 4.0 Equipment

The following equipment may be employed wholly or in part during use of this SOP (refer to the governing document referencing this SOP for detailed requirements):

- Stiff-bristle scrub brushes
- Plastic buckets, scoops, trowels, and troughs
- Soap
- Nalgene® or Teflon® sprayers or wash bottles or 2- to 5-gallon, manual-pump sprayers (pump sprayer material must be compatible with the solution used)
- Plastic sheeting, plastic bags, and/or aluminum foil to keep decontaminated equipment clean between uses
- Disposable wipes, rags, or paper towels
- Potable water (potable water may be required to be tested for contaminants before use)
- De-mineralized water
- Gloves, safety glasses, and other protective clothing as specified in the health and safety plan
- High-pressure pump with soap dispenser or steam-spray unit (for large equipment only)
- Appropriate decontamination solutions pesticide grade or better and traceable to a source

- Tools for equipment assembly and disassembly
- 55-gallon drums or tanks for temporary storage of decontamination water
- Pallets for drums or tanks holding decontamination water

## 5.0 Procedures

All reusable equipment (non-dedicated) used to collect, handle, or measure samples shall be decontaminated before coming into contact with any sample media or personnel using the equipment. Decontamination of equipment shall occur either at a specified location, central decontamination station or at portable decontamination stations set up at the sampling location, drill site, or monitoring well location. The centrally-located decontamination area may include an appropriately-sized bermed and lined area on which equipment decontamination occurs and equipped with a collection system and/or storage vessels. In certain circumstances, berming may not be necessary when small quantities of water are being generated and for some short duration field activities. Equipment shall be transported to and from the decontamination area in a manner to prevent cross contamination of equipment and/or the area.

Typically at the Libby Site, decontamination water will not be captured and will be discharged to the ground at the site. However, the exact procedure for decontamination waste disposal may be discussed in the governing document referencing this SOP. Also, solvent rinse fluids may need to be segregated from other investigation-derived waste (IDW).

All items that come into contact with potentially contaminated media shall be decontaminated before use, between sampling locations (does not need to be performed between aliquots of an individual sample) and/or drilling locations, and after use. All decontamination procedures for the equipment being used are provided in the following sections.

***General Guidelines***

- Potable or de-mineralized water shall be free of all contaminants of concern. Depending upon the governing document referencing this SOP, analytical data from the water source may be required to ensure it is clean.
- Sampling equipment that has come into contact with oil and grease shall be cleaned with methanol or other approved alternative to remove the oily material. This may be followed by a hexane rinse and then another methanol rinse. Regulatory or Libby Site-specific requirements regarding solvent use shall be stated in the governing document referencing this SOP.
- All solvents[1] shall be pesticide-grade or better and traceable to a source. The corresponding lot numbers shall be recorded in the appropriate field logbook.
- Decontaminated equipment shall be allowed to air dry before being used.
- Documentation of all equipment, including type of equipment, date, time, method of decontamination, and any associated field quality control sampling, shall be recorded in the field logbook.

[1]Solvents are potentially hazardous materials and must be handled, stored, and transported accordingly. Solvents shall never be used in a closed building. See the investigation-specific health and safety plan and/or the chemical's MSDS for specific information regarding the safe use of the chemical.

- Gloves, boots, safety glasses, and any other personnel protective clothing and equipment shall be used as specified in the governing document referencing this SOP and/or health and safety plan.

## 5.1 Heavy Equipment Decontamination

Heavy equipment typically used at the Libby Site includes drilling rigs, trucks, and excavators. For any heavy equipment used during EPA response actions, the equipment decontamination procedures provided in the current version of the Libby Asbestos Site Response Action Work Plan shall apply. For all other field activities, follow these steps when decontaminating heavy equipment:

1. Establish a bermed decontamination area that is large enough to fully contain the equipment to be cleaned. If available, an existing wash pad or appropriate paved and bermed area may be used; otherwise, use one or more layers of heavy plastic sheeting to cover the ground surface and berms. All decontamination pads shall be upwind of the investigation area(s).
2. With the heavy equipment in place, spray areas (rear of rig or backhoe) exposed to contaminated media by pressurized means. Be sure to spray down all surfaces, including the undercarriage.
3. Use brushes, soap, and appropriate decontamination water to remove dirt whenever necessary.
4. Remove equipment from the decontamination pad.
5. After decontamination activities are completed, collect all plastic sheeting, and disposable gloves, boots, and clothing in containers or receptacles. All receptacles containing contaminated items must be properly labeled for disposal as detailed in the governing document referencing this SOP.

## 5.2 Downhole Equipment Decontamination

Downhole equipment includes hollow-stem augers, drill pipes, rods, and stems. Follow these steps when decontaminating this equipment:

1. Set up a centralized decontamination area, if possible. This area shall be set up to collect contaminated rinse waters and to minimize the spread of airborne spray.
2. Set up a “clean” area upwind of the decontamination area to receive cleaned equipment for air-drying. At a minimum, clean plastic sheeting must be used to cover the ground, tables, or other surfaces on which decontaminated equipment is to be placed. All decontamination areas shall be upwind of any areas under investigation.
3. Using soap and appropriate water with pressurization (e.g., Hudson® sprayer), spray the contaminated equipment. Aim downward to avoid spraying outside the decontamination area. Be sure to spray inside corners and gaps especially well. Use a brush, if necessary, to dislodge dirt.
4. If using soapy water, rinse the equipment using clean appropriate water with pressurization.
5. Remove the equipment from the decontamination area and place in a clean area upwind to air dry.
6. After decontamination activities are completed, collect all plastic sheeting, and disposable gloves, boots, and clothing in containers or receptacles. All receptacles containing

contaminated items must be properly labeled for disposal as detailed in the governing document referencing this SOP.

## 5.3 Sampling Equipment Decontamination

Follow these steps when decontaminating sampling equipment:

1. Set up a decontamination line. The decontamination line shall progress from "dirty" to "clean." A clean area shall be established upwind of the decontamination wash/rinse activities to dry the equipment.
2. Disassemble any items that may trap contaminants internally. Do not reassemble the items until decontamination and air drying are complete.
3. Wash the items with appropriate water and soap using a stiff brush as necessary to remove particulate matter and surface films. With the exception of polyvinyl chloride or plastic items, the items may be steam-cleaned using soap and hot water as an alternative to brushing. Items that have come into contact with concentrated and/or oily contaminants may need to be rinsed with a solvent such as hexane and allowed to air dry prior to this washing step.
4. Thoroughly rinse the items with potable water.
5. If sampling for organic compounds, thoroughly rinse the items with solvent (e.g., isopropanol) followed by a rinse using de-mineralized water. The specific chemicals used for the solvent rinse phase shall be specified in the work plan. Solvents are potentially hazardous materials and care must be exercised when using these chemicals to prevent adverse health effects. Appropriate personal protective equipment (PPE) must be worn when using these chemicals. These chemicals (including spent rinsate) must be managed and stored appropriately. Special measures such as proper labels, paperwork, notification, etc. may be required when transporting or shipping solvent chemicals.
6. Rinse the items thoroughly using de-mineralized water.
7. Allow the items to air dry completely.
8. After decontamination activities are completed, collect all plastic sheeting, and disposable PPE. Place the contaminated items in properly labeled bags or containers for disposal. Refer to the governing document referencing this SOP for labeling and waste management requirements.

## 5.4 Pump Decontamination

Follow the manufacturer’s recommendation for specified pump decontamination procedures. At a minimum, follow these steps when decontaminating pumps:

1. Set up the decontamination area and separate “clean” storage area using plastic sheeting to cover the ground, tables, and other surfaces. Set up three containers: the first container shall contain dilute (non-foaming) soapy water; the second container shall contain potable water; and the third container shall contain de-mineralized water.
2. The pump shall be set up in the same configuration as for sampling. Submerge the pump intake (or the pump, if submersible) and all downhole-wetted parts (tubing, piping, foot valve) in the soapy water of the first container. Pump soapy water through the pump assembly. Scrub the outside of the pump and other wetted parts with a metal brush.

3. Move the pump assembly to the potable water container while leaving discharge outlet in the waste container. All downhole-wetted parts must be immersed in the potable water rinse. Pump potable water through the pump assembly until it runs clear.
4. Move the pump intake to the de-mineralized water container. Pump the water through the pump assembly. Pump the volume of water through the pump specified in the field plan. Usually, three pump-and-line-assembly volumes shall be required.
5. Remove the decontaminated pump assembly to the clean area and allow it to air dry upwind of the decontamination area. Intake and outlet orifices shall be covered to prevent the entry of airborne contaminants and particles.

### 5.5 Instrument Probe Decontamination

Instrument probes used for field measurements (e.g., pH meters, conductivity meters) shall be decontaminated between samples and after use with de-mineralized water. At no time shall a sample probe be placed in contact with water within a sample container.

### 5.6 Waste Disposal

Waste disposal should follow the requirements listed in Libby project-specific SOP for handling investigation-derived waste (IDW) and the governing document referencing this SOP. The following are guidelines for disposing of waste:

- Decontamination water will typically not be captured, packaged, labeled, or stored as IDW at the site. Decontamination water will be discharged to the ground at the work site. Other materials used in the decontamination process will be disposed of as IDW.
- Small quantities of decontamination solutions may be allowed to evaporate to dryness.
- If large quantities of used decontamination solutions shall be generated, each type of waste shall be segregated in separate containers.
- Plastic sheeting and disposable protective clothing will be treated and disposed of as asbestos-containing materials.

## 6.0 Restrictions/Limitations

If the field equipment is not thoroughly rinsed and allowed to completely air dry before use, volatile organic residue, which interferes with the analysis, may be detected in the samples. The occurrence of residual organic solvents is often dependent on the time of year sampling is conducted. In the summer, volatilization is rapid, and in the winter, volatilization is slow. Check with EPA Region 8 and the State of Montana for approved decontamination solvents.

## 7.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

### 7.1 Training

Every effort will be made to ensure proper field equipment decontamination, which will be achieved to the extent possible through proper training, use of designated field staff, and

provision of TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require staff re-training.

### 7.2 Field Checks

Adherence to field equipment decontamination requirements may be checked on a daily basis by the TL for the first week of each field activity. These checks can be extended to once per month as field activities continue, and any non-compliance discussed with the field team member. If field activities continue beyond six months, the frequency of assessing field equipment decontamination will be established by the field Quality Assurance Manager.

## 8.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 4-5, Field Equipment Decontamination, January 2012.

# Libby Asbestos Superfund Site
# Standard Operating Procedure
# Handling Investigation-derived Waste

**Prepared by:** _____ Date: 4/12/12
CDM Smith

**Approved by:** _____ Date: 4/12/12
EPA Region 8

| Revision No. | Date | Reason for Revision |
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| 0 | 4/12/12 | -- |

## 1.0 Objective

The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for handling investigation-derived waste (IDW) resulting from work performed by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

## 2.0 Background

### 2.1 Definitions

Hazardous Waste – Discarded material that is regulated listed waste, or waste that exhibits ignitability, corrosivity, reactivity, or toxicity as defined in 40 CFR 261.3 or state regulations.

Investigation-derived Waste (IDW) – Discarded materials resulting from field activities such as sampling, surveying, drilling, excavation, and decontamination processes that, in present form, possess no inherent value or additional usefulness without treatment.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Site – All buildings (if applicable) and land within the boundaries of the EPA's designated geounits, which may represent individual properties within the Libby Site, a collection of properties, or a larger geographical area.

Treatment, Storage, and Disposal Facility (TSDF) – Permitted facilities that accept hazardous waste shipments for further treatment, storage, and/or disposal. These facilities must be permitted by the EPA and appropriate state and local agencies.

### 2.2 Discussion

At the Libby Site, field investigation and response action activities may result in the generation of IDW. IDW may include soil and cuttings from test pits or well installation; soil and other materials from the collection of samples; personal protective equipment (PPE); and other wastes or supplies used during the sampling and testing of potentially hazardous materials.

The vast majority of Libby Site IDW is expected to relate to the contaminant of concern – Libby amphibole asbestos. The overall management of IDW must comply with applicable regulatory requirements.

# 3.0 Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for handling IDW will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this SOP.

Team Leader (TL) – The TL is responsible for identifying Libby Site-specific requirements for the disposal of IDW in accordance with federal, state, and/or facility requirements, and ensuring that all IDW procedures are conducted in accordance with this SOP. The TL will communicate with the field team members regarding the specific objectives and anticipated situations that require deviation from this SOP.

Field Team Members – Field team members are responsible for adhering to the procedures contained in this SOP, and communicating any unusual or unplanned condition to the TL.

# 4.0 Equipment

Equipment required for IDW containment may vary according to field activity requirements. Management decisions concerning the necessary equipment required shall consider containment method, sampling, labeling, maneuvering, and storage (if applicable). Equipment must be onsite and inspected before commencing work.

## 4.1 IDW Containment Devices

The appropriate containment device (e.g., bags, drums, tanks, etc.) and the ultimate disposition of the IDW shall be specified in the governing document referencing this SOP. Typical IDW containment devices include:

- Plastic sheeting (polyethylene) with a minimum thickness of 6 mil
- U.S. Department of Transportation (DOT)-approved steel containers
- Polyethylene or steel bulk storage tanks

The volume of the appropriate containment device shall be specified in the governing document referencing this SOP.

## 4.2 IDW Container Labeling

A “Waste Container” or “IDW Container” label or indelible marking shall be applied to each container. Labeling or marking requirements for onsite IDW not expected to be transported offsite are as detailed below.

- Labels and markings must contain the following information: project name, generation date, location of waste origin, container identification number, sample number (if applicable), and contents.

- Each label or marking will be applied to the upper one-third of the container at least twice, on opposite sides.

- Containers that are 5 gallons or less may only require one label or set of markings.
- Labels or markings will be positioned on a smooth part of the container. The label must not be affixed across container bungs, seams, ridges, or dents.
- Labels must be constructed of a weather-resistive material with markings made with a permanent marker or paint pen and capable of enduring the expected weather conditions. If markings are used, the color must be easily distinguishable from the container color.
- Labels will be secured in a manner to ensure that they remain affixed to the container.

Labeling or marking requirements for IDW expected to be transported off of the work site must be in accordance with the requirements of 29 CFR 1926.1101.

### 4.3 IDW Container Movement

Staging areas for IDW containers shall be predetermined and in accordance with investigation-specific requirements. Arrangements shall be made before field mobilization as to the methods and personnel required to safely transport IDW containers to the staging area. Transportation of IDW containers offsite via a public roadway is prohibited unless 49 CFR 172 requirements are met.

### 4.4 IDW Container Storage

Containerized IDW awaiting results of pending chemical analysis or further onsite treatment shall be staged on site. Staging areas and bulk storage procedures are to be determined according to investigation-specific requirements. Containers are to be stored in such a fashion that the labels can be easily read. A secondary/spill container must be provided for liquid IDW storage and as appropriate for solid IDW storage (e.g., steel drums shall not be stored in direct contact with the ground).

## 5.0 Procedures

The three general options for managing IDW are: 1) collection and onsite disposal; 2) collection for offsite disposal; and 3) collection and interim management. The option selected shall take into account the following factors:

- Type (soil, sludge, liquid, debris), quantity, and source of IDW
- Risk posed by managing the IDW onsite
- Compliance with regulatory requirements
- IDW minimization and consistency with the Libby Site remedy

### 5.1 Collection and Onsite Disposal

#### 5.1.1 Soil/Sludge/Sediment

Unless otherwise specified in the governing document referencing this SOP, when handling soil/sludge/sediment IDW at the Libby Site, the following will apply:

- Return IDW to boring, pit, or source immediately after generation as long as returning the media to these areas will not increase site risks (i.e., the contaminated soil will not be in a different area or at a different depth than from where it was originally obtained).

#### 5.1.2 Aqueous Liquids

Unless otherwise specified in the governing document referencing this SOP, options for handling aqueous liquid IDW at the Libby Site are listed below. These options may require results of laboratory analysis to obtain client and/or regulatory approval.

- Discharge to ground surface close to the well from which it was extracted, only if soil contaminants will not be mobilized in the process and the action will not contaminate clean areas. If IDW from the sampling of background up-gradient wells is not a community concern or associated with soil contamination, this presumably uncontaminated IDW may be released on the ground around the well.
- When small amounts (i.e., less than 5 gallons) of used decontamination fluids are generated during site characterization activities (e.g., during soil sampling), the fluids may be discharged to the ground surface within the sampling area or allowed to evaporate from an open bucket.

#### 5.1.3 Disposable PPE

Disposable PPE IDW (not including excess soil volume) for the Libby Site will be collected in garbage bags and marked “IDW” with an indelible ink marker. These bags will be deposited into the asbestos-containing material (ACM) waste stream for appropriate disposal at the local Class IV asbestos landfill. Excess soil volume will be returned to the area from where it was collected.

### 5.2 Collection and Interim Management

Collection and interim management options that may be employed for Libby Site IDW are provided herein.

Storing IDW onsite until the final action may be practical in the following situations:

- Returning wastes (especially sludges and soils) to their onsite source area would require re-excavation for disposal as determined for the final site remedy.
- Interim storage in containers may be necessary to provide adequate protection to human health and the environment.
- Storing IDW until the final disposal of all wastes from the site will eliminate the need to address this issue more than once.
- Interim storage may be necessary to provide time for sampling and analysis.

## 6.0 Restrictions/Limitations

Managers of the site shall determine the most appropriate disposal option for IDW an activity-specific basis. Parameters to consider, especially when determining the level of protection, include: the volume of IDW and the nature of contaminants present in the site soil. Special disposal/handling may be needed for drilling fluids because they may contain significant solid components and therefore may need to be handled, treated, and disposed as non-liquid waste. Disposable sampling materials, disposable PPE, decontamination fluids, etc. will always be

managed on a site-specific basis. Under no circumstances shall these types of materials be stored in a site office, facility, or warehouse.

# 7.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

## 7.1 Training

Every effort will be made to ensure proper handling of IDW, which will be achieved to the extent possible through proper training, use of designated field staff, and provision of TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require staff re-training.

## 7.2 Field Checks

Adherence to requirements for handling IDW may be checked on a daily basis by the TL (or their designate) for the first week of each field activity. These checks can be extended to once per month as field activities continue. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require field team member re-training. If field activities continue beyond six months, the frequency of assessing field logbook entries will be established by the field Quality Assurance Manager or their designate.

# 8.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 2-2, Guide to Handling Investigation-derived Waste, January 2012.

# Libby Asbestos Superfund Site
# Standard Operating Procedure
# Sample Custody

**Prepared by:** _____ Date: 4/12/12
CDM Smith

**Approved by:** _____ Date: 4/12/12
EPA Region 8

| Revision No. | Date | Reason for Revision |
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## 1.0 Objective

Sample custody procedures are integral to maintaining and documenting the possession of environmental samples collected by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for sample custody for the Libby Site. Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

## 2.0 Background

### 2.1 Definitions

Chain-of-custody record (COC) – Used to document the custody, control, transfer, analysis, and disposition of samples.

Custody seal – An adhesive-backed seal that is applied to an individual sample or sample container to demonstrate that sample integrity has not been compromised during sample transfer.

Facility – A designated sample processing facility, analytical laboratory, or long-term storage area, for Libby Site samples.

Field sample data sheet (FSDS) – A controlled document used to record sample information.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Sample – Material to be analyzed that is contained in single or multiple containers representing a unique sample number.

Sample custody – The possession or safe-keeping of samples in such a manner that prevents tampering, damage, or loss.

Sample labels – Adhesive-backed labels that contain, at a minimum, the unique sample number/identifier. Sample labels are typically used on field documentation, sample cassettes, and containers, and may be pre-printed to minimize sequencing or transcription errors.

## 2.2 Discussion

Because of the evidentiary nature of samples collected during environmental investigations, possession must be traceable from the time the samples are collected until their derived data are introduced as evidence in legal proceedings. To maintain and document sample possession, sample custody procedures must be followed.

# 3.0 Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for the custody of samples will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this SOP.

Team Leader (TL) – Responsible for ensuring that strict chain-of-custody procedures are maintained during all sampling events.

Sampler – Responsible for the care and custody of samples from the time of collection until they are transferred.

Field Sample Coordinator (FSC) – Responsible for accepting samples into their custody from the sampler(s), producing COCs, and relinquishing or shipping samples to the appropriate facility.

Laboratory Coordinator (LC) – Responsible for coordinating the preparation and/or analysis of Libby Site samples with project facilities in order to achieve requested turnaround times for analytical data.

# 4.0 Equipment

Depending upon staff responsibility, the following equipment will be employed during use of this SOP:

- Field logbook
- FSDSs
- Indelible blue or black ink pens
- Sample labels
- Zip-top plastic bags
- Custody seals
- Container(s) in which to keep/protect samples

# 5.0 Procedures

## 5.1 Preparation

Communications between the TL, sampler(s), the FSC, the LC are critical to ensure the efficient throughput of samples to meet project data objectives. As such, an FSC will attend all field planning meetings to gather information about sampling events (e.g., sample quantities, special sample handling, processing, or analysis concerns, and requested turnaround times). For long-term field programs, sampling staff will notify the FSC daily of the estimated number and type of samples to be collected. In either case, the FSC will relay the pertinent investigation-specific information to the LC, who will, in turn, coordinate preparation and/or analysis with project facilities. On an as-needed basis (typically daily during the field season), the FSC will schedule meetings in which to relinquish samples to the LC.

## 5.2 Operation

A sample is under custody if it is: 1) in your possession, 2) in your view after being in your possession, 3) in your possession and you locked it up, or 4) in a designated secure area. The following procedures detail the process used to maintain the custody of each Libby Site sample. Note that if at any point samples are left unattended or receipt of samples is refused, this must be documented in the field logbook or on the COC, as appropriate.

### 5.2.1 Sampler Custody

Sample custody begins at the time of sample collection and will be maintained using a field logbook and FSDSs to document pertinent sample-related information. Samples will be placed in safe areas where they are protected from tampering, damage, or loss. Following sample collection, custody seals will be used as an indicator of tampering. Samples will remain in the sampler's possession, within sight, or in a secure area (e.g., locked vehicle) until the sample is relinquished.

For samples collected using zip-top bags as the primary container, all samples will be double-bagged and custody sealed on the outer bag by the sampler. For samples collected using cassettes, the cassette will be custody sealed so that both end caps of the sampling cassette are covered but sample labels or identifiers are not obstructed. The cassette will then be placed in a zip-top bag.

Sampler(s) may be required to transfer custody of samples directly to an FSC or a designated secure sample storage location, or to hand deliver or ship samples to a facility – refer to the governing document referencing this SOP for specifics. Project-specific SOP EPA-LIBBY-2012-07, *Packaging and Shipping Environmental Samples*, will be followed for samples that are required to be shipped.

If relinquishing to an FSC or secure storage area, the sampler will note in the field logbook the time of transfer, and the name and company affiliation of the receiver or dedicated storage location. Completed and quality-checked FSDSs will accompany the samples.

### 5.2.2 FSC Custody

Upon receipt of samples and accompany FSDSs, the FSC will verify that:

- Each FSDS is complete
- Each sample is accounted for
- Soil samples are double-bagged
- Each cassette is sealed in its own zip-top bag and caps on cassettes are in place
- Sample containers (e.g., bags, bottles) are tightly sealed
- Custody seals are correctly and securely placed on each sample
- Samples appear to be in an acceptable condition (i.e., cassettes are not cracked; sample containers are not leaking, etc.).
- No information is provided on the sample or sample container that would disclose the origin of the sample to the facility

The FSC will immediately contact the sampler if any acceptance issues are encountered. Once accepted, the FSC will prepare a COC using EPA-specified data management tools (e.g., Data Entry Tool, Scribe). An investigation-specific Analytical Summary Sheet (available in the SAP or Libby Field eRoom) will be attached to the COC. The FSC will group or batch the appropriate number of individual samples on a COC to facilitate data reporting, or as otherwise requested by the LC.

The following general batching guidelines will be used for commonly sampled Libby Site media:

- 10 or fewer non-clearance air samples on one COC
- one set of five clearance air samples and two corresponding field blanks on one COC
- 20 or fewer soil or soil-like (e.g., duff, wood chip) samples on one COC
- 10 or fewer dust samples on one COC

Following coordination with the LC, the FSC will hand deliver or ship samples (following project-specific SOP EPA-LIBBY-2012-07, *Packaging and Shipping Environmental Samples*) to the designated facility. All samples will be maintained in a secure location by the FSC until they are relinquished to another party.

### 5.3 Post-operation

Sample documentation (logbooks, FSDSs, field copy of the COC, etc.) will be maintained in accordance with Libby Site data management requirements and any special requirements stated in the governing document referencing this SOP (e.g., posting to an eRoom).

## 6.0 Restrictions/Limitations

For EPA Contract Laboratory Program sampling events, combined chain-of-custody/traffic report forms generated with Scribe or other EPA-specific records may be used. Refer to EPA regional guidelines for completing these forms. Scribe software may be used to customize sample labels and custody records when directed by the client.

## 7.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

### 7.1 Training

Every effort will be made to ensure proper sample custody from the point of collection to final disposition. Sample custody will be maintained to the extent possible through proper training, use of designated field staff, and provision of TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require staff re-training.

### 7.2 Field Checks

Field checks for adherence to this SOP may be performed on a daily basis by the TL for the first week of each field activity. These checks can be extended to once per month as field activities continue. Any non-compliance issues will be discussed with field personnel and corrected. If field activities continue beyond six months, the frequency of assessing sample custody procedures will be established by the field Quality Assurance Manager.

## 8.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 1-2, Sample Custody, January 2012.

# Libby Asbestos Superfund Site
# Standard Operating Procedure
# Packaging and Shipping Environmental Samples

**Prepared by:** _____ Date: 4/12/12
CDM Smith

**Approved by:** _____ Date: 4/12/12
EPA Region 8

| Revision No. | Date | Reason for Revision |
|---|---|---|
| 0 | 4/12/12 | -- |

## 1.0 Objective

The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for the packaging and shipping of environmental samples collected by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). Sections 2.0 through 7.0 of this SOP outline requirements for the packaging and shipping of regulated environmental samples under the U.S. Department of Transportation (DOT) Hazardous Materials Regulations, the International Air Transportation Association (IATA), and International Civil Aviation Organization (ICAO) Dangerous Goods Regulations (for shipment by air) and applies only to domestic shipments.

This SOP does not cover the requirements for packaging and shipment of equipment or bulk chemicals that are regulated under the DOT, IATA, and ICAO, nor does it address shipment of hazardous materials. Hazardous material will not be shipped unless personnel have received training that meets the requirements of the governing agency and the DOT.

Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

## 2.0 Background

### 2.1 Definitions

Bottle ware – Plastic or glass bottles or jars used to contain sampled material. Their purpose is to keep sampled material from mixing with the ambient environment.

Chain-of-custody record (COC) – Used to document the custody, control, transfer, analysis, and disposition of samples.

Custody seal – An adhesive-backed seal that is applied to an individual sample or sample container to demonstrate that sample integrity has not been compromised during sample transfer.

Environmental sample – An aliquot of air, water, plant material, sediment, or soil that represents potential contaminant levels at a site. This procedure applies only to environmental samples that

contain less than reportable quantities for any foreseeable hazardous constituents according to DOT regulations promulgated in 49 CFR - Part 172.101 Appendix A.

Facility – A sample processing facility, analytical laboratory, or long-term storage area that serves as the receiver for Libby Site samples.

Excepted quantity – Excepted quantities are limits to the mass or volume of a hazardous material in the sample containers below which DOT, IATA, ICAO regulations do not apply. The excepted quantity limits are very low. Most regulated shipments will be made under limited quantity.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Limited quantity – Limited quantity is the maximum amount of a hazardous material below which there are specific labeling or packaging exceptions.

Performance testing – Performance testing is the required testing of outer packaging. These tests include drop and stacking tests.

Qualified Shipper – A qualified shipper is a person who has been adequately trained to perform the functions of shipping hazardous materials.

Site – All buildings (if applicable) and land within the boundaries of the EPA's designated geounits, which may represent individual properties within the Libby Site, a collection of properties, or a larger geographical area.

### 2.2 Discussion

Proper packaging and shipping is necessary to ensure the integrity of environmental samples during transport. These shipments are potentially subject to regulations published by DOT, IATA, or ICAO. Failure to abide by these rules places both the governing agency and the individual employee at risk of serious fines.

## 3.0 Responsibilities

Successful execution of this SOP requires a clear definition of assigned roles and responsibilities. All staff responsible for packaging or shipping Libby Site environmental samples will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this SOP.

Team Leader (TL) – Responsible for overseeing sample packaging and shipping processes as described in this SOP.

Packager/Shipper – Party (typically the Field Sample Coordinator or Sampler) responsible for properly packaging and shipping samples to the designated project facility.

Qualified Shipper – Responsible for ensuring that samples undergoing shipment contain no other contaminant that meets the definition of "hazardous material" as defined by DOT, and for determining the amount of preservative in each sample so that accurate determination of quantities can be made.

# 4.0 Equipment

## 4.1 Environmental Samples without Preservatives

The following equipment will be used when packaging and shipping Libby Site samples:

- Shipping containers (e.g., insulated cooler for limited quantities, a sturdy box for air samples)
- Bubble wrap or other space filler
- Heavy-duty plastic garbage bags
- Plastic zip-top bags
- Custody seals
- Clear packaging tape
- Completed chain-of-custody record
- Duct tape
- Completed shipping label
- Completed return address label (for return of coolers)

Vermiculite, shredded paper, expanded polystyrene, or other absorbent material will not be used for packaging or shipping Libby Site samples. Plastic bubble wrap and ice (as required) is acceptable packing material.

## 4.2 Environmental Samples with Preservatives

In addition to the equipment listed in Section 4.1, the following additional equipment is required when packaging samples containing preservatives:

- Sample containers
- Insulated coolers
- ice packs/bags or “blue ice”
- Sample labels
- Nitrile gloves

# 5.0 Procedures

### 5.1.1 Preparation

Considerations that must be made prior to shipping samples include selecting the appropriate shipping option (e.g., overnight delivery) so that analytical holding times for the samples are not exceeded; packaging samples in time to meet courier or shipping service pick-up times; and making arrangements with the project facility regarding Saturday receipt of samples.

## 5.2 Operation

### 5.2.1 Solid Media Samples without Preservatives

The following processes will be employed by the Packager/Shipper for non-preserved, solid media samples (soil, duff, bark, bulk material), and samples collected on cassettes (air, dust). Section 5.2.2 provides procedures for packaging and shipping aqueous samples (groundwater, surface water), or samples with aqueous content (sediment, sludge). Due to the potential for cross contamination, samples collected on cassettes must not be shipped in the same container as solid media samples. Refer to the guidance document referencing this SOP for temperature control requirements (ice).

1. Verify the samples undergoing shipment meet the definition of an “environmental sample” and are not a hazardous material as defined by DOT. Professional judgment and/or consultation with qualified persons such as the Health and Safety Manager shall be observed.
2. Select a sturdy shipping container. Ensure that coolers are in good repair. Air and dust samples must be shipped in separate containers from solid media samples.
3. Place samples into the shipping container. During placement, ensure custody seals are securely in place and verify the contents of the shipping cooler against the COC. The COC shall reflect only those samples within the shipping container.
4. Fill all remaining space with bubble wrap or other appropriate space filler, to prevent the sample(s) from being jostled.
5. After the COC has been signed and dated (time included), retain the field copy of the COC. If using a cooler, place the following items into a zip-top plastic bag for inclusion in the cooler: the top two copies of the COC, an analytical parameters table (if applicable), a copy of the investigation-specific analytical requirements summary sheet (applicable to any asbestos analysis), a completed return shipping label for return of the cooler, and any additional contact, results distribution, or billing information. Tape the sealed zip-top bag to the inside of the cooler lid and securely close. If using a box, include all aforementioned documentation inside the box along with the samples.
6. Attach a completed custody seal across the opening of the shipping container on opposite sides. If using a cooler, the cooler lid shall be secured with tape by wrapping each end of the cooler a minimum of two times. The tape shall be affixed to the cooler so that only half of the custody seal is covered, preventing the cooler from being opened without breaking the seal.
7. Secure the completed shipping form to the shipping container. Schedule the container for pickup or drop off at shipper.
8. Once the container is shipped, notify the laboratory of the shipment number and anticipated arrival date/time.

### 5.2.2 Aqueous or Aqueous-content Samples without Preservatives

This process below will be employed by the Packager/Shipper for non-preserved, aqueous (or aqueous content) samples collected in bottle ware (water, sediment, sludge). Refer to the guidance document referencing this SOP for temperature control requirements (ice).

1. Verify the samples undergoing shipment meet the definition of an “environmental sample” and are not a hazardous material as defined by DOT. Professional judgment and/or consultation with qualified persons such as the Health and Safety Manager shall be observed.
2. Be sure the caps on all bottles are tightened to prevent leaking. Ensure custody seals are securely in place.
3. For glass containers, wrap each container in bubble wrap and secure with waterproof tape to prevent breakage.
4. Place each plastic or bubble-wrapped glass container into a zip-top bag. Smaller glass containers, such as 40-milliliter vials, may be wrapped together for the same sample.
5. Remove as much trapped air when sealing the bag.

6. Select a sturdy cooler in good repair. To control contents: duct tape closed any interior drain plugs from the inside; duct tape closed any exterior drain plugs from the outside; and line the cooler with two large heavy-duty plastic garbage bags.
7. Place the samples into the cooler with sufficient space to allow for the addition of packing material between the samples. It is preferable to place glass sample bottles and jars into the cooler vertically (glass containers are less likely to break when packed vertically rather than horizontally). During placement, verify the contents of the shipping cooler against the COC. The COC shall reflect only those samples within the cooler.
8. Fill all remaining space with bubble wrap or other appropriate space filler to prevent the sample(s) from being jostled.
9. After the COC has been signed and dated (time included), retain the field copy of the COC. Place the following items into a zip-top plastic bag for inclusion in the cooler: the top two copies of the COC, an analytical parameters table (if applicable), a copy of the Analytical Summary Sheet as provided in the governing document referencing this SOP (only applicable to asbestos analysis), a completed return shipping label for return of the cooler, and any additional contact, results distribution, or billing information. Tape the sealed zip-top bag to the inside of the cooler lid and securely close.
10. Fill all remaining space between the samples with packing material. Remove excess air from garbage bags and seal each bag by securely taping the opening closed and then applying a custody seal on the outermost bag.
11. Attach a completed custody seal across the opening of the cooler on opposite sides. The cooler lid shall be secured with tape by wrapping each end of the cooler a minimum of two times. The tape shall be affixed to the cooler so that only half of the custody seal is covered, preventing the cooler from being opened without breaking the seal.
12. Secure the completed shipping form to the shipping container. Schedule the container for pickup or drop off at shipper.
13. Once the container is shipped, notify the laboratory of the shipment number and anticipated arrival date/time.

### 5.2.3 Samples Requiring Temperature Controls

If temperature controls (i.e., ice) are required (refer to the guidance document referencing this SOP), in addition to the procedures listed in Section 5.2.1 (for solid media samples) or Section 5.2.2 (for aqueous samples), the Packager/Shipper will:

1. Duct tape closed any drain plugs (inside and outside) and line the cooler with two large heavy-duty plastic garbage bags. (This step will already have been performed for aqueous/aqueous-content samples.)
2. Place ice in one-gallon plastic zip-top bags and properly seal the bags.
3. Place bags of ice on top of and between the samples to ensure adequate temperature controls during transport.
4. Ensure a temperature blank is secured inside the cooler.

### 5.2.4 All Samples with Preservatives

Prior to shipping samples with preservatives, the Qualified Shipper will determine the amount of preservative in each sample. Excepted quantities of preservatives are provided in the following table:

**Excepted Quantities of Preservatives**

| Preservative | | Desired in Final Sample | | Quantity of Preservative (ml) for Specified Container | | | | |
|---|---|---|---|---|---|---|---|---|
| 5 drops = 1 ml | | **pH** | **Conc.** | **40 ml** | **125 ml** | **250 ml** | **500 ml** | **1 L** |
| NaOH | 30% | >12 | 0.08% | -- | 0.25 | 0.5 | 1 | 2 |
| HCl | 2N | <1.96 | 0.04% | 0.2 | 0.5 | 1 | -- | -- |
| $HNO_3$ | 6N | <1.62 | 0.15% | -- | 2 | 4 | 5 | 8 |
| $H_2SO_4$ | 37N | <1.15 | 0.35% | 0.1 | 0.25 | 0.5 | 1 | 2 |

Conc. = concentration
ml = milliliters
% = percent
L = liter

NaOH = sodium hydroxide
HCl = hydrochloric acid
$HNO_3$ = nitric acid
$H_2SO_4$ = sulfuric acid

In addition to the steps outlined in the appropriate section above for the specific media sampled, these additional steps are to be followed when packaging limited-quantity sample shipments:

1. Nitrile gloves are to be worn by anyone handling the sampling containers.
2. All sample containers will be labeled with the sample number and what preservative is being used. Protect the labels with waterproof tape. At a minimum the sample label must contain:

   - Sample number
   - Project or Case number
   - Date and time of sample collection
   - Preservative
   - Analysis

The FSDS will be used to collect all other sample information.

3. The Packager/Shipper will ensure a trip blank(s) is secured inside the cooler(s).
4. The maximum weight of the cooler shall not exceed 30 kg (66 lbs) for any limited-quantity shipment of dangerous goods.

### 5.3 Post-operation

Shipping documentation will be maintained by the Packager/Shipper to confirm that shipments have been delivered and accepted by the receiver.

## 6.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

### 6.1 Training

Every effort will be made to ensure proper sample custody from the point of collection to final disposition. Sample custody will be maintained to the extent possible through proper training, using designated field staff, and providing TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require staff re-training.

### 6.2 Field Checks

Field checks for adherence to this SOP may be performed on a daily basis by the TL (or their designate) for the first week of each investigation. These checks can be extended to once per month as investigation activities continue, and any errors noticed during the checks will be discussed with field personnel and corrected. If investigation activities continue beyond six months, the frequency of assessing sample packaging and shipping procedures will be established by the field Quality Assurance Manager or their designate.

## 7.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 2-1, Packaging and Shipping Environmental Samples, January 2012.

# Libby Asbestos Superfund Site
# Standard Operating Procedure
# Air Sample Collection

**Prepared by:** _____ Date: 4/9/12
CDM Smith

**Approved by:** _____ Date: 4/9/12
EPA Region 8

| Revision No. | Date | Reason for Revision |
|---|---|---|
| 0 | 4/6/12 | Includes elements from previous Libby SOPs EPA-LIBBY-01 (*Sampling of Asbestos Fibers in Air*) and CDM-LIBBY-14 (*Stationary Air Sample Collection*) to present a unified, updated approach to collecting Libby Site air samples. |

## 1.0 Objective

The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for performing air sampling by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). Modifications to this SOP may be detailed in governing documents referencing this SOP.

## 2.0 Background

### 2.1 Definitions

DryCal® – A type of air flow meter used at the Libby Site as a primary flow standard for calibrating rotameters.

Field sample data sheet (FSDS) – A controlled document used to record sample information.

Inert tubing – Inert tubing (e.g., Tygon®) is used in the sampling train to connect the outflow end of the sample cassette to the sampling pump.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Personal air sample – An air sample collected within the breathing zone of the individual being sampled.

Phase contrast microscopy (PCM) sample cassette – A 25-millimeter (mm), three-piece cassette with a 50mm electronically conductive extension cowl loaded with a 0.8 micron pore size, mixed cellulose ester (MCE) filter.

Rotameter – A type of air flow meter.

Sample labels – Adhesive-backed labels that contain, at a minimum, the unique sample number/identifier. Sample labels are typically used on field documentation, sample cassettes, and containers, and may be pre-printed to minimize sequencing or transcription errors.

Sampling pump – A device used to pull air through a filter medium at an established rate. Common pumps used at the Libby Site are the SKC Airchek Sampler, Model 224-PCXR4 (low-volume battery-powered sampling pump) and the Gast 1532 rotary vane pump (high-volume alternating current sampling pump).

Sampling stands – Telescoping tripods designed to hold sample cassettes at a desired height and isolate them from the vibrations of the sampling pump.

Site – All buildings (if applicable) and land within the boundaries of the EPA's designated geounits, which may represent individual properties within the Libby Site, a collection of properties, or a larger geographical area.

Stationary (ambient) air sample – An air sample collected from a fixed location.

### 2.2 Discussion

Air sampling generally consists of using sampling pumps to draw air over a sample filter for a pre-determined volume in order to measure airborne quantities or concentrations of asbestos fibers. Air sample data serves many purposes at the Libby Site – samples may be investigatory in nature, be used to determine compliance with Occupational Safety and Health Administration requirements, or measure attainment of action levels or cleanup criteria established by EPA to evaluate response actions. Documents governing air sampling activities shall specify the intended use of the air sampling data.

## 3.0 Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for collecting air samples will understand and implement the requirements contained herein, as well as any additional requirements stated in the governing document referencing this SOP.

Team Leader (TL) – The TL is responsible for overseeing air sample collection processes as described in this SOP. The TL is also responsible for checking all work performed and verifying that the work satisfies the objectives of the data collection effort. It is also the responsibility of the TL to communicate the need for any deviations from the SOP with the appropriate personnel, and document the deviation using a Libby Field Record of Modification Form.

Field Team Members – Field team members performing air sampling are responsible for adhering to the procedures contained in this SOP. The field team members should have limited discretion with regard to collection procedures but should exercise judgment regarding the exact locations of samples within the specified sampling area. Field team members are also responsible for communicating any sample collection issues (e.g., equipment failure) to the TL for the purpose of troubleshooting and information-sharing with other field team members.

# 4.0 Equipment

The following equipment is required for Libby Site air sampling:

- Sampling pump
- PCM sample cassettes
- Sampling stands
- Inert tubing
- Rotameter
- DryCal®
- Sample labels
- Pint-sized plastic zip-top bags
- Cooler or other rigid container
- Custody Seals
- Small standard screwdriver (used to adjust the flow rate in low-volume pumps)
- Field logbooks
- FSDSs
- Indelible blue or black ink pens

# 5.0 Procedures

Prior to conducting work at any Libby work site, health and safety procedures, as specified in the governing health and safety plan, will be reviewed and the appropriate personal protective equipment donned.

## 5.1 Preparation

### 5.1.1 Calibrating the Rotameter with an Electronic Calibrator

Rotameters used for pump calibration are calibrated to a primary flow standard on a quarterly basis. The primary flow standard in use at the Libby Site is the DryCal® DC-Lite, manufactured by Bios International Corporation. Procedures for rotameter calibration with the DC-Lite flow meter are as follows:

1. Obtain the actual temperature and pressure in Libby, Montana from the local National Oceanic and Atmospheric Administration (NOAA) weather station. Record actual temperature and pressure in the fields provided on the Precision Rotameter Calibration Data Sheet (Attachment 1).
2. Set up the calibration train as shown in EPA SOP #2015 (EPA 1994), Figure 4, with the sampling pump, rotameter, and primary flow meter (Attachment 2).
3. The rotameter will be held perpendicular to the plane of the table in a vertical position.
4. Turn the DC-Lite and sampling pump on.
5. Turn the flow adjustment screw or knob on the pump until the desired flow rate is attained.
6. Calibrate rotameter to desired ball reading, as read from the middle of the flow ball, with a sampling pump and sample cassette in-line. The cassette used for calibration must be the same type and from the same lot of sample cassettes that will be used for sampling. Record value in the ball reading column on the rotameter calibration data sheet.

7. Check adjusted flow rate of sampling pump to the DC-Lite flow calibrator primary flow standard. Ten repetitive flow measurements will be averaged and that result recorded in the flow rate column for the selected interval.
8. Repeat this process at 10 intervals over the range of the precision rotameter.
9. Input data into rotameter calculation sheet to generate the corrected flow rate.

### 5.1.2 Flow Rates and Sample Volume

In general, air samples will be collected using flow rates ranging between 1.0 and 10.0 liters per minute (L/min), with a minimum total sample volume of 1,200 liters. Flow rates will be set at the discretion of the field team member in order to capture, at a minimum, 80 percent (%) of the workday. The sampling pump will provide a non-fluctuating air flow through the filter, and will maintain the initial volume flow rate to within ±10% throughout the sampling period. If at any time the measurement indicates that the flow rate has increased or decreased by more than 10% of the set flow rate, sample collection will cease and the sample will be voided.

In no case will a sample be collected at a flow rate lower than 1.0 L/min, since the linear flow velocity would fall below 4 centimeters per second (cm/sec), which is the minimum velocity specified by the International Organization for Standardization (ISO) method 10312 (ISO 1995) that is used for Libby project air samples.

As samples are initially collected during the sampling event and analyzed, flow rates and sample times may be adjusted to ensure the loading on the sample filter facilitates reaching the required sensitivity goals (i.e., to prevent filter overloading). Filter loading is discussed in more detail in Section 5.2.2 of this SOP.

### 5.1.3 Calibrating the Sampling Pump with a Rotameter

Each sampling pump will be calibrated before and after each sampling event with a primary or secondary calibration device as described below. This is to ensure that each sampling pump is operating to project requirements as stated in Section 5.2.

The procedures used for sampling pump calibration are as follows:

1. Set up the calibration chain as shown in EPA SOP #2015 (EPA 1994), Figure 5 (Attachment 3) using a rotameter, sampling pump, and a representative sample cassette. The sample cassette to be used for sampling is installed between the pump and the calibrator.
2. To set up the calibration train, attach one end of tubing to the sample cassette base, then attach the other end of the tubing to the inlet plug on the pump. Another piece of tubing is attached from the sample cassette cap to the rotameter.
3. The flow meter should be held in a vertical position.
4. Turn the sampling pump on.
5. Turn the flow adjustment screw or knob on the manifold regulating air flow to the samples until the middle of the float ball on the rotameter is lined up with the pre-calibrated flow rate value.

Each rotameter used for field calibration will be transported to and from each sampling location in a sealed zip-top plastic bag.

### 5.1.4 Collecting Multiple Samples using One Pump

A sampling pump equipped with more than one manifold may be used to collect more than one sample at a time. In the case two samples will be collected from one pump, calibration must be checked after each alteration of the flow regulators. For example: Turn the knob on (manifold A) until the middle of the float ball on the rotameter is at the desired flow rate value. Turn the knob on (manifold B) until the middle of the float ball on the rotameter is at the desired flow rate value. Verify the calibration of (manifold A), adjust as required. This process must be repeated until both (manifold A) and (manifold B) are at the desired flow rate.

## 5.2 Operation

### 5.2.1 Air Sampling Locations

If not specifically discussed in the governing document referencing this SOP, the location of each stationary air sample will be determined by field personnel based on site-specific conditions (e.g., personnel breathing zone, near equipment, soil excavation boundaries, etc.).

### 5.2.2 Sample Collection Protocol

Each air sample will be collected according to the following procedures:

1. Place a sample label on the sample cassette. Place the corresponding sample label on the FSDS.
2. Determine proper sample location. For a fixed air monitor, this will generally be at a height that represents the breathing zone of the potentially exposed population (e.g., 4-6 feet above the ground or floor). For personal air monitoring, the cassette will typically be placed on the lapel just below the face of the individual being monitored.
3. Set up the sampling train and attach the air intake hose to the sample cassette base. Follow calibration procedures listed in Section 5.1.3. The sample cassette will be positioned such that it is held facing downwards at an approximate 45 degreee angle to avoid any particles entering the filter by precipitation. Remove the sample cassette cap and turn the sampling pump on.
4. Record all pertinent information on the FSDS.
5. Unless otherwise specified in the governing document referencing this SOP, check the sampling pump at a minimum of every 4 hours. If the sample filter darkens in appearance or if loose dust is observed inside the cassette, the sample period will be terminated and the remaining steps below followed to complete collection of the sample. The loading observations will be noted on the FSDS in the comment section.
6. At the end of the sampling period, attach the sample cassette cap with the flow meter device inserted according to the appropriate sampling train. Do not remove the sampling cassette from the sampling train.
7. Collect the post-sampling flow rate with the rotameter. Turn the pump off.
8. Record the stop date and time.
9. Record the post-sampling flow rate.

10. Remove the tubing from the sample cassette. Holding the sample cassette upright, replace the inlet plug on the sample cassette cap and the outlet plug on the sample cassette base. Do not put sample cassettes in shirt or coat pockets as the filters can pick up fibers.
11. Sign and date custody seal and wrap it around both ends of the sample cassette. The custody seal should not cover the sample label.
12. Place each sample cassette in a half-quart sized plastic zip-top sample bag. Each bag should be marked with indelible ink indicating the sample number.

#### 5.2.3 Pump Failure Procedures

If a sampling pump faults prior to the total desired run time, the following procedures will be used:

1. Record the time of the observed pump fault in the comments section of the FSDS.
2. If using a SKC low-volume pump, record the total sample time (in minutes) from the pump counter and note accordingly in the comments section of the FSDS sheet, then add total minutes collected to the start time and document the actual stop time in the stop time section of the FSDS.
3. If no minutes appear on the pump counter, void the sample and recollect as specified by the governing document referencing this SOP, or as directed by the TL or health and safety representative.
4. If time allows, change out the pump and restart sampling. Turn the sampling pump back on and calibrate as required (Section 5.1.3) until desired sample volume requirements are met.

### 5.3 Post-operation

Non-disposable air sampling equipment will be decontaminated according to instructions provided in the governing document referencing this SOP. In general, sampling pumps and tubing will be wet-wiped prior to and following sample collection. Dispose of the wipes as IDW.

Sample custody, and any packaging and shipping requirements, for Libby Site samples will be specified in the governing document referencing this SOP. Project documentation (field logbook, FSDS) will be retained according to data management requirements and/or in the project file.

## 6.0 Restrictions/Limitations

High levels of dust or other suspended particulates in air may clog or overload the sample filter and reduce the ability to observe and characterize asbestos fibers on the filter. Precautions should be taken to avoid unnecessary sources of dust emissions or use of aerosol sprays. Sampling requirements (e.g., flow rate, sampling time) may need to be adjusted accordingly to avoid filter overload.

## 7.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, but not limited to, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

### 7.1 Training

Every effort will be made to ensure consistency in collecting air samples in support of the Libby Site. Consistency will be achieved to the extent possible through proper training, using designated field staff, and providing TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require re-training of the field team.

### 7.2 Equipment Maintenance

The manufacturer's instructions regarding operating procedures and maintenance will be reviewed prior to equipment use. Equipment and instrumentation will be utilized in accordance with manufactures instructions.

### 7.3 Field Quality Control Samples

The field quality control (QC) samples for air sampling at the Libby Site typically consist of lot blanks and field blanks. Refer to the governing document referencing this SOP for field QC sample collection requirements and acceptance criteria.

## 8.0 References

U.S. Environmental Protection Agency. 1994. Asbestos Sampling, Standard Operating Procedure #2015, Revision 0.0. November 17.

International Organization for Standardization. 1995. Ambient Air – Determination of Asbestos Fibers – Direct Transfer Transmission Electron Microscopy Method. ISO 10312:1995(E).

# Attachment 1

## Libby Asbestos Project
## Precision Rotameter Calibration Data Sheet

Project Number: _____

Calibration Date: _____ Calibrated By: _____

Odometer ID: _____ Primary Standard ID: _____

Actual Temp. (ºF): _____ Actual Pressure (in. Hg): _____

°F = degrees Fahrenheit
in. Hg = inches mercury

| | Ball Reading =Y (mid-ball) | Flow Rate = $X_1$ (L/min) |
|---|---|---|
| **1.** | _____ | _____ |
| **2.** | _____ | _____ |
| **3.** | _____ | _____ |
| **4.** | _____ | _____ |
| **5.** | _____ | _____ |
| **6.** | _____ | _____ |
| **7.** | _____ | _____ |
| **8.** | _____ | _____ |
| **9.** | _____ | _____ |
| **10.** | _____ | _____ |

**Rotameter Calibration Procedure:**

1. Obtain the actual temperature and actual pressure in Libby, MT from the local NOAA weather station. Record the actual temperature and actual pressure in the fields provided above.
2. Calibrate rotameter to desired ball reading with a sampling pump and cassette in-line. The cassette must be the same type and from the same lot of cassettes that will be used for sampling. Record the value in the “Ball Reading” column above.
3. Check the adjusted flow rate of the sample pump to the DryCal® primary flow standard. Ten repetitive flow measurements will be averaged and that result recorded in the “Flow Rate” column for the selected interval.
4. Repeat this process at 10 intervals over the range of the precision rotameter. Input data into rotameter calculation sheet to generate the corrected flow rate.

# Attachment 2

**APPENDIX B (Cont'd)**

Figures

FIGURE 4. Calibrating a Rotameter with a Bubble Meter

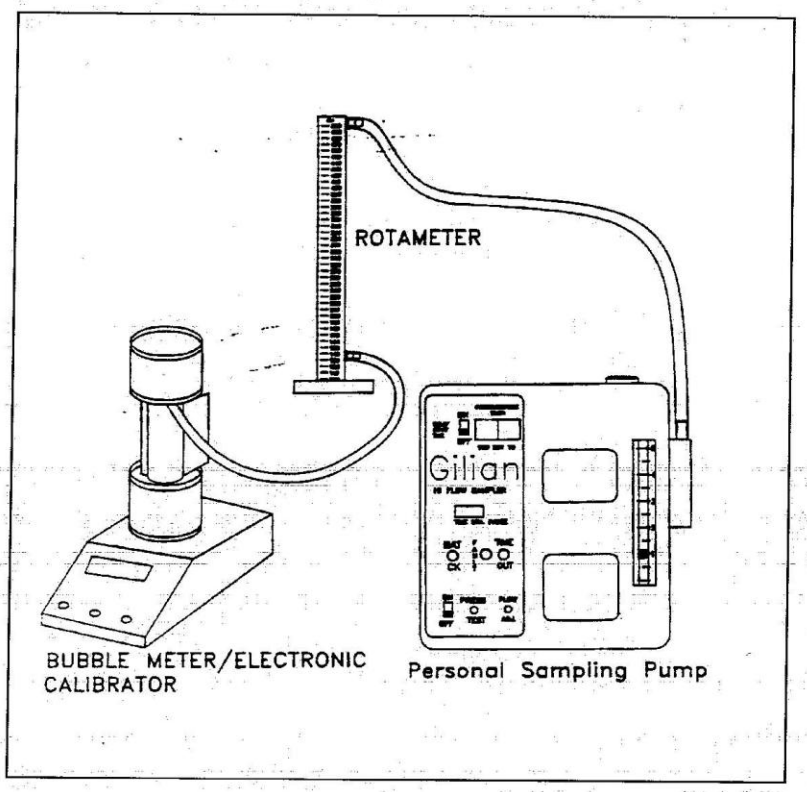


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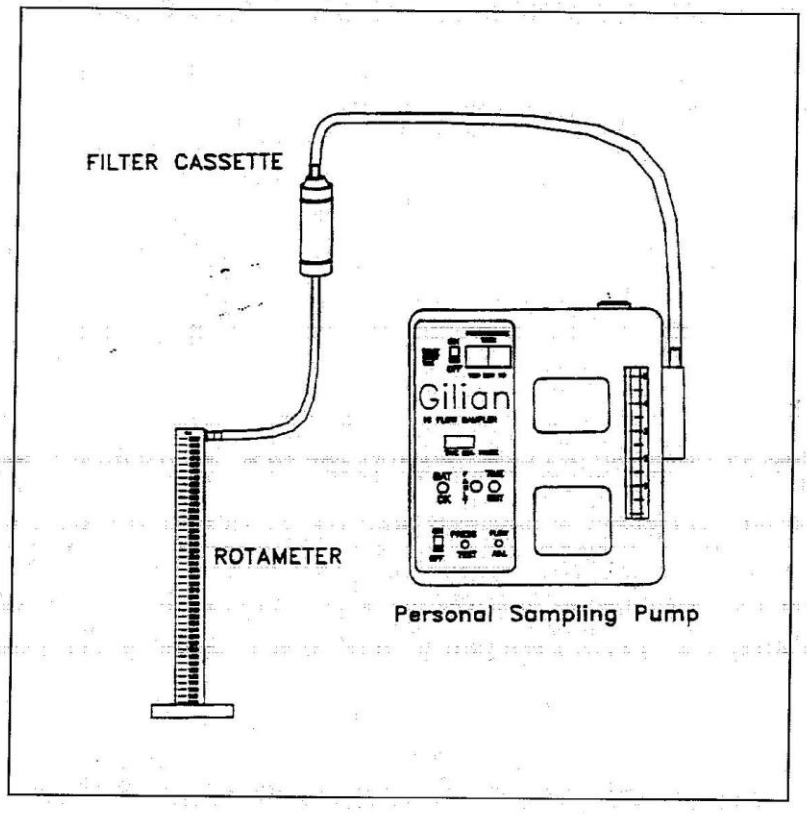
Figure obtained from EPA SOP #2015 (EPA 1994).

# Attachment 3

**APPENDIX B (Cont'd)**

Figures

FIGURE 5. Calibrating a Sampling Pump with a Rotameter




17

Figure obtained from EPA SOP #2015 (EPA 1994).