1231638

REMOVAL DESIGN INVESTIGATION
SAMPLING AND ANALYSIS PLAN

FOR

OPERABLE UNIT 7 OF THE LIBBY ASBESTOS SUPERFUND SITE

April 16, 2010

Prepared for:

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

Contract Number 407026
Contract Task Order Number 63

Prepared by:

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

REMOVAL DESIGN INVESTIGATION
SAMPLING AND ANALYSIS PLAN

FOR

OPERABLE UNIT 7 OF THE LIBBY ASBESTOS SUPERFUND SITE

Prepared for:

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

REVIEWS AND APPROVALS

Tetra Tech Project Manager: J. Edward Surbrugg — Date: April 16, 2010
J. Edward Surbrugg, Ph.D.

DEQ Project Officer: Catherine LeCours — Date: April 16, 2010
Catherine LeCours

EPA Remedial Project Manager: Victor Ketelapper — Date: 4-19-2010
Victor Ketelapper

DISTRIBUTION LIST

Name	Responsibility	Affiliation
Catherine LeCours	DEQ Project Officer	Montana Department of Environmental Quality – Helena, Montana
J. Edward Surbrugg	Tetra Tech Project Manager	Tetra Tech EM Inc. – Helena, Montana
Victor Kettelapper	EPA Remedial Project Manager	Environmental Protection Agency

Additional copies of the Operable Unit 7 removal design investigation documents can be made available to the above-listed persons for further distribution within their respective agencies.

CONTENTS

Section **Page**

DISTRIBUTION LIST ..... **II**

ACRONYMS AND ABBREVIATIONS ..... **VI**

1.0 INTRODUCTION **1**

1.1 REMOVAL DESIGN INVESTIGATION OBJECTIVES 2
1.2 PROJECT SCHEDULE AND DELIVERABLES 2

2.0 PROJECT BACKGROUND **3**

2.1 SITE LOCATION 3
2.2 SITE HISTORY 3
2.3 OCCURRENCE OF LIBBY AMPHIBOLE 5
2.4 SUMMARY OF THE TAPE INSPECTIONS 5

3.0 DATA QUALITY OBJECTIVES **6**

3.1 STEP 1 – STATE THE PROBLEM 6
3.2 STEP 2 – IDENTIFY THE DECISION 6
3.3 STEP 3 – IDENTIFY THE INPUTS TO THE DECISION 7
3.4 STEP 4 – DEFINE THE BOUNDARIES OF THE STUDY 7

3.4.1 Spatial Bounds *7*
3.4.2 Temporal Bounds *7*

3.5 STEP 5 – DEVELOP DECISION RULES 8
3.6 STEP 6 – SPECIFY TOLERABLE LIMITS ON DECISION ERRORS 8
3.7 STEP 7 – OPTIMIZE THE INVESTIGATION DESIGN 10

4.0 SAMPLING PROGRAM **12**

4.1 PRE-SAMPLING ACTIVITIES 12

4.1.1 Field Planning *12*
4.1.2 Inventory and Procurement of Equipment and Supplies *12*

4.2 REMOVAL DESIGN INVESTIGATION 13

4.2.1 Property Selection for Removals *14*
4.2.2 Land Survey *14*
4.2.3 Scheduling Removal Design Investigations *15*
4.2.4 Previously Collected Data *15*
4.2.5 Interior Detailed Inspection *15*

4.2.5.1 Attic Inspection 16
4.2.5.2 Living Space Assessment and Wall Inspection 16
4.2.5.3 Understructure Inspection 16
4.2.5.4 Bulk Material Samples 17
4.2.5.5 Interior Soil Samples 17
4.2.5.6 Interior Inspection Documentation 17

4.2.6 Exterior Detailed Inspection *17*

CONTENTS
(Continued)

Section **Page**

4.2.6.1 Visual Inspection 18
4.2.6.2 Soil Sampling 18
4.2.6.3 Exterior Inspection Documentation 19

4.3 FIELD QUALITY CONTROL SAMPLES 20

4.3.1 Equipment Blanks 20
4.3.2 Field Duplicate Samples 20

4.4 GENERAL PROCESSES 20

4.4.1 Equipment Decontamination 21
4.4.2 Investigation-Derived Waste 21
4.4.3 Recordkeeping and Chain of Custody 21
4.4.4 Field Logbooks 22
4.4.5 Sample Labeling and Identification 23
4.4.6 Photographic Documentation 23

5.0 LABORATORY OPERATONS 24

5.1 ANALYTICAL METHODS AND TURNAROUND TIMES 24

5.1.1 Soil Samples 24
5.1.2 PLM-9002 – Bulk Material Samples 25

5.2 HOLDING TIMES 25
5.3 LABORATORY CUSTODY PROCEDURES 25
5.4 LABORATORY QA/QC 25
5.5 LABORATORY DOCUMENTATION AND REPORTING 26
5.6 LABORATORY NONCONFORMANCE 26

6.0 DATA MANAGEMENT 27

6.1 TABULAR DATA 27
6.2 DOCUMENTS AND RECORDS 27

7.0 QA/QC PROCEDURES 28

7.1 QA/QC OBJECTIVES 28
7.2 INTERNAL QC CHECKS 28
7.3 AUDITS, CORRECTIVE ACTIONS, AND QA REPORTS 29

7.3.1 Field Inspections and Sampling Procedures Audits 29
7.3.2 Corrective Action Procedures 29

REFERENCES 30

Appendix

A TETRA TECH SITE-SPECIFIC HEALTH AND SAFETY PLAN
B FIELD FORMS AND LABORATORY FORMS
C STANDARD OPERATING PROCEDURES

FIGURES

Figure **Page**

2-1 OPERABLE UNIT 7 4

TABLES

Table **Page**

3-1 PRINCIPAL STUDY QUESTIONS AND ALTERNATIVE ACTIONS 7
3-2 SUMMARY OF INPUTS TO RESOLVE STUDY QUESTIONS AND USE OF INFORMATION ACQUIRED FROM INPUTS 8
3-3 DECISION RULES 9
3-4 LIMITS ON DECISION ERRORS 11

4-1 PROPERTY SKETCH DETAILS 18
4-2 VISUAL INSPECTION AND SOIL SAMPLING PROTOCOLS 19
4-3 FIELD QUALITY CONTROL SAMPLES 20

ACRONYMS AND ABBREVIATIONS

AHERA	Asbestos Hazard Emergency Response Act
AR	Aspect ratio
ASTM	ASTM International (formerly the American Society for Testing and Materials)
CDM	Camp, Dresser & McKee
CFR	Code of Federal Regulations
cm^2	Square centimeters
COC	Chain of custody
CPR	Cardiopulmonary resuscitation
CUA	Common use area
DEQ	Montana Department of Environmental Quality
DQO	Data quality objective
EDD	Electronic data deliverable
EPA	U.S. Environmental Protection Agency
ERS	Environmental Resource Specialist
ESAT	Environmental Services Assistant Team
GPS	Global positioning system
HASP	Health and safety plan
HVAC	Heating, ventilation, and air conditioning
ID	Identification
IDW	Investigation-derived waste
ISO	International Organization for Standardization
ISTM	International Society for Testing Materials
L	Length
LA	Libby Amphibole
LUA	Limited-use area
NIOSH	National Institute for Occupational Safety and Health
NUA	Non-use area
OSHA	Occupational Safety and Health Administration
OU	Operable unit
PDA	Portable digital assistant
PDF	Personal data format
PLM	Polarized light microscopy
PLM-VE	Polarized light microscopy – visual estimation
PPE	Personal protective equipment
QAPP	Quality assurance project plan
QC	Quality control

ACRONYMS AND ABBREVIATIONS
(Continued)

RDI	Removal Design Investigation
s/cm^2	Structures per square centimeter
SAP	Sampling and analysis plan
SOP	Standard operating procedure
SRC	Syracuse Research Corporation
SUA	Specific-use area
TAPE	Troy Asbestos Property Evaluation
USACE	US Army Corps of Engineers
VCI	Vermiculite-containing insulation
VV	Visible vermiculite
WP	Work Plan

1.0 INTRODUCTION

Tetra Tech received Task Order 63 from the Montana Department of Environmental Quality, Remediation Division (DEQ), under DEQ Contract No. 407026. The purpose of this task order is to provide administrative, technical, field, sampling, and oversight support to the United States Army Corp of Engineers (USACE) during removal activities in 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. DEQ is the lead agency for OU7 through a cooperative agreement with EPA.

This document serves as the removal design investigation (RDI) sampling and analysis plan (SAP) for OU7 and will guide pre-removal design activities that will be performed by EPA, DEQ, USACE, or their contractors. The document describes investigation and sampling activities that will be implemented to fill data gaps needed to design removal activities at properties within OU7. Because of similar tasks being conducted concurrently in Operable Unit 4 (OU4) of the Libby Asbestos Superfund Site, this document is a companion to the OU4 Work Plan prepared by Camp Dresser & McKee (Camp, Dresser, & McKee [CDM] 2010).

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

The purpose of this SAP is to describe the sampling objectives, data quality objectives (DQO), locations, and measurement methods to support removal designs for properties within OU7.

The SAP is organized as follows:

Section 1 – Introduction
Section 2 – Project Background
Section 3 – Data Quality Objectives
Section 4 – Sampling Program
Section 5 – Laboratory Operations
Section 6 – Data Management
Section 7 – Quality Assurance/Quality Control Procedures
Section 8 – References

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

1.1 REMOVAL DESIGN INVESTIGATION OBJECTIVES

The primary objective of the OU7 RDI is to collect the additional data necessary to design removal activities at properties within OU7, where Troy Asbestos Property Evaluation (TAPE) investigations have identified the presence of Libby Amphibole (LA) and/or LA source materials.

1.2 PROJECT SCHEDULE AND DELIVERABLES

RDI activities are expected to begin in April 2010 and are anticipated to be completed by September 31, 2010. Approximately 110 properties in OU7 have been identified as candidates for removal actions.

2.0 PROJECT BACKGROUND

From the 1920s until 1990, an active vermiculite mine and associated processing operations were located in Libby, Montana. While it was 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 have found asbestos throughout many areas in and around Libby that include a form of amphibole asbestos known as LA.

2.1 SITE LOCATION

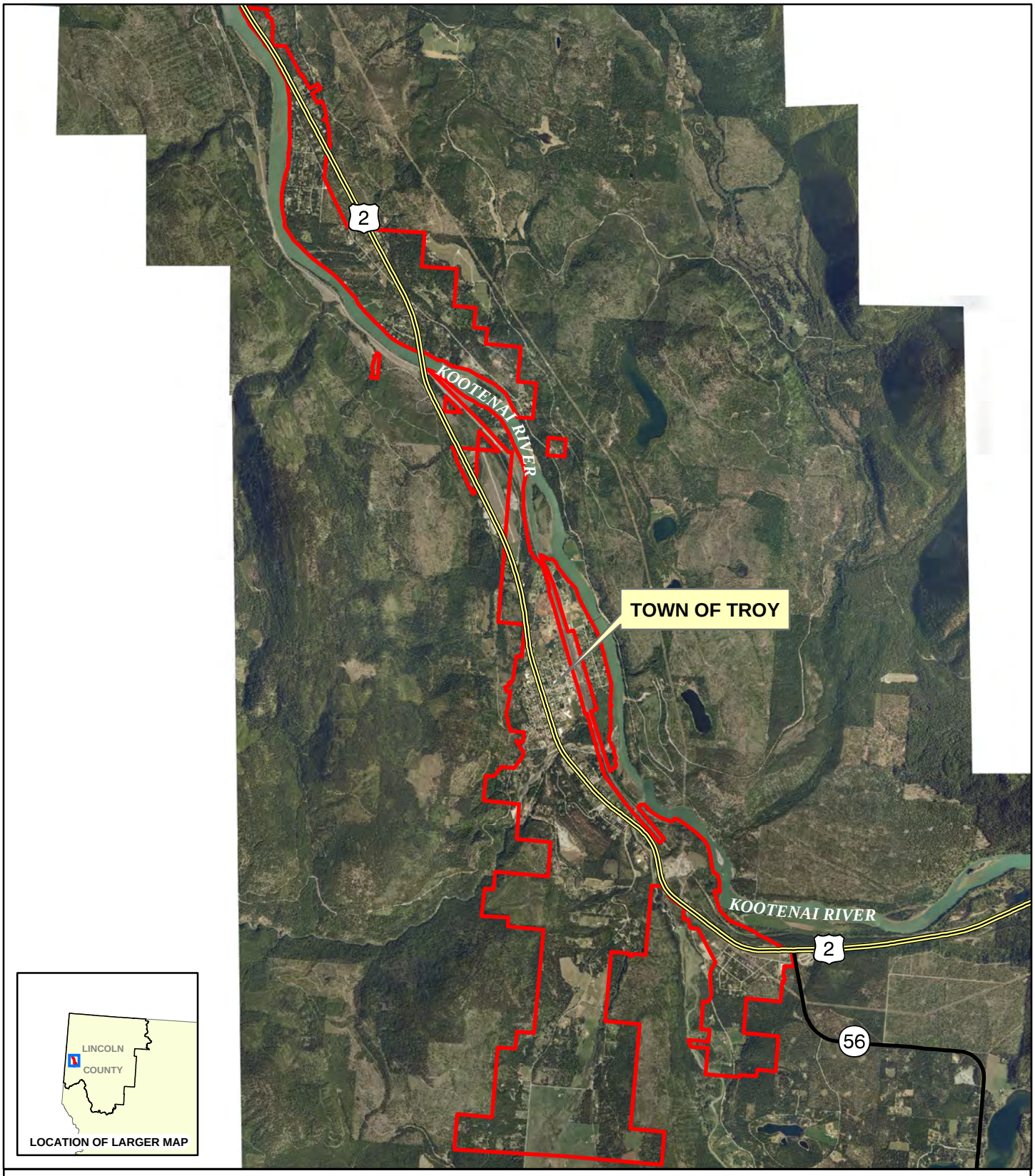
Troy, Montana is located 18 miles northwest of Libby, Montana and has been designated as OU7 of the Libby Asbestos Superfund Site. OU7 is located within the Kootenai River valley at an elevation ranging from 1,850 feet above mean sea level at the northern end of OU7 to 2,500 feet above mean sea level 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 contained within the OU.

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

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 both morphology and mineralogy to the insulation found in Libby, a systematic screening of interiors of Troy area residences, public areas, schools, and businesses was conducted to gather information to determine how many Troy area properties have LA present. This systematic screening is referred to as the TAPE inspections.

Some of the vermiculite mine workers lived in Troy and commuted to the mine in Libby to work each day. 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.



TETRA TECH EM, INC

Legend

OPERABLE UNIT 7 BOUNDARY

0 1 Miles

N

LIBBY ASBESTOS SUPERFUND SITE

FIGURE 2-1
OPERABLE UNIT 7

GIS map by DWH - TTEMI-HE
FIG2-1_OU7_BOUNDARY_032510.mxd

Residents of Troy also 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 frequent visits. In addition, 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, spilled or placed on transportation corridors, and for insulating buildings in and around Troy.

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 within 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 has been found in interior and exterior walls due to sifting from the attic. In rare cases, vermiculite has been found as an additive in building materials such as plaster, mortar, and concrete.

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

2.4 SUMMARY OF THE TAPE INSPECTIONS

The TAPE inspections were initiated in 2007 to characterize the nature and extent of LA-containing materials present in interior and exterior locations of properties within the OU7 boundary. To date, this has entailed a systematic screening of approximately 1,280 Troy area residences, public areas, schools, and businesses in order to gather sufficient information to determine how many Troy area properties meet the removal action criteria for LA.

As a result of the TAPE inspections, a total of 110 properties were identified for removal actions. Parcels selected for removal actions were categorized by the areas where LA or LA source materials were identified, including: interior areas (i.e. attics), exterior soils, or a combination of both interior and exterior areas. Removal selection criteria were based on the following: 1) analytical results, 2) visual observations, 3) historical information such as confirmed transport of vermiculite originating from Libby source areas, and 4) any other pertinent information specific to a property.

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 presented in this section 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 include:

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

The purpose of this step is to describe the problem to be addressed. Although the OU7 TAPE inspections have been largely completed and the parcels requiring removal actions have been identified, data gaps still remain and prevent the development of detailed removal designs. These data gaps need to be addressed in order to design removals at the properties identified for removals. The RDI is designed to fill these data gaps by further delineating the extent of LA on each property. This SAP describes the inspection and sampling procedures that will be used to collect data of sufficient quality and representativeness to design the removal actions.

3.2 STEP 2 – IDENTIFY THE DECISION

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

TABLE 3-1

PRINCIPAL STUDY QUESTIONS AND ALTERNATIVE ACTIONS

Response Item Evaluated	Principal Study Question	Alternative Actions
Quantify characteristics of identified LA or vermiculite containing materials where data gaps have been identified.	What is extent of vermiculite containing material present in buildings?	▪ Sketch and document location of living space with LA-contaminated indoor dust for removal planning ▪ Take no action
		▪ Sketch and document location of visible vermiculite for removal planning ▪ Take no action
	What is extent of visible vermiculite in surface soils?	▪ Where data gaps exist, sketch and document location and extent of vermiculite-containing soil for removal planning ▪ Take no action
	What is the extent of LA, as detected by analytical methods, in surface soils?	▪ Where data gaps exist based on analytical results, collect additional samples and then sketch and document location and extent of LA in soil for removal planning ▪ Take no action

Notes:

LA Libby Amphibole

3.3 STEP 3 – IDENTIFY THE INPUTS TO THE DECISION

The purpose of this step is to identify the information and measurements that need to be obtained to resolve the decision statements. The information needed to resolve the principal study questions are summarized in Table 3-2.

3.4 STEP 4 – DEFINE THE BOUNDARIES OF THE STUDY

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

3.4.1 Spatial Bounds

The horizontal boundaries of the RDI are the boundaries of each of the 110 properties identified for removal. The vertical boundaries extend from the highest point at a property, approximately two stories, to the depth of soil samples collected, approximately 6 inches below ground surface.

3.4.2 Temporal Bounds

For each property, the temporal boundaries of this investigation include the time from when it was determined that LA or LA source materials exist on the property to when the RDI has been completed.

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 vermiculite insulation present in property buildings?	Visual Inspection	For each property undergoing an RDI, a visual inspection will be performed within each building on the property. The results of the visual inspection will be used to determine the extent of LA source materials for removal planning.
Is LA detected in friable building materials (e.g., plaster) that contain vermiculite additives?	Bulk Material Samples	For each property undergoing an RDI, bulk material samples will be collected from friable building materials that contain vermiculite. The results of the bulk material samples will be used to determine if LA is present in the building materials at individual properties for removal planning.
Is LA detected at concentrations greater than or equal to 5,000 s/cm^2 in indoor dust from any one previously collected dust samples from individual properties?	Dust Samples	For each property where dust samples were collected during TAPE investigations, analytical results will be reviewed to determine if LA is present in indoor dust at individual properties for removal planning. Dust samples will not be collected as part of this investigation.
Is vermiculite and/or LA visible in surface soils?	Visual Inspection	For each property undergoing an RDI, semi-quantitative visual estimation inspections for vermiculite will be performed on surface soils to determine the extent of vermiculite for removal planning.
What is the extent of LA in surface soils?	Soil Samples	For each property undergoing an RDI, additional surface soil samples may be collected from use areas (e.g., specific-use areas, common-use areas, limited-use areas, etc.) to determine the extent of LA for removal planning.

Notes:
LA Libby Amphibole
RDI Removal design investigation
s/cm^2 Structures per square centimeter

3.5 STEP 5 – DEVELOP DECISION RULES

This step describes the method to be used 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.

3.6 STEP 6 – SPECIFY TOLERABLE LIMITS ON DECISION ERRORS

The tolerable limits on decision errors, used to establish performance goals for the data collection design, are specified in this step.

TABLE 3-3
DECISION RULES

Principal Study Question	Input to Resolve Question	Input Requirements	Action Level	Decision Rule
What is extent of vermiculite insulation present in buildings?	Visual Inspection	Delineation details including location, volume and access for removal.	Presence of vermiculite	Vermiculite insulation documented will be measured and sketched for subsequent removal action.
What is extent of LA-containing friable building materials (e.g., plaster) that contain vermiculite additives?	Bulk Material Samples	Analysis: PLM by NIOSH 9002 Reported Result: % LA AS: Method defined as 1%, but qualitative estimates of LA present below 1% reported as less than 1% or ND	Any detectable LA	If any LA is detected in bulk material samples, the building material(s) that the bulk sample represents will be sketched and documented for subsequent removal action.
What is the extent of LA in surface soils?	Visual Inspection Soil Samples	CDM-LIBBY-06 for Visual Analysis and Laboratory Analysis by PLM-VE and PLM-Grav with project-specific modifications Reported Result: % LA AS: 0.2% LA	Detectable quantities of visible vermiculite as defined in CDM-LIBBY-06 Any detectable LA in laboratory samples	If vermiculite is observed in surface soils, the location will be sketched/documented for sampling and potential subsequent removal action. If any detectable levels of LA are found in surface soil samples, the location will be sketched/documented for subsequent removal action and confirmation soil samples collected.

Notes:
AS Analytical sensitivity
LA Libby Amphibole
ND Nondetect
NIOSH National Institute for Occupational Safety and Health
% Percent
PLM Polarized light microscopys/cm^2 Structures per square centimeter

Specific to performing the RDI, two types of decision errors are possible:

- A Type I (false negative) decision error would occur if a risk manager decides that an inspection/sample does not contain vermiculite/LA above a level of concern, when in fact it is of concern.
- A Type II (false positive) decision error would occur if a risk manager decides that an inspection/sample does contain vermiculite/levels of LA above a level of concern, when in fact it does not.

DEQ is most concerned about avoiding Type I errors, since an error of this type may leave humans exposed to unacceptable levels of LA.

DEQ is also concerned with the probability of making Type II (false positive) decision errors. Although this type of decision error does not result in unacceptable human exposure, it may result in unnecessary expenditure of resources.

For the purpose of completing all seven steps of the DQO process, the null hypotheses and consequences of making an incorrect decision are summarized in Table 3-4. However, 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 that are expected 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.

TABLE 3-4
LIMITS ON DECISION ERRORS

Principal Study Question	Null Hypothesis	Type I Error Will Result in:	Type II Error Will Result in:
What is extent of vermiculite insulation present in buildings?	Vermiculite insulation is present in buildings.	Not collecting the correct removal data needed in the RDI. This would result in not completing removal of interior vermiculite successfully and in turn, an increased risk to human health.	Determining that buildings contain vermiculite insulation when actually they do not, overestimating the amount of vermiculite insulation present, or incorrectly reporting the location of vermiculite insulation. This would result in unnecessarily performing a removal action or inefficiency during removal that adds to removal costs.
What is extent of LA-containing friable building materials (e.g., plaster) that contain vermiculite additives?	Friable building materials contain vermiculite with LA.	Determining that friable building materials that contain vermiculite do not contain LA when they actually do. The LA-containing building material(s) would not be included in the removal action and in turn, an increased risk to human health.	Determining that friable building materials that contain vermiculite contain LA when actually they do not, overestimating the amount of friable building materials, or incorrectly reporting the location of the friable building materials. This would result in unnecessarily including the building materials in the removal action or inefficiency during removal and adds unnecessary costs to the removal.
What is the extent of LA in surface soils?	Surface soils contain LA.	Determining that surface soils do not contain LA when they actually do. The LA-containing soils would not be included in the removal action and in turn, an increased risk to human health.	Determining that surface soils contain LA when actually they do not, overestimating the amount of LA-containing soils present, or incorrectly reporting the location of LA-containing soils. This would result in unnecessarily including exterior excavation to the removal action, overestimating the amount of LA-containing soils present, or incorrectly reporting the location of LA-containing soils and adds unnecessary costs or inefficiency to the and removal.

Notes:
LA Libby Amphibole
RDI Removal design investigation

4.0 SAMPLING PROGRAM

This section summarizes field activities that will be performed in support of the RDI in OU7. This section also provides brief summaries of SOPs, including project-specific modifications where applicable and project-specific details not discussed in the SOPs. As previously mentioned, the RDI is designed to determine the extent of LA for subsequent removal actions.

The site-specific HASP and addendum (Appendix A) should be consulted to determine health and safety protocols for performing RDI work. Field forms and project-specific SOPs are included in Appendices B and C, respectively.

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

- 2007 TAPE Work Plan (WP) for OU7
- 2009 Tetra Tech Aggressive Attic Entry SOP
- CDM-LIBBY-05, Revision 3, Soil Sample Collection at Residential and Commercial Properties
- CDM-LIBBY-06, Revision 1, Semi-Quantitative Visual Estimation of Vermiculite in Soils at Residential and Commercial Properties

The following sections summarize field activities that will be performed during the implementation of the sampling investigation efforts described in this SAP.

Analytical methods for all samples collected in accordance with this SAP are discussed in detail in Section 5.

4.1 PRE-SAMPLING ACTIVITIES

Prior to beginning of field activities, a field kickoff meeting will be conducted, required training will be performed, and appropriate site specific instructions will be provided to the field team.

4.1.1 Field Planning and Required Equipment and Supplies

Before field crews mobilize to perform the RDI, the contractors will prepare detailed property maps that identify individual OU7 properties. The RDI activities schedule will be refined as Tetra Tech schedules the inspections at dates and times convenient to the property owners.

The field manager will conduct an inventory of project-procured equipment and supplies prior to field work. Any additional required equipment or supplies will be procured. The following equipment is required for sampling activities conducted under this SAP:

- Field logbooks
- Indelible ink pens
- Digital camera with memory card, as appropriate
- Sample paperwork and sample tags/labels
- Custody seals
- Plastic zip-top bags
- Soil sampling equipment
- PPE as required by site-specific HASP (Appendix A)
- Geo XT PDA
- Cordless drill and scope
- Ladder
- Standard hand tools (screwdrivers, hammer, pry-bar, etc.)
- Measuring wheel/tape

4.2 REMOVAL DESIGN INVESTIGATION

This section describes the sampling methods and procedures that will be used to complete RDIs. RDIs are performed to capture additional information on a property to support removal activities. RDIs are completed at properties that have undergone a TAPE inspection and display one or more removal triggers.

The following is a summary of field activities that will be performed by DEQ, USACE, or their contractors during the RDI:

- Property selection and communication
- Land survey
- Scheduling investigations
- Review of previously collected data
- Interior inspection
- Exterior inspection

4.2.1 Property Selection and Communication

The EPA has established criteria for the removal of vermiculite attic insulation and/or soil contaminated with LA asbestos fibers from properties in OU4. A similar set of criteria have been established for OU7, but have been adjusted to reflect the results of the TAPE inspection results. The criteria for OU7 are: 1) the visual observation of vermiculite insulation in the attic or living space; and 2) LA asbestos fibers present in soil samples at a concentration greater than 1%. In addition, a combination of the information gathered during the interview, analytical results from soil sampling, and the results of visual property inspection will determine the need for further exterior action at a property.

The nature of the removal action will be considered during the initial removal action scheduling. Exterior removal actions will involve significantly more time than interior actions. Properties slated for removal actions will be clustered geographically to maximize the efficiency of the removal.

DEQ has determined the parcels targeted for removal. The property owner will be contacted to confirm willingness to participate. Information provided to the property owner at that time will include general details on the investigation and removal process, and a tentative time-frame for investigation and potential removal activities. The property will be placed in the queue for continued investigation activities once the owner has confirmed willingness to participate in the entire process. The presence of children at the property will expedite the property on the removal schedule, if possible. If the property owner is unwilling to participate with the complete investigation and removal process within the stipulated time-frame, the property will be reconsidered for removal at a later date.

4.2.2 Land Survey

A land survey will be conducted at each property that requires an exterior removal action and has a property owner willing to participate in the process. Land surveys will include property boundaries to determine the limits of the property on which the removal is being conducted. Land surveys will also include major physical and geographic features of the property (e.g., structures/buildings, trees, individual land use areas). The survey contractor will be a registered and licensed land surveyor in the State of Montana.

A land survey will be requested once a property is identified as requiring an exterior removal action. When available, a hard copy of the survey will be used by the RDI team to mark soil sample locations and results, locations of visible vermiculite, and additional inspection information. When land surveys are not

available, site-specific sketches will be completed on aerial photographs, scaled graph paper, or equivalent. Specific information to be captured by the RDI team is discussed in the following sections.

4.2.3 Scheduling Removal Design Investigations

The property owner will be notified of the need for RDI activities on their property. The RDI will be scheduled for a time that is convenient for the property owner or tenant. If an interior removal has been identified for the property, the property owner or tenant will need to be present to allow access to the interior of each building on the property. If only exterior removal actions have been identified for the property, the property owner or tenant may or may not need to be present.

4.2.4 Previously Collected Data

Prior to arriving at a property, the RDI team will review TAPE collected data in order to identify data gaps. All TAPE data and any data collected during an Environmental Resource Specialists (ERS) initial response will be reviewed. A complete set of property-specific data is maintained in the project file folder at the DEQ Troy Information Center located in Troy, Montana office. All property data (i.e., scanned data archive, Scribe database, and ERS initial assessment form, etc.) will be reviewed to identify data gaps for the RDI.

4.2.5 Interior Detailed Inspection

Interior detailed inspections will be performed when previous investigation findings indicate either LA is present or unknown within buildings (e.g., house, garage, shed, barn, etc.) at the property. Interior inspection activities may include:

- Attic inspection
- Living space assessment and wall inspection
- Understructure inspection
- Bulk material samples, if needed
- Interior soil samples, if needed
- Interior inspection documentation

Interior inspections will be performed to determine the location and extent of LA-containing materials within a building. Information will also be collected regarding the general construction and condition of the building and access to LA-containing materials. Interior inspections will include attic spaces, living spaces, and understructures (e.g., basement, cellar, crawl space). Interior details will be recorded on the PDA, in the logbook, and on the associated sketch(s) as discussed in Section 4.2.5.6.

4.2.5.1 Attic Inspection

Attic inspections will be completed in buildings where previous inspections indicated the presence of vermiculite insulation, or if the presence/absence of vermiculite was not confirmed during previous investigations. Attic inspections will be limited to confirming the presence/absence of vermiculite insulation and collecting sufficient details to support removal activities. All attic spaces will be inspected until either vermiculite insulation is confirmed, or until the entire attic has been inspected and no vermiculite insulation is present. Once vermiculite insulation is confirmed in an attic space, all details for the attic will be collected from that location and the inspection will cease.

Attic details will be recorded on the PDA, in the logbook, and on the associated sketch(s) as discussed in Section 4.2.5.6.

4.2.5.2 Living Space Assessment and Wall Inspection

Interior living spaces will be further inspected to obtain data gaps identified regarding presence and nature of vermiculite materials. Vermiculite may appear in living spaces as insulation that is leaking from the attic or walls, or as an additive in building materials. Living space assessments will include inspecting all walls, all ceiling and wall penetrations (plumbing, heating, ventilation and air conditioning [HVAC] systems, electrical fixtures, cracks, gaps, etc.), and plaster/mortar materials. If vermiculite additives are identified within building materials, bulk material samples may be required as discussed in Section 4.2.5.4.

Based on previous investigation findings, small amounts of vermiculite insulation are likely to be present within wall cavities of buildings that have vermiculite attic insulation. If vermiculite insulation is observed within the attic of a building, it will be assumed that the walls below those attic sections will contain some amount of vermiculite. This will be noted within the interior inspection documentation as detailed in Section 4.2.5.6.

Living space details will be recorded on the PDA, in the logbook, and on the associated sketch(s) as discussed in Section 4.2.5.6.

4.2.5.3 Understructure Inspection

Building understructures will be inspected to determine if vermiculite materials are present. Vermiculite may appear in understructures as insulation that is leaking from the attic or walls, as additives in building materials, or as vermiculite in soil floors. Understructure inspections will include inspecting all ceiling and wall penetrations (plumbing, HVAC, electrical, cracks, gaps, fixtures, etc.), plaster/mortar materials,

and inspecting soil floors. If the building understructure has a soil floor, a visual inspection will be completed per Section 4.2.6.1 of this SAP. If vermiculite is not observed within the soil floor, soil samples will be collected as discussed in Section 4.2.5.5.

Understructure details will be recorded on the PDA, in the logbook, and on the associated sketch(s) as discussed in Section 4.2.5.6. In addition to general details, the RDI team will make a determination as to the frequency the understructure is used. Understructures will be categorized as frequently used, infrequently used, or a combination of the two (for separate areas). Infrequently used understructures will include areas that are accessed on an irregular basis only, generally for maintenance purposes only.

4.2.5.4 Bulk Material Samples

Bulk material samples will be collected when vermiculite additives are identified within a building material, and only if that material is friable (i.e., easily pulverized by hand). Bulk material samples will be collected in compliance with 40 CFR 763.86.

4.2.5.5 Interior Soil Samples

Soil samples will be collected from inside a structure only if significant soil areas are present (e.g., soil floor) where vermiculite was not observed during visual inspection and where data gaps exist (e.g. previous limited access). Individual flower pots/planters will not be sampled. Soil samples will be collected in accordance with Section 4.2.6.2.1.

4.2.5.6 Interior Inspection Documentation

Details for each building/structure inspected will be recorded in the PDA and logbook. Attic, living space, and understructure sketches will be completed as appropriate. Sketches will include the details indicated in Table 4-1. Sketches will only be prepared for the levels/floors of the structure where LA source materials are observed and/or where samples are collected.

4.2.6 Exterior Detailed Inspection

Exterior detailed inspections will be performed at properties where previously collected data indicates the presence of a current removal trigger. Exterior inspections are performed to further define the location and extent of LA-containing material and to ensure that the entire property has been characterized. Exterior inspection information will be recorded in the logbook, PDA, and associated sketches.

Exterior inspection activities include:

- Visual inspection
- Soil sampling
- Exterior inspection documentation

4.2.6.1 Visual Inspection

Visual inspection of exterior soils will be completed in accordance with CDM-LIBBY-06. The number of point inspections to be completed per use area is defined in Table 4-2.

4.2.6.2 Soil Sampling

Soil samples were collected during previous investigation/screening activities to determine the presence/absence of LA within soil throughout varying sizes of use areas. Delineation samples will be collected to further define the extent of LA in soil throughout the property.

TABLE 4-1

PROPERTY SKETCH DETAILS

Interior Inspection Sketch Details		
Attic	**Living Space**	**Understructure**
o Plan view/layout – including dimensions o Types of insulation o Depth of insulations o Attic accesses - location and size o Head space – structure cross-section o Hazards (in attic and near access) o Obstacles o Joist – size and spacing o Flooring (above and below joist)	o Floor plan/layout o Location of visible vermiculite leaking from walls and attic, etc.	o Soil samples – locations and results o Visual inspection results o Floor types – soil versus solid flooring

Exterior Inspection Sketch Details	
Analytical Sketch	**Visual Inspection Sketch**
o Soil samples – locations and results o Personal items within areas requiring removal o Fence lines o Underground utilities – if known o Overhead utilities – if not shown on survey o BD Numbers for all structures on the property	o Visual inspection results – each point inspection labeled as (N)=None, (L)=Low, (I)=Intermediate, or (H)=High level of visible vermiculite o Personal items within areas requiring removal o Fence lines o Underground utilities – if known o Overhead utilities – if not shown on survey o BD Numbers for all structures on the property

BD – Building

TABLE 4-2
VISUAL INSPECTION AND SOIL SAMPLING PROTOCOL

Area Type[1]	Visual Inspection Protocol[2]	Soil Sampling Protocol[3]
SUA (Flowerbed, Garden, Play Area, etc.)	1 PI/100 ft^2	1 sample/1,000 ft^2
Driveway (SUA)	1 PI/200 ft^2	1 sample/6,000 ft^2
CUA (Yard, etc)	1 PI/100 ft^2	1 sample/3,000 ft^2
LUA (Field, Pasture, etc.)	1 PI/500 ft^2	1 sample/15,000 ft^2
ISA (Shed, Carport, Garage, etc.)	1 PI/100 ft^2	1 sample per use area
Crawlspace (ISA)	1 PI /100 ft^2	1 sample per use area
NUA (Wooded Area, etc.)	No Inspection	No Sampling

[1]Mulitple SUAs of the same type within the same general area may be combined to form one sample area. Examples include gardens along the drip line of the house, or multiple raised flower beds within a CUA.
[2]A minimum of 5 points will be inspected per use area regardless of size.
[3]All soil samples are 30-point composites. Areas where vermiculite is observed will also be sampled.

SUA – Specific Use Area
CUA – Common Use Area
LUA – Limited Use Are
NUA – Non Use Area
ISA – Interior Surface Area
PI – Point Inspection
ft^2 – square feet

4.2.6.2.1 Sample Collection

The frequency of RDI soil samples will be collected in accordance with Table 4-2, which defines the maximum area per soil sample. The RDI soil samples will be collected following the procedures described in the TAPE Work Plan (Tetra Tech 2007). Thirty soil aliquots will be placed into a stainless steel bowl, homogenized, and placed in a re-closable plastic bag.

4.2.6.3 Exterior Inspection Documentation

The PDA, logbook, and associated sketch(es) will be completed for each property inspected as part of this SAP. Sample information and visual inspection results will be recorded on two (2) separate property sketches. If available, a property survey will be utilized as the baseline for these sketches. If a property survey is not available, aerial photos, scaled graph paper, or an equivalent will be used. Sample information and visual inspection results may be combined on one sketch if quality and clarity can be maintained. Sketches will include the details indicated in Table 4-1.

4.3 FIELD QUALITY CONTROL SAMPLES

Field quality control (QC) samples are currently not required for bulk materials due to the homogenous nature of the material being sampled. Field QC samples associated with soil samples include equipment blanks and field duplicate samples. These are described below and summarized in Table 4-3.

TABLE 4-3
FIELD QUALITY CONTROL SAMPLES

Sample Type	Associated QC Sample	Collection Frequency	Analysis Frequency	Analysis Request	Acceptance Criteria
Soil	field duplicate	1 per 20 field samples	100%	PLM-VE/PLM-Grav	<30% RPD
Bulk Material	N/A	N/A	N/A	N/A	N/A

Notes:

PLM-VE Polarized light microscopy visual area estimation method
PLM-grav Polarized light microscopy gravimetric estimation method
RPD Relative percent difference
N/A Not applicable

4.3.1 Equipment Blanks

Equipment blanks are currently not required by EPA for soil sampling at the Site because: 1) detection levels for LA using current polarized light microscopy (PLM) analytical methods are not low enough to capture concentrations that would be expected in equipment blanks; and 2) the frequency of detection for LA in historically-collected project equipment blanks is extremely low.

4.3.2 Field Duplicate Samples

Field duplicate samples for RDI soil sampling activities will be collected at a rate of 1 per 20 field samples collected. Field duplicate samples will be collected from areas that are being sampled during one of the investigation activities discussed in the previous sections. However, individual composite points for the duplicate sample will be collected from different locations (within the same use area) than the original sample. Field duplicate samples will be collected in accordance with the TAPE WP.

4.4 GENERAL PROCESSES

This section describes the general field processes that will be used to support the sampling described in this SAP and includes references to the general and project-specific SOPs where applicable.

4.4.1 Equipment Decontamination

Stainless steel scoops and bowls will be used for soil sampling; therefore, decontamination of the equipment that is in contact with the soil will be necessary. If a small metal shovel is required to assist with sampling to 6 inches in hard, compacted soils, the shovel will be thoroughly cleaned and decontaminated. Decontamination will occur in the location where the sample was collected and will include spraying the equipment with distilled water followed by drying with paper towels. The water will be allowed to fall on the ground surface within the area just sampled and the paper towels will be placed in a labeled asbestos waste bag.

Visible soil on hands or clothing will be removed by washing with soap and water. Additional personnel decontamination procedures, including requirements for decontamination zones, are described in Section 10.1 of the TAPE HASP (Appendix A). PPE will include 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 TAPE HASP (Appendix A).

4.4.2 Investigation-Derived Waste

Investigation-derived waste will include used wet wipes, wet paper towels, and disposable gloves, used respirator cartridges, used plastic tubing, disposable protective outerwear, plastic floor coverings, and other minimal waste. It is possible, but not likely, that these investigation-derived waste materials may contain some asbestos. Therefore, 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 generated by the RDI field teams, such as food containers and waste paper, will be separately bagged and properly disposed of as solid waste.

4.4.3 Recordkeeping and Chain of Custody

At the end of each day, or more often if required, the RDI field teams will return to the DEQ Troy Information Center to download the PDA and transfer the soil, QC samples, and copies of the appropriate logbook pages to the field sample coordinator (or the coordinator's designee). Digital photographs will also be downloaded daily to a computer at the DEQ Troy Information Center. Photographs will be labeled and downloaded into the Troy project Scribe database based on property, use area, and building identification (ID) numbers. Individual photographs will not be routinely printed from the DEQ Troy Information Center.

An individual file (both paper and electronic) will be maintained for each property inspected. Originals of all field forms will be kept in each individual property file in the DEQ Troy Information Center for the duration of the RDI project so that information is available if questions arise. Scanned personal data 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 Troy Scribe database and individual electronic property files will be stored outside of the DEQ Troy Information Center, and will be updated periodically for the duration of the sampling, inspection, and reporting phases of the RDI project. Copies of all field sketches, quality assurance/quality control (QA/QC) records, and field logbooks will be available on request at any time during the RDI project to DEQ, EPA, or to the Troy property owners.

After the PDA electronic information is downloaded to the Troy Scribe database, from the RDI field teams, the field sample coordinator will check all building, use area, and sample ID numbers for accuracy. The field sample coordinator will then print out a hard copy of the chain-of-custody form and store these records with the associated samples collected for the OU7 properties. The chain-of-custody report will be transferred to the Environmental Services Assistant Team (ESAT) Laboratory Coordinator.

Until samples have been transferred to the ESAT Laboratory Coordinator, all RDI samples will be securely held by the individual contractors. Samples may be stored in storage bins within locked vehicles or in a secured (locked) area of the DEQ Troy Information Center. All RDI samples collected from the OU7 properties, including QC samples, will be transferred to the ESAT Laboratory Coordinator on a regular basis to be decided prior to initiation of sampling. The ESAT Laboratory Coordinator will provide contractors with a copy of the released chain-of-custody (COC). The ESAT Laboratory Coordinator will then transfer the samples to the on-site laboratory for preparation and then to an off-site laboratory for analysis.

4.4.4 Field Logbooks

Documentation of investigation field activities conducted under this SAP will be recorded in field logbooks maintained specifically for this sampling program. Logbooks are controlled documentation (i.e., sequentially numbered) and maintained by DEQ, USACE, or their contractors.

The logbook is an accounting of activities at the site and will duly 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 property visited. The header information should include the address, and the property owner’s name. When closing out a logbook page with lineout and signature, the author will also

print his/her name underneath the signature. Original logbooks will be maintained in the DEQ Troy Information Center.

4.4.5 Sample Labeling and Identification

A unique alphanumeric code, or sample ID number, will identify each sample collected during RDI sampling. 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 building or equipment. Sample IDs will correlate with sample location IDs, which will be identified in the field logbooks.

The sample labeling scheme is as follows:

TD-XXXX

Where:

TD identifies that a sample is collected in accordance with this RDI SAP and XXXX represents a 4-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 both the inner and outer sample bags for soil samples.

4.4.6 Photographic Documentation

Photographs will be taken with a digital camera at any place that field personnel determine necessary. A description of each photograph taken 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 should clearly state where each photograph was taken (e.g. building or use area ID number). Electronic photograph files will be saved each day to a project-designated computer housed at the DEQ Troy Information Center and named so that photographs for a particular property or activity can easily be retrieved.

Following completion of RDI activities, all photo files pertaining to a property will be copied onto a compact disc and filed in the DEQ Troy Information Center along with other property-specific documentation.

5.0 LABORATORY OPERATONS

EPA's ESAT will be responsible for all sample analysis, including any sample processing prior to analysis. The contractors will relinquish RDI samples to the EPA Laboratory Coordinator, processing facility, or laboratory, as designated by DEQ, USACE, and EPA. The Sample Coordinator will be responsible for communicating with the EPA 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.

This section discusses the analytical methods, custody and documentation procedures, QA/QC requirements, and data management requirements to be followed by the laboratory in support of the OU7 RDI activities.

5.1 ANALYTICAL METHODS AND TURNAROUND TIMES

This section describes the analytical methods used for RDI samples. The Sample Coordinator will provide the EPA with requested turn-around times for all samples relinquished. In general, it is expected that analysis for all RDI soil and bulk samples will be complete within 2 weeks from the time the laboratory receives them.

5.1.1 SOIL SAMPLES

Prior to analysis, all soil samples require a processing step. Soil samples will be processed using the current version of the Libby soil sample processing SOP (ISSI-LIBBY-01) (ISSI Consulting Group [ISSI] 2000) and the procedures in the *Soil Preparation Work Plan* (TechLaw 2007). The contractor will indicate the current version of the soil sample processing SOP in the analysis request section of the COC. It is the responsibility of the soil preparation facility to specify the appropriate PLM method as it corresponds to the specific sample fraction being submitted for analysis (i.e., fine ground or coarse fraction) on their COCs to the laboratory.

All soil samples collected as part of this effort, including field duplicate samples, will be analyzed for asbestos by the PLM visual estimation method (PLM-VE) and the PLM gravimetric method (PLM-Grav) in accordance with SOPs SRC-LIBBY-03 (Syracuse Research Corporation [SRC] 2003) and SRC-LIBBY-01 (SRC 2002), respectively.

5.1.2 PLM-9002 – BULK MATERIAL SAMPLES

All bulk material samples collected as part of this effort will be analyzed in accordance with National Institute for Occupational Safety and Health (NIOSH) 9002, Issue 2, *Asbestos (Bulk) by PLM* (NIOSH 1994).

Because the level of detection is estimated (at less than 1 percent asbestos) for this method, no specific level of detection has been established for project samples analyzed using NIOSH 9002.

5.2 HOLDING TIMES

For the samples specified for collection in this SAP, no holding time requirements will be employed.

5.3 LABORATORY CUSTODY PROCEDURES

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

The basic laboratory sample custody process is as follows. Upon receipt at the laboratory, each sample shipment will be inspected to assess the condition of the shipment and the individual samples. This inspection will include verifying sample integrity. The accompanying COC will be cross-referenced with all of 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 on receipt. 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. Subcontract laboratories that analyze field samples on the Libby project must maintain particular certifications and must satisfactorily complete project-specific training requirements to ensure that proper QA/QC practices are conducted during sample analysis.

Each laboratory is required to participate in an onsite laboratory audit carried out by the EPA Superfund Analytical Services Branch, which is independent of the Troy team members.

Lastly, analytical laboratories will be provided a copy of this SAP. Samples collected under this SAP will be analyzed in accordance with standard EPA and/or nationally-recognized analytical procedures in order 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 Libby Asbestos Project Laboratory 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 implementation. In addition, 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 EPA Laboratory Coordinator will communicate the changes to the EPA 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 EPA Laboratory Coordinator if major problems occur (e.g., catastrophic equipment failure). The EPA Laboratory Coordinator will then notify the RDI 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 during the RDI will be under the supervision of the Tetra Tech Database Manager in the DEQ Troy Information Center. RDI field crews will generate field data on paper copies, electronic forms, handheld computers, and/or digital photographs. All field data will be managed according to EPA reporting requirements specified in the EPA Data Management Plan (EPA 2010).

These reporting requirements were developed to help satisfy EPA's cleanup 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 2010).

6.1 TABULAR DATA

The Database Manager will be required to format and submit all tabular data in accordance with EPA reporting requirements (EPA 2010). Operational electronic data will be QC reviewed, entered into a Scribe database, and published to Scribe.net the same day the data are collected. This will ensure that EPA has consistent and up-to-date information.

6.2 DOCUMENTS AND RECORDS

The Records Manager will be required to format and submit all operations documents and records in accordance with EPA reporting requirements (EPA 2010). Documents will be stored in file cabinets at the DEQ Troy Information Center within 10 business days of completion of field activities at a given property.

7.0 QA/QC PROCEDURES

The QA/QC objectives, internal QC checks, and audits completed for the OU7 RDI project are described in the sections below. Field QC control procedures are described in Section 4.4 above.

7.1 QA/QC OBJECTIVES

The QA/QC objectives of the RDI 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 chain-of-custody procedures, and analyzing field quality control samples and laboratory quality control samples. The DQOs are described in detail in Section 3.0.

7.2 INTERNAL QC CHECKS

Tetra Tech's Analytical Coordinator will conduct data verification on 100 percent of the RDI data generated. This includes cross-checking that sample IDs and sampling dates have been reported correctly on the laboratory report, that calculated analytical sensitivities or detection levels are as expected, that results have been transferred correctly from laboratory bench sheets to the electronic data deliverable (EDD) to Scribe database, and that the laboratory reports and EDDs are complete. If discrepancies are found, Tetra Tech will notify EPA. The data verification process also includes reviewing field and laboratory QC sample results, as applicable.

In addition, the DQOs presented in Section 3 will be reconciled during the data verification process. This entails comparing the reported results against the project-specific action levels discussed in Section 3. Attainment of project-specific DQOs is necessary to accurately determine what areas do or do not contain LA and /or LA source materials, necessary for development of property-specific removal action plans. Non-attainment of project DQOs may result in additional follow-up visits to the property for additional sample collection and/or field observations.

Since soil samples will be analyzed by EPA ESAT in accordance with Libby Asbestos Superfund Site protocols, including EPA's most recent protocols relating to QA/QC for the Libby Asbestos Superfund Site, the QA/QC protocols followed by the laboratories are not within Tetra Tech's immediate control.

7.3 AUDITS, CORRECTIVE ACTIONS, AND QA REPORTS

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

7.3.1 Field Inspections and Sampling Procedures Audits

The Tetra Tech QA/QC manager will be responsible for audits of RDI inspections and sampling procedures. Audits will be conducted weekly for the duration of the RDI. Audits will consist of the QA/QC manager or his designee attending a Troy RDI inspection/sampling event and observing the RDI field team's activities. The field team will not be warned of the audit. The auditor will compare the field team's activities with the protocols provided in this SAP and the attached project-specific guidance and evaluate compliance with the protocols using the audit form provided in Appendix C. After the audit, the auditor will provide the completed audit form to the DEQ, EPA, and USACE project managers.

7.3.2 Corrective Action Procedures

The QA/QC auditor may use his or her discretion to provide immediate verbal feedback to the RDI field team, if necessary, to ensure that deficiencies are fixed as quickly as possible. The field team leader and QA/QC manager will review the report with the RDI 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 fixed. 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 re-inspection or re-sampling of any Troy properties is required. Re-inspection or re-sampling will be required only if the field team failed to correctly complete the RDI, or collected samples incorrectly.

REFERENCES

Camp Dresser & McKee (CDM). 2010. Draft Final Sampling and Analysis Plan, General Property Investigation, Libby Asbestos Site, Operable Unit 4. March.

ISSI Consulting Group (ISSI). 2000. ISSI-LIBBY-01. Soil Sample Preparation. Revision 1 (original version). January 7. Revision 2 dated July 12, 2000. Revision 3 dated May 7, 2002. Revision 4 dated August 1, 2002. Revision 5 dated March 6, 2003. Revision 6 dated March 24, 2003. Revision 7 dated August 5, 2003. Revision 8 dated May 4, 2004. Revision 9 dated May 14, 2007. Revision 10 dated December 6, 2007.

National Institute for Occupational Safety and Health (NIOSH). 1994. Manual of Analytical Methods for Asbestos (bulk) by PLM. 9002. Issue 2. August.

Syracuse Research Corporation (SRC). 2002. SRC-LIBBY-01. Qualitative Estimation of Asbestos in Coarse Soil by Visual Examination Using Stereomicroscopy and Polarized Light Microscopy. November 12. Revision 1, dated May 20, 2003. Revision 2, dated April 21, 2004.

SRC 2003. SRC-LIBBY-03. Analysis of Asbestos Fibers in Soil by Polarized Light Microscopy. March 3. Revision 1, dated December 11, 2003. Revision 2 dated October 10, 2008.

TechLaw. 2007. Soil Preparation Work Plan. Libby Asbestos Site – Operable Unit 7. Revision D. March.

Tetra Tech. 2007. Troy Asbestos Property Evaluation Work Plan (Field Sampling Plan and Quality Assurance Project Plan) for the Troy Asbestos Property Evaluation Project, Troy Operable Unit 7. July.

U.S. Environmental Protection Agency (EPA). 2001. "Requirements for Quality Assurance Project Plans, QA/R-5. Final. March.

EPA. 2005. Region 8 Background Factsheet, Libby Asbestos. Date accessed: July 5, 2005. Online address: http://www.epa/gov/region8/superfund/libby/lbybkgd.html

EPA. 2006. Guidance on Systematic Planning Using the Data quality Objectives Process, EPA QA/G4

EPA. 2010. EPA Data Management Plan, Libby Asbestos Site. Version 2010.1. Prepared by EPA Region 8 and EPA Emergency Response and Removal DATA Team. March.

APPENDIX A

TETRA TECH
SITE-SPECIFIC HEALTH AND SAFETY PLAN
TROY ASBESTOS PROPERTY EVALUATION

(Available to Agencies upon Request)

APPENDIX B

FIELD FORMS AND LABORATORY FORMS

Record of Modification

to the

Troy Sampling and Quality Assurance Project Plan

Field Activities

TFO-__ __ __ __ __ (numbered by Data Manager)

Instructions to Requester: **Fax to contacts at bottom of form for review and approval.**
File approved copy with Data Manager at the Troy Field Office (TFO).
Data Manager will maintain legible copies in a binder that can be accessed by TFO personnel.
If Modification is Temporary for a Single Parcel, Data Manager will scan this and place in parcel's electronic file.

Project Work Plan/QAPP (check one)**:**

- O Troy Removal Design Investigation WP/SAP
- O Other (Title and approval date):_____

Site-Specific Guidance/SOP (Number and Revision No.) (check one)**:**

- O Tetra Tech Aggressive Attic Inspection SOP
- O CDM-LIBBY-05, Current Revision (30-point soil sample collection)
- O CDM-LIBBY-06, Current Revision (Visible Vermiculite Estimation)

Other (Title, Number/Revision): _____

Requester: _____ Title: _____

Company: _____ Date: _____

Description of Modification (attach additional sheets if necessary; state section and page numbers of each document that are affected by the proposed modification):_____

_____

_____

Field logbook and page number / FSDS where Modification is documented (or attach associated correspondence):

_____

Potential Implications of Modification: _____

_____

_____

Duration of Modification (check one):

O Temporary

Date(s):_____ AD-_____

BD(s)-_____ TT(s)-_____

O Permanent (Proposed Text Modification Section) Effective Date:_____

Proposed Text Modifications in Associated Document (attach additional sheets if necessary):_____

_____

_____

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

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

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

EPA Review and Approval: _____ Date:_____
(*USEPA RPM or designate*)

Revised March 25, 2010

DATA QUALITY INDICATOR DEFINITIONS

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

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

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

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

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

APPENDIX C

STANDARD OPERATING PROCEDURES

STANDARD OPERATING PROCEDURES
FOR
TROY ASBESTOS PROPERTY EVALUATION
AGGRESSIVE ATTIC INSPECTION ACTIVITIES
TO VERIFY PRESENCE OR ABSENCE OF
VERMICULITE-CONTAINING INSULATION

Prepared for:

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

Contract Number 407026
Contract Task Order Number 41

Prepared by:

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

May 2009

TABLE OF CONTENTS

Section **Page**

1.0 SCOPE OF WORK 1

2.0 GENERAL TECHNICAL REQUIREMENTS 1

2.1 PERSONAL DOCUMENTATION REQUIREMENTS 2
2.2 ISOLATION AND ENGINEERING CONTROLS 2
2.3 POLYETHYLENE SHEETING 2
2.4 EQUIPMENT 2
2.5 STAGING CHAMBER CONSTRUCTION 3
2.6 PERSONAL PROTECTIVE EQUIPMENT 3
2.7 TRAINING 3
2.8 AIR MONITORING BY TETRA TECH 4
2.9 GENERAL SAFETY HAZARDS 4
2.10 EMERGENCIES 5
2.11 FACILITIES 5
2.12 TRANSPORTATION AND DISPOSAL 6
2.13 PREPARATION 6
2.14 EXECUTION 6
2.15 CLEAN-UP 7

3.0 PROCEDURAL SEQUENCING 8

1.0 SCOPE OF WORK

The work specified in this Standard Operating Procedure (SOP) includes all procedures necessary to complete aggressive attic inspection activities in areas above ceilings of primary and secondary buildings during the Troy Asbestos Property Evaluation (TAPE) inspections. These procedures supplement existing TAPE attic inspection procedures outlined in Section 4.4.1 of the TAPE Work Plan and Section 9.1 of the Health and Safety Plan in which attic access was limited to field technicians' torso levels. Libby amphibole (LA) can not be identified by visual inspection; therefore, field technicians will look specifically for vermiculite-containing insulation (VCI) during the attic inspections. All forms of vermiculite identified in attics, including expanded or unexpanded material will be deemed "VCI" by the field inspectors. The existing TAPE attic inspection procedures were sufficient to determine the presence or absence of VCI in most attics, but were not aggressive enough to determine the presence of VCI in all attics. The more aggressive procedures described in this SOP will be needed when there are limited attic access locations and the entire attic space can not be adequately inspected from the available access hatch locations. This SOP addresses attic inspection activities in partially finished or unfinished attics when a field technician is required to enter the attic with his/her full body. Such work includes, but is not limited to: installation of work area isolation and engineering controls; inspection activities as specified in this document; and equipment and personal decontamination procedures. All potential asbestos-related VCI inspection activities must be performed in compliance with applicable federal, state, and local regulations, and this document.

2.0 GENERAL TECHNICAL REQUIREMENTS

This section describes the general technical requirements for attic inspection procedures and provides guidelines for performing the work. All sections of this SOP shall be used when Tetra Tech EMI, Inc. (Tetra Tech) field personnel are performing aggressive attic inspections.

2.1 PERSONAL DOCUMENTATION REQUIREMENTS

- AHERA Contractor/Supervisor or Worker training certificates for all field technicians.
- Personnel respirator fit test records.
- Personnel medical examination records.

2.2 ISOLATION AND ENGINEERING CONTROLS

- Deactivate or isolate the HVAC system servicing the staging room.
- Seal passive air return grilles with one layer of polyethylene sheeting.
- Use fire resistant polyethylene sheeting materials.
- Install and activate a high efficiency particulate air (HEPA) filtered 600 cfm air filtration unit at an attic vent furthest from the access hatch point of entry, The unit will be activated once the access hatch is opened and remain running until decontamination procedures are completed.

2.3 POLYETHYLENE SHEETING

- Use fire resistant polyethylene sheeting materials.
- Use one layer of 6 mil on the floor and walls of the staging chamber.
- Use one layer of 6 mil over the passive HVAC return duct grills in the staging room.
- Use one layer of 6 mil on the floor outside the staging chamber.

2.4 EQUIPMENT

- Personal Protective Equipment (PPE)
- HEPA vacuum
- Polyethylene sheeting
- Asbestos disposal bags
- Ladder
- 600 cfm air filtration unit
- Water misting sprayer
- Duct tape and painter’s tape
- Disposable towels
- 5-gallon wash basin
- Flashlight and electric lights
- Support planks
- Camera
- Staging chamber

2.5 STAGING CHAMBER CONSTRUCTION

- A staging chamber shall be used for interior accessed aggressive attic inspections only. Staging chambers will not be required when accessing attics from the exterior of the buildings.
- The staging chamber will consist of a single stage “pop up” design mini-containment and will serve as the clean room, wash area and equipment room. The staging chamber shall be large enough to house a ladder and all necessary equipment. Modified staging chamber designs may be installed on site in areas where a pop up units can not be used; for example at stairways or within closets.
- The staging chamber will be installed at the base of the interior attic access hatch. A staging chamber will not be required when an exterior access hatch is used.
- A wash basin decontamination system shall be used inside the staging chamber.
- Equipment and waste decontamination will be completed inside the staging chamber.

2.6 PERSONAL PROTECTIVE EQUIPMENT

- The minimum respiratory protection required shall be half-face air purifying respirators upon successful completion of a negative exposure assessment (NEA), or upon providing of documentation meeting the requirements of 29 CFR 1926.1101 showing personnel air sampling data which justifies this level of respiratory protection.
- Prior to a successful NEA, all initial aggressive attic inspections shall be performed using powered air purifying respirators or full-face negative pressure respirators.
- Disposable outer garments such as Tyvek or polypropylene coveralls including head/foot coverings shall be worn. Inspectors shall use a double suit method.
- Protective eyewear should be worn if powered air purifying respirators or full face respirators are not used.
- Bump caps or hardhats and knee pads should be worn.

2.7 TRAINING

- A certified contractor/supervisor shall be on-site at all times during aggressive attic inspections. Training for the contractor/supervisor must meet the requirements of 29 CFR 1926.32 (f) and the EPA's Model Accreditation Plan (40 CFR 763).
- Field technicians who conduct aggressive attic inspections must have completed either AHERA worker training or contractor/supervisor training. Worker training must also meet the requirements of 29 CFR 1926.32. The minimum worker training must be a 32-hour OSHA-approved course.

2.8 AIR MONITORING BY TETRA TECH

- Tetra Tech will conduct personnel exposure air monitoring assessments using the OSHA compliance method (National Institute of Safety and Health [NIOSH] 7400 phase contrast microscopy [PCM]) during the first attic inspections of the field season and periodically throughout the remainder of the field season. Tetra Tech will discontinue or modify the procedures if fiber levels exceed limits of 0.1 fibers per cubic centimeter of air (f/cc) inside the attic or 0.01 f/cc in the staging chamber outside the attic. Work stoppage may also be required if other health and safety related issues are identified that could lead to injury of workers.
- At the onset of the field season, Tetra Tech will collect background air samples to establish baseline airborne fiber levels in the staging rooms prior to beginning the work. Samples will be collected for transmission electron microscopy (TEM) analysis and will be archived during the project. Background sample analysis by TEM will only be required if perimeter stationary air sample results exceed the specified requirements of 0.01 f/cc by the PCM analytical method.
- Tetra Tech will collect perimeter stationary air samples using a PCM method during the initial aggressive attic inspection procedures to document airborne fiber levels outside the staging chambers and in the staging rooms. The results will be provided the same day, or at a minimum of 24-hour turn-around time. The sensitivity of the PCM method is limited, making asbestos fibers difficult to distinguish from non-asbestos fibers. NIOSH Method 7400 will be used to analyze air samples by PCM. This method does not accurately distinguish between asbestos and non-asbestos fibers and simply considers any fiber with a length-to-width ratio of 3:1 to be an asbestos fiber. Therefore, the PCM method will be used to document the general cleanliness of aggressive attic access procedures.
- Air samples will be collected to monitor airborne asbestos fibers levels in a work area. Samples will be collected using personal monitoring pumps or larger-volume floor pumps. The samples will be used to establish the respiratory protection requirements for workers. Air samples will also be collected after a response action or abatement project to evaluate whether the work area has been adequately cleaned.

2.9 GENERAL SAFETY HAZARDS

- Assess each building for general safety hazards before entering attics and avoid attic entry if safety is in jeopardy.
- Insects and nests: Have the property owners use wasp/hornet spray to kill insects and nests prior to accessing attic areas. A waiting period may be required after application to ensure that nests have been abandoned. Cover all skin surfaces with PPE. Avoid access if safety is in jeopardy.
- Photo document the existing condition of the attic access hatch and ceilings prior to the attic entry. Note any existing cracks or other damage to the ceilings and discuss the presence with the property owner prior to the attic entry.
- Rodents/animals: Cover all skin surfaces with PPE. Avoid disturbing droppings and wear respirators at all times. Avoid access if safety is in jeopardy.

- Broken joist or unstable ceilings: Assess ceilings prior to and during attic access and avoid access if safety is in jeopardy.
- Electrical wiring: Avoid all electrical wiring and assume that all wiring is potentially hazardous. Avoid access if safety is in jeopardy.
- Exposed nails: Beware of nails at all times. Wear head, eye, hand and knee protection at all times.
- Unstable objects or debris: Avoid disturbing objects or debris stored in the attic. Do not relocate items stored inside the attics when moving about.
- High temperature hazards: High temperatures will present safety hazards during the summer season. Aggressive attic access procedures should be scheduled during morning hours whenever possible. Attic inspections should be limited to no more than 10 minutes. Operate an air filtration unit for at least 10 minutes prior to accessing excessively hot attics to provide cooling and fresh air intake. Safe Work Practices 6-15 and 6-16 discuss heat and cold stress and include monitoring methods appropriate for the season and location of work (see Appendix B of the TAPE HASP).

2.10 PROPERTY DAMAGE AND OTHER EMERGENCIES

- Ceiling Damage: Assess the condition of all ceilings before beginning the inspection procedures and avoid access if safety is in jeopardy. The second technician remaining below the ceiling should inspect the ceilings throughout the inspection process to ensure that damage does not occur. Notify the owner in all cases if ceiling damage occurs during the inspection procedure. If a ceiling breach occurs, discontinue the inspection procedure immediately and get off of the ceiling. If non-VCI debris falls into the living spaces, seal the ceiling breach and clean up the debris immediately. The owners will be informed that the TAPE DEQ representative will be contacting them and full damage repairs will be made. If VCI debris falls into the living space, notify the TAPE field manager immediately. Request that the property owner vacate the affected room(s) during the cleanup procedure. Isolate the effected/contaminated room with polyethylene critical barriers on doors and HVAC ducts. Seal the ceiling breach, wet wipe, and HEPA vacuum all contaminated debris. The TAPE field manager will supervise cleaning of the effected room(s) and will collect air clearance samples prior to recommending that the property owner re-occupy the area. A detailed incident report, including photographic documentation, should be compiled throughout the process. The owner will be informed that the TAPE DEQ representative will be contacting them to discuss the extent of repairs to be made.
- Health & Safety Emergency: If an injury occurs to an inspection team member during a procedure, discontinue the inspection immediately and leave the attic. If the injury is serious and emergency medical assistance is required, call 911 immediately and then notify the TAPE field office and TAPE field manager.

2.11 FACILITIES

- Electrical power will be supplied by the property owner.

- Water will be brought on-site by Tetra Tech. Water for decontamination procedures will be containerized in Hudson sprayers and/or sealable 5-gallon buckets.

2.12 TRANSPORTATION AND DISPOSAL

- Tetra Tech will transport and dispose of all contaminated materials in accordance with all applicable federal, state, and local regulations.

2.13 PREPARATION

- Two inspection team members are required for this procedure.
- Post warning signs at entrances to the staging chamber.
- Install staging chamber and ladder at base of the interior attic access hatch.
- Install a high efficiency particulate air (HEPA) filtered 600 cfm air filtration unit at an attic vent furthest from the access hatch point of entry.
- Cover as large an area as possible (up to 6 feet by 6 feet floor area) under the work area with 6-mil polyethylene sheeting.
- Prepare an asbestos disposal bag and bag any waste that is generated.
- Don 2 layers of Tyvek or polypropylene overalls, gloves, respirator, and other PPE.
- Use high-powered flashlights during all attic inspection procedures.

2.14 EXECUTION

- Set up ladder inside the staging chamber. Seal a polyethylene sheeting flap from the top of the staging chamber to outside of the access hatch using painter's tape or duct tape. Care should be taken to apply tape to surfaces without damaging paint or ceiling texture.
- Remove access hatch carefully by placing it atop an adjacent ceiling area. HEPA vacuum any gross debris on top of the access hatch.
- The 600 cfm air filtration unit will be activated once the access hatch is opened and remain running until decontamination procedures are completed.
- If VCI is observed at any point during the attic inspection, the inspection team member will promptly complete the visual inspection of the attic from that point and leave the attic.
- Wet any big pieces of VCI debris that falls from the attic with a Hudson sprayer and place it in the asbestos disposal bag.
- Install adequate lighting to ensure safe access in the attic.
- Perform the inspection work in the attic being careful to remain on top of the ceiling joists at all times. The inspectors should rotate 2 or 3 (10-inch by 3-foot) planks on top of the ceiling joists to support their weight when moving within the attic. While kneeling on the planks wearing knee pads, the inspectors should support their weight evenly centered between the ceiling joists at all times.

2.15 CLEAN-UP

- The following clean-up practices will be employed for all attic inspections regardless of presence of VCI.
- Wet wipe the ladder and tools that were used to perform the inspection work.
- While inside the staging chamber, HEPA vacuum coveralls after descending the ladder. Remove coveralls and place in an asbestos disposal bag.
- Wet wipe the interior of the staging chamber before disassembly or removal from the site.
- Wet wipe hands, face and exposed PPE with wet towels prior to removing respirator.
- Remove respirator and wipe the respirator with a wet rag. Place the respirator into a bag. Later, clean the respirator according to the procedure outlined in the respiratory protection section of the TAPE HASP.
- Mist, roll, and place the polyethylene sheeting in the asbestos disposal bag.
- Detach and de-activate the 600 cfm air filtration unit from the attic vent. Seal the contaminated inlet side of the unit with polyethylene sheeting and duct tape before transporting it.
- Double bag all waste.
- Dispose of all LA asbestos contaminated waste in accordance with all applicable Federal, State, and Local regulations.

3.0 PROCEDURAL SEQUENCING

The following provides a recommended progression of the work at the site:

1) Use exterior access hatches first when they are available.

2) Photo document the existing condition of access hatches and ceilings throughout the inspection area. Note any existing cracks or other damage to the ceilings and discuss their presence with the property owner prior to the attic entry.

3) Shut down all heating and air conditioning units and keep them "off" throughout inspection activities. Seal the air supply and return ductwork serving the staging room with airtight and watertight critical barriers.

4) Install the staging chamber below the interior access hatch. If the access hatch is located inside a closet or another location where personal items must be moved prior to installing the chamber, request permission from the owner to move and/or cover items with polyethylene sheeting before starting set up. Take photos of existing conditions prior to disturbing any personal items and be sure to replace all items appropriately upon completion of the inspection procedures.

5) Conduct personnel exposure assessments air sampling to document a negative exposure assessment at the beginning of the field season attic inspections and periodically during the season. Personnel air monitoring will be collected during multiple inspections the first day to determine an 8-hour time weighted average (TWA) as well as a 30-minute short term exposure limit (STEL). Personnel air monitoring samples will be analyzed on a 24-hour turnaround basis. Initial negative exposure assessments will be conducted to document at least one attic with VCI.

6) Conduct stationary air sampling in areas adjacent to the staging chamber during the initial inspections of the field season and periodically during the season. Stationary air monitoring samples will be analyzed on a 24-hour turnaround basis. Initial stationary air monitoring will be conducted to document at least one attic inspection with VCI.

7) Install and activate a HEPA filtered 600 cfm air filtration unit at an attic vent furthest from the access hatch point of entry. The unit will be activated once the access hatch is opened and remain running until decontamination procedures are completed. Operate the air filtration unit for at least 10 minutes prior to accessing excessively hot attics to provide cooling and fresh air intake.

8) Conduct a preparation inspection of the work area to ensure containment integrity prior to starting the aggressive attic inspection.

9) Containerize debris routinely during aggressive attic inspection activities. Exercise caution to avoid tracking contamination from the attic to the "clean" staging chamber or staging room.

10) Once the inspection is finished, complete decontamination as outlined in Section 2.15.

Site-Specific Sampling Guidance
Libby Superfund Site

Guidance No.: **CDM-LIBBY-05, Revision 3**

Guidance Title: **Soil Sample Collection at Residential and Commercial Properties**

Approved by:

Project Manager	Date
Technical Reviewer	Date
QA Reviewer	Date
EPA Approval	Date

Section 1
Purpose

The goal of this standard operating procedure (SOP) is to provide a consistent method for the collection of 30-point composite surface soil sampling to support all investigations conducted at the Libby Superfund Site and specified in governing guidance documents. This SOP describes the equipment and operations used for sampling surface soils in residential and commercial areas, which will be submitted for the analysis of Libby amphibole asbestos. Refer to each investigation-specific guidance documents or work plan for detailed modifications to this SOP, where applicable. The EPA Team Leader or their designate must approve deviations from the procedures outlined in this document prior to initiation of the sampling activity.

Section 2
Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff with responsibility for the collection of soil samples is responsible for understanding and implementing the requirements contained herein as well as any other governing guidance documents.

Task Leader (TL) or Field Team Leader (FTL) - The TL or FTL is responsible for overseeing sample collection processes as described in EPA approved governing guidance documents (i.e., site-specific sampling and analysis plans [SAPs], quality assurance project plans [QAPPs], etc.). The TL or FTL is also responsible for checking all work performed and verifying that the work satisfies the specific tasks outlined by this SOP and all governing guidance documents. The TL or FTL will communicate with the field team members regarding the specific collection objectives and anticipated situations that require deviation from this SOP. It is also the responsibility of the TL or FTL to communicate the need for any deviations from the SOP with the appropriate EPA personnel (team leader or their designate), and document the deviations using a Field Modification Form provided in each SAP or QAPP.

Field team members - Field team members performing the sampling described in this SOP are responsible for adhering to the applicable tasks outlined in this procedure while collecting samples at properties associated with the Libby Superfund Site. The field team members should have limited discretion with regard to collection procedures but should exercise judgment regarding the exact location of sample points, within the boundaries outlined by the TL or FTL.

Section 3
Equipment

- Measuring tape or wheel – Used to estimate the square footage of each land use area.
- Pin flags – Used to identify composite points within each sampling area.
- Trowel or push probe - For collecting surface soil samples.
- Shovel - For collecting surface soil samples.
- Stainless steel mixing bowl - Used to mix and homogenize composite soil samples after collection. Zip-top bags may also be used for homogenization if approved by the governing guidance documents.
- Gloves - For personal protection and to prevent cross-contamination of samples (disposable, powderless plastic or latex).
- Sample container - Gallon-sized zip-top plastic bags (2 per sample).
- Field clothing and personal protective equipment (PPE) - As specified in the current version of the site health and safety plan (HASP).
- Field sprayers – Used to suppress dust during sample collection and to decontaminate nondisposable sampling equipment between samples.
- Deionized (DI) water- Used in field sprayers to suppress dust and to clean and decontaminate sampling equipment.
- Plastic bristle brush - Used to clean and decontaminate sampling equipment.
- Wipes - Disposable, paper. Used to clean and decontaminate sampling equipment.
- Aluminum foil – Used to wrap decontaminated sampling equipment in between uses to prevent contamination during transport.
- Alconox – Used to clean and decontaminate sampling equipment weekly.
- 6-mil poly bag – Used to store and dispose of investigation-derived waste (IDW).
- Trash bag - Used to store and dispose of general trash.
- Field logbook/PDA - Used to record progress of sampling effort and record any problems and field observations.

- Visual Vermiculite Estimation Form (VVEF) – Used to record semi-quantitative estimates of visual vermiculite at each sub-sample location and point inspection (PI).

- Permanent marking pen - Used to label sample containers.

- Sample ID Labels (Index IDs)– Pre-printed stickers used to label sample containers.

- Cooler or other rigid container - Used to store samples while in the field.

- Custody Seals - For ensuring integrity of samples while in the field and during shipping.

Section 4
Sampling Approach

Upon arrival at each property, the field team will locate all parcels requiring sample collection depending on the investigation-specific objectives detailed in governing guidance documents. Parcels on a property will be sectioned into zones that share a similar land use. Zones established by land use areas may be subdivided based on site conditions (e.g., access, construction setup considerations, etc.). Use areas include:

- Specific Use Area (SUA): flowerbed, garden, flowerpot, stockpile, play area, dog pen, driveway (non-paved), parking lot (non-paved), road (non-paved), alley (non-paved)

- Common Use Area (CUA): yard, former garden, former flowerbed, walkway

- Limited Use Area (LUA): pasture, maintained/mowed field, overgrown areas with trails/footpaths, overgrown areas in between SUAs/CUAs

- Interior Surface Area (ISA): soil floor of garage, pumphouse, shed, crawlspace, earthen basement

- Non-Use Areas(NUA): wooded lot, un-maintained field. NUAs will be identified but will not be sampled at this time because they are not presently considered a complete exposure pathway. However, to the extent that NUAs may become a complete exposure pathway in the future, EPA may revisit NUAs at a later date.

After areas have been designated as zones (i.e., SUA zones, CUA zones, LUA zones, NUA zones, ISA zones), the field team will measure the zones with a measuring wheel and label the zone type and approximate square footage on the field sketch and/or design drawings. There is not a minimum or maximum square footage restriction on any zone.

In establishing zones at the property, no area type may be combined with any other area type. For example, driveways and flowerbeds are both SUAs but will be

separated into unique zones for soil sampling. Similarly, large CUAs such as yards may be subdivided into front yard, side yard, and back yard zones dependent on site conditions. Sectioning properties into additional zones will be at the discretion of the FTL but consistent among the teams. Conversely, not all land use areas previously mentioned will be applicable at every property.

It is anticipated that SUAs and ISA zones will generally tend to be smaller parcels. Combining small, proximal SUAs into one zone will be at the discretion of the FTL but consistent among teams. With the exception of proximal SUAs, all other land use areas will be contiguous when establishing zones at each property.

Composite sampling requires soil collection from multiple (sub-sample) points. Composite samples will be collected from similar land use areas (i.e., SUA, CUA, etc.) and will not be combined with any other use area. One composite sample will be collected from each zone.

For SUAs (e.g., driveway, garden, dog pen, etc.), composite samples will be collected from the 0- to 6–inch depth interval. If a depth of 6 in. cannot be attained given the varying levels of compaction in driveways, roads, etc. the maximum depth attainable will be documented in the field logbook/PDA. For non-SUAs (e.g., yard, former flowerbed, crawlspace, etc.), composite samples will be collected from 0 to 3 inches. All composite soil samples will have 30 sub-samples (i.e., 30-point composite sample) of approximately equal size for a final sample volume between 2,000 and 2,500 grams. Table 1 lists the sample depth for each type of land use area.

TABLE 1
SAMPLING AREA AND DEPTH

Land Use Area	Label	Sampling Depth (Inches)
Special Use Area	SUA	0 – 6
Common Use Areas	CUA	0 – 3
Limited Use Area	LUA	0 – 3
Non-Use Area	NUA	Not Sampled
Interior Surface Zone	IS	0 – 3

As each sub-sample is collected, the soil will be inspected for visual vermiculite (VV) and the location and semi-quantitative estimates of VV will be recorded as prescribed in the SOP for Semi-Quantitative Visual Estimation of Vermiculite in Soil, Revision 1 (CDM 2007a).

Areas of SUAs with VV will not be sampled. Instead, the location will be recorded in the field logbook/PDA and on the field sketch or design drawing. If the SUA is of substantial size (greater than 1000 square feet [ft^2]), and the VV is localized, additional PIs will be collected to determine the extent of VV and a sample will be collected from

the remainder of the zone that does not contain VV. If the SUA measures less than 1,000 ft^2 and VV is present, a sample will not be collected from that SUA. Proximal SUAs will not be combined into a SUA zone if VV is present. If visible vermiculite is not observed, proceed with sample collection of the SUA zone

Section 5
Sample Collection

Don the appropriate PPE as specified in the governing HASP. A new pair of disposable gloves is to be worn for each sample collected. Segregate land use areas on the property into zones as described in Section 4. To reduce dust generation during sampling, use a sprayer with DI water to wet each sub-sample location prior to collection. Use the trowel to check beneath the surface soil layer, but do not advance more than 6 inches. If VV is observed, record the information on the field sketch or design drawing. If VV is observed within a large SUA, do not collect a sample from the area containing VV as described above.

Within each zone, select 30 sub-sample locations equidistant from each other. These 30 sub-sample locations will comprise the 30-point composite sample for that zone. All composite sub-samples will originate from the same land use area. For example, do not mix sub-samples from SUAs with sub-samples from LUAs.

Clean the sub-sample locations of twigs, leaves, and other vegetative material that can be easily removed by hand. Using the trowel or push probe, excavate a hole in the soil approximately 2 inches in diameter and 6 inches deep for SUAs, or 3 inches deep for non-SUAs, while placing the excavated material directly inside the gallon-sized zip-top plastic bag. Repeat this step for each subsequent sub-sample until the appropriate number of composite sub-samples has been collected. As each sub-sample is collected, inspect the location for VV as prescribed in the SOP for Semi-Quantitative Visual Estimation of Vermiculite in Soil, Revision 1 (CDM 2007a).

Samples collected from zones measuring greater than 3,000 ft^2 will require additional PIs to inspect the soil for VV, but no more than 30 sub-samples will be collected from a zone for each composite sample. Samples collected from zones measuring less than 3,000 ft^2 will have the same number of sub-samples as PIs unless additional PIs are required to identify the extent of localized VV.

Homogenize the sample as required by governing guidance documents. Once the sample is homogenized, fill the zip-top plastic bag to 1/3rd full (approximately 2000 grams). Affix the sample index ID label to the inside of the bag and write the index ID number on the outside of the bag, or affix an additional label using clear packing tape. Sample index ID numbers will be assigned based on the investigation-specific guidance document. Double bag the sample and repeat the labeling process for the outer bag. Decontaminate equipment between composite samples as described in Section 8.

Repeat steps outlined above until all samples from a property have been collected.

Soil field duplicate samples will be collected at the rate specified in governing guidance documents. Field duplicate samples will be collected as samples co-located in the same zone. The duplicate will be collected from the same number of sub-samples as the parent sample, but the sub-sample locations of the duplicate sample will be randomly located in the zone. The inspection for VV at each sub-sample location will follow the same protocol as referenced above. These samples will be independently collected with separate sampling equipment or with the original sampling equipment after it has been properly decontaminated. For tracking purposes, the parent/duplicate sample relationship will be recorded in accordance with sample documentation requirements stated in the governing guidance document. These samples will be used to determine the variability of sample results in a given land use area. These samples will not be used to determine variability in sampling techniques.

Section 6
Site Cleanup

IDW will be managed as prescribed in Section 3.2.10 of the Site-wide QAPP [SWQAPP] (CDM 2007b) or other applicable governing guidance documents. In general, replace the soil plug with excess sample volume. The soil should be placed back into the hole and tamped down lightly. If sandy areas such as playgrounds are sampled, refilling the soil plug is not necessary.

Rinse water, the roots of vegetation removed during sampling, and any excess soil volume may be returned to the sampled area.

Section 7
Documentation

A field logbook/PDA will be maintained by each individual or team that is collecting samples as prescribed in Section 3.2.4 of the SWQAPP (CDM 2007b) or other applicable governing guidance documents. Guidance documents will detail conditions which require attention, but at a minimum the following information should be collected:

- Project name
- Title of governing documents
- Property address
- Date
- Time

- Team members
- Weather conditions
- PPE used
- Locations of any samples or sub-samples that could not be acquired
- Descriptions of any deviations to the SAP or SOP and the reason for the deviation
- Relinquishment of samples to project sample coordinator

Complete required documentation as detailed in applicable governing guidance documents.

Section 8
Quality Assurance/Quality Control

Quality control samples will include:

- Field duplicates

Detailed information on QC sample collection and frequency is prescribed in Section 3.1.3.2 of the SWQAPP (CDM 2007b) or other applicable governing guidance documents.

Section 8
Decontamination

All sampling equipment must be decontaminated prior to reuse. Specific instructions on sample equipment decontamination are included in the applicable governing guidance documents. In general, the procedure to decontaminate all soil sampling equipment is outlined below:

- Remove all visible contamination with plastic brush
- Use DI water and plastic brush to wash each piece of equipment
- Remove excess water present on the equipment by shaking
- Use a paper towel to dry each piece of equipment
- Wrap dried equipment in aluminum foil

Once a week all soil sampling equipment will be cleaning using Alconox and DI water.

Spent wipes, gloves, aluminum foil, and PPE must be disposed of or stored properly as IDW, specified in Section 3.2.10 of the SWQAPP (CDM 2007b) or other applicable governing guidance documents.

Section 9
Sample Custody

Field sample custody and documentation will follow the requirements described in Section 3.2.11 of the SWQAPP (CDM 2007b) or other applicable governing guidance documents.

Section 10
Glossary

Governing guidance documents - The written document that spells out the detailed site-specific procedures to be followed by the project leader and the field personnel for completing specific investigations. These documents will clearly indicate specific requirements for the implementation of this SOP.

Libby Superfund Site – The Libby Superfund Site contains all buildings and land within the boundaries of each operable unit (OU) of the site and illustrated on the most recent version of the OU boundary map.

Sub-sample - The actual location at which the sample is taken. The dimension of a sample point is 2 inches across by 3 inches deep (6 inches for SUAs).

Composite Sampling - A sample program in which multiple sample points are compiled together and submitted for analysis as a single sample.

Land Use Area - A section of property segregated by how the property owner uses the area. The area can be classified as a SUA, LUA, CUA, ISA, or NUA.

Section 11
References

CDM. 2007a. Semi-Quantitative Visual Estimation of Vermiculite in Soils at Residential and Commercial Properties, Revision 1. CDM-LIBBY-06.

CDM. 2007b. Site-Wide Quality Assurance Project Plan. Draft in review.

Site-Specific Sampling Guidance
Libby Superfund Site

SOP No.: **CDM-LIBBY-06, Revision 1**

SOP Title: Semi-Quantitative Visual Estimation of Vermiculite in Soils at Residential and Commercial Properties

Approved by:

5/10/07
Technical Reviewer — Date

5/10/07
QA Reviewer — Date

05/10/07
Volpe Center Approval — Date

5/10/07
EPA Approval — Date

Section 1
Purpose

EPA will identify and delineate the extent of any visible vermiculite (VV) present in soils as part of all investigations conducted at the Libby Superfund Site and specified in governing guidance documents. The goal of this standard operating procedure (SOP) is to provide a consistent approach to identify and characterize any VV present in soils.

The semi-quantitative approach presented in this SOP for visually estimating VV in soil will be revised as required to optimize data collection as the sampling teams gain experience. This will be accomplished by expanding and/or improving this SOP, supporting pictorial standards, and additional electronic data acquisition efforts, as necessary.

Section 2
Definitions

Specific Use Area (SUA) – Discrete exterior parcels on a property with a designated specific use. Due to the nature of activities typically carried out in SUAs, residents may be especially vulnerable to exposures when Libby amphibole asbestos (LA) contaminated soil becomes airborne. SUAs may be bare or covered with varying amounts of vegetation. SUAs include:

- Flower Pot
- Flowerbed
- Garden
- Stockpile
- Play Area
- Dog Pen
- Driveway (non-paved)
- Parking Lot (non-paved)
- Road (non-paved)
- Alley (non-paved)

Common Use Area (CUA) – Exterior parcels on a property with varied or generic use. CUAs may be bare or covered with varying amounts of vegetation. CUAs include:

- Walkway
- Yard (front, back, side, etc.)
- Former Garden
- Former Flowerbed

Limited Use Area (LUA) – Exterior parcels on a property that are accessed, utilized, and maintained on a very limited basis. LUAs may be bare or covered with varying amounts of vegetation. LUAs include:

- Pasture
- Maintained/Mowed Fields
- Underneath porches/decks[1]
- Overgrown Areas (with trails/footpaths, or between SUAs/CUAs)

Interior Surface Area (ISA) – Interior soil surfaces of buildings such as garages, pumphouses, sheds, and crawlspaces.

Non-Use Area (NUA) – Exterior parcels on a property with no current use (e.g., areas that are un-maintained and not accessed). NUAs may be bare or covered with varying amounts of vegetation. NUAs include:

- Wooded Lots
- Un-maintained Fields

Since NUAs are not currently accessed, they are not presently considered a complete exposure pathway. As such, semi-quantitative visual estimates of vermiculite in soil will not be captured at this time. However, to the extent that NUAs may become a complete exposure pathway in the future, EPA may revisit these NUAs at a later date.

Zone[2] – Parcels on a property that share a similar land use or subdivisions of a land use area based on site conditions (e.g., access, construction setup considerations, etc.) or sampling requirements. No area type may be combined with any other area type. For example, driveways and flowerbeds are both SUAs but will be separated into unique zones for visual inspection. Similarly, large CUAs such as yards may be subdivided into front yard, side yard, and back yard zones dependent on site conditions. Sectioning properties into additional zones will be at the discretion of the field team leader but consistent among the teams.

It is anticipated that SUAs and ISA zones will generally tend to be smaller parcels. Combining small, proximal SUAs into one zone will be at the discretion of the field team leader but consistent among teams. No ISA will be combined with any other ISA for visual inspection. There is not a maximum square footage restriction on any zone.

---

[1] The soils underneath porches and decks will be classified as LUAs depending on ground clearance and accessibility to homeowners and pets. If these areas are not accessible, they will be classified as NUAs.
[2] The restriction on the maximum square footage of SUA zones (1,000 ft2) and non-SUA zones (2, 500 ft2) was eliminated from the previous iteration of this SOP after the data were reviewed by EPA and determined to sufficiently characterize the presence of VV regardless of zone square footage. Additionally, this will allow the flexibility necessary for field teams to identify areas of zones most cost effectively for removal purposes.

Point Inspection (PI) – Used in SUA, CUA, LUA, and ISA zones. A PI is an intrusive visual inspection of the top portions of the soil at a randomly selected point within a zone. A PI consists of the active displacement of the surface soil with a small shovel and visual inspection of the displaced soil to determine if VV is present. If VV is observed during the PI, the location and a semi-quantitative estimate of VV contamination will be recorded.

Section 3
Applicability

This SOP applies to properties within the Libby Superfund Site at varying stages of the removal process including, but not limited to, all screening and risk-based investigations, pre-design inspections, and removal actions. Investigation-specific modifications to this SOP are outlined in the governing guidance document for each investigation. The following locations on a property will be evaluated for the presence/absence of VV:

- All parcels on a property where soil samples are being collected.
- All parcels on a property where soil was non-detect for LA during previous sampling activities.
- All SUA parcels on a property that have not been previously characterized as containing VV

Section 4
Procedure

Figure 1 illustrates the procedures and decision rules for this SOP. The three primary procedural steps are listed below:

- Establish zones
- Perform PI
- Perform semi-quantification of visual vermiculite

Each is described in the following subsections.

4.1 Establish Zones

Upon arrival at the property, the field team will locate all areas requiring sample collection (i.e., where previous soil sample results were non-detect for LA or SUAs have not been previously characterized for VV). Parcels will be identified as SUA zones, CUA zones, LUA zones, NUA zones, or ISA zones. The field team will measure the zone sizes and note them on the field sketch and/or design drawings. Zones will be assigned according to the definitions provided above.

4.2 Point Inspections[3]

As defined above, a PI is an intrusive visual inspection performed for the entire surface of a zone. Professional judgment may be used to determine the exact location of PIs; however, the following guidelines will be implemented to maintain consistency.

A minimum of 30 PIs will be evaluated per zone if sampling is required within that zone. If soil sampling is not required, a minimum of 5 PIs will be evaluated within each zone. Zones larger than 500 square feet (ft^2) will require evaluation at a minimum of 1 PI per 100 ft^2 (10 ft by 10 ft area). The PI locations will be randomly selected and will be spatially representative of the entire zone. Locations of the PIs and semi-quantitative estimates of VV (i.e., low, intermediate, or high) will be recorded on the field sketch for each PI. While a minimum of 5 PIs will be conducted per zone, there is no set maximum. Rather, the maximum number of PIs is variable—dependent upon the total area of the zone and achieving the minimum required frequency of 1 PI per 100 ft^2.

The following sections outline procedures for inspecting each use area (e.g., SUA, CUA, LUA, ISA). The procedure for semi-quantification of VV is provided in the next section.

<u>SUA Zone:</u>

- Visually inspect the PI point using a spade or trowel to remove any cover material, including excess debris (e.g., mulch, rock, etc.) and organic material, from the surface of the soil. Remove and visually inspect soil to a depth of 0-6 inches below ground surface[4].
- If a depth of 6 in. cannot be attained given the varying levels of compaction in driveways, roads, etc. the maximum depth attainable will be documented in the field logbook.
- Record semi-quantitative estimate of VV observed as described in the following section.
- Replace soil and cover material.
- Repeat as necessary employing procedure outlined above.

<u>CUA and LUA Zones:</u>

- Visually inspect the PI point using a spade or trowel, carefully removing organic material, including grass, from the surface of the soil. Remove and visually inspect soil to a depth of 0 - 3 inches below ground surface[5].

---

[3] Surface Inspections- The non-intrusive visual inspection of the immediate surface of a zone was eliminated from the previous iteration of this SOP after their data were reviewed and determined by EPA to provide no additional information over that gained through Point Inspections.
[4] A soil depth of 6 inches for SUAs was chosen to approximate the depths to which digging would be expected during typical activities occurring in these SUA zones (e.g., gardening, child digging in dirt, etc.)
[5] A soil depth of 0-3 inches was chosen to approximate the depths to which soil disturbance would be most likely during typical activities occurring in these CUA and LUA zones (e.g., lawn mowing, etc.)

- Record semi-quantitative estimate of VV observed as described in the following section.
- Carefully replace all soil and organic material.
- Repeat as necessary employing procedure outlined above.

ISA Zone:

- Move items as necessary to access the soil surface.
- Visually inspect the PI points using a spade or trowel, remove and visually inspect soil to a depth of 0 - 3 inches below ground surface[6].
- Record semi-quantitative estimate of VV observed as described in the following section.
- Repeat as necessary employing procedure outlined above.

If during the PI, VV is observed to be localized within a zone, the portion with vermiculite will be denoted on the field sketch. If additional PIs are necessary to determine the boundaries of the area, approximately 10 to 20% additional PIs will be evaluated to determine the extent of localized vermiculite.

4.3 Semi-Quantification of Visual Vermiculite

During PI, the field team will estimate the quantity of vermiculite observed. Each PI location for all zones will be assigned a semi-quantitative estimate of visible vermiculite content using a 4-point scale: none (blank), low (L), intermediate (M), and high (H)[7]. For PI locations where VV is observed, semi-quantitative estimates (e.g., L, M, or H) will be recorded on the field sketch. PI locations where VV is not observed will not be recorded on the field sketch. Photographs illustrating these quantities are attached to this SOP as Figure 2. Additionally, jars of vermiculite-containing soils representing these three levels will be available for training and reference.

Under the current version of this SOP, there will be no effort to design an approach to combine vermiculite levels for PIs within or among zones. While the viability of combining semi-quantitative visual estimates within or among zones may be assessed as a pilot-scale evaluation, any PI with visible vermiculite qualifies as vermiculite-containing soil for the area represented by the inspection point or inspection zone.

[6] A soil depth of 0-3 inches was chosen to approximate the depths to which soil disturbance would be most likely during typical activities occurring in these IS zones (e.g., entering crawlspace, retrieving items from shed, etc.)

[7] Based on EPA's review of previous data, the 5-level scale VV identification scheme was not meaningful and will be reduced to a 4-level scale. As such the quantity of "Gross" VV in the previous iteration of this SOP was combined with High. Previously collected data of Gross VV should be considered analogous to High VV under this revised SOP.

Section 5
Health & Safety/Engineering Controls

All personnel will carry out visual inspections in accord with proper personal protective equipment (PPE) and other monitoring/governing requirements outlined in the most recent version of the Site Health and Safety Plan governing the work being conducted.

All visual inspections will employ appropriate engineering controls to minimize dust (e.g., wetting soil during inspection) as prescribed in the Site-Specific Standard Operating Procedure for Soil Sample Collection (CDM-LIBBY-05, Revision 2).

Section 6
Equipment Decontamination

Equipment decontamination is not required between each PI from the same zone, but is required before moving to another inspection zone. Decontamination of equipment will be conducted as required by the governing guidance documents.

Section 7
Documentation

As noted above, information about the presence of vermiculite will be recorded on the field sketch or design drawing for the property under investigation. Each zone will be marked with:

- Zone type (i.e., SUA, CUA, LUA, NUA, or ISA)
- Zone area in ft^2
- PI locations/points
- Semi-quantitative estimate of VV content for each PI (i.e., L, M, H)

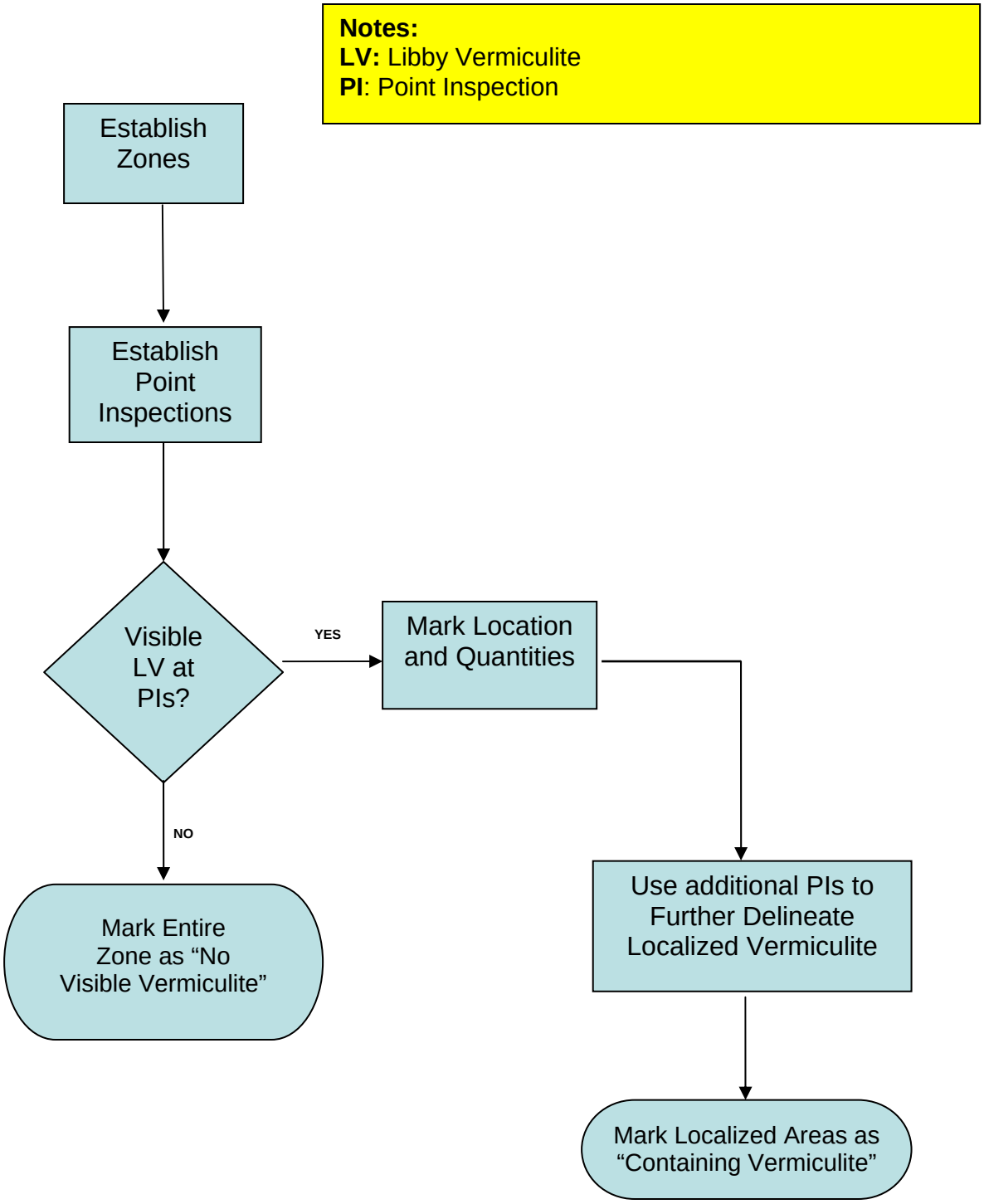
In addition to field sketch/design drawing documentation, each field team will generate a Visual Vermiculite Estimation Form (VVEF) (Figure 3) to document the semi-quantitative visual estimates of VV for each PI for possible future information use. This form will be managed according to governing guidance documents.

Section 8
Training

Every effort will be made to ensure consistency in the semi-quantitative evaluation of VV in soil to the extent possible. This will include training (e.g., field calibration), specimen examples (i.e., jars/photographs of low, intermediate, and high quantities of vermiculite, etc.), designated field staff, and oversight by the field team leader. Figures illustrating none, low, intermediate, and high quantities of vermiculite are attached to this SOP for reference (Figure 2).

To ensure consistency over time, the field team leader will verify semi-quantitative assignments at a rate of one property per team per week. The field team leader will sign off on those field sketches that were verified. If inconsistencies are noted, the field team leader will hold re-training with all teams participating simultaneously. Updates to the SOP and its attached specimen examples will occur as necessary and the EPA Project Team Leader and Technical Assistance Unit will be notified when these updates are recommended by the field team leader or field investigation manager.

Figure 1 – Visible Vermiculite Inspection Process



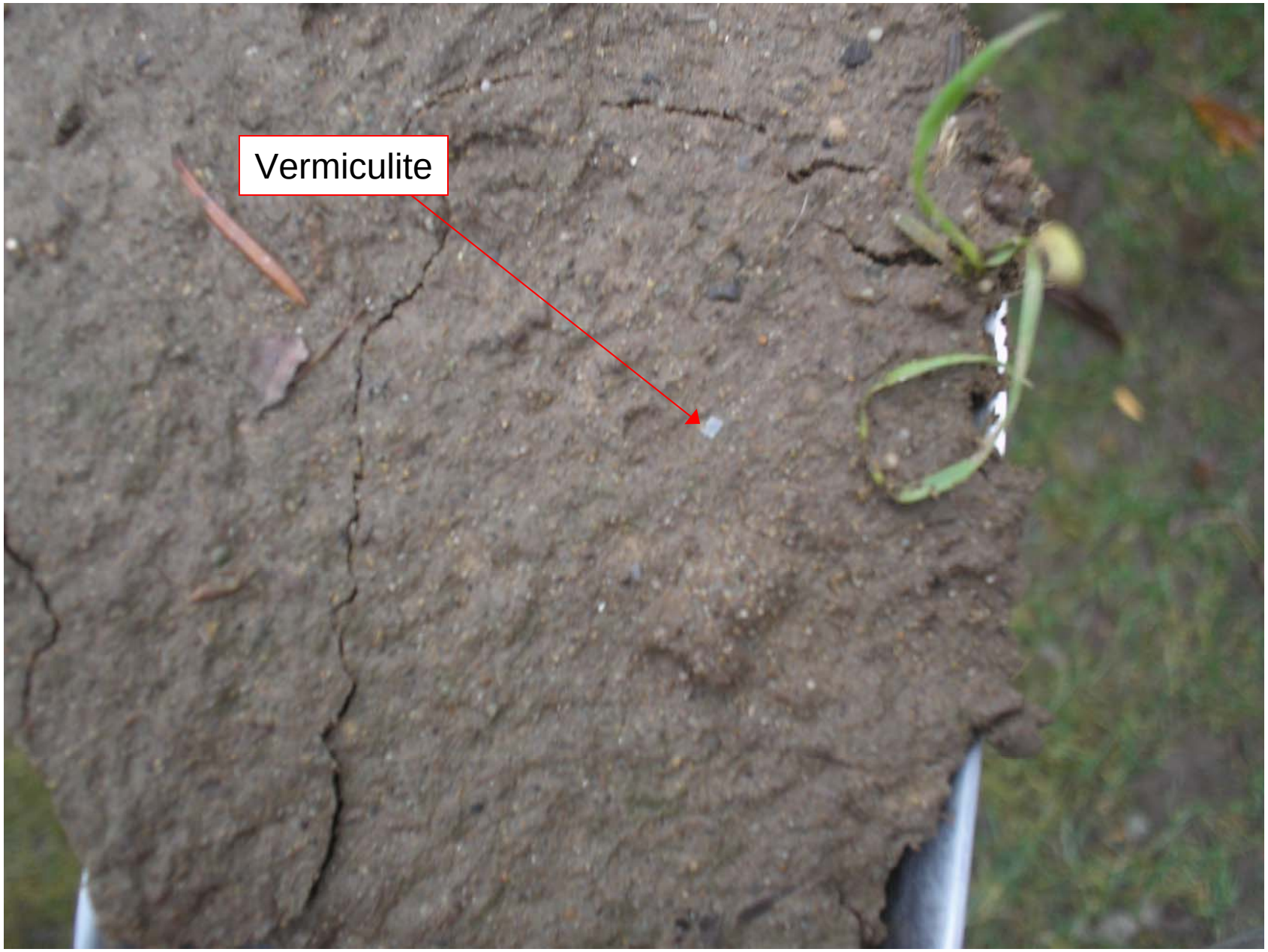


Figure 2a: Low Visible Vermiculite – A maximum of a few flakes of vermiculite observed within a given visual inspection point

Figure 2b: Intermediate Visible Vermiculite – Vermiculite easily observed throughout visual inspection point, including the surface.

Figure 2c: Intermediate Visible Vermiculite – Vermiculite easily observed throughout visual inspection point, including the surface.

Figure 2d: High Visible Vermiculite – Vermiculite easily observed throughout visual inspection point, including the surface.

LIBBY SUPERFUND SITE
Visual Vermiculite Estimation Form (VVEF)

Field Logbook No.: _____ Page No.: _____ Site Visit Date: _____ BD Number: _____
Address: _____ Structure Description: Property
Occupant: _____ Phone No.: _____
Owner (If different than occupant): _____ Phone No.: _____
Investigation Team: _____ Investigation Name: _____
Field Form Check Completed by (100% of Forms): _____ Visual Verification by Field Team Leader (10% of forms): _____

		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8
Type (SUA/CUA/LUA/IS)									
Description									
Area Size (square feet)									
General Comment (Cover, etc.)									
PIs (X=None, L=Low, M=Intermediate, H=High)	**X**								
	L								
	M								
	H								
	Total	0	0	0	0	0	0	0	0

Areas previously identified for removal not inspected for visible vermiculite? **Yes** **No** **NA** **Location(s):** _____