FIELD SAMPLING SUMMARY REPORT

PHASE III REMEDIAL INVESTIGATION
OPERABLE UNIT 3

ACTIVITY-BASED SAMPLING

LIBBY ASBESTOS SUPERFUND SITE

January 2010

Prepared by:

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<th>Description</th>
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<tr>
<td>µm</td>
<td>micrometer</td>
</tr>
<tr>
<td>AOC</td>
<td>Administrative Order on Consent</td>
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<tr>
<td>CDM</td>
<td>Camp Dresser McKee, Inc.</td>
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<tr>
<td>CERCLA</td>
<td>Comprehensive Environmental Response, Compensation and Liability Act</td>
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<tr>
<td>COC</td>
<td>contaminant(s) of concern; chain-of-custody</td>
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<tr>
<td>EPA</td>
<td>U.S. Environmental Protection Agency</td>
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<tr>
<td>FD</td>
<td>field duplicate</td>
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<tr>
<td>FSDS</td>
<td>field sample data sheet</td>
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<tr>
<td>FSSR</td>
<td>Field Sampling Summary Report</td>
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<tr>
<td>GIS</td>
<td>geographic information system</td>
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<tr>
<td>GPS</td>
<td>global positioning system</td>
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<tr>
<td>HEPA</td>
<td>high-efficiency particulate-air</td>
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<tr>
<td>Index ID</td>
<td>index identification number</td>
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<tr>
<td>KDC</td>
<td>Kootenai Development Corporation</td>
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<tr>
<td>LA</td>
<td>Libby Amphibole</td>
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<tr>
<td>LPM</td>
<td>Liter per minute</td>
</tr>
<tr>
<td>MCE</td>
<td>microcellulose ester</td>
</tr>
<tr>
<td>MDEQ</td>
<td>Montana Department of Environmental Quality</td>
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<tr>
<td>mL</td>
<td>milliliter</td>
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<td>MWH</td>
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<tr>
<td>OU</td>
<td>Operable Unit</td>
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<tr>
<td>PLM-VE</td>
<td>polarized light microscopy and visual estimation</td>
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<tr>
<td>PPE</td>
<td>personal protective equipment</td>
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<td>QC</td>
<td>quality control</td>
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<tr>
<td>RI/FS</td>
<td>Remedial Investigation/Feasibility Study</td>
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<td>RPM</td>
<td>Remedial Project Manager</td>
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<td>SAP</td>
<td>Sampling and Analysis Plan</td>
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<tr>
<td>SOP</td>
<td>Standard Operating Procedure</td>
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<tr>
<td>SRC</td>
<td>Syracuse Research Corporation</td>
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<td>TEM</td>
<td>transmission electron microscopy</td>
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1.0 PROJECT OVERVIEW

1.1 BACKGROUND SUMMARY

The vermiculite deposit at Vermiculite Mountain, six miles northeast of Libby, Montana, contains veins of asbestiform amphibole minerals (e.g., winchite, richterite and tremolite). The asbestiform amphibole minerals that occur at Vermiculite Mountain are collectively termed “Libby Amphibole” (LA) by the U.S. Environmental Protection Agency (EPA). Historic mining, milling, and processing of vermiculite from the former W.R. Grace mine at Vermiculite Mountain released LA fibers to the environment. Long-term inhalation of large quantities of LA fibers associated with the vermiculite is known to have caused adverse health effects in some workers at the mine and processing facilities and possibly in others in Libby.

In 2000, EPA began cleanup actions at Libby under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA; also known as Superfund) to eliminate sources of LA exposure to residents and workers. Initial efforts were focused mainly on wastes remaining at former vermiculite processing areas. As work progressed, action shifted to cleanup of homes and workplaces in the residential/commercial areas of Libby, designated by EPA as Operable Unit 4 (OU4) of the Libby Asbestos Site.

As part of the Superfund designation of the Libby Asbestos Site, the former mine and environs at Vermiculite Mountain were designated OU3. OU3 includes the property in and around the former vermiculite mine and forest areas surrounding the mine that may have been impacted by releases and subsequent migration of contaminants from the mine. Figure 1-1 shows the location of the mine site and the preliminary study area boundary of OU3. EPA established the preliminary study area boundary for the purpose of planning and developing the scope of the remedial investigation/feasibility study (RI/FS) for OU3. This study area boundary may be revised as data are obtained on the nature and extent of environmental contamination associated with releases that may have occurred from the mine site.
1.1.1 Phase I Remedial Investigation

In September 2007, EPA initiated a Remedial Investigation/Feasibility Study (RI/FS) of OU3 and produced the *Phase I Sampling and Analysis Plan for Operable Unit 3, Libby Asbestos Superfund Site* (OU3 Phase I SAP) to begin the characterization of environmental conditions at OU3. The OU3 Phase I SAP contains information on the history and operations of the former mine and discussions on general site geography, geology, hydrology and other relevant background information. The SAP also contains the preliminary sampling locations and the Standard Operating Procedures (SOPs) that were used as guidance during the OU3 Phase I RI performed in October 2007. Phase I included sampling and analysis of soil, mine wastes, sediment, surface water, and ambient air at the former mine site, and tree bark, duff and mineral soil on the mine site and in surrounding forested areas within an eight-mile radius of the mine site. The field sampling performed as part of the Phase I RI is summarized in the *Phase I Field Sampling Summary Report* (Phase I FSSR), which documents the sampling locations and procedures employed during the Phase I RI at OU3.

Prior to implementing the OU3 Phase I RI, EPA had collected very limited information to evaluate contaminants of potential concern at the former Vermiculite Mountain mine property and potential releases to adjacent forest lands, surface water and groundwater. Areas outside the former mine property are of potential concern because they are used by the public for recreation, by logging companies for timber harvesting, and by wildlife as habitat. Contaminants of potential concern at OU3 include not only LA, but other mining-related contaminants that may have been released to the environment. The overall objective of sampling at OU3 is to collect sufficient information to allow evaluation of risks to humans and ecological receptors from exposure to mining-related releases, and to support the development and evaluation of remedial alternatives to address any unacceptable risks that are identified. This will occur over multiple, phased sampling events; the findings of each phase of sampling will be used to guide subsequent phases of investigation.
Phase I sampling and analysis was intended to provide initial information on the nature and extent of asbestiform LA and non-asbestos contamination, to identify contaminants of potential concern to be investigated during the RI, and to begin collection of data to establish a study area boundary for subsequent phases of the RI. Phase I was not expected to provide data that would be sufficient to fully characterize the nature and extent of contamination or to support a risk assessment. Rather, the results of Phase I were intended to provide sufficient information so that a more detailed and extensive sampling effort (Phase II) could be designed for implementation during the 2008 field season.

1.1.2 Phase II Remedial Investigation

The Phase II RI was performed from early April through October, 2008 and consisted of three parts: Part A (surface water and sediment sampling), Part B (groundwater and ambient air sampling) and Part C (ecological sampling). Part A field sampling was performed in accordance with the Phase II Sampling and Analysis Plan for Operable Unit 3, Libby Asbestos Superfund Site; Part A: Surface Water and Sediment, final version dated May 29, 2008 (Phase IIA SAP). Part B field sampling was performed in accordance with the Phase II Sampling and Analysis Plan for Operable Unit 3, Libby Asbestos Superfund Site; Part B: Ambient Air and Groundwater, final version dated July 2, 2008 (Phase IIB SAP). Part C was performed in accordance with the Phase II Sampling and Analysis Plan for Operable Unit 3, Libby Asbestos Superfund Site; Part C: Ecological Data, final version dated September 17, 2008 (Phase IIC SAP).

Parts A and B of the Phase II RI focused on mine-site media (surface water, groundwater, sediments and ambient air) to more fully characterize the nature, extent and seasonal variation of contamination on the former mine property. Field activities performed under Parts A and B of the Phase II SAP are summarized in the Phase II Field Sampling Summary Report, Parts A and B. Part C of the Phase II RI included ecological sampling performed by Parametrix, Inc. in late September and early October, 2008, and is summarized in separate documents.
1.1.3 Phase III Remedial Investigation

The Phase III RI at OU3 began in early June, 2009. Activity-based sampling (ABS) was conducted in accordance with the Remedial Investigation for Operable Unit 3, Libby Asbestos Superfund Site Phase III Sampling and Analysis Plan (Phase III SAP), as amended by field modifications issued by EPA. Ecological sampling performed by Parametrix, Inc. at OU3 during the 2009 field season is discussed in a separate document.

1.2 PURPOSE OF THE PHASE III REMEDIAL INVESTIGATION

The results of Phase I sampling and analysis of forest materials (tree bark, duff and mineral soil) from the lands that surround the mine site were used to select locations where ABS was performed during Phase III. Phase III ABS was intended to simulate the activities of recreational visitors to the forest lands that surround the mine site and the concentrations of LA to which such visitors may be exposed. Data generated during Phase III ABS will be used in human health risk assessments and possibly as a basis for management decisions by the U.S. Forest Service and other forest-land stakeholders.

1.3 PURPOSE OF THIS DOCUMENT

This Phase III FSSR is a summary of ABS performed in support of the RI/FS at OU3 during the 2009 field season. OU3 includes the property at and around the former vermiculite mine at Vermiculite Mountain potentially impacted by releases and subsequent migration of hazardous substances from the mine site and former mine operations (the preliminary boundaries of OU3 are depicted on Figure 1-1 of this document). The final boundaries of OU3 had not been defined prior to Phase III RI field sampling in June 2009. Final boundaries for OU3 will be based primarily upon the extent of contamination associated with releases from the former mine, as determined by analytical results for samples collected during Phases I, II, III and any subsequent phases of the RI. The final boundary of OU3 will be defined in the final EPA-approved RI/FS report.
This FSSR is a summary of sampling activities, locations and methods employed during the Phase III RI at OU3. Analytical results for samples collected during the Phase III RI are not presented in this document; analytical data and interpretations are summarized as part of Sampling and Analysis Plans (SAPs), which heretofore have been prepared by EPA for implementation during each field season or phase of work. Phase III analytical results will be the basis for the data-gathering activities and scope of subsequent phases of RI at OU3. After all RI activities have been completed, a comprehensive RI Report will be prepared. The RI Report will contain all analytical results, interpretations and conclusions for the OU3 Remedial Investigation.

### 1.4 PROJECT ORGANIZATION

#### 1.4.1 Project Management

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

The Montana Department of Environmental Quality (MDEQ) is the support regulatory agency for Superfund activities within OU3. The MDEQ Project Manager for OU3 is Catherine LeCours. EPA consults with MDEQ as provided for by CERCLA, the National Contingency Plan, and applicable guidance in conducting Superfund activities at OU3.

EPA has entered into an Administrative Order on Consent (AOC) with Respondents W.R. Grace & Co.-Conn. and Kootenai Development Corporation (KDC). Under the terms of the AOC, the Respondents implemented the Phase I, Phase II and Phase III SAPs at OU3. The designated Project Coordinator for the Respondents is Robert Medler of Remedium Group, Inc., a subsidiary of W.R. Grace & Co.-Conn.

#### 1.4.2 Technical Support

EPA was supported in this project by contractors, including:
• **Syracuse Research Corporation (SRC)** assisted in the development of the Phase III SAP and will assist in the evaluation and interpretation of the Phase III analytical data.

• **NewFields Boulder LLC**, as a subcontractor to SRC, provided support in developing the SAP and with mapping and other geographic information system (GIS) applications, and will assist in the design and evaluation of the feasibility study.

1.4.3 **Field Sampling Activities**

Phase III ABS field sampling activities were performed by W.R. Grace & Co.-Conn. and KDC with support from MWH Americas, Inc. (MWH) and Chapman Construction, Inc. (CCI) of Libby, Montana, in accordance with the Phase III SAP and field modifications authorized by EPA (see Appendix A of this FSSR). Individuals responsible for implementation of the OU3 Phase III field sampling program are listed below:

- MWH Project Manager/Field Supervisor: John Garr
- MWH Field quality control (QC)/Health and Safety Officer: Toby Leeson
- MWH Quality Assurance Officer: Stephanie Boehnke
- CCI point-of-contact: Mike Chapman

1.4.4 **Sample Preparation and Analysis**

All samples collected as part of the OU3 Phase III RI were submitted to an EPA-selected/approved laboratory for preparation and/or analysis. All sample analyses for LA were performed Hygeia Analytical Laboratories of Sierra Madre, California, and all analytical data validation and verification is to be performed by SRC.

1.4.5 **Data Management**

Administration of the OU3 master database is performed by EPA contractors. The primary database administrator is Lynn Woodbury of SRC. Ms. Woodbury is responsible
for sample tracking, uploading new data, performing error checks to identify inconsistent or missing data, and ensuring that all questionable data are checked and corrected as needed. When the OU3 database has been populated, checked and validated, relevant LA data from the Phase III RI will be transferred into the Libby2 database for final storage.
2.0 PHASE III ACTIVITY-BASED SAMPLING

2.1 SUMMARY OF PHASE III ACTIVITY-BASED SAMPLING PROGRAM

The objective of OU3 Phase III activity-based sampling (ABS) and analysis was to provide information to characterize LA concentrations to which visitors to the forest lands that surround the mine site may be exposed while engaging in typical recreational activities, including:

- All-terrain vehicle (ATV) riding
- Hiking
- Wood-gathering
- Fire-pit digging
- Campfire burning

These activities were performed according to an ABS script detailed in the Phase III SAP and amended by field modifications issued by EPA. The following sections of this FSSR are summaries of the ABS performed during Phase III.

2.2 ABS LOCATIONS

Data collected from 2006 through 2009 at the Vermiculite Mountain mine site meteorological station indicate the predominant wind direction in the OU3 area is to the northeast. The 11 locations selected by EPA for the Phase III ABS program in 2009 generally coincide with three “downwind” transects along which tree bark, duff and mineral soil were sampled during the Phase I RI in October, 2007. The downwind transects are centered on the mine site and radiate 8 miles out, at bearings of N15°E, N45°E and N75°E (Figure 2-1).

Before final selection of Phase III ABS locations, the initially proposed locations were field checked by MWH. Based on this reconnaissance, minor adjustments (up to about 0.5-mile) were made to some of the proposed locations to ensure that access, forest and logging roads (for ATV riding), topography, forest density and other site features were such that ABS could be conducted safely and effectively.
2.3 ABS CONDITIONS

ABS was conducted only on days when there was no rain, no standing water on the forest and logging roads, and when visible dust was generated by driving trucks and ATVs on the unpaved roads at normal speeds (20 mph or less).

2.4 PERFORMANCE OF ABS SCRIPT

The activities chosen for ABS during the Phase III RI were intended to represent those performed by hunters, hikers, campers and others who use the forest land for recreation. The details and durations of the original script components contained in the final SAP dated May 26, 2009 were adjusted during pilot testing in mid-August, 2009, after it was learned that almost all of the samples collected under the original ABS script in July 2009 were heavily loaded with dust and could not be analyzed by direct methods. EPA-issued field modifications to the original ABS script contained in the final SAP dated May 26, 2009 are provided in Appendix A (on CD in pocket).

The ABS script was performed by two teams, each consisting of two CCI employees (who performed the activities) and one MWH employee (who directed the activities by two-way radio, recorded field data and managed the samples). During the 2009 field season, after the final (third) revision of the Phase III SAP (dated August 31, 2009) had been issued, six full rounds of ABS were performed at each of the 11 designated locations. The seventh and eighth rounds were incomplete (with eight locations and three locations sampled, respectively) because sampling was interrupted by rain and snow storms.

2.4.1 ABS Participants

Each ABS activity was performed by the two CCI employees (“participants”), who were designated “Person 1” and “Person 2.” Each ABS participant was fitted with two air-sampling pumps and sampling cassettes: one pump was set to draw air through the filter cassette at 4 liters per minute (LPM), the other was set to pump at 2 LPM. The laboratory was instructed to analyze the 4 LPM sample collected by Person 1 if the inner
surface of the cassette cowling was free of dust and the filter was not overloaded. If the 4 LPM cassette worn by Person 1 was determined by the laboratory to be overloaded, the 2 LPM cassette worn by Person 1 was selected for analysis. If the Person 1, 2 LPM cassette was overloaded, that sample would be analyzed by indirect methods. Samples collected by Person 2 were retained by the laboratory as replicate samples. Thus, three sets of four sample cassettes were used at each location during each round of ABS. One set was used during ATV riding, one set was used during hiking, and one set was used for the composite wood gathering/fire-pit digging/campfire burning activities.

The ATV riding and hiking activities were done by having Person 1 initially lead and Person 2 follow; the participants switched lead/follow positions half-way through the activity duration. The wood-gathering, fire-pit digging and campfire burning activities were performed simultaneously by the two participants, each wearing a set of two pumps and air-sampling cassettes. In other words, the ATV riding and hiking samples were collected as discrete samples; the samples collected during the wood-gathering/fire-pit digging/campfire burning activities were composites. Because the participants’ exposure times and activities were identical, samples collected by Person 1 and Person 2 are considered to be replicates.

Each ABS participant was fitted with a wrist-worn global positioning system (GPS) device to record their movements during the ABS activities. Figures 2-2 through 2-9 depict the tracks of ABS during each of the six complete and two partial rounds of ABS conducted during Phase III.

Because they were actively disturbing potentially contaminated soil, duff and vegetation during performance of the ABS script, the two ABS participants wore Level C Modified personal protective equipment (PPE) consisting of the following:

- Full-face powered air-purifying respirator (PAPR) fitted with high-efficiency particulate-air (HEPA) filters
- Double-layer Tyvek™ hooded, footed coveralls
• Latex boot covers
• Double-layer nitrile gloves

2.4.2 ABS Director

Performance of the ABS script was overseen by an MWH employee (“director”) who stayed at a “base station” established on a road within the ABS location. The ABS director used a stopwatch to time each activity and a two-way radio to communicate lead/follow position switches and activity changes to the participants. The ABS director was also responsible for calibrating and adjusting the air sampling pumps, recording data on the field sampling data sheet (FSDS) and in the logbook, maintaining the sample chain-of-custody (COC) and managing the sample cassettes. Because the ABS director remained at the base station during performance of the ABS script and did not actively disturb potentially contaminated materials, they were not required to wear a respirator or other PPE.

2.5 ABS SCRIPT COMPONENTS

2.5.1 ATV Riding

With the exception of the ABS-10 location, ATV riding was performed on unpaved forest and logging roads within each ABS location boundary (or in instances where roads were limited, within a half-mile outside the boundary). Because there are no roads within the boundary of the ABS-10 location (see Figure 2-1), ATV riding at this location was performed on the nearest forest road west of ABS-10, in upper Rainy Creek.

The ATVs were operated at speeds of 10 miles per hour or less. For the first 10 minutes of the activity, Person 1 led and Person 2 followed; the participants switched the lead/follow positions for the second 10 minutes of the activity. The participants were instructed to follow the lead ATV at the distance they would follow under normal recreational conditions, if they were not wearing PPE. The following distance was dependent on the amount of dust generated by the lead ATV, which varied as a function of road material type and moisture content, humidity, air temperature, wind speed and
direction and other factors. During rounds performed under less-dusty conditions, the following distance was typically less than 50 yards; under very dry, dusty conditions the following distance was as much as 200 yards.

### 2.5.2 Hiking

At the conclusion of the ATV riding activity, the participants were given fresh cassettes for use during the hiking activity. Hiking was performed within each ABS location boundary, generally in less-densely-forested, more open areas likely to be used by recreational visitors. As in ATV riding, Person 1 would lead for the first half (40 minutes) of the activity and Person 2 would follow, switching positions for the second 40 minutes of the hiking activity. The following distance was typically about ten feet. To the extent possible, different areas were hiked during each ABS round.

### 2.5.3 Wood Gathering

At the conclusion of the hiking activity, the participants were given fresh sample cassettes and spent 10 minutes collecting about 40 pounds of dead-and-down pine and fir wood for use during the campfire burning activity. At most locations a mix of hand-broken and chainsawed pieces up to 2 feet long were collected and placed in a 55-gallon, 10-mil polyethylene bag. The pieces ranged from 2 to 8 inches in diameter. To the extent possible, pieces with bark were selected. The bag of wood was closed, taped and labeled with the location identification, date and time, and placed in the bed of the truck for transport to the Flyway for burning under controlled conditions.

### 2.5.4 Fire-Pit Digging

At the conclusion of the wood-gathering activity, the participants each used a shovel to clear vegetation, duff and other combustible debris down to the mineral soil layer from an area of forest floor about 5 feet in diameter. This activity simulated the preparation of a fire pit, as might be performed by a camper, and lasted 5 minutes. Locations selected for fire-pit digging were typically near the base station, but a different location was selected for each ABS round. At the conclusion of fire-pit digging, the pumps were turned off and
the sample cassettes were capped and stored until later use during the campfire burning activity.

2.5.5 Campfire Burning

The building of campfires with wood collected from each ABS location was done at the Remedium decontamination area on the north bank of the Kootenai River immediately upstream from the mouth of Rainy Creek (an area known as the “Flyway”). Each fire was built in a 3-foot square, 6-inch high welded steel pan placed on a 3-inch thick pad of sand and gravel about 16 feet in diameter. As a further precaution against uncontrolled fires, the area outside the gravel pad was sprayed with water under gravity flow through a garden hose attached to a 500-gallon water tank.

Prior to building the campfire, participants donned new PPE, the air sampling pumps and cassettes used during the wood gathering and fire-pit digging activities were re-attached, and the pumps were started. To start the fires quickly, logs collected from each ABS location were piled in the pan and gasoline was used to ignite the wood.

Once the fire was started, the participants walked slowly around the edge of the gravel pad for 20 minutes. At the conclusion of the burning period, the air sampling pumps were turned off, the sample cassettes were collected and capped, the fire was extinguished with water and the steel pan was decontaminated by rinsing the charred wood and ashes into a trash can for later disposal at the Amphitheater on the mine site.

2.6 ABS EQUIPMENT AND INSTRUMENTATION

- **Air Sampling Pump**: SKC model AirChek XR5000™ (0.005 – 5.0 LPM)
- **Sample Cassette**: 25mm 0.8-micron pore size, conductive, cowled MCE cassettes
- **Inert tubing**: Tygon™ R-3603 tubing, 1/4” inner diameter and 7/16” outer diameter
- **Primary Calibrator**: BIOS Intl. DryCal DC-Lite™ model MH (0.2 – 17 LPM)
• **Secondary Calibrator**: Dwyer rotameter, SKC model 320-4A5 (0.4 – 5 LPM)

• **GPS Unit**: Garmin Forerunner™ model 205 wrist-worn GPS

• **ATVs**: Polaris Ranger™ 4x4 2-passenger all-terrain vehicles, Honda FourTrax Rancher™ 400cc and Suzuki QuadSport Z400™ 400cc 4x4 single-passenger all-terrain vehicles

• **Sample Storage**: Vendor-supplied, partitioned cassette shipping boxes.

• **Sample shipping**: Small insulated plastic coolers with integrated handles on top to ensure the container remained upright during shipment to the laboratory.

• **Field logbook**: Rite in the Rain™ all-weather journal 390N

• **Pens**: Rite in the Rain™ all-weather pen #37, various ball point pens, and permanent markers

• **Photo identification board**: 12”x20” dry-erase board

• **Camera**: Nikon Coolpix L17™ digital camera

• **2-way radios**: Motorola Talkabout T9500XLR™ FRS (UHF-band)

### 2.7 SAMPLING METHODS

#### 2.7.1 Sample Collection

The participants each wore two AirChek XR5000™ air-sampling pumps attached to belts worn outside their PPE (one set to pump at 4 LPM, the other set at 2 LPM). Tubing from each pump was duct-taped to the back of the participant’s Tyvek™ coveralls, with the open ends of the tubing positioned on either side of the participant’s neck. With the tubing in-place, the ABS director removed the plug from the discharge side of each cassette and attached the cassette to the tubing. Each sample cassette was taped in-place, with the open (intake) end of the cassette cowl aimed downward, within the participant’s breathing zone (about 9 inches from the participant’s face).
Sampling cassette cowl caps remained in-place until the activity began and the pumps were turned on. During the activity, the ABS director retained the caps and stored them in a closed Ziploc™ plastic bag until the activity ended, the pumps were turned off and the caps were replaced.

2.7.2 Primary Field Calibration of Air Sampling Pumps and Rotameters

A BIOS Intl. DryCal DC-Lite™ model MH air-flow calibrator with a range of 0.2 LPM to 17 LPM was used to calibrate each of the rotameters used to set and confirm air sampling pump flow rates in the field. The DC-Lite™ automatically adjusts for temperature and pressure, eliminating the need for manual compensation or correction of flow-rate values. A calibration graph was produced for each of the rotameters, over a range of flow rates, to allow directly-read flow rates measured with the rotameter to be quickly and easily converted to true values (as determined by the DC-Lite™). Each rotameter was checked against the DC-Lite™ at the start and end of each day’s ABS; measured flow rates were found to be very consistent, with less than 2.5-percent variation.

2.7.3 Secondary Field Calibration of Air Sampling Pumps

The flow rate of each air-sampling pump was measured, adjusted (if necessary) and recorded at the beginning of each ABS activity, and measured and recorded at the conclusion of each activity. The flow-rate measurement procedure consisted of using a rotameter connected by 8 inches of Tygon™ tubing to a dedicated cassette end cap, which was inserted into the intake (cowl) end of the sampling cassette. The pump was turned on for a brief period and the pump flow rate was adjusted as close to the target flow rate (4.0 LPM or 2.0 LPM, as appropriate) as possible, using the flow-rate value indicated by the center of the rotameter ball and converting to the true flow-rate value indicated on the calibration graph. The dedicated calibration equipment (cassette cap, rotameter and Tygon tubing) was stored in a closed Ziploc™ plastic bag when not in use.

The AirChek XR5000™ pumps used in the ABS program are equipped with isothermal flow sensors that measure air flow directly. The pump is electronically controlled to
deliver flow to within 5 percent of the flow set-point, and will automatically shut off and display a flow fault if the flow rate cannot be maintained (due to battery failure, crimped air sampling tubing, pump fault, etc.). The pumps used during Phase III ABS were observed to consistently deliver flow rates with less than 2.5-percent variation. The Airchek XR5000™ is driven by an internal lithium-ion battery; during periodic battery conditioning run-down, the pumps were observed to run continuously for as long as 96 hours, with no observed variation in flow rate (more than double the running life claimed by the manufacturer).

2.8 QUALITY CONTROL SAMPLES

2.8.1 Lot Blanks

Before any air cassettes were used for ABS, the cassette lot was verified to be asbestos-free. This was accomplished by sending two unopened cassettes per lot of cassettes for TEM analysis using ISO 10312 counting protocols, as modified by Libby-specific laboratory modifications. All lot blanks submitted during ABS in 2009 were analyzed as “ND” (non-detect) by the project analytical laboratory (Hygeia Laboratories of Sierra Madre, California).

2.8.2 Field Blanks

A field blank for ambient air was prepared by removing the sampling cassette from the shipping box, opening the cassette to the air in the area where the ABS samples were to be taken, then closing the cassette and packaging for shipment and analysis. Field blanks for ambient air were collected at a rate of one for each ABS round; each field blank was collected at a different ABS location.

2.9 SAMPLE HANDLING

At the time of collection, each sample was labeled with a unique 5-digit sequential index identification (index ID) number. The index IDs for all samples collected as part of
Phase III sampling have a prefix of “P3” (e.g., P3-12345). Information on whether the sample was representative of a field sample or a field-based QC sample (e.g., field blank) was documented on the FSDS.

The ABS director maintained a field logbook with sequentially-numbered, non-removable pages. Information on sampling activities and conditions that was not otherwise recorded on the FSDS forms was recorded in the field logbook. Scans of the FSDS and field logbooks are contained in Appendix B and C, respectively (on CD in pocket).

2.9.1 Sample Containers

ABS samples were collected using cowled, 25-mm diameter, 0.8-µm pore size microcellulose ester (MCE), conductive filter cassettes supplied by EMSL Laboratories of Westmont, New Jersey. The sample cassettes remained capped until immediately before the pump was turned on and the ABS activity began. Cassettes were capped immediately after the activity ended and the pump was turned off.

2.9.2 Sample Preservation and Storage

Fresh sampling cassettes were stored in the partitioned cassette shipping box, with end caps on. At the conclusion of each sampling activity, the cassettes were re-capped and returned to the shipping box. Used cassettes were stored cowl-end-up to prevent particles from being dislodged from the filter media during transit. Because there are no special preservation requirements or holding times for asbestos samples, the cassettes were stored at ambient conditions, under custody of the ABS director.

2.10 SAMPLE DOCUMENTATION AND IDENTIFICATION

Field data observed during collection of each ABS sample were documented by the ABS director on OU3 Phase III RI-specific FSDS. At the time of collection, each sample was assigned a unique index ID number using pre-printed adhesive labels supplied by SRC. The index ID labels were provided in quadruplicate; one label was attached to the sample
cassette, another was placed on the FSDS and a third was placed in the field logbook (the fourth label was reserved for use in re-labeling, if necessary). Index IDs for all samples collected as part of the Phase III ABS bear the prefix of “P3” (e.g., P3-12345). Information on whether the sample is representative of a field sample or a field-based QC sample (e.g., field blank) was documented on the FSDS, but was not included on the chain-of-custody, to ensure that the sample type was unknown to the analytical laboratory.

Each field sampling team maintained a field logbook with sequentially numbered, non-removable pages. All potentially relevant information not recorded on the FSDS forms was recorded in the field logbook. Scans of the ABS logbook and FSDS forms are provided as PDF files in the Appendix B and C, respectively (on CD in pocket).

2.11 SAMPLE CHAIN-OF-CUSTODY AND SHIPMENT

Chain-of-custody (COC) was maintained until final disposition of the samples by the laboratory and acceptance of analytical results. A COC form specific to the Phase III ABS program accompanied every shipment of samples to the analytical laboratory. All corrections to the COC record were initialed and dated by the person who made the corrections. Original COCs accompanied the samples to the laboratory; copies were made and retained to document each change of custody. All samples were sent directly to the analytical laboratory by FedEx priority overnight service. Scans of the ABS COCs are provided as PDF files in Appendix D (on CD in pocket).

2.12 ANALYSIS

All samples collected during Phase III ABS were submitted for asbestos analysis using transmission electron microscopy (TEM) in accordance with the International Organization for Standardization (ISO) 10312:1995 method counting protocols, as modified by Libby-specific laboratory modifications. Detailed descriptions of laboratory protocols and analytical methods are provided in the Phase III SAP and associated standard operating procedures.
2.13 HEALTH AND SAFETY

“Tailgate” safety meetings for all ABS team members were conducted by an ABS director at the start of each day’s work. Bear deterrent spray, first-aid kits, cooling vests (during hot weather) and water were carried in the ABS team vehicles and made available for use by team members during project work.

ABS participants were equipped with Level C personal protective equipment (PPE) consisting of two sets of hooded Tyvek™ coveralls, full-face respirator, nitrile gloves and latex boot covers. Respirators were fitted with P100 high-efficiency particulate-air (HEPA) filter cartridges.

Because ABS was performed in remote areas far from the project decontamination facility, the outer layer of ABS participants’ PPE was rinsed thoroughly with water from a pressure-washer before they removed their PPE at the ABS base station. Coveralls, boot covers and gloves were disposed of after one use; fresh PPE was donned for ABS at each location, and before each campfire building/burning activity (which was performed at a dedicated burning ground outside the forest). All equipment (trucks, trailers, shovels, etc.) was decontaminated by pressure-washing between each ABS location, and before being transported off forest lands and onto paved roads.