Water Source Identification Study – Phase II
Sampling and Analysis Plan/Quality Assurance Project Plan
Libby Asbestos Superfund Site
Libby, Montana

Revision 0 – April 2012

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Prepared for:

U.S. ENVIRONMENTAL PROTECTION AGENCY
Region 8

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Libby Asbestos Superfund Site
Libby, Montana

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List of Acronyms and Abbreviations

Ago	area of a grid opening
CDM Smith	CDM Federal Programs Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHISQ	chi-squared
COC	chain-of-custody
Cw	water concentration
EDD	electronic data deliverable
EFA	effective filter area
EPA	U.S. Environmental Protection Agency
ERT	Environmental Response Team
ESAT	Environmental Services Assistance Team
DE Tool	data entry tool
DQO	data quality objective
f/L	fibers per liter
FSDS	field sample data sheet
FTL	field team leader
GIS	geographic information system
GOx	number of grid openings examined
GPS	global positioning system
H&S	health and safety
HASP	health and safety plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HDPE	high-density polyethylene
ID	identification
IDW	investigation-derived waste
KDC	Kootenai Development Corporation
L	liters
LA	Libby amphibole
LC	laboratory coordinator
MCL	maximum contaminant level
MDEQ	Montana Department of Environmental Quality
MFL	million fibers per liter
mL	milliliter
mm^2	square millimeters
N	number of asbestos structures counted
NFG	National Functional Guidelines
NIST	National Institute of Standards and Technology
NVLAP	National Voluntary Laboratory Accreditation Program
NYSDOH	New York State Department of Health
OSHA	Occupational Safety and Health Administration
OU	Operable Unit

PM	project manager
QA	quality assurance
QAM	Quality Assurance Manager
QAPP	quality assurance project plan
QA/QC	quality assurance/quality control
QATS	Quality Assurance Technical Support
QC	quality control
ROM	record of modification
RPM	remedial project manager
SAP	sampling and analysis plan
Site	Libby Asbestos Superfund Site
SOP	standard operating procedure
SRM	standard reference material
TAS	target analytical sensitivity
TEM	transmission electron microscopy
um	micrometers
USGS	United States Geological Survey
USACE	United States Army Corps of Engineers
V	volume of water applied to the filter

A Project Management

A3. Distribution List

Copies of this completed/signed sampling and analysis plan/quality assurance project plan (SAP/QAPP) should be distributed to:

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- Thomas Cook, cookte@cdmsmith.com (1 electronic copy)
- Dominic Pisciotta, pisciottadm@cdmsmith.com (3 hard copies, 1 electronic copy)

Copies of this SAP/QAPP will be distributed to the individuals above by CDM Federal Programs Corporation (CDM Smith), either in hard copy or in electronic format (as indicated above). The CDM Smith Project Manager (or their designate) will distribute updated copies each time a SAP/QAPP revision occurs.

A4. Project Task Organization

Figure A-1 presents an organizational chart that shows lines of authority and lines of communication for this project. The following sections summarize the entities and individuals that will be responsible for providing project management, technical support, and quality assurance (QA) for this project.

A4.1 Project Management

The U.S. Environmental Protection Agency (EPA) is the lead regulatory agency for Superfund activities within the Libby Asbestos Superfund Site (Site). The EPA Region VIII Libby Asbestos Project Team Leader is Victor Ketellapper. The EPA Regional Project Manager (RPM) for this sampling effort is Elizabeth Fagen. The EPA Onsite Field Team Leader for this sampling effort is Michael Cirian.

The U.S. Army Corps of Engineers (USACE), Omaha District, provides project management, environmental engineering, and remediation support to EPA at the Site. The USACE Program Manager is Mary Darling. The USACE Construction Control Representatives are Jeremy Ayala, Jeff Hubbard, and Mark Buss.

The Montana Department of Environmental Quality (MDEQ) is the support regulatory agency for Superfund activities at the Site. The MDEQ project manager (PM) for this sampling effort is Carolyn Rutland. EPA will consult with MDEQ as provided for by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the National Contingency Plan, and applicable guidance in conducting Superfund activities.

A4.2 Technical Support

A4.2.1 SAP/QAPP Development

This SAP/QAPP was developed by CDM Smith at the direction of and with oversight by the EPA and the USACE. This SAP/QAPP contains all the elements required for both a SAP and a

QAPP and has been developed in general accordance with the *EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5* (EPA 2001) and the *Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G4* (EPA 2006). The CDM Smith Project Manager (or their designate) is responsible for distributing updated copies of the SAP/QAPP if a revision occurs.

A4.2.2 Field Sampling Activities

CDM Smith will also be responsible for conducting all field sampling activities in support of the sampling program described in this SAP/QAPP. Key CDM Smith personnel that will be involved in this sampling program include:

- Thomas Cook, Site Manager
- Dominic Pisciotta, Field Team Leader
- Tracy Dodge, Field Sample Coordinator
- Scott Miller, Field Data Manager
- Terry Crowell, Quality Assurance Manager
- Damon Repine, Health and Safety Manager

A4.2.3 Asbestos Analysis

All samples of water collected as part of this project will be sent for preparation and analysis for asbestos at laboratories selected and approved by EPA to support the Site. The EPA Environmental Services Assistance Team (ESAT) is responsible for procuring all analytical and preparation laboratory services and providing direction to the analytical laboratories. Don Goodrich (EPA Region 8) is responsible for managing the ESAT laboratory support contract for asbestos. The ESAT Region 8 Team Manager at TechLaw, Inc. is Mark McDaniel. He is also the designated laboratory coordinator for the Libby project that is responsible for directing the analytical laboratories, prioritizing analysis needs, and managing laboratory capacity.

A4.2.4 Data Management

All data generated as part of this sampling effort will be managed and maintained in Scribe. The EPA Environmental Response Team (ERT) is responsible for the administration of all Scribe data management aspects of this project. Joseph Schafer is responsible for overseeing the ERT data management support contract. ERT is responsible for the development and management of Scribe and the project-specific data reporting requirements for the Libby project.

The CDM Smith field data manager (Scott Miller) is responsible for uploading sample information to the field Scribe project database. ESAT is responsible for managing and maintaining analytical data reporting tools and uploading new analytical results to the analytical Scribe project database. The ESAT project data manager for the Libby project is Janelle Lohman (TechLaw, Inc.).

A4.3 Quality Assurance

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

A5. Problem Definition/Background

A5.1 Site Background

Libby is a community in northwestern Montana located 7 miles southwest of a vermiculite mine that operated from the 1920s until 1990. The mine began limited operations in the 1920s and was operated on a larger scale by the W.R. Grace Company from approximately 1963 to 1990. Studies revealed that the vermiculite from the mine contains amphibole-type asbestos, referred to in this SAP/QAPP as Libby amphibole (LA).

Epidemiological studies revealed that workers at the mine had an increased risk of developing asbestos-related lung disease (McDonald *et al.* 1986, Amandus and Wheeler 1987, Amandus *et al.* 1987, Sullivan 2007). Additionally, radiographic abnormalities were observed in 17.8 percent of the general population of Libby including former workers, family members of workers, and individuals with no specific pathway of exposure (Peipins *et al.* 2003). Although the mine has ceased operations, historic or continuing releases of LA from mine-related materials could be serving as a source of on-going exposure and risk to current and future residents and workers in the area. The Site was listed on the Superfund National Priorities List in October 2002.

A5.2 Reasons for this Project

Since 1999, EPA has conducted sampling and cleanup activities at the Site related to asbestos-related health problems in the Libby population. Water is utilized at the Site as part of a variety of response activities, including dust suppression, personal and equipment decontamination, watering lawns, and washing paved roads. Currently, water for use in these activities is collected from the Kootenai River at the City of Libby pump station located in Operable Unit 1

(OU1). In order to reduce truck traffic within OU1, the City of Libby intends to abandon this pump station. As a result, it will be necessary to identify a new water source for use at the Site.

In October 2011, site managers identified 13 potential water source candidates (see **Figure A-2**). At the time, there were little to no data on asbestos concentrations for these potential water sources. Thus, the EPA developed a sampling program to measure asbestos concentrations in water for each of these potential water sources. Because asbestos concentrations in water are influenced by flow variations, this sampling program was separated into two phases to ensure data are representative of both low flow (Phase I) and high flow (Phase II) conditions.

Phase I of the sampling program was performed in November 2011 in accordance with EPA (2011) and measured asbestos concentrations under low flow conditions. A total of 6 field samples were collected at each location as part of the Phase I sampling program; however, only the first sample collected at each station was initially selected for analysis. **Table A-1** presents asbestos water concentrations measured in Phase I samples selected for analysis. As shown, with one exception, all samples were non-detect for asbestos (at an analytical sensitivity of 9,890 L^{-1}). One sample, collected from the Kootenai River adjacent to Kootenai Development Corporation (KDC) flyaway pump house, reported one chryostile structure, resulting in a water concentration of 0.01 million fibers[1] per liter (MFL).

This SAP/QAPP describes Phase II of the sampling program and will seek to collect water samples from each potential water source during high flow conditions. Once asbestos concentrations in each potential water source have been adequately characterized, one or more of these sources will be selected as a replacement water source for use at the Site.

A5.3 Applicable Criteria and Action Limits

The maximum contaminant level[2] (MCL) for asbestos in drinking water is 7 MFL, which is based on fibers longer than 10 micrometers (um) in length. However, the MCL may not be applicable to the intended water uses for anticipated response activities (e.g., use in dust suppression, personal and equipment decontamination, watering lawns, and washing paved roads). At present, there are no asbestos criteria or action limits that apply specifically to the use of water as part of anticipated response activities.

A6. Project/Task Description

A6.1 Task Summary

Basic tasks that are required to implement this SAP/QAPP include collecting water samples at each potential water source identified for evaluation in Phase II and analyzing these samples to

[1] Based on total asbestos (i.e., structures longer than 0.5 um with an aspect ratio greater than or equal to 3:1)
[2] http://water.epa.gov/drink/contaminants/index.cfm#List

provide data on asbestos water concentrations for each source. These basic tasks are described in greater detail in subsequent sections of this SAP/QAPP.

A6.2 Work Schedule

The work schedule for performing these tasks begins with collection of water samples from each potential water source. This task will be completed during the peak high flow period, which is expected to occur in May. Sample analysis and data evaluation and interpretation tasks will be performed in the spring of 2012. The goal is to have the Phase II results summarized and new water source(s) selected as soon as possible in the 2012 removal season.

A6.3 Locations to be Evaluated

The locations where water samples will be collected are described in Section B1.1.

A6.4 Resources and Time Constraints

As noted above, the first time constraint is that Phase II water must be collected during the time period of high flow conditions, which is expected to occur in May. The second time constraint is to obtain the data, evaluate the results, and select a new water source(s) as soon as possible in the 2012 removal season.

A7. Quality Objectives and Criteria

A7.1 Performance Criteria

As noted previously, there are no asbestos criteria or action limits that apply specifically to the use of water as part of anticipated response activities. Data on asbestos concentrations for the potential water source candidates are very limited. However, extensive surface water sampling in streams and creeks in Operable Unit 3 (the mine site) has shown that total LA concentrations in water can be highly variable, ranging from less than 0.1 MFL to over 250 MFL, with maximum concentrations typically observed during high flow conditions. For the purposes of this sampling effort, the analytical requirements established in Section B4 are such that concentrations of LA in water will be reliably detected and quantified if present at levels of 0.05 MFL or higher.

A7.2 Precision

The precision of asbestos measurements is determined mainly by the number (N) of asbestos structures counted in each sample. The coefficient of variation resulting from random Poisson counting error is equal to $1/N^{0.5}$. In general, when good precision is needed, it is desirable to

count a minimum of 3-10 structures per sample, with counts of 20-25 structures per sample being optimal.

A7.3 Bias and Representativeness

It is expected that LA concentrations in water may vary widely as a function of location and meteorological conditions. Consequently, obtaining data that are fully representative of this wide range of potential levels of LA in water is difficult. The water samples that are collected as part of this project will be collected in May during high flow conditions, so LA concentrations in water are likely to be representative of high-end conditions (particularly for the in-stream sampling locations).

A7.4 Completeness

Target completeness for this project is 100 percent. If any samples of water are not collected, or if LA analysis is not completed successfully, this could result in that portion of the study providing no useful information.

A7.5 Comparability

The data generated during this study will be obtained using standard sample collection protocols and analytical methods for LA, and will yield data that are comparable to existing and future analyses of LA in water.

A7.6 Method Sensitivity

The method sensitivity (analytical sensitivity) needed for LA in water is discussed in Section B4.

A8. Special Training/Certifications

A8.1 Field

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

Training Requirement	Location of Documentation Specifying Training Requirement Completion
Read and understand the governing health and safety plan (HASP)	HASP signature sheet
Attend an orientation session with the field health and safety (H&S) manager	Orientation session attendance sheet

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

All training documentation will be stored in the CDM Smith field office. It is the responsibility of the field H&S manager to ensure that all training documentation is up-to-date and on-file for each field team member.

Prior to beginning field sampling activities, a field planning meeting will be conducted to discuss and clarify the following:

- Objectives and scope of the fieldwork
- Equipment and training needs
- Field operating procedures, schedules of events, and individual assignments
- Required quality control (QC) measures
- Health and safety requirements

It is the responsibility of each field team member to review and understand all applicable governing documents associated with this sampling program, including this SAP/QAPP, all associated SOPs (see **Appendix A**), and the applicable HASP.

A8.2 Laboratory

A8.2.1 Certifications

All analytical laboratories participating in the analysis of samples for the Libby project are subject to national, local, and project-specific certifications and requirements. Each laboratory is accredited by the National Institute of Standards and Technology/ National Voluntary Laboratory Accreditation Program (NIST/NVLAP) for the analysis of asbestos by transmission electron microscopy (TEM). This includes the analysis of NIST/NVLAP standard reference materials (SRMs), or other verified quantitative standards, and successful participation in two NIST/NVLAP proficiency rounds per year for TEM.

Copies of recent proficiency examinations from NVLAP or an equivalent program are maintained by each participating analytical laboratory. Many of the laboratories also maintain

certifications from other state and local agencies. Copies of all proficiency examinations and certifications are also maintained by the laboratory coordinator (LC).
Each laboratory working on the Libby project is also required to pass an on-site EPA laboratory audit. The details of this EPA audit are discussed in Section B5.2.3. The LC also reserves the right to conduct any additional investigations deemed necessary to determine the ability of each laboratory to perform the work. Each laboratory also maintains appropriate certifications from the state and possibly other certifying bodies (e.g., New York State Department of Health (NYSDOH)) for methods and parameters that may also be of interest to the Libby project. These certifications require that each laboratory has all applicable state licenses and employs only qualified personnel. Laboratory personnel working on the Libby project are reviewed for requisite experience and technical competence to perform asbestos analyses. Copies of personnel resumes are maintained for each participating laboratory by the LC in the Libby project file.

A8.2.2 Laboratory Team Training/Mentoring Program

Initial Mentoring

The orientation program to help new laboratories gain the skills needed to perform reliable analyses at the Site involves successful completion of a training/mentoring program that was developed for new laboratories prior to their analysis of Libby field samples. All new laboratories are required to participate in this program. The training program includes a rigorous 2-3 day period of on-site training provided by senior personnel from those laboratories already under contract on the Libby project, with oversight by the QATS contractor. The tutorial process includes a review of morphological, optical, chemical, and electron diffraction characteristics of LA, as well as training on project-specific analytical methodology, documentation, and administrative procedures used on the Libby site. The mentor will also review the analysis of at least one sample by each type of analytical method with the trainee laboratory.

Site-Specific Reference Materials

Because LA is not a common form of asbestos, United States Geological Survey (USGS) prepared site-specific reference materials using LA collected at the Libby mine site (EPA 2008a). Upon entry into the Libby program, each laboratory is provided samples of these LA reference materials. Each laboratory is required to analyze multiple LA structures present in these samples by TEM in order to become familiar with the physical and chemical appearance of LA and to establish a reference library of LA EDS spectra. These laboratory-specific and instrument-specific LA reference spectra (EPA 2008b) serve to guide the classification of asbestos structures observed in Libby field samples during TEM analysis.

Regular Technical Discussions

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

Professional/Technical Meetings

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

A8.2.3 Analyst Training

All TEM analysts for the Libby project undergo extensive training to understand TEM theory and the application of standard laboratory procedures and methodologies. The training is typically performed by a combination of personnel, including the laboratory manager, the laboratory quality assurance manager (QAM), and senior TEM analysts.

In addition to the standard TEM training requirements, trainees involved with the Libby project must familiarize themselves with Site-specific method deviations, project-specific documents, and visual references. Standard samples that are often used during TEM training include known pure (traceable) samples of chrysotile, amosite, crocidolite, tremolite, actinolite and anthophyllite, as well as fibrous non-asbestos minerals such as vermiculite, gypsum, antigorite, kaolinite, and sepiolite. New TEM analysts on the Libby project are also required to perform an *EDS Spectra Characterization Study* (EPA 2008b) on the LA-specific reference materials provided during the initial training program to aide in LA mineralogy recognition and definition. Satisfactory completion of each of these tasks must be approved by a senior TEM analyst.

All TEM analysts are also trained in the Site-specific laboratory QA/QC program requirements for TEM. The entire program is discussed to ensure understanding of requirements and

responsibilities. In addition, analysts are trained in the project-specific reporting requirements and data reporting tools utilized in transmitting results. Upon completion of training, the TEM analyst is enrolled as an active participant in the Libby laboratory program.

A training checklist or logbook is used to assure that the analyst has satisfactorily completed each specific training requirement. It is the responsibility of the laboratory QAM to ensure that all TEM analysts have completed the required training requirements.

A9. Documentation and Records

Field teams will record sample information on the most current version of the Site-specific field sample data sheets (FSDSs) developed for water[3]. Section B3.1 provides detailed information on the sample documentation requirements for water samples collected as part of this study. In brief, the FSDS forms document the unique sample identification (ID) number assigned to every surface water sample collected as part of this program. In addition, the FSDSs provide information on whether the sample is representative of a field sample or a field-based QC sample (e.g., field blank, field duplicate). Flow data should be recorded on the Stream Flow (Discharge) Measurement Form provided in the standard operating procedure (SOP) for stream flow measurement (see Section B2.1.2). The field teams will also record information related to sample collection in a field logbook.

All analytical data for asbestos generated in the analytical laboratory will be documented on Site-specific laboratory bench sheets. Section B4.2 provides detailed information on the requirements for laboratory documentation and records. In brief, the data recorded on the bench sheets are entered into a Site-specific electronic data deliverable (EDD) template spreadsheet developed for recording TEM results for surface water[4].

It is the also responsibility of the field team and laboratory staff to maintain logbooks and other internal records throughout the sample lifespan as a record of sample handling procedures. Significant deviations (i.e., those that impact or have the potential to impact investigation objectives) from this SAP/QAPP, or any procedures referenced herein governing sample handling, will be discussed with the EPA Project Manager (or their designate), USACE Construction Control Representative, and CDM Smith Project Manager prior to implementation. Such deviations will be recorded on a Record of Modification (ROM) form. Sections B5.1.2 and B5.2.2 provide detailed information on the procedures for preparing and submitting ROMs by field and analytical laboratory personnel, respectively.

[3] The most recent version of the water FSDS form is provided in the Libby Field eRoom.
[4] The most recent version of the TEM EDD for water is provided in the Libby Lab eRoom.

B Data Generation and Acquisition

B1. Phase II Study Design

B1.1 Sampling Locations

In October 2011, site managers identified 13 potential water source candidates for evaluation in Phase I (see **Figure A-2**), including the following:

1. City pump near Cabinet View Country Club (SP-131927) – sampling point at the Cabinet View Country Club pump house Cabinet View Country Club Road.
2. Libby Creek, upstream of the OU5 fire pond (SP-145700) - sampling point southeast (upstream) of the flume that feeds the OU5 fire pond.
3. Libby Creek, south of the Libby airport (SP-145702) – sampling point northeast of the Hammer Cutoff Road bridge.
4. Pipe Creek, Kootenai River Road (SP–15707) - sampling point on the west side (upstream) of the Kootenai River Road bridge near the standpipe.
5. Pipe Creek, Bobtail Cutoff Road (SP-145709) – sampling point southeast (upstream) of the Bobtail Cutoff Road bridge.
6. Cedar Creek (SP-145706) – sampling point on the west side (upstream) of the US Highway 2 bridge near the standpipe.
7. Cherry Creek (SP-145703) – sampling point on the north side (upstream) of the Granite Creek Road bridge.
8. Kootenai River, upstream of the confluence with Rainy Creek (SP-145711) – sampling point from pump house at the OU2/Flyway property.
9. Granite Creek (SP-145701) – sampling point on the west side of US Highway 2 by the standpipe.
10. Flower Creek (SP-145704) – sampling point on the west side (upstream) of the Balsam Street bridge on the west side of the creek.
11. Parmenter Creek (SP-145705) – sampling point at the southeast corner of the bridge on Dome Mountain Avenue.
12. Quartz Creek (SP-145708) – sampling point upstream of the Kootenai River Road bridge.
13. J. Neils Park (SP-145710) – sampling point at the well vault standpipe in the southeast corner of the soccer fields on County Park Road.

During the Phase I sampling, it was determined that location #1 could not be sampled because the existing pump in the pump house was found to be non-functional, thus it was excluded from further evaluation. Since the Phase I sampling, site managers have determined that locations #3, #7, #10, and #11 are too far from cleanup activities planned for 2012 and excluded them from further evaluation in Phase II. Site managers also identified the following additional water source candidates for use in Troy:

14. Troy county shop hydrant (potable city water)
15. Hydrant located at the corner of West Riverside Avenue across from Roosevelt Park (non-potable water source)

Figure B-1 provides a map that shows the location of each potential water source that will be sampled as part of Phase II. If necessary, any changes in sampling locations should be documented in the field logbook and new global positioning system (GPS) location coordinates should be recorded on the FSDS form. If any sampling locations become inaccessible, this information should be documented in the field logbook.

B1.2 Sampling Frequency

Based on concentration and flow monitoring conducted at a station in lower Rainy Creek, flow rates and concentrations begin to increase in late April, peak in mid-May, and decrease in late May (see **Figure B-2**). It is assumed that most of the candidate water sources will follow a similar time trend.

To ensure that this sampling effort captures the peak run-off period, sampling crews should be prepared to mobilize the week of April 29th; however, sampling should not occur until flow conditions are visually observed to be increasing. This visual observation will be supplemented with a review of the continuous flow monitoring data from the flume[5] located in lower Rainy Creek (LRC-6) and flow information from the USGS gauging station on the Fisher River[6] (Station ID 12302055). Once flow is observed to be increasing, a total of six water samples will be collected from each candidate source within a two-week period. The first three samples will be collected on consecutive days within the first one-week period (e.g., Monday, Tuesday, and Wednesday). The remaining three samples will be collected every other day during the following one-week period (e.g., Monday, Wednesday, and Friday).

In order to capture potential daily fluctuations in asbestos concentrations as a consequence of flow variations, the sample collection time will be varied to best represent potential source water collection times (i.e., the first sample will be collected in the morning, the next sample will be collected in the afternoon, etc.). Because it is not anticipated that the removal contractor would adjust water collection schedules to accommodate weather events, by analogy, no effort will be made to adjust this sampling schedule due to weather events.

B1.3 Study Variables

As demonstrated in **Figure B-2**, asbestos concentrations in water are influenced by flow variations. The Phase I sampling program included the collection water samples during low

[5] This flume and autosampler is operated by Remedium. EPA will coordinate with Remedium to obtain the autosampling data for the flume on a regular basis to help guide field mobilization efforts.
[6] http://waterdata.usgs.gov/mt/nwis/

flow conditions (in November 2011). Thus, the Phase II data, which will be collected during high flow conditions (in May 2012), combined with the data from Phase I, should provide information on the range of variability of asbestos concentrations in water as a function of flow fluctuations.

B1.4 Critical Measurements

The critical measurement associated with this project is the measurement of the concentration of asbestos in water. The analysis of asbestos may be achieved using several different types of microscope, but EPA generally recommends using TEM because this technique has the ability to clearly distinguish asbestos from non-asbestos structures and to classify different types of asbestos (i.e., LA, chrysotile).

To ensure that measured concentration data are representative of high flow conditions, measurements of stream velocity should be made using a portable, electronic flowmeter at the time of sample collection.

B1.5 Data Reduction and Interpretation

Water samples collected in the field will be filtered by the analytical laboratory and the resulting filter will be used to prepare grids for TEM examination (see Section B4). From this examination, the total number of asbestos structures for each type of asbestos is determined and the water concentration is calculated as follows:

$$Cw = (N \cdot EFA) / (GOx \cdot Ago \cdot V \cdot 1E+06)$$

where:

Cw	= Water concentration (MFL)
N	= Number of asbestos structures observed (fibers)
EFA	= Effective filter area (mm^2)
GOx	= Number of grid openings examined
Ago	= Area of a grid opening (mm^2)
V	= Volume of water applied to the filter (L)
1E+06	= Conversion factor (fibers per liter [f/L] --> MFL)

Analysis results from Phase I and II will be used to rank order each candidate water source in order of maximum reported asbestos water concentration (from lowest to highest). Any sources where maximum asbestos water concentrations exceed 7 MFL (based on asbestos structures longer than 10 um) will automatically be excluded from consideration as a water source. Sources where concentrations are consistently non-detect will be given preference to those where detectable levels of asbestos are reported.

The final determination of which of these water sources will be selected for final use will depend upon ease of access, the availability of existing infrastructure, and the proximity to cleanup activities. No additional water source locations may be utilized by the removal contractor without asbestos data. Selected water sources will continue to be monitored in accordance with the requirements specified in the *Response Action SAP* (CDM Smith 2011).

B2. Sampling Methods

B2.1 Sample Collection

B2.1.1 Water

All water samples will be collected using the procedures described in standard operating procedure (SOP) EPA-LIBBY-2012-08, *Surface Water Sampling* (see **Appendix A**). In brief, approximately 200-400 milliliters (mL) of water will be collected for each sample and placed into a 500-mL capacity high-density polyethylene (HDPE) wide-mouth, or equivalent, container. Headspace must be left in the collection container to allow for the ozonation/ultraviolet treatment and sonication of the sample by the analytical laboratory prior to analysis (see Section B4.1). To minimize impacts of field collection activities to subsequent locations downstream, water samples will be collected from downstream to upstream.

B2.1.2 Flow

Flow measurement will be made using a portable, electronic flowmeter device (e.g., Marsh-McBirney) in basic accordance with the EPA Region 6 *SOP for Streamflow Measurement* (see **Appendix A**). Flow data should be recorded on the Stream Flow (Discharge) Measurement Form provided in the SOP.

B2.2 Global Positioning System Coordinate Collection

If not already collected, the GPS location coordinates will be recorded for each water source location in basic accordance with Site-specific SOP CDM-LIBBY-09, *GPS Coordinate Collection and Handling* (see **Appendix A**). Field-collected GPS data are converted to a usable geographic information system (GIS) format using the general processes described in SOP CDM-LIBBY-09. After the conversion from GPS points to GIS files, 100% of the data is checked visually to identify any potential data entry errors.

B2.3 Equipment Decontamination

Equipment used to collect, handle, or measure environmental samples will be decontaminated in basic accordance with SOP EPA-LIBBY-2012-04, *Field Equipment Decontamination* (see **Appendix A**). Materials used in the decontamination process will be disposed of as

investigation-derived waste (IDW) as described below. This SOP specifies the minimum procedural requirements for equipment decontamination. Additional equipment decontamination procedures are also specified in the surface water collection SOP (see SOP EPA-LIBBY-2012-08).

B2.4 Handling Investigation-derived Waste

Any disposable equipment or other IDW will be handled in general conformance with SOP EPA-LIBBY-2012-05, *Handling Investigation-Derived Waste* (see **Appendix A**).

B3. Sample Handling and Custody

B3.1 Sample Identification and Documentation

B3.1.1 Sample Labels

Water samples will be labeled with sample ID numbers supplied by field administrative staff and will be signed out by the sampling teams. The labels will be affixed to the outside of the sample container and covered with a piece of clear packaging tape.

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

2W-#####

where:

2W = Prefix that designates water samples collected under this Phase II SAP/QAPP
= A sequential five-digit number

To avoid potential transcription errors in the field, multiple labels of the same sample ID numbers are prepared – one label is affixed to the collected sample, one label is affixed to the FSDS. Labels may also be affixed to the field logbook.

B3.1.2 Field Sample Data Sheets

As noted previously in Section A9, field teams will record water sample information on the most current version of the Site-specific FSDS for water. Use of standardized forms ensures consistent documentation across samplers. Hard copy FSDSs are location-specific and allow for the entry of up to three individual samples from the same location on the same FSDS form. If columns are left incomplete due to fewer than three samples being recorded on a sheet, the blank columns will be crossed out, dated, and signed by the field team member completing the FSDS. Erroneous information recorded on a hard copy FSDS will be corrected with a single line

strikeout, initial, and date. The correct information will be entered in close proximity to the erroneous entry.

FSDS information will be completed in the field before field personnel leave the sampling location. To ensure that all applicable data is accurately entered and all fields are complete, a different field team member will check each FSDS. The team member completing the hard copy form and the team member checking the form will initial the FSDS in the proper fields. In addition, the field team leader (FTL) will also complete periodic checks of FSDSs prior to relinquishment of the samples to the field sample coordinator. Once FSDSs and samples are relinquished to the field sample coordination staff, the FSDSs are again checked for accuracy and completeness when data are input into the local Scribe field database.

If a revision is required to the hard copy FSDS during any of these checks, it will be returned to the field team member initially responsible for its completion. The error will be explained to the team member and the FSDS corrected. If the team member is no longer on site, revisions will be made by sample coordination staff or the FTL. It is the responsibility of the field data manager to make the appropriate change in the local Scribe field database.

Each hard copy FSDS is assigned a unique sequential number. This number will be referenced in the field logbook entries related to samples recorded on individual sheets. Field administrative staff will manage the hard copy FSDSs in their respective field office. Original FSDSs will be filed by medium and FSDS number. Hard copies of all FSDS forms will also be sent to the CDM Smith office in Denver, Colorado for archive.

B3.1.3 Field Logbooks

The field logbook is an accounting of activities at the Site and will duly note problems or deviations from the governing documents. Field logbooks will be maintained in general conformance with SOP EPA-LIBBY-2012-01, *Field Logbook Content and Control* (see **Appendix A**).

Separate field logbooks will be kept for each investigation and the cover of each field logbook will clearly indicate the name of the investigation and its sequence number. Field logbooks will be completed for each investigation activity prior to leaving a sampling location. Field logbooks will be checked for completeness and adherence to SOP requirements on a daily basis by the FTL or their designate for the first week of each investigation. When incorrect field logbook completion procedures are discovered during these checks, the errors will be discussed with the author of the entry and corrected. Erroneous information recorded in a field logbook will be corrected with a single line strikeout, initial, and date. The correct information will be entered in close proximity to the erroneous entry.

The field administrative staff will manage the field logbooks by assigning unique identification numbers to each field logbook, tracking to whom and the date each field logbook was assigned, the general investigation activities recorded in each field logbook (e.g., ambient air monitoring),

and the date when the field logbook was returned. As field logbooks are completed, originals will be catalogued and maintained by the field administrative staff in their respective field office. Scanned copies of field logbooks will be maintained on the local servers for the CDM Smith offices in Libby and Denver.

B3.2 Field Sample Custody

All teams will ensure that samples, while in their possession, are maintained in a secure manner to prevent tampering, damage, or loss. All samples and FSDSs will be relinquished by field staff to the field sample coordinator or a designated secure sample storage location at the end of each day.

B3.3 Chain-of-Custody Requirements

The chain-of-custody (COC) is used as physical evidence of sample custody and control. This record system provides the means to identify, track, and monitor each individual sample from the point of collection through final data reporting. A complete COC record is required to accompany each shipment of samples. COC procedures will follow the requirements as stated in SOP EPA-LIBBY-2012-06, *Sample Custody* (see **Appendix A**).

At the end of each day, all samples will be relinquished to the field sample coordinator or a designated secure storage location by the sampling team following COC procedures, and an entry will be made into the field logbook indicating the time samples were relinquished and the sample coordinator who received the samples. The field sample coordinator will follow COC procedures to ensure proper sample custody between acceptance of the sample from the field teams to delivery or shipment to the laboratory.

A member of the sample coordination staff will manually enter sample information from the hard copy FSDS into the local Scribe field project database using a series of standardized data entry forms developed in Microsoft Access by ESAT, referred to as the sample Data Entry Tool, or the "DE Tool". The DE Tool has a variety of built-in QC functions that improve accuracy of data entry and help maintain data integrity. After the data entry is checked against the hard copy FSDSs (by a different sample coordination staff member than completed the original data entry), the DE Tool is used to prepare an electronic COC. A three-page carbon copy COC will be generated from the electronic COC. The field sample coordinator will retain one hard copy of the COC for the project file; the other two hard copies of the COC will accompany the sample shipment.

The field sample coordinator will note the analytical priority level for the samples (based on consultation with the LC) at the top of the COC. A copy of the investigation-specific Analytical Requirements Summary Sheet (see **Appendix B**) will also accompany each COC.

If any errors are found on a COC after shipment, the hard copy of the COC retained by the field sample coordinator will be corrected with a single strikeout, initial, and date. A copy of the corrected COC will be provided to the LC for distribution to the appropriate laboratory. It is the responsibility of the field data manager to make any corrections to the local Scribe field project database. Sample and COC information will be published to Scribe.NET regularly from the local Scribe field project database by the field data manager (see Section B10.1 for additional details).

B3.4 Sample Packaging and Shipping

Samples will be packaged and shipped in general accordance with SOP EPA-LIBBY-2012-07, *Packaging and Shipping of Environmental Samples* (see **Appendix A**).

A custody seal will be placed over at least two sides of the shipping cooler and then secured by tape. Prior to sealing the shipping container, the sample coordinator will perform a final check of the contents of the shipment with the COC, sign and date the designated spaces at the bottom of the COC. The field sample coordinator will then place the custody seals on the shipping container.

The field sample coordinator will be responsible for sending samples to the appropriate location, as specified by the LC. With the exception of samples that are hand-delivered to the EMSL Mobile Laboratory in Libby, all samples will be sent to the Troy SPF subsequent shipment to the appropriate analytical laboratory, or archive.

Samples will be hand-delivered, picked up by a courier service, or shipped by a delivery service to the designated location, as applicable. For hand-deliveries and courier pickups, samples will be packaged for transit such that they are contained and secure (i.e., will not be excessively jostled). Clean plastic totes with the lids secured or sample coolers may be used for this purpose. For samples requiring shipment, an established overnight delivery service provider (e.g., Federal Express) will be used.

B3.5 Holding Times

Because sample preparation will include techniques to address any issues related to holding time (see Section B4.1), there are no holding time requirements for water samples collected as part of this sampling program.

B3.6 Archival and Final Disposition

All samples and grids will be maintained in storage at the analytical laboratory unless otherwise directed by EPA. When authorized by EPA, the laboratory will be responsible for proper disposal of any remaining samples, sample containers, shipping containers, and packing materials in accordance with sound environmental practice, based on the sample analytical

results. The laboratory will maintain proper records of waste disposal methods, and will have disposal company contracts on file for inspection.

B4. Analytical Methods

B4.1 Analysis of LA in Water

B4.1.1 Sample Preparation

All water samples should be prepared for asbestos analysis in basic accordance with the techniques in EPA Method 100.2, as modified by Libby Laboratory Record of Modification (ROM)[7] LB-000020A. In brief, all water samples will be prepared using an ozone/ultraviolet treatment that oxidizes organic matter that is present in the water or on the walls of the bottle, destroying the material that causes clumping and binding of asbestos structures. Following treatment, an aliquot of water (generally about 50 milliliters) will be filtered through a 25-millimeter diameter polycarbonate filter with a pore size of 0.1 um with a mixed cellulose ester filter (0.45 um pore size) used as a support filter.

B4.1.2 Analysis Method

Approximately one quarter of the filter will be used to prepare a minimum of three grids using the grid preparation techniques described in Section 9.3 of ISO 10312:1995(E). Grids will be examined by TEM in basic accordance with the recording procedures described in ISO 10312:1995(E), as modified by the most recent versions of Libby Laboratory ROMs LB-000016, LB-000029, LB-000066, LB-000067, and LB-000085.

B4.1.3 Counting Rules

All structures with fibrous morphology, an x-ray diffraction pattern consistent with amphibole asbestos, an energy dispersive spectrum consistent with LA, length greater than or equal to 0.5 um, and an aspect ratio (length:width) greater than or equal to 3:1 will be counted and recorded. If observed, chrysotile structures will be recorded, but chrysotile structure counting may stop after 50 structures have been recorded.

B4.1.4 Target Analytical Sensitivity

The level of analytical sensitivity needed to ensure that analysis of water samples will be adequate is derived by finding the concentration of LA in water that might be of potential concern, and then ensuring that if a water sample were encountered that had a true concentration equal to that level of concern, it would be quantified with reasonable accuracy. As noted previously, there are no asbestos criteria or action limits that apply specifically to the

[7] Copies of the most recent versions of all Libby Laboratory ROMs are provided in the Libby Lab eRoom.

use of water as part of anticipated response activities. Thus, for the purposes of planning this sampling effort, the analytical requirements for LA measurements were derived such that concentrations of LA in water will be reliably detected and quantified if present at levels of 0.05 MFL (50,000 f/L).

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

$$TAS = \text{Target Conc} / \text{Target Count}$$

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

$$\text{Probability of detection} = 1 - \text{Poisson}(0, \text{Target Count})$$

Assuming a minimum detection frequency of 99 percent, the target count is 5 fibers. Based on this, the target analytical sensitivity is:

$$TAS = (50{,}000 \text{ f/L}) / (5 \text{ fibers}) = 10{,}000 \text{ L}^{-1}$$

The number of grid openings that must be examined (GOx) to achieve the TAS is calculated as:

$$GOx = EFA / (TAS \cdot Ago \cdot V)$$

where:

GOx = Number of grid openings
EFA = Effective filter area (assumed to be 1295 square millimeters [mm^2])
TAS = Target analytical sensitivity $(L)^{-1}$
Ago = Grid opening area (assumed to be 0.013 mm^2)
V = Water volume applied to the filter (L)

Assuming that 0.1 L of water is able to be applied to the filter, the number of grid openings that will need to be examined for each water sample to achieve the TAS is about 100.

B4.1.5 Stopping Rules

The TEM stopping rules for this program are as follows:

Examine at least two grid openings from each of two grids. Continue examining grid openings until one of the following stopping rules is achieved:

1. An analytical sensitivity of 10,000 L^{-1} has been achieved.
2. A total of 100 asbestos structures have been observed. In this case, finish examining the grid opening with the 100th structure, then stop.
3. A total of 1.0 mm^2 of filer area has been examined (this is approximately 100 grid openings).

An analytical requirements summary sheet (**WATER-0412**), which details the specific analytical requirements associated with this sampling program, is provided in **Appendix B**. A copy of this summary sheet will be submitted with each COC.

B4.2 Data Reporting

Detailed raw structure data will be recorded and results transmitted using the standard Libby project EDD spreadsheet for reporting TEM results for water samples[8]. Standard project data reporting requirements will be met for this dataset. EDD spreadsheets will be transmitted electronically (*via* email) to the following:

- Doug Kent, Kent.Doug@epa.gov
- Janelle Lohman, Lohman.Janelle@epa.gov
- Tracy Dodge, DodgeTA@cdmsmith.com
- Phyllis Haugen, HaugenPJ@cdmsmith.com
- Libby project email address for CDM Smith, libby@cdmsmith.com

B4.3 Analytical Turn-around Time

Analytical turn-around time will be negotiated between the EPA LC and the laboratory at the time the samples are shipped. In general, because of the need to identify a new water source as soon as possible, it is anticipated that a turn-around times of less than 1 week may be needed, but this may be revised as determined necessary by EPA.

B4.4 Custody Procedures

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

Upon receipt at the facility, each sample shipment will be inspected to assess the condition of the shipment and the individual samples. This inspection will include verifying sample integrity. The accompanying COC record will be cross-referenced with all of the samples in the

[8] The most current version of the TEM EDD for water is provided in the Libby Lab eRoom.

shipment. The laboratory sample coordinator will sign the COC record and maintain a copy for their project files.

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

B5. Quality Assurance/Quality Control

B5.1 Field

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

B5.1.1 Training

Before performing field work in Libby, field personnel are required to read all governing field guidance documents relevant to the work being performed and attend a field planning meeting specific to the Phase II sampling effort. Additional information on field training requirements is provided in Section A8.1.

B5.1.2 Modification Documentation

All field deviations from and modifications to this SAP/QAPP will be recorded on the Libby field ROM Form (see **Appendix C**). The ROM forms will be used to document all permanent and temporary changes to procedures contained in guidance documents governing investigation work that have the potential to impact data quality or usability. Any minor deviations (i.e., those that will not impact data quality or usability) will be documented in the field logbooks. ROMs are completed by the FTL overseeing the investigation/activity, or by assigned field or technical staff. As modifications to governing documents are implemented, the FTL will communicate the changes to the field teams conducting activities associated with the modification.

Each completed field ROM is assigned a unique sequential number (e.g., LFO-000026) by the CDM Smith field QAM. A ROM tracking log for all field modifications is maintained by the field QAM. This tracking log briefly describes the ROM being documented, as well as ROM author, the reviewers, and date of approval. Once a form is prepared, it is submitted to the

appropriate EPA RPM for review and approval. Copies of approved ROMs are available in the Libby Field eRoom.

B5.1.3 Field Surveillances and Audits

Field surveillances consist of periodic observations made performed by the FTL (or their designate) to evaluate continued adherence to investigation-specific governing documents. The schedule for performing field surveillances is dependent on the duration of the investigation, frequency of execution, and magnitude of process changes. Because this sampling program is similar to the Phase I sampling program implemented in November 2011, and a field surveillance was conducted during the Phase I sampling with no critical deficiencies identified, it is not anticipated that a field surveillance will be performed for the Phase II sampling program. However, field surveillances may be conducted if field processes are revised or other QA/QC procedures indicate potential deficiencies.

Field audits are broader in scope than field surveillances and are evaluations conducted by qualified technical or QA staff that are independent of the activities audited. Field audits can be conducted by CDM Smith, internal EPA or USACE staff, or the EPA contracted auditors. It is not anticipated that a field audit will be performed of the Phase II sampling program.

B5.1.4 Field QC Samples

Two types of field QC samples will be collected for surface water as part of this sampling program – field blanks and field duplicates.

<u>Field Blank</u>

A field blank is a sample of the same medium as field samples, but which does not contain any contaminant. A field blank for water shall be prepared by placing 400 mL of clean water (e.g., store bought drinking water) into the same type of sample collection container as the field samples. Field blanks will be collected at a frequency of one field blank per field team per day. It is the responsibility of the FTL to ensure that the appropriate number of field blanks is collected. Field blanks will be given a unique sample number and will be specified as a field blank on the FSDS. The field blanks will be analyzed for asbestos fibers by the same method as will be used for field sample analysis. One field blank per week, chosen at random by the sample coordinator, is analyzed for each investigation. The field blanks will be analyzed for asbestos fibers by the same method as will be used for field sample analysis.

If asbestos is observed on the analyzed field blank, all other field blanks collected by that team during that week will be submitted for analysis to determine the potential impact on the related sample results. If any asbestos structures are observed on a field blank, the FTL and/or laboratory manager will be notified and will take appropriate measures to ensure staff are employing proper sample handling techniques. In addition, a qualifier of "FB" will be added to

the related field sample results in the project database to denote that the associated field blank had asbestos structures detected.

Field Duplicate

Field duplicates for water are a second 400-mL water sample collected sequentially from the same station as the parent sample. The field duplicate is collected using the same collection technique as the parent sample. Water field duplicate samples will be collected at a rate of 1 field duplicate per 20 field samples (5%). It is the responsibility of the FTL to ensure that the appropriate number of field duplicates is collected. Each field duplicate is given unique sample number, and field personnel record the Sample number of the associated co located sample in the parent sample number field of the FSDS. The same station location is assigned to the field duplicate sample as the parent field sample. Field duplicates will be sent for analysis by the same method as field samples and are blind to the analytical laboratories (i.e., the laboratory cannot distinguish between field samples and field duplicates).

Field duplicate results will be compared to the original parent field sample using the Poisson ratio test using a 90% confidence interval (Nelson 1982). Because field duplicate samples are expected to have inherent variability that is random and may be either small or large, typically, there is no quantitative requirement for the agreement of field duplicates. Rather, results are used to determine the magnitude of this variability to evaluate data usability. In general, if more than 20% of field duplicate samples for an investigation are determined to be statistically different, the data usability assessment should alert data users to this inherent variability.

B5.2 Laboratory

Laboratory QA/QC activities include all processes and procedures that have been designed to ensure that data generated by an analytical laboratory are of high quality and that any problems in sample preparation or analysis that may occur are quickly identified and rectified. The following sections describe each of the components of the analytical laboratory QA/QC program implemented at the Site.

B5.2.1 Training/Certifications

All analytical laboratories participating in the analysis of samples for the Libby project are subject to national, local, and project-specific certifications and requirements. Additional information on laboratory training and certification requirements is provided in Section A8.2.

Laboratories handling samples collected as part of this sampling program will be provided a copy of and will adhere to the requirements of this SAP/QAPP. Samples collected under this SAP/QAPP will be analyzed in accordance with standard EPA and/or nationally-recognized analytical procedures (i.e., Good Laboratory Practices) in order to provide analytical data of known quality and consistency.

B5.2.2 Modification Documentation

All deviations from project-specific and method guidance documents will be recorded on the Libby laboratory ROM Form (see **Appendix C**). The laboratory ROM will be used to document all permanent and temporary changes to analytical procedures when changes or revisions are needed to improve or document specifics about analytical methods or procedures used by the laboratory. The laboratory ROM form provides a standardized format for tracking procedural changes in sample analysis and allows project managers to assess potential impacts on the quality of the data being collected. Laboratory ROMs will be completed by the appropriate laboratory or technical staff. As ROMs are completed, it is the responsibility of the LC to communicate any changes to the project laboratories.

Each completed laboratory ROM is assigned a unique sequential number (e.g., LB-000026) by the QATS contractor. A laboratory ROM tracking log for all field modifications is maintained by the QATS contractor. This tracking log briefly describes the ROM being documented, as well as ROM author, the reviewers, and date of approval. Once a form is prepared, it is submitted to the appropriate EPA RPM for review and approval. Copies of approved ROMs for this SAP/QAPP are available in the Libby Lab eRoom.

B5.2.3 Laboratory Audits

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

<u>External Audits</u>

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

Evaluation of the capability for a laboratory to analyze a sample by a specific method is made by observing analysts performing actual sample analyses and interviewing each analyst responsible for the analyses. Observations and responses to questions concerning items on each

method-specific checklist are noted. The determination as to whether the laboratory has the capability to analyze a sample by a specific method depends on how well the analysts follow the protocols detailed in the formal method, how well the analysts follow the laboratory-specific method SOPs, and how the analysts respond to method-specific questions.

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

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

It is the responsibility of the QATS contractor to prepare an On-Site Audit Trend Analysis Report on an annual basis. This report shall include a compilation and trend analysis of the on-site audit findings and recommendations. The purpose of this reported is to identify common asbestos laboratory performance problems and isolate the potential causes.

<u>Internal Audits</u>

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

B5.2.4 Laboratory QC Analyses

The Libby-specific QC requirements for TEM analyses of asbestos are patterned after the requirements set forth by National Voluntary Laboratory Accreditation Program (NVLAP). In brief, there are three types of laboratory-based QC analyses for TEM – laboratory blanks, recounts, and repreparations. Detailed information on the Libby-specific requirements for each type of TEM QC analysis, including the minimum frequency rates, selection procedures, acceptance criteria, and corrective actions are provided in the most recent version of Libby Laboratory Modification LB-000029.

With the exception of inter-laboratory analyses, it is the responsibility of the laboratory manager to ensure that the proper number of TEM QC analyses are completed. Inter-laboratory analyses for TEM will be selected *post hoc* by the QATS contractor or their designate in accordance with the selection procedures presented in LB-000029. The LC will provide the list of selected inter-laboratory analyses to the laboratory manager and will facilitate the exchange of samples between the analytical laboratories.

B6/B7. Instrument Maintenance and Calibration

B6/B7.1 Field Equipment

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

B6/B7.2 Laboratory Instruments

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

B8. Inspection/Acceptance of Supplies and Consumables

B8.1 Field

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

The only specialized equipment necessary for Phase II sampling activities is an adequate supply of 1-liter capacity HDPE sampling containers and a Marsh-McBirney portable flow meter.

B8.2 Laboratory

The laboratory manager is responsible for ensuring that all reagents and disposable equipment used in this project is free of asbestos contamination. This is demonstrated by the collection of laboratory blank samples, as described in Section B5.

B9. Non-Direct Measurements

As noted in Section B1.5 above, analysis results from Phase II will be combined with data from the Phase I sampling effort and will be used to determine which of the candidate water sources will be selected as the replacement(s) for the OU1 pump station. Because the Phase I results were collected and analyzed using procedures that are equivalent to those specified in this SAP/QAPP, these data are comparable and appropriate for use. The Phase I results were obtained by querying the appropriate Scribe project databases (see **Table A-1** for a summary of the Phase I results).

B10. Data Management

The following subsections describe the field and analytical laboratory data management procedures and requirements for this investigation. These subsections also describe the project databases utilized to manage and report data from this investigation. Detailed information regarding data management procedures and requirements can be found in the *EPA Data Management Plan* for the Libby Asbestos Superfund Site (EPA 2012).

B10.1 Field Data Management

Scribe is a software tool developed by ERT to assist in the process of managing environmental data. A Scribe project is a Microsoft Access database. Data for the Site are captured in various Scribe projects. Additional information regarding Scribe and the Libby Scribe project databases is discussed in Section B10.3.

The field data manager utilizes a "local" field Scribe project database (i.e., LibbyCDM_Field.mdb) to maintain field sample information. The term "local" denotes that the database resides on the server or personal computer of the entity that is responsible for the creating/managing the database. It is the responsibility of the field data manager to ensure that all local field Scribe project databases are backed-up nightly to a local server.

Field sample information from the FSDS is manually entered by a member of the field sample coordination staff using a series of standardized data entry forms (i.e., DE Tool). This tool is a

Microsoft Access database that was originally developed by ESAT. The DE Tool is currently maintained by CDM Smith and resides on the local server in the Libby field office. This tool is used to prepare an electronic COC. Data in the DE Tool are imported into the local field Scribe project database by the field data manager.

It is the responsibility of the field data manager to "publish" sample and COC information from the local field Scribe database to Scribe.NET on a daily basis. It is not until a database has been published via Scribe.NET that it becomes available to external users.

B10.2 Analytical Laboratory Data Management

The analytical laboratories utilize several standardized data reporting tools developed specifically for the Libby project to ensure consistency between laboratories in the presentation and submittal of analytical data. In general, a unique Libby-specific EDD has been developed for each analytical method and each sampling medium. Electronic copies of all current EDD templates are provided in the Libby Lab eRoom.

Once the analytical laboratory has populated the EDD with results, the spreadsheet(s) are transmitted via email to the ESAT LC, the ESAT project data manager, and the FTL (or their designate). (Other email recipients may also be specified by the ESAT LC).

The ESAT project database manager utilizes a local analytical Scribe project database (i.e., LibbyLab2012.mdb) to maintain analytical results information. The EDDs are uploaded directly into the analytical Scribe project database. It is the responsibility of the ESAT project data manager to publish analytical results information from the local analytical Scribe database to Scribe.NET.

B10.3 Libby Project Database

As noted above, Scribe is a software tool developed by ERT to assist in the process of managing environmental data. A Scribe project is a Microsoft Access database. Multiple Scribe projects can be stored and shared through Scribe.NET, which is a web-based portal that allows multiple data users controlled access to Scribe projects. Local Scribe projects are "published" to Scribe.NET by the entity responsible for managing the local Scribe project. External data users may "subscribe" to the published Scribe projects via Scribe.NET to access data. Subscription requests are managed by ERT.

All data collected for this investigation will be maintained in Scribe. As discussed above, data will be are captured in various Scribe project databases, including a field Scribe project (i.e., LibbyCDM_Field.mdb) and an analytical results Scribe project (i.e., LibbyLab2012.mdb).

B10.4 Data Reporting

Data users can access data for the Libby project through Scribe.NET. To access data, a data user must first download the Scribe application from the EPA ERT website[9]. The data user must then subscribe to each of the published Scribe projects for the Site using login and password information that are specific to each individual Scribe project. Scribe subscriptions for the Libby project are managed by ERT. Using the Scribe application, a data user may download a copy of any published Scribe project database to their local hard drive. It is the responsibility of the data user to regularly update their local copies of the Libby Scribe projects via Scribe.NET.
The Scribe application provides several standard queries that can be used to summarize and view results within an individual Scribe project. However, these standard Scribe queries cannot be used to summarize results across multiple Scribe projects (e.g., it is not possible to query both the "LibbyCDM_Field" project and the "LibbyLab2012" project using these standard Scribe queries).
If data users wish to summarize results across multiple published Scribe projects, there are two potential options. Data users may request the development of a "combined" project from ERT. This combined project compiles tables from multiple published Scribe projects into a single Scribe project. This allows data users to utilize the standard Scribe queries to summarize and view results.

Alternatively, data users may download copies of multiple published Scribe project databases for the Site and utilize Microsoft Access to create user-defined queries to extract the desired data across Scribe projects. This requires that the data user is proficient in Microsoft Access and has an intimate knowledge of proper querying methods for asbestos data for the Site.

It is the responsibility of the data users to perform a review of results generated by any data queries and standard reports to ensure that they are accurate, complete, and representative. If issues are identified by the data user, they should be reported to the ESAT project data manager for resolution through a Data Management Request form (see **Appendix D**). It is the responsibility of the ESAT project data manager to notify the appropriate entity (e.g., field, Troy SPF, analytical laboratory) in order to rectify the issue. A follow-up email will be sent to the party reporting the issue to serve as confirmation that a resolution has been reached and any necessary changes have been made.

[9] http://www.ertsupport.org/scribe_home.htm

C Assessment and Oversight

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

C1. Assessment and Response Actions

C1.1 Assessments

System assessments are qualitative reviews of different aspects of project work to check the use of appropriate QC measures and the general function of the QA system. Field and office system assessments will be performed under the direction of CDM Smith's QA Director, with support from the CDM Smith QAM. As noted previously, it is anticipated that no field audits or surveillances will be performed for the Phase II sampling program. However, field surveillances may be conducted if field processes are revised or other QA/QC procedures indicate potential deficiencies. Laboratory system assessments/audits will be coordinated by the EPA.
Performance assessments for the laboratories may be accomplished by submitting blind reference material (i.e., performance evaluation samples). These assessment samples are samples with known concentrations that are submitted to the laboratories without identifying them as such to the laboratories. Performance assessments will be coordinated by the EPA.

C1.2 Response Actions

Corrective response actions will be implemented on a case-by-case basis to address quality problems. Minor actions taken to immediately correct a quality problem will be documented in the applicable field or laboratory logbooks and a verbal report will be provided to the appropriate manager (e.g., the FTL or EPA LC). Major corrective actions will be approved by the EPA Remedial Project Manager and the appropriate manager prior to implementation of the change. Major response actions are those that may affect the quality or objective of the investigation. EPA project management will be notified when quality problems arise that cannot be corrected quickly through routine procedures.

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

C2. Reports to Management

No regularly-scheduled written reports to management are planned as part of this project. However, QA reports will be provided to management for routine audits and whenever quality problems are encountered. Field staff will note any quality problems on FSDSs or in field

logbooks. Further, the CDM Smith project manager will inform EPA project management upon encountering quality issues that cannot be immediately corrected. Weekly reports and change request forms are not required for work performed under this SAP/QAPP.

D Data Validation and Usability

D1/D2. Data Review, Verification and Validation

D1/D2.1 Data Review

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

D1/D2.2 Criteria for LA Measurement Acceptability

Several factors are considered in determining the acceptability of LA measurements in surface water samples analyzed by TEM. This includes the following:

- *Evenness of filter loading.* This is evaluated using a chi-squared (CHISQ) test, as described in ISO 10312 Annex E. If a filter fails the chi-square test for evenness, the result may not be representative of the true concentration in the sample, and the results should be given low confidence.

- *Results of QC samples.* This includes both field and laboratory QC samples, such as field and laboratory blank samples, field duplicates, and various types of recount and re-preparation analyses. If significant LA contamination is detected in field or laboratory blanks, all samples prepared on that day should be considered to be potentially biased high and will be appropriately qualified. If agreement between original analyses and field or laboratory duplicates (i.e., repreparations, recount analyses) is poor, results for those samples should be given low confidence.

D1/D2.3 Data Verification Method

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

For analytical laboratories that utilize the Libby-specific EDD spreadsheets, data checking of reported analytical results begins with automatic QC checks that have been built into the spreadsheets. In addition to these automated checks, a detailed manual data verification efforts will be performed for 10% of all surface water samples and analysis results. This data verification process utilizes Site-specific SOPs developed to ensure TEM results and field sample information in the OU3 database are accurate and reliable:

- EPA-LIBBY-09 – SOP for TEM Data Review and Data Entry Verification – This Site-specific SOP describes the steps for the verification of TEM analyses, based on a review of the laboratory benchsheets, and verification of the transfer of results from the benchsheets into the project database.

- EPA-LIBBY-11 - SOP for FSDS Data Review and Data Entry Verification – This Site-specific SOP describes the steps for the verification of field sample information, based on a review of the FSDS form, and verification of the transfer of results from the FSDS forms into the project database. An FSDS review is performed on all samples selected for TEM data verification.

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

Data verification will be performed by appropriate technical staff that are familiar with project-specific data reporting, analytical methods, and investigation requirements. The data verifier will prepare a data verification report (template reports are included in the SOPs) to summarize any issues identified and necessary corrections. A copy of this report will be provided to the appropriate project data manager, LC, and the EPA RPM. The data verifier will also complete and submit a Data Management Request form (see **Appendix D**), including any electronic files summarizing identified discrepancies, to the ESAT project data manager for resolution. A follow-up email will be sent to the party reporting the issue to serve as confirmation that a resolution has been reached.

It is the responsibility of the ESAT project data manager to coordinate with the FTL and/or LC to resolve any project database corrections and address any recommended field or laboratory procedural changes from the data verifier. The ESAT project data manager is also responsible for electronically tracking in the project database which data have been verified, who performed the verification, and when.

D1/D2.4 Data Validation Method

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

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

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

A comprehensive data validation effort should be completed quarterly and results should be reported as a technical memorandum. This technical memorandum shall detail the validation procedures performed and provide a narrative on the quality assessment for each type of asbestos analysis, including the data qualifiers assigned, and the reason(s) for these qualifiers. The technical memorandum shall detail any deficiencies and required corrective actions.

The QATS contractor will also prepare an annual addendum to the *Quality Assurance and Quality Control Summary Report for the Libby Asbestos Superfund Site* (CDM Smith 2011) to summarize results of the quarterly data validation efforts. This addendum should include a summary of any data qualifiers that are to be added to the project database to denote when results do not meet NFG guidelines and/or project-specific acceptance criteria. This addendum should also include recommendations for Site QA/QC program changes to address any data quality issues.

The data validator will complete and submit a Data Management Request form (see **Appendix D**) for each data validation effort to the ESAT project data manager. This form should include a summary of the records that have been validated, the date they were validated, any recommended data qualifiers, and their associated reason codes. It is the responsibility of the ESAT project data manager to ensure that the appropriate data qualifiers and reason codes recommended by the data validator are added to the project database, and to electronically track in the project database which data have been validated, who performed the validation, and when.

In addition to performing quarterly data validation efforts, it is the responsibility of the QATS contractor (or their designate) to perform a regular evaluation of all field blanks and SPF preparation blanks, to ensure that any potential contamination issues are quickly identified and

resolved. If any blank contamination is noted, the QATS contractor should immediately contact the appropriate field QAM or SPF QAM to ensure that corrective actions are made.

D3. Reconciliation with User Requirements

It is the responsibility of data users to perform a data usability assessment to ensure that data quality objectives (DQOs) have been met, and reported investigation results are adequate and appropriate for their intended use. This data usability assessment should utilize results of the data verification and data validation efforts to provide information on overall data quality specific to each investigation.

The data usability assessment should evaluate results with regard to several data usability indicators. **Table D-1** summarizes several indicators of data usability and presents general evaluation methods for each indicator. Depending upon the nature of the investigation, other evaluation methods may also be appropriate. The data usability assessment results and conclusions should be included in any investigation-specific data summary reports.

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

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FIGURES

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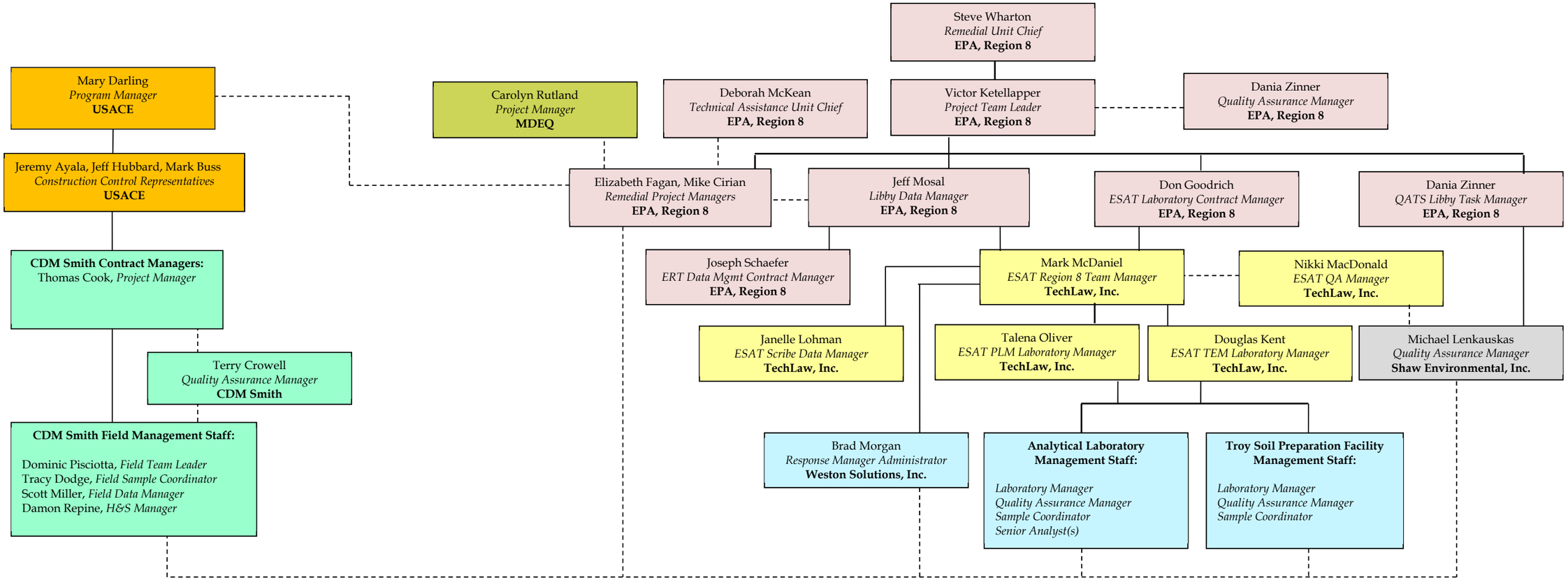

Figure A-1. Organizational Chart for the Phase II Water Source Study

EPA Region 8 Staff
USACE Staff
MDEQ Staff
CDM Smith Staff
TechLaw Staff
TechLaw Subcontractors
Shaw Staff
Lines of authority
Lines of communication

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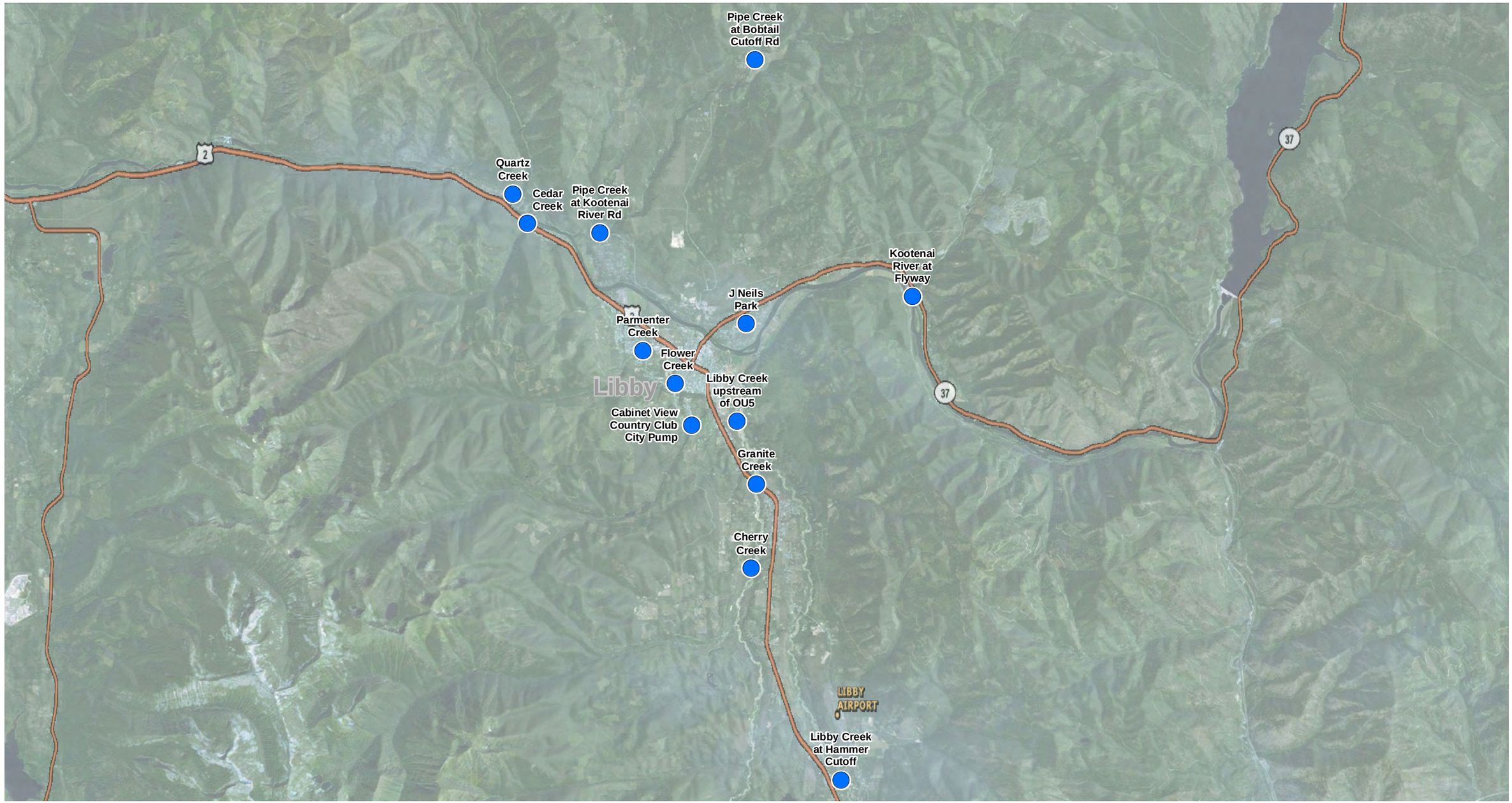

Legend

Water Source Location

3 1.5 0 3 6

Miles

1 inch = 3 miles

Map Date: 3/6/2012

Figure A - 2
Map of Water Source Sampling Locations Evaluated in Phase I
Libby Asbestos Project
Libby, Montana

CDM Smith

CDM Map File: R:\2603-Volpe\Libby\GIS\MXD\WaterSources_111007.mxd

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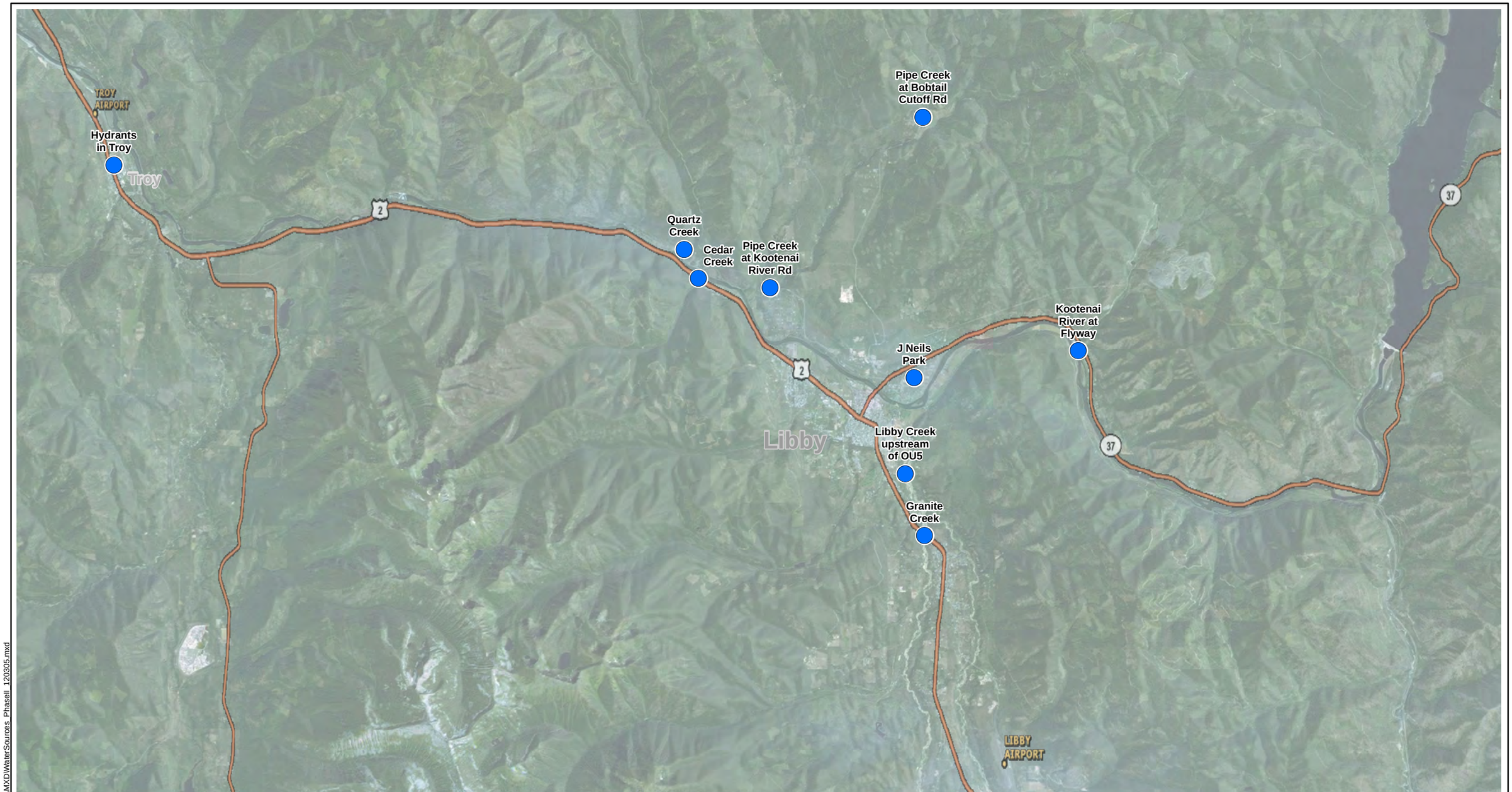

Legend

Water Source Location

3 1.5 0 3 6

Miles
1 inch = 3 miles

Map Date: 3/7/2012

Figure B - 1
Map of Water Source Sampling Locations for Evaluation in Phase II
Libby Asbestos Project
Libby, Montana

CDM Smith

CDM Map File: R:\2603-Volpel\Libby\GIS\MXD\WaterSources_PhaseII_120305.mxd

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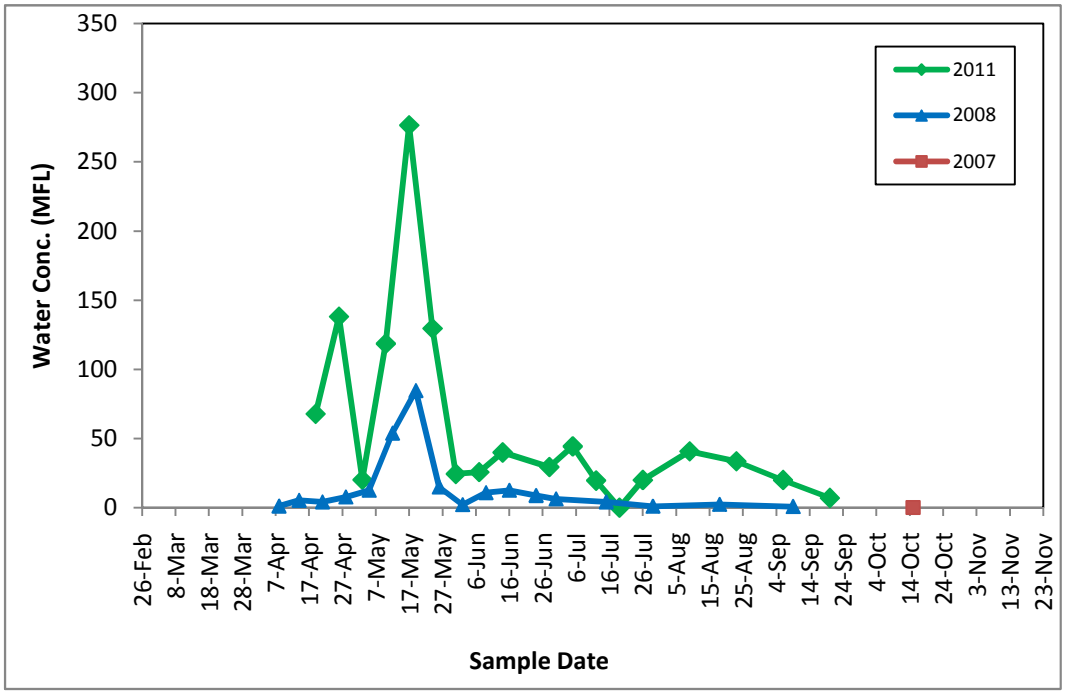
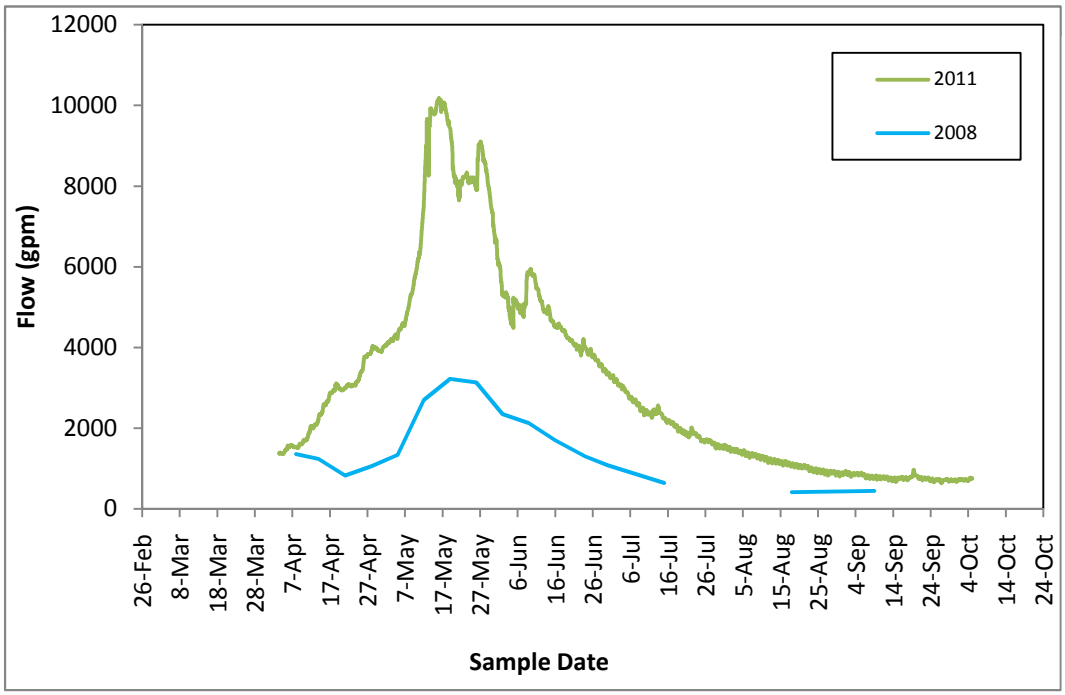
FIGURE B-2
MEASURED LA AND FLOW IN LOWER RAINY CREEK (LRC-6)

Panel A: Total LA Water Concentration



Panel B: Flow



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TABLES

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TABLE A-1. WATER CONCENTRATIONS OF ASBESTOS MEASURED IN THE PHASE I SAMPLES SELECTED FOR ANALYSIS

Phase I Location #	Location Description	Location ID	Sample ID	Sample Date	Sample Time	Analysis Sensitivity (1/L)	No. Structures Observed			Water Conc. (MFL)		
							LA	OA	CH	LA	OA	CH
#1	City pump near Cabinet View Country Club	SP-131927	*no samples collected* [1]									
#2	Upstream of OU5 fire pond flume	SP-145700	1W-00001	11/7/2011	11:19	9,890	0	0	0	0	0	0
#3	NE of Hammer Cutoff bridge	SP-145702	1W-00014	11/7/2011	12:17	9,890	0	0	0	0	0	0
#4	Upstream of Kootenai River Rd bridge, near stand pipe	SP-145707	1W-00004	11/7/2011	14:20	9,890	0	0	0	0	0	0
#5	Upstream of Bobtail cut off Rd bridge	SP-145709	1W-00005	11/7/2011	14:49	9,890	0	0	0	0	0	0
#6	Upstream of US Highway 2 bridge, near standpipe	SP-145706	1W-00006	11/7/2011	13:33	9,890	0	0	0	0	0	0
#7	NE of Granite Creek Rd bridge	SP-145703	1W-00007	11/7/2011	12:30	9,890	0	0	0	0	0	0
#8	Kootenai River adjacent to KDC flyaway pumphouse	SP-145711	1W-00008	11/7/2011	15:10	9,890	0	0	**1**	0	0	**0.010**
			1W-00015[2]	11/8/2011	08:03	9,890	0	0	0	0	0	0
#9	W side of US Highway 2, S side of creek	SP-145701	1W-00009	11/7/2011	11:46	9,890	0	0	0	0	0	0
#10	Upstream of Balsam St bridge	SP-145704	1W-00010	11/7/2011	13:09	9,890	0	0	0	0	0	0
#11	NW corner of bridge on Dome Mountain Ave	SP-145705	1W-00011	11/7/2011	13:21	9,890	0	0	0	0	0	0
#12	Upstream of Kootenai River Rd bridge	SP-145708	1W-00012	11/7/2011	14:05	9,890	0	0	0	0	0	0
#13	J Neils Park	SP-145710	1W-00013	11/9/2011	16:30	9,890	0	0	0	0	0	0

[1] No samples collected because the existing pump in the pumphouse was found to be non-functional.
[2] This sample was analyzed due to the presence of asbestos in sample collected on previous day.

ID = identifier
1/L = 1/liters
LA = Libby amphibole
OA = other amphibole
CH = chrysotile
MFL = million fibers per liter

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Table D-1 General Evaluation Methods for Assessing Asbestos Data Usability

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

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

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APPENDICES

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Water Source Identification Study – Phase II SAP/QAPP

Appendix A
Standard Operating Procedures (SOPs)

SOP ID	SOP Description
EPA-LIBBY-2012-01	Field Logbook Content and Control
EPA-LIBBY-2012-04	Field Equipment Decontamination
EPA-LIBBY-2012-05	Handling Investigation-Derived Waste
EPA-LIBBY-2012-06	Sample Custody
EPA-LIBBY-2012-07	Packaging and Shipping of Environmental Samples
EPA-LIBBY-2012-08	Surface Water Sampling
CDM-LIBBY-09	GPS Coordinate Collection and Handling
EPA Region 6 SOP	Streamflow Measurement
EPA-LIBBY-09	TEM Data Review and Data Entry Verification
EPA-LIBBY-11	FSDS Data Review and Data Entry Verification

***The most recent versions of all SOPs are provided electronically in the Libby Field eRoom (https://team.cdm.com/eRoom/R8-RAC/Libby).*

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Appendix B
Analytical Requirements Summary Sheet (WATER-0412)

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SAP REQUIREMENTS SUMMARY #WATER-0412
SUMMARY OF PREPARATION AND ANALYTICAL REQUIREMENTS FOR ASBESTOS

Title: Libby Asbestos Superfund Site, Water Source Identification Study – Phase II

SAP Date (Revision): April 25, 2012 (Revision 0)

EPA Technical Advisor: Elizabeth Fagen (303-312-6095, fagan.elizabeth@epa.gov); Mike Cirian (406-293-6194, cirian.mike@epa.gov)
(contact to advise on DQOs of SAP related to preparation/analytical requirements)

Sampling Program Overview: This study is designed to analyze surface water samples from several potential water source candidates under high flow conditions. A total of 10 sampling locations will be evaluated. At each location, a total of 6 surface water samples will be collected within a 2-week time interval (N total = 60 field samples, plus field QC samples). Sampling is expected to occur in May 2012, although the specific timing of the collection effort will depend upon stream flow conditions.

Sample ID Prefix: 2W-

TEM Preparation and Analytical Requirements for Water Samples:

Medium Code	Medium, Sample Type	Preparation Details (a)				Analysis Details			Applicable Laboratory Modifications (current version of)
		Investi-gative?	Indirect Prep?		Filter Archive?	Method	Counting/ Recording Rules	Analytical Sensitivity/ Stopping Rules	
			With Ashing	Without Ashing					
A	Water	Yes	No	No	Yes	TEM – ISO 10312	All asbestos (b); L: $\geq$ 0.5 µm AR: $\geq$ 3:1	Count a minimum of 2 grid openings in 2 grids, then continue counting until one is achieved: i) sensitivity of 10,000 L^{-1} is achieved ii) 100 structures are recorded iii) 1.0 mm^2 of filter area has been examined (approx. 100 GOs)	LB-000016, LB-000029, LB-000066, LB-000067, LB-000085

(a) Sample and filter preparation should be performed in basic accordance with EPA Method 100.2 (as modified by LB-000020A). Grid preparation should be performed in basic accordance with Section 9.3 of ISO 10312:1995(E).
(b) If observed, chrysotile structures should be recorded, but chrysotile structure counting may stop after 50 structures have been recorded.

Laboratory Quality Control Sample Frequencies:

TEM (c): Lab Blank – 4% (c) See LB-000029 for selection procedure and QC acceptance criteria
Recount Same – 1%
Recount Different – 2.5%
Verified Analysis – 1%
Repreparation – 1%
Interlab – 0.5%

Requirements Revision:

Revision #:	Effective Date:	Revision Description
0	4/10/2012	N/A
1	4/25/2012	Change SAP/QAPP finalization date Change stopping rule from 100 GOs to 1.0 mm^2

Analytical Laboratory Review Sign-off:

☒ EMSL – Libby [sign & date: R.K. Mahoney 6 April 2012]
☒ EMSL – Cinnaminson [sign & date: RDenton 04/18/12]
☒ EMSL – Beltsville [sign & date: _J. Centifonti_ 5 April 2012___]
☒ EMSL – Denver [sign & date: E. Orthun 4.12.12]
☒ ESAT [sign & date: _Douglas_Kent_26_March_2012___]
☒ Hygeia [sign & date: _Kyeong Corbin 3-27-12_____]
☒ RESI [sign & date: ____Jeanne Spencer 27-Mar-2012___]

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

Water Source Identification Study – Phase II SAP/QAPP

Appendix C
Record of Modification (ROM) Forms

The most recent version of the field ROM is provided electronically in the Libby Field eRoom (https://team.cdm.com/eRoom/R8-RAC/Libby).

The most recent version of the laboratory ROM is provided electronically in the Libby Lab eRoom (https://team.cdm.com/eRoom/mt/LibbyLab).

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Appendix D
Data Management Request Form

[An example of the Data Management Request Form is provided.

Actual requests should be transmitted via the file "AppD_ESAT Data Mgmt Rqst Form.xlsm"

located in the Libby Lab eRoom (https://team.cdm.com/eRoom/mt/LibbyLab).]

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ESAT Region 8
Data Management Request Form

Today's Date:

Name: Phone #:

Organization: Email:

Tool/Database:

Request Category: ☐ Issue ☐ Tool ☐ Task

Type of Request: Data Fix Attachments Included: None

Attachments:

Request:

Priority: ☐ Low ☐ Medium ☐ High Date Needed By:

Email:

- ☐ Melissa Bryant
- ☐ Randy Dorian
- ☐ Erin Formanek
- ☐ Janelle Lohman
- ☐ Mark McDaniel
- ☐ Frank McGuire
- ☐ Diane Rode
- ☐ Joe Shaefer
- ☑ Jim Slavens
- ☐ Dania Zinner
- ☐ Other (List)