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Water Source Identification Study – Phase I
Sampling and Analysis Plan
Libby Asbestos Superfund Site
Libby, Montana

Revision 0 - November 1, 2011

Contract No. W9128F-11-D-0023
Task Order No. 0001

Prepared for:

U.S. ENVIRONMENTAL PROTECTION AGENCY
Region 8

Prepared by:

U.S. Army Corps of Engineers
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Water Source Sampling Study – Phase I
Sampling and Analysis Plan
Libby Asbestos Superfund Site
Libby, Montana

Revision Log:

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Date: 11/1/11

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List of Acronyms

Ago	area of a grid opening
APP	Accident Prevention Plan
ASTM	American Society for Testing and Materials
CAPAR	corrective and preventive action request
CDM	CDM Federal Programs Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
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
f/L	fibers per liter
FSDS	field sample data sheet
FTL	field team leader
GOx	number of grid openings examined
GPS	global positioning system
HAZWOPER	Hazardous Waste Operations and Emergency Response
HDPE	high-density polyethylene
ID	identification
IDW	investigation-derived waste
L	liters
LA	Libby amphibole
LC	laboratory coordinator
MCL	maximum contaminant level
MDEQ	Montana Department of Environmental Quality
MFL	million fibers per liter
mm^2	square millimeters
N	number of asbestos structures counted
NIST	National Institute of Standards and Technology
NVLAP	National Voluntary Laboratory Accreditation Program
OU	Operable Unit
PDOP	position dilution of precision
PPE	personal protective equipment
QA	quality assurance
QC	quality control
SAP	sampling and analysis plan
Site	Libby Asbestos Superfund Site
SOP	standard operating procedure

List of Acronyms (Cont.)

TAS	target analytical sensitivity
TEM	transmission electron microscopy
um	micrometers
USACE	United States Army Corps of Engineers
V	volume of water applied to the filter

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A Project Management

A3. Distribution List

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

U.S. Environmental Protection Agency, Region VIII
1595 Wynkoop Street; 8EPR-SR
Denver, Colorado 80202-1129

- Victor Ketellapper, Ketellaper.Victor@epa.gov (1 hard copy, 1 electronic copy)
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- Carolyn Rutland, CRutland@mt.gov (1 electronic copy)
- John Podolinsky, JPodolinsky@mt.gov (1 electronic copy)

TechLaw, Inc.
ESAT, Region VIII
16194 W 45th Drive
Golden, Colorado 80403

- Doug Kent, Kent.Doug@epa.gov (1 electronic copy)

CDM – Libby Field Office
60 Port Boulevard, Suite 201
Libby, Montana 59923

- Dominic Pisciotta, pisciottadm@cdm.com (3 hard copies, 1 electronic copy)

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

A4. Project Task Organization

Figure A-1 presents an organizational chart that shows lines of authority and reporting responsibilities for this project. The following sections summarize the entities and individuals that will be responsible for providing project management, technical support, and quality assurance 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 Region VIII Project Manager for this sampling effort is Elizabeth Fagen. The EPA Region VIII 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 and Mark Buss.

The Montana Department of Environmental Quality (MDEQ) is the support regulatory agency for Superfund activities at the Site. The MDEQ PM for this sampling effort is John Podolinsky. 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

SAP Development

This SAP was developed by CDM at the direction of and with oversight by the EPA and the USACE. This SAP contains all the elements required for both a field sampling plan and quality assurance project plan 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 Project Manager (or their designate) is responsible for distributing updated copies of the SAP if a revision occurs.

Field Sampling Activities

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

- Paul Lammers, Project Manager
- Dominic Pisciotta, Field Team Leader
- Tracy Dodge, Sample Coordinator
- Diane Rode, Field Data Manager
- Terry Crowell, Quality Assurance Manager
- Damon Repine, Health and Safety Manager

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. The laboratory coordinator for the Libby project is TechLaw, Inc. (primary point of contact is Doug Kent). Mr. Kent is responsible for directing the analytical laboratories, prioritizing analysis needs, and managing laboratory capacity.

Data Management

The EPA Environmental Response Team (ERT) is responsible for all data management aspects of this project. Dania Zinner (EPA Region 8) is responsible for overseeing the ERT data management support contract. The primary database administrator for the Libby project is TechLaw, Inc. (primary point of contact is Janelle Lohman). Ms. Lohman is responsible for sample tracking, uploading new data, performing error checks to identify incorrect, inconsistent or missing data, and ensuring that all questionable data are checked and corrected, as needed.

A4.3 Quality Assurance

The EPA Quality Assurance Manager for this project is Rebecca Thomas. Ms. Thomas is independent of the entities planning and obtaining the data, and is responsible for ensuring that this SAP is prepared in accordance with EPA guidelines and requirements.

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 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 (OU) 1. 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.

Site managers have identified several potential water source candidates, including the following:

- City pump near Cabinet View Country Club
- Libby Creek upstream of the OU5 fire pond
- Libby Creek at Hammer Cutoff Road
- Pipe Creek at Kootenai River Road
- Pipe Creek at Bobtail Cutoff Road
- Cedar Creek at US Highway 2
- Cherry Creek at Granite Creek Road
- Kootenai River, upstream of the confluence with Rainy Creek
- Granite Creek at US Highway 2
- Flower Creek at Balsam Street

- Parmenter Creek at Dome Mountain Avenue
- Quartz Creek at Kootenai River Road
- J. Neils Park

There are little to no data on asbestos concentrations in any of these potential water sources. Therefore, measurements of asbestos concentrations in water are needed to characterize each of these potential water sources.

It is anticipated that asbestos concentrations in water will be influenced by flow variations. For this reason, this sampling program is separated into two phases. The Phase I sampling program will collect water samples at different collection times in order to capture potential daily fluctuations under low flow conditions. The Phase II sampling program will seek to collect water samples during high flow conditions.

This SAP describes Phase I of the plan for collecting initial measurements of asbestos concentrations in water for use in characterizing each of these potential water sources. It is anticipated that Phase II monitoring of potential water sources will occur in the spring of 2012 A separate Phase II SAP will be developed prior to this sampling effort. 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[1] (MCL) for asbestos in drinking water is 7 million fibers per liter (MFL), which is based on fibers longer than 10 micrometers (um) in length. However, the MCL is not likely to 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 include collecting water samples at each potential water source and analyzing these samples for asbestos to provide initial data on water concentrations of asbestos for each source. These basic tasks are described in greater detail in subsequent sections of this SAP.

[1] http://water.epa.gov/drink/contaminants/index.cfm#List

A6.2 Work Schedule

The work schedule for performing these tasks begins with collection of water samples from each potential water source. It is anticipated that this task will be completed in early November 2011, before snowfall begins. Sample analysis and data evaluation and interpretation tasks will be performed over the winter of 2011/2012. The goal is have the Phase I results summarized and a Phase II SAP developed before the start of high-flow conditions in April 2012.

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 I water must be collected before snowfall begins. The second time constraint is to obtain the data, evaluate the results, and develop the Phase II SAP before the start of high-flow conditions in 2012. This is important because surface water sampling in streams and creeks in OU3 have shown that asbestos concentrations are highly dependent upon flow (i.e., higher concentrations are measured during high flows).

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 OU3 has shown that total LA concentrations in water can be highly variable, ranging from less than 0.1 MFL to over 250 MFL. 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 October during low flow conditions, so LA concentrations in water are likely to be biased low (particularly for in-stream sampling locations).

To the extent feasible, sampling methods will attempt to collect water using methods that mimic the water retrieval methods that will be used by the removal contractor. Thus, the resulting water samples should be representative of expected conditions that will be encountered by the removal contractor.

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 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 water samples must have appropriate training. Prior to beginning field sampling activities, a field planning meeting will be conducted and any required trainings will be completed.

Field Planning Meeting

The field planning meeting will be conducted by the assigned CDM field team leader (FTL) and attended by the field staff, a member of the CDM quality assurance (QA) staff, CDM sample coordinator, and a member of the CDM field health and safety staff. The EPA Remedial Project Manager and USACE Construction Control Representative will be notified of the meeting's date and time. The agenda will be reviewed and approved by the QA staff and the health and safety officer prior to the meeting. The meeting will briefly 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
- Documents governing fieldwork that must be on site
- Any changes in the field planning documents

A written agenda will be distributed and an attendance list will be signed by all meeting participants. Copies of these documents will be maintained in the project files. Additional meetings will be held when required by the documents governing fieldwork or when the scope of the assignment changes significantly. The field team personnel will perform the following activities before and during field activities, as applicable:

- Review and understand applicable governing documents
- Ensure that all sample analyses are scheduled through the EPA laboratory coordinator (LC)
- Obtain required sample containers and other supplies
- Obtain and check field sampling equipment
- Obtain and maintain personal protective equipment (PPE)

Training Requirements

Prior to starting work at the Libby field office, any new team member must complete the following, at a minimum:

- Read the *CDM Accident Prevention Plan* (APP) (CDM 2011a) – documented on plan signature sheet and required reading report
- Attend an orientation session with the Site health and safety officer – documented on orientation session attendance sheet
- Read and understand all relevant governing documents – documented on required reading report

- Occupational Safety and Health Administration 40-Hour Hazardous Waste Operations and Emergency Response (HAZWOPER) and relevant 8-hour refreshers – documented by training certificates
- Current 40-hour HAZWOPER medical clearance
- Respiratory protection training as required by 29 Code of Federal Regulations (CFR) 1910.134 – documented by training certificate
- Asbestos awareness training as required by 29 CFR 1910.1001 – documented by training certificate
- Sample collection techniques – documented on orientation session attendance sheet and/or field planning meeting agenda

All training documentation will be stored in the Libby project files.

A8.2 Laboratory

All laboratories that analyze water samples for asbestos as part of this project must have the capability and equipment to perform the preparation and analysis procedures specified in Section B4.1. Laboratories must participate in and have satisfied the certification requirements in the last two proficiency examinations from the National Institute of Standards and Technology (NIST)/National Voluntary Laboratory Accreditation Program (NVLAP). In addition, laboratories must also have demonstrated proficiency by successful analysis of Libby-specific performance evaluation samples and/or standard reference materials and must participate in the on-going Libby laboratory QA program for the Libby project. The Libby laboratory QA program consists of laboratory team training and mentoring, analyst training, facility QC samples, inter-laboratory sample analysis, and facility audits. It is the responsibility of the EPA LC to ensure that these requirements are satisfied and to ensure that appropriate documentation of laboratory certification is available in laboratory files.

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. This FSDS form is maintained by and available from the CDM Libby field office. The FSDSs document the unique sample identifier for every 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). All samples and FSDSs will be relinquished by the field staff to the sample coordinator or a designated secure sample storage location at the end of each day. Upon completion of the FSDS by the sampler and a subsequent QC check by an independent field team member, the sample coordinator will use the FSDSs to generate a chain-of-custody (COC) record. The COC record then accompanies the samples to the analytical laboratory. Hard copies of all FSDSs and COCs are maintained in the CDM Libby field office.

All analytical data for asbestos generated in the analytical laboratory will be documented on Site-specific laboratory bench sheets. The data from these bench sheets will then be transferred into the most current version of the Site-specific electronic data deliverable (EDD) template spreadsheets and transmitted electronically to the project data managers. These EDD template spreadsheets are maintained by and available from the EPA LC. Copies of all laboratory bench sheets and completed EDDs are maintained by each analytical laboratory. Hard copy laboratory job data packages (which include the laboratory bench sheets) and completed EDDs are submitted to the EPA LC. (See Section B10 for details on electronic data management.)

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, 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 Project Manager prior to implementation. Such deviations will be recorded on the Libby Asbestos Project Record of Modification Form specific to field, preparation facility, or laboratory activities, as applicable (see Appendix C). As modifications are approved by EPA and implemented, the EPA LC will communicate the changes to the EPA laboratories. Approved modification forms will be maintained by the submitting party.

B Data Generation and Acquisition

B1. Phase I Study Design

B1.1 Sampling Locations

Site managers have identified 13 potential water source candidates, 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–145707) - 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 pumphouse 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.

Figure B-1 provides a map that shows the location of each potential water source based on a preliminary site reconnaissance that was conducted in September 2011. If necessary, sampling locations may be adjusted in the field at the time of sample to better reflect actual anticipated use by the removal contractor. 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

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

It is anticipated that asbestos concentrations in water will be influenced by flow variations. For this reason, the Phase I sampling program will collect water samples at different collection times in order to capture potential daily fluctuations under low flow conditions. In addition, the Phase II sampling program (which is expected to begin in the spring of 2012) will seek to collect water samples during high flow conditions. Thus, these data should provide information on the range of variability in water concentrations of asbestos as a function of flow fluctuations.

B1.4 Critical Measurements

The critical measurement associated with this project is the measurement of the concentration of LA in water. The analysis of LA may be achieved using several different types of microscope, but EPA generally recommends using transmission electron microscopy (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).

B1.5 Data Reduction and Interpretation

Water samples collected in the field will be filtered 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)

Data for asbestos concentrations in water generated from the Phase I sampling program will be used to prioritize, but not exclude, potential water sources. If detectable levels of asbestos are present in some water sources and not others, those sources with detectable levels will be placed lower on the prioritized list of potential sources. If several sources have detectable levels of asbestos in water, this may indicate the need to investigate potential water processing techniques (e.g., filtering, settling) that may be used to reduce, or eliminate, the number of asbestos structures in source water prior to use in response activities.

It is anticipated that the selection of the replacement water source(s) will not be completed until the results of the Phase II sampling program are available.

B2. Sampling Methods

B2.1 Water Sample Collection

Water samples will be collected, handled, and documented in basic accordance with CDM SOP 1-1, *Surface Water Sampling* (see Appendix A), with the following project modifications:

- Section 5.1, Preparation – Plastic sheeting will not be used for sampling purposes. Recording/verification of sample depth is not required.
- Section 5.2.2, Method for Collecting Discrete Shallow Surface Water Samples… – Sample containers will not be placed into individual zip-top plastic bags.

Approximately one liter of water will be collected for each sample (leaving some headspace in the container) and placed into a 1-liter capacity high-density polyethylene (HDPE), or equivalent, container. To minimize affects of field collection activities to subsequent locations downstream, water samples will be collected from downstream to upstream.

B2.2 Global Positioning System Coordinate Collection

If not already collected, the GPS location coordinates will be recorded for each water source location in accordance with Site-specific standard operating procedure (SOP) CDM-LIBBY-09,

GPS Coordinate Collection and Handling (see Appendix A). To ensure proper collection of GPS data, the following criteria have been established at the site for data with accuracy to ±1 meter:

- The operator of the GPS unit must be standing at the sample location before the data collection begins.
- Once the unit begins collection of location data, the operator must remain standing at the sample location until the minimum required data points have been collected.
- A minimum of 30 data points must be collected at each XY coordinate.
- GPS collection is completed when the position dilution of precision (PDOP) is less than 4.5.

B2.3 Equipment Decontamination

Decontamination of sampling equipment will be conducted in accordance with CDM SOP 4-5, *Field Equipment Decontamination at Non-Radioactive Sites* (see Appendix A), with the following exceptions:

- Section 4.0, Required Equipment - Plastic sheeting will not be used during decontamination procedures. American Society for Testing and Materials (ASTM) Type II water will not be used. Rather, locally available de-ionized water will be used.
- Section 5.0, Procedures - Decontamination water will not be captured and will be discharged to the ground at the worksite.
- Section 5.3, Sampling Equipment Decontamination – Sampling equipment that has been decontaminated will not be wrapped in plastic sheeting or aluminum foil. As stated in CDM SOP 4-5, Section 5.0, all equipment will be decontaminated before and after use (i.e., rinsed with locally available de-ionized water).
- Section 5.6, Waste Disposal - Decontamination water will not be captured and will not be packaged, labeled, or stored as investigation-derived waste (IDW). Decontamination water will be discharged to the ground at the worksite.

Materials used in the decontamination process will be disposed of as IDW as described below.

B2.4 Handling Investigation-derived Waste

Any disposable equipment or other IDW will be handled in accordance with CDM SOP 2-2, *Guide to Handling of IDW* (see Appendix A), with the following modification:

- Section 5.2, Offsite Disposal – All IDW will be collected in transparent garbage bags and marked "IDW" with an indelible ink marker. These bags will be deposited into the asbestos contaminated waste stream for appropriate disposal at the local landfill.

B3. Sample Handling and Custody

B3.1 Sample Identification and Documentation

Sample Labels

Water samples will be labeled with sample identification (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:

1W-#####

where:

1W = Prefix that designates water samples collected under this Phase I SAP
= A sequential five-digit number

Field Documentation

FSDSs that record specifics related to sample collection will be completed for each sample in accordance with current project data reporting requirements.

In addition, field logbooks will be maintained in accordance with CDM SOP 4-1, *Field Logbook Content and Control* (see Appendix A). The field logbook is an accounting of activities at the Site and will note any problems or deviations from the governing plans and observations related to the SAP. As logbooks are completed, originals will be maintained in the CDM office in Libby, Montana. Copies of logbooks will be posted to the Libby project eRoom after completion of the sampling program.

B3.2 Field Sample Custody

Field sample custody will follow the requirements specified in CDM SOP 1-2, *Sample Custody* (see Appendix A). All teams will ensure that samples, while in their possession, are maintained in a secure manner to prevent tampering, damage, or loss. FSDS and COC records will be prepared in accordance with EPA's Site-specific data requirements. All samples and FSDSs will be relinquished by field staff to the sample coordinator/broker or a designated secure sample storage location at the end of each day. Upon completion of the FSDS by the sampler and a subsequent QC check by an independent field team member, the sample coordinator/broker will use the FSDSs to generate a COC record.

B3.3 Chain-of-Custody Requirements

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

General custody and sample shipping procedures for collected samples will follow the requirements stated CDM SOP 1-2, *Sample Custody* (see Appendix A), with the following modifications:

- 5.1 Transfer of Custody and Shipment –
  - A COC record will not be completed in the field. Initial sample custody will be documented through the collection of sample information using FSDSs, along with a physical sample.
  - Sample labels/tags will be limited to a unique sample ID, which will be clearly indicated using pre-printed labels or handwritten on the sampling container.
  - Sampling teams will secure a custody seal on each individual sample.

Three copies of the COC record will be printed using three-part carbonless paper. One copy will be filed in the Libby CDM office and the other two will accompany sample shipments. The sample coordinator/broker will note the priority level for the samples (based on consultation with EPA) at the top of the COC record. The sample coordinator/broker will check the COC record against the samples in the shipping container to ensure consistency and accuracy and will hand-deliver or ship samples, as appropriate. If any errors are found on the COC record after delivery/shipment, the paper copy of the COC record maintained in the Libby CDM office will be corrected by the sample coordinator/broker with a single strikeout, initial, and date. The corrected copy will then be faxed to the analytical laboratory, and the information updated in all appropriate electronic data management systems.

For hand-deliveries, a sample coordinator will relinquish samples and corresponding COC records to the EPA LC under strict custody. During relinquishment, the sample coordinator will complete the following information in the designated spaces at the bottom of the COC record: signature, company name, date, and time. The EPA LC will also complete the required information and will make a note regarding sample condition (e.g., OK – accept). The sample coordinator/broker will retain the bottom copy of the COC record for the CDM project record.

B3.4 Sample Packaging and Shipping

Samples will be packaged and shipped in accordance with CDM SOP 2-1, *Packaging and Shipping of Environmental Samples* (see Appendix A), with the following modifications:

- 1.4 Required Equipment – Vermiculite (or other absorbent material) will not be used for packaging or shipping samples.
- 1.5 Procedures – No vermiculite or other absorbent material will be used to pack the samples.

Samples will be hand-delivered to the EPA LC, picked up by a delivery service courier, or shipped by a delivery service to the designated facility or laboratory, as applicable. For hand-deliveries, the sample coordinator/broker will package samples 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, prior to sealing the shipping container, the sample coordinator will complete the following information in the designated spaces at the bottom of the COC record: signature, company name, date, and time. The sample coordinator/broker will retain the bottom copy of the COC record for the CDM project record.

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

Sample Preparation

All water samples should be analyzed for asbestos in accordance with the preparation and analysis techniques in EPA Method 100.1, *Analytical Method for Determination of Asbestos Fibers in Water* (EPA 1983). In brief, samples will be prepared using the water sample techniques described in Section 6.2 of EPA Method 100.1. This treatment 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, using the technique for vacuum filtration described in Section 6.3 of EPA Method 100.1.

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 6.4 of EPA Method 100.1. Grids will be examined by TEM in basic accordance with the procedures described in Sections 6.6 and 6.7 of EPA Method 100.1.

Counting Rules

All structures with fibrous morphology, an x-ray diffraction pattern consistent with amphibole asbestos, a 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.

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 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 = Target Conc / 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:

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

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

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

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.

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 100^{th} structure, then stop.
3. A total of 100 grid openings have been examined.

An analytical requirements summary sheet (WATER-1111), 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. 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@cdm.com
- Phyllis Haugen, HaugenPJ@cdm.com
- Libby project email address for CDM, libby@cdm.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, turn-around times of 2-4 weeks are acceptable, but this may be revised as determined necessary by EPA.

B4.4 Custody Procedures

Custody procedures are provided in the respective QA management plans for each laboratory that processes or analyzes Libby samples. These plans were independently audited and found to be satisfactory by the EPA's facility audit team.

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 shipment. The facility sample custodian will sign the COC record and maintain a copy for their project files. For laboratory work, the original COC record will be appended to the hard copy data report. Next, the sample custodian may assign a unique laboratory number to each sample on receipt. This number will identify the sample through all further handling and reporting at the facility. It is the responsibility of each facility to maintain internal documentation throughout sample preparation, analysis, data reporting, and sample archiving.

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.

Training

Before performing field work in Libby, field personnel are required to read the *CDM APP* (CDM 2011a) for the Site and the appropriate project-specific field guidance documents relevant

to the work being performed. Additional information on field training requirements is provided in Section A8.1.

Modification Documentation

Minor deviations encountered in day-to-day field work will be noted in the field logbook. Major deviations from this SAP that modify the sampling approach and associated guidance documents will be recorded on the Libby Asbestos Project Record of Modification Form for Field Activities (Appendix C). The modification form will be used to document all permanent and temporary changes to procedures contained in guidance documents governing investigation work. In addition, the Record of Modification Form will be used to document any information of interest as requested by EPA or USACE project management. As field modifications to governing documents are implemented, the FTL will communicate the changes to the field teams conducting activities associated with the modification. When the EPA or USACE project management team determines the need, revised governing documents may be issued to incorporate modifications.

Field modification forms are completed by the FTL overseeing the investigation. Once a form is completed, a technical review is completed by the CDM project manager or designate, and then reviewed and approved by the EPA and USACE project leader or designate.

A record is kept to track the person who completed each form and a brief description of the modification documented on each form. Each completed modification form is assigned a unique ID number and maintained at the CDM office in Libby, Montana by a QA staff member.

Field Surveillances and Audits

The quality of field processes is evaluated by field surveillances and audits conducted by CDM, USACE, and/or EPA. Field surveillances consist of periodic observations made to evaluate continued adherence to investigation-specific governing documents. Field surveillances are conducted for each investigation conducted at the Site, and are most often performed by the FTL (or designate).

The schedule for performing field surveillances is dependent on the duration of the investigation, frequency of execution, and magnitude of process changes. At a minimum, a field surveillance will be performed during the first week of this sampling program. Following the first week, additional field surveillances will be conducted as necessary (i.e., when field processes are revised or other QA/QC procedures indicate potential deficiencies).

When deficiencies are observed during the surveillances, the observer will immediately discuss the observation with the field team member and retrain the team member if required. If the observer finds deficiencies across multiple field members or teams, the FTL will plan and hold

an investigation-specific field meeting. At this meeting the observations made will be discussed as well as any corrective actions required (i.e., retraining).

The observer will document that field surveillances have occurred using the appropriate field surveillance checklist. This checklist will also be used to record any field meetings that were conducted including topics discussed, person conducting the meeting, and field team members attending the meeting.

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

Field QC Samples

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

Field Blanks – The collection frequency for water field blanks will be one field blank per week. Field blanks for water are samples of water from an uncontaminated source (e.g., store-bought drinking water). At the time of field sample collection, one liter of uncontaminated water will be placed in the same type of container as used for the field samples (e.g., 1-liter HDPE container). Field blanks will be given a unique sample ID 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. Field blanks will be blind to the laboratory (i.e., the laboratory will not be able to distinguish between field samples and field blanks). If any asbestos structure is observed on a field blank, the FTL will be notified and will take appropriate measures to ensure field staff are employing proper sample collection and handling techniques. In addition, the project database may be used to correlate the field blanks to the related field samples and a qualifier potentially applied.

Field Duplicates – Field duplicates for water are collected from the same sampling location and same time as the parent sample. The duplicate is collected using the same collection technique as the parent sample. At the time of the field sample collection, a second 1-liter HDPE container (i.e., the field duplicate container) will be filled immediately following collection of the parent field sample. Field duplicate samples will be given a unique sample ID number from the parent field sample; however, field personnel will reference the sample ID number of the parent sample in the Sample Parent ID section of the FSDS. The same location ID number will be assigned to the field duplicate sample as the parent field sample. Field duplicate samples will be collected at a rate of 1 per 20 (10 percent) of the non-QC field samples. These samples will be used to evaluate the degree of inherent variability of sample results due to sampling and analysis procedures. As such, there are no specified acceptance criteria for field duplicates.

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.

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. Samples collected under this SAP 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.

Modification Documentation

When changes or revisions are needed to improve or document specifics about analytical methods or procedures used by the laboratory, these changes are documented using the Libby Asbestos Project Record Laboratory Modification Form (Appendix C). The laboratory modification 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. As modifications are approved by the EPA and implemented, the EPA LC will communicate the changes to the laboratories. Approved modification forms will be maintained by the submitting party.

Laboratory Audits

Each of the analytical laboratories for the Site is required to participate in an on-site laboratory audit carried out by the EPA Superfund Analytical Services Branch *via* the Quality Assurance Technical Support (QATS) contract. These audits are performed by EPA personnel (and their contractors) external to, and independent of, the Libby project 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.

Laboratory QC Analyses

The Libby-specific QC requirements for TEM analyses of asbestos are patterned after the requirements set forth by NVLAP. In brief, there are three types of laboratory-based QC analyses that are performed for TEM – laboratory blanks, recounts, and repreparations. Libby Laboratory Modification[2] #LB-000029B provides detailed information on each type of TEM QC analysis, the frequency and selection requirements, the acceptance criteria, and corrective actions.

B6/B7. Instrument Maintenance and Calibration

B6/B7.1 Field Equipment

Field equipment maintenance will be conducted and documented as described in CDM SOP 5-1, *Control of Measurement and Test Equipment*.

When a piece of equipment is found to be operating incorrectly, the equipment will be labeled out-of-order and placed in a separate area from the rest of the sampling equipment. The person who identified the equipment as "out-of-order" will notify the FTL overseeing the investigation activities. It is the responsibility of the FTL to facilitate repair of the equipment. This may include having appropriately trained field team members complete the repair or shipment to the manufacturer.

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 director of the analytical 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

In advance of field activities, the CDM FTL will check the field equipment/supply inventory and procure any additional equipment and supplies that are needed. The CDM FTL will also ensure any in-house measurement and test equipment used to collect data/samples as part of this SAP 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.

[2] Libby laboratory modifications can be accessed on the Libby Laboratory eRoom.

The following equipment will be required for sampling activities:

- Field logbook
- Indelible ink pen
- Digital camera
- GPS unit, measuring wheel, stakes
- FSDS forms
- Sample labels
- Custody seals
- 1-liter capacity HDPE sampling containers
- PPE, as required by the *CDM APP* (CDM 2011a)
- Land survey map or aerial photo

B9. Non-Direct Measurements

There are no non-direct measurements that are anticipated for use in Phase I of this project.

B10. Data Management

Field information, sample preparation data, and analytical laboratory results will be transmitted to EPA, and will be managed by ERT, in an electronic Scribe project database in accordance with the procedures specified in the EPA *Data Management Plan* (EPA 2011) for the Site. Submitting entities will review all data for completeness and accuracy prior to submittal.

Data users will access all project data by subscribing to the appropriate Scribe project via Scribe.net. Instructions for downloading the latest version of the Scribe software (Scribe v3.8 Build 5) can be found at http://www.ertsupport.org/downloads.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's QA Director, with support from CDM's project QA Coordinator. Quality Procedure 4.5, as defined in CDM's *Quality Manual* (CDM 2011b), provides requirements for conducting field and office system assessments, or audits. It is anticipated that a field surveillance will be performed during the first week of sampling described in this SAP. Following the first week, additional field surveillances will be conducted as necessary (i.e., when 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 RPM 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. Quality problems that cannot be corrected quickly through routine procedures may require implementation of a corrective and preventive action request (CAPAR) form, as provided in CDM's *Quality Manual* (CDM 2011b).

All CAPARs will be submitted to either CDM's project manager or project QA manager for review and issuance. CDM's project manager or project QA manager will notify the EPA project management when quality problems arise that may require a CAPAR.

In addition, when modifications to this SAP are required, either for field or laboratory activities, a Libby Asbestos Project Record of Modification Form (Appendix C) must be completed.

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, CDM's project manager will inform the project QA Coordinator upon encountering quality issues that cannot be immediately corrected. Weekly reports and change request forms are not required for work performed under this SAP.

D Data Validation and Usability

D1/D2. Data Review, Verification and Validation

Data review of Scribe 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 EPA database administrator, who will then notify the appropriate entity (field, preparation facility, or laboratory) in order to correct the issue.

Data verification includes checking that results have been transferred correctly from laboratory data printouts to the finalized laboratory report and to the EDD and that both the laboratory report and EDD are complete before they are submitted to the EPA. This function is performed primarily as a function of built-in QC checks in the EDDs. When data are uploaded into the project database, sample and laboratory results are reviewed for compliance with project-specific reporting requirements. The data users may also identify and report any data discrepancies encountered during data use to EPA database administrator, who will then notify the appropriate laboratory in order to correct the issue.

EPA may also choose to conduct a more detailed data verification and validation effort depending upon the intended data use. Details on the procedures for performing these data verification and validation efforts will be addressed in EPA's *Site-Wide Quality Assurance Project Plan* for the Site, which is currently under revision.

D3. Reconciliation with User Requirements

It is the responsibility of data users to evaluate data quality prior to their use in decision-making. The user requirements will be reconciled during the data quality evaluation process. During this process, the data users will compare the reported results against the project-specific requirements. Non-attainment of project requirements may result in additional sample collection or field observations in order to achieve project needs.

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Figures

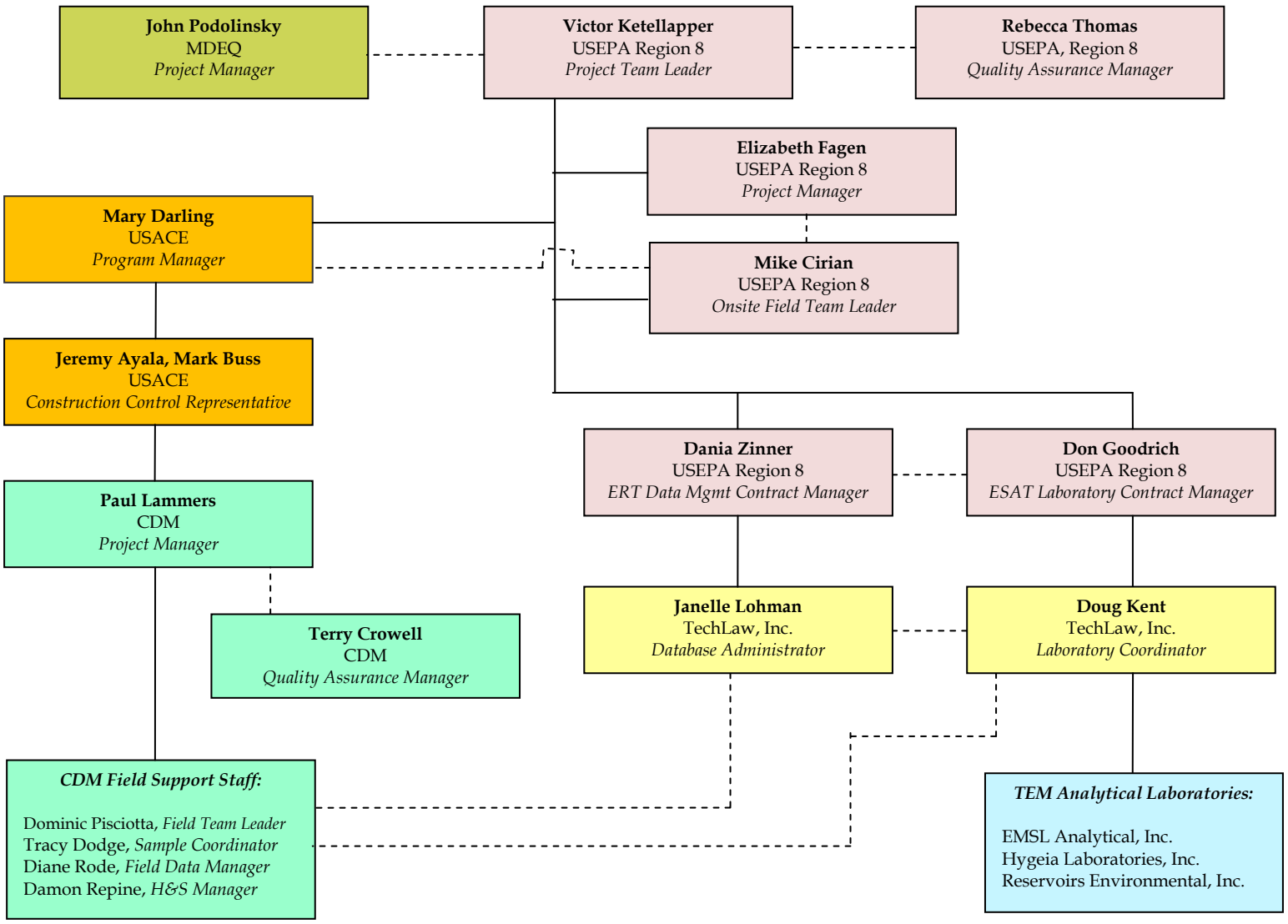
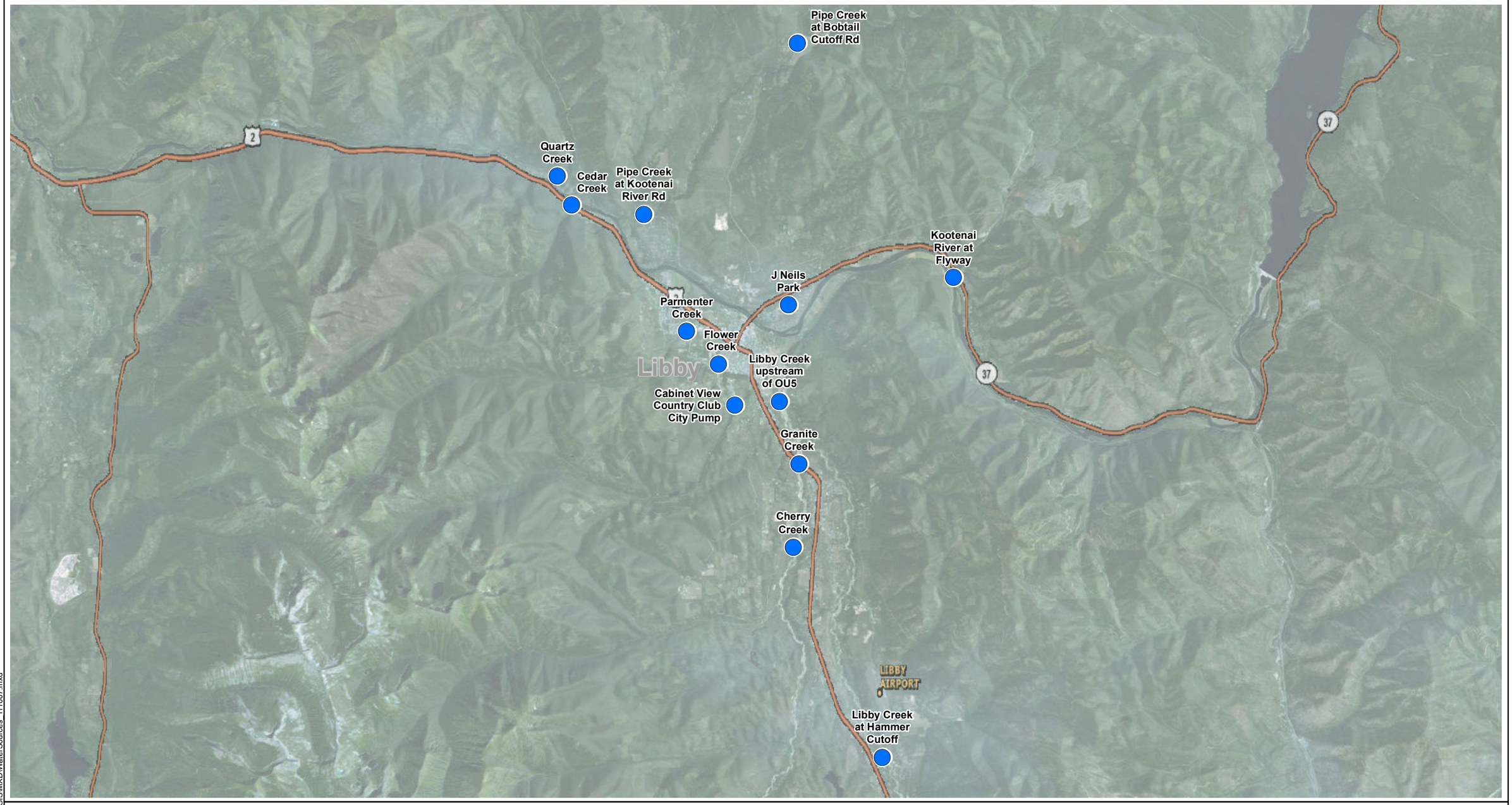


Figure A-1. Organizational Chart for Water Source Identification Study

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



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

Legend

- Water Source Location

3 1.5 0 3 6

Miles

1 inch = 3 miles

Map Date: 10/25/2011

Figure B - 1
Map of Water Source Sampling Locations

Libby Asbestos Project
Libby, Montana

CDM

Appendix A
Standard Operating Procedures

Surface Water Sampling

SOP 1-1
Revision: 7
Date: March 2007

Prepared: Del Baird

Technical Review: Curt Coover

E-Signed by Michael C. Malloy
VERIFY authenticity with ApproveIt

QA Review: Jo Nell Mullins

Approved:

Signature/Date

E-Signed by P. Michael Schwan
VERIFY authenticity with ApproveIt

Issued:

Signature/Date

1.0 Objective

The purpose of this standard operating procedure (SOP) is to define requirements for collection and containment of surface water samples.

2.0 Background

Surface water samples are collected to determine the type(s) and level(s) of contamination in a particular surface water body and/or its biological disposition.

2.1 Definitions

Surface Water - Water that flows over or rests on the land and is open to the atmosphere. This includes ditches, streams, rivers, lakes, pools, ponds, and basins.

Shallow Surface Water - Water within 1 to 3.3 feet (0.3 to 1 meter) of the surface of a body of water.

Deep Surface Water - Water deeper than 3.3 feet (1 meter) of the surface of a body of water.

Grab Sample - A discrete portion or aliquot taken from a specific location at a given point in time.

Simple Composite - Two or more subsamples taken from a specific media and site at a specific point in time. The subsamples are collected and mixed, and then a single average sample is taken from the mixture.

Temporal Composite - Two or more subsamples taken from a specific media and site over a period of time. The subsamples are collected and mixed, and then a single average sample is taken from the mixture.

Churn Splitter - Large vessel for compositing subsamples. Includes a mechanism to agitate the water to keep solids suspended.

2.2 Associated Procedures

- CDM Federal SOP 1-2, *Sample Custody*
- CDM Federal SOP 2-1, *Packaging and Shipping Environmental Samples*
- CDM Federal SOP 4-1, *Field Logbook Content and Control*
- CDM Federal SOP 4-2, *Photographic Documentation of Field Activities*
- CDM Federal SOP 4-5, *Field Equipment Decontamination at Nonradioactive Sites*

3.0 General Responsibilities

Site Manager - The site manager is responsible for ensuring that field personnel are trained in the use of this SOP, related SOPs, and the required equipment.

Field Team Leader - The field team leader (FTL) is responsible for ensuring that sampling efforts are conducted in accordance with this procedure and any other SOPs pertaining to specific media sampling. The FTL also must ensure that the quantity and location of surface water samples collected meet the requirements of the site-specific plans.

Note: Responsibilities may vary from site to site. Therefore, all field team member responsibilities shall be defined in the field plan or site/quality assurance project plan (QAPP).

4.0 Required Equipment

All or part of the equipment listed under the "as needed" category may be required at any specific site, depending on the plan(s) for that site.

- Site-specific plans
- Field logbook
- Indelible black-ink pens and markers
- Labels and appropriate forms/documentation for sample shipment
- Appropriate sample containers
- Insulated cooler and waterproof sealing tape
- Ice bags or "blue ice"
- Plastic zip-top bags
- Clear waterproof tape
- Personal protective clothing and equipment
- Latex or appropriate gloves
- Rubber boots and/or rubberized waders
- Life jacket
- Kimwipe or paper towels
- Clean plastic sheeting
- Tap and deionized water
- Appropriate photographic equipment and supplies
- Appropriate decontamination equipment and supplies

As needed:

- Pond sampler with 1-liter (L) beaker (preferably Teflon®), clamp, and heavy-duty telescoping pole
- Weighted bottle sampler, 1-L capacity (preferably Teflon) and handle; see USGS Open File Report 2005-1087 for selection of sampler; a Kemmerer or Van Dorn sampler may be used if Teflon is not required
- Churn splitter
- Peristaltic pump or suitable replacement
- Temperature, pH, and conductivity meter(s), dissolved oxygen meter, redox potential meter (as required by project plan)
- Boat with depth finder for deep water or inaccessible shorelines
- Global positioning system (GPS) unit
- Tape measure
- Any personal protective equipment specified in the site-specific health and safety plan
- Spare parts for all equipment

5.0 Procedures

5.1 Preparation

The following steps should be taken when preparing for sampling surface water:

1. Review site-specific health and safety plan and project plans before initiating sampling activity.

2. Don the appropriate personal protective clothing as dictated by the site-specific health and safety plan.

3. Select wadeable stream/river sampling locations that exhibit cross-sectional homogeneity and are well-mixed. Avoid areas where the channel is constricted or bends where scouring may have occurred. For lake samples, the investigator should consider the lake stratification caused by seasonal temperature differences. If possible, select a location that can be described precisely, such as xx feet upstream of xx bridge. Use caution when wading streams more than 1 to 2 feet deep. Flowing water can be a safety hazard.

4. Prepare sampling site by laying out clean plastic sheeting on the ground or any flat, level surfaces near the sampling area and place equipment to be used on the plastic.

5. Make field measurements as required by the project plans in physical, chemical, and biological characteristics of the water (e.g., discharge, gage height, temperature, dissolved oxygen, conductivity, pH).

6. The samples shall be collected from areas of least to greatest contamination (when known) and, when collecting several samples in 1 day, always collect from downstream to upstream.

7. The sampler should be facing upstream when sampling, both for proper sample collection and for safety (ability to observe floating objects).

8. Document the sampling events, recording all information in the designated field logbook and take photographs if required or if possible. Document any and all deviations from this SOP and include rationale for changes.

9. The collection points shall be located on a site map and described in the field logbook. Use GPS if required or if possible.

10. Label each sample container with the appropriate information. Secure the label by covering it with a piece of waterproof clear tape.

11. Decontaminate reusable sampling equipment after sample collection according to CDM Federal SOP 4 5.

12. Processes for verifying depth of samples must be included in site-specific project plans.

13. Check that a trip blank/temperature blank, when necessary, is included in the chilled cooler. Quality assurance/quality control sample requirements vary from project to project. Consult the project-specific work plan for quality requirements.

5.2 Shallow Surface Water Sample Collection for Wadeable Streams

5.2.1 Method for Collecting Samples for Volatile Organic Compound Analysis

All volatile organic compound (VOC) samples should be discrete samples. The following steps must be taken when collecting shallow surface water VOC samples:

If the volatile organic analysis (VOA) vials do not require a preservative:

1. Approach the sample location from downstream; do not enter the sample area. Slowly submerge VOA vials completely into an area of gently flowing water and fill. Do not disturb bottom sediments. The open end of the vials should be pointed upstream

Note: When collecting samples for VOC analysis, avoid collecting from a surface water point where water is cascading and aerating.

2. Cap the VOA vial while it is underwater. Be sure to dislodge all air bubbles from the cap before sealing the vial.

3. Turn the capped vial upside down and check for air bubbles. Tap the bottom of the vials to dislodge any bubbles that may have formed around the cap or sides. Discard and resample if bubbles are present.

4. Proceed to Step 5 below.

If the VOA vials require a preservative:

1. Collect a sufficient sample in a clean glass jar as in Steps 1 and 2 above for unpreserved vials. Specific sampling devices to be used must be specified in site-specific plans.

2. Decant the sample immediately into prepreserved VOA vials. It is recommended that the amount of preservative be predetermined on a separate aliquot of sample that is subsequently discarded. Tip vials slightly while filling to reduce turbulence until nearly filled. Then straighten vial to vertical for final filling. Ensure that a meniscus is raised above the lip of the vial before capping.

3. Cap each vial once the meniscus has formed.

4. Turn the capped vial upside down and check for air bubbles. Tap the bottom of the vials to dislodge any bubbles that may have formed around the cap or sides. Discard and resample if bubbles are present.

5. Wipe the outside of sample vials with a Kimwipe or clean paper towel. Affix a completed sample label.

6. Place sample vial(s) in a zip-top plastic bag and seal the bag.

7. Immediately pack all samples into a chilled cooler.

5.2.2 Method for Collecting Discrete Shallow Surface Water Samples for Nonvolatile Organic or Inorganic Compound Analysis

The following steps must be followed when collecting discrete shallow surface water samples for nonvolatile organic or inorganic compound analysis:

1. Directly dip the sample container, with the opening facing upstream, into the surface water and fill. If wading is necessary, approach the sample location from downstream; do not enter the actual sample area. Do not disturb underlying sediments.

2. Filter samples if required by the site-specific plan.

3. Add appropriate preservatives to the sample containers if required and check pH.

Note: Use a separate container when field testing pH, conductivity, temperature, etc. Do not insert pH paper or probe directly into sample container.

4. Cap the sample containers and wipe the outer surfaces of the sample containers clean with a Kimwipe or clean paper towel. Affix a completed sample label.

5. Place sample container(s) in individual zip-top plastic bags, if possible, and seal the bags.

6. Immediately pack all samples into a chilled cooler.

5.2.3 Method for Collecting Simple Composite Shallow Surface Water Samples for Nonvolatile Organic or Inorganic Compound Analysis

If the QAPP requires the use of simple composite samples, then a sampler capable of collecting composite samples is required. For width and depth integrated (WDI) composite samples, a DH-48 or DH-81 are recommended, but the QAPP may specify an alternative. The following steps must be followed when collecting simple composite shallow surface water samples for nonvolatile organic or inorganic compound analysis:

1. Record the gage height, if any, before and after sampling.

2. Select the number of width increments based on the requirements of the QAPP. Generally, small well mixed streams require few increments while large or poorly mixed streams require more increments.

3. For fewer than six width increments, subsample locations can be visually estimated. For more than five width increments, string a tape measure across the stream above the water surface to be able to accurately identify the subsample locations. Increments should be evenly spaced across the stream for equal width-integrated (EWI) sampling.

4. If depth-integrated sampling is required, collect a subsample at each width increment by submerging the sampler, orifice facing upstream, from the surface to near the bottom and back up to the surface again in an even steady motion. Do not disturb the sediment at the bottom. The sampler should be retrieved less than full. If the sampler is full, empty it and repeat the subsample collection.

5. If depth-integrated sampling is not required, submerge the sampler with the orifice facing upstream into the surface water and fill.

6. Empty the sampler into a churn splitter or temporary container for later splitting.

7. Repeat Steps 4 to 6 for each width increment.

8. If temporary containers were used, empty into churn splitter. Operate the churn splitter by moving the churn up and down in a steady motion fast enough to homogenize the sample without causing aeration. While the churn is in motion, fill the sample bottles from the tap on the churn.

9. Follow Steps 2 though 6 in Section 5.2.2.

5.2.4 Method for Collecting Temporal Composite Shallow Surface Water Samples for Nonvolatile Organic or Inorganic Compound Analysis

If the QAPP requires the use of temporal composite samples, this can be accomplished using a series of discrete samples collected by hand or an automated sampler, or using a series of simple composite samples. Refer to the preceding sections for collecting the subsamples. The compositing scheme can be time-based (e.g., once per hour for 4 hours) or time-discharge (or time gage height) based (e.g., once per hour until the gage height exceeds xx feet, then change to once per 15 minutes).

Because of the project-specific nature of temporal composite sampling, the specific requirements should be identified in the QAPP. The following are general steps to be followed to collect temporal composite samples:

1. Provide for a method of measuring discharge or gage height before, during, and after sample collection as required in the QAPP.

2. Select the number of time increments based on the requirements of the QAPP. If the time increments change based on a change in flow or water quality, specify the trigger, the new time increment, and any additional trigger to return to the previous increment.

3. Calculate the storage volume for the subsamples and provide a churn splitter of adequate size to contain the entire sample to be composited.

4. Collect the samples according to a method described in this SOP or alternate specified in the QAPP.

5. Provide for cold storage of subsamples, if possible. Do not process any subsamples by filtering or preserving unless specified in the QAPP.

6. Following collection of all subsamples, empty the containers into a churn splitter. If discrete data are required including laboratory or field analysis, retain a portion of the subsample.

7. Operate the churn splitter by moving the churn up and down in a steady motion fast enough to homogenize the sample without causing aeration. While the churn is in motion, fill the sample bottles from the tap on the churn.

8. Follow Steps 2 though 6 in Section 5.2.2.

9. Field parameters should be measured in the surface water at the time of collection. Some field parameters can be measured on the subsamples at the time of compositing, but the temperature and temperature-dependant parameters will not be representative.

5.3 Deep Surface Water Sample Collection

5.3.1 Method for Collecting Samples at Specified Depth Using a Weighted Bottle Sampler

The following steps must be followed when collecting surface water samples at specific depths using a weighted bottle sampler:

1. Lower the weighted bottle sampler to the depth specified in the site-specific plan.

2. Remove the stopper by pulling on the sampler line; allow the sampler to fill with water.

3. Release the sampler line to reseat the stopper and retrieve the sampler to the surface.

4. Wipe the weighted bottle sampler dry with a Kimwipe or clean paper towel.

5. Remove the stopper slowly. Fill the specified number of sample containers by slightly tipping the sampler against each sample bottle. Samples to be used for VOC analysis should be decanted directly from the sampler first into prepreserved VOA vials. It is recommended that the amount of preservative be predetermined on a separate aliquot of sample that is subsequently discarded. Add appropriate preservatives to the other sample containers and check pH. Samples may be pooled in stainless steel, glass, or Teflon containers to obtain the necessary volumes. Filter samples if required. Collect sample in separate container for pH, conductivity, temperature, and other measurements if necessary.

6. Close each sample container with the Teflon-lined cap once it is filled. Check for air bubbles in the VOC sample containers. If bubbles are present, discard and resample.

7. Wipe the outside of the sample containers clean with a Kimwipe or clean paper towel. Affix a completed sample label.

8. Place sample container(s), if possible, in individual zip-top plastic bags, and seal the bags.

9. Immediately pack all samples into a chilled cooler.

5.3.2 Method for Deep Surface Water Sample Collection Using a Peristaltic Pump

The following steps must be followed when collecting deep surface water samples using a peristaltic pump:

1. Install clean medical-grade silicon or Teflon tubing on the pump head. Leave sufficient tubing on the discharge side for convenient dispensing of liquid directly into sample containers.

2. Select the appropriate length of Teflon intake tubing necessary to reach the specified sampling depth. Attach the intake sampling tube to the intake pump tube.

3. Lower the intake tube into the surface water at the specified sampling location to the specified depth; make sure the end of the intake tube does not touch underlying sediments.

4. Start the pump and allow at least three tubing volumes of liquid to flow through and rinse the system before collecting any samples. Do not immediately dispense the purged liquid back to the surface water body. Instead, collect the purged liquid and return it to the source after sample collection is complete.

5. Fill the specified number of sample containers directly from the discharge line. Filter samples if required by the site-specific plan. While filling, allow the liquid to flow gently down the inside of the sample bottle to minimize turbulence.

For VOC samples, fill prepreserved VOA vials and allow a meniscus to form above the top of the container before capping. It is recommended that the amount of preservative be predetermined on a separate aliquot of sample that is subsequently discarded. Check VOA vials to ensure that there are no air bubbles. Add appropriate preservatives to the other samples and check pH.

Note: Use a separate container when field-testing pH, conductivity, temperature, etc. Do not insert pH paper or probe directly into sample container.

6. Cap the sample container(s). Wipe the outside of sample containers clean with a Kimwipe or clean paper towel. Affix a completed sample label.

7. Place sample container(s) in individual zip-top plastic bags and seal the bags.

8. Immediately pack all samples into a chilled cooler.

9. Drain the pump system, rinse it with deionized water, and wipe it dry. Replace all tubing with new tubing before sampling at another sampling location. Place all used tubing in plastic bags to be discarded or decontaminated according to the site-specific plans.

6.0 Restrictions/Limitations

Peristaltic pumps are generally not capable of lifting water distances greater than 20 to 25 feet (6 to 7.5 meters) above the normal hydrostatic level.

Grab sampling for VOC analysis or for analysis of any other compound(s) that may be degraded by aeration is necessary to minimize sample disturbance and, hence, analyte loss. The representativeness of this sample, however, is difficult to determine because the collected sample represents a single point and has been disturbed.

7.0 References

U. S. Department of Energy. Hazardous Waste Remedial Actions Program. *Quality Control Requirements for Field Methods,* DOE/HWP-69/R1. July 1990 or current revision.

_____. Hazardous Waste Remedial Actions Program. *Standard Operating Procedures for Site Characterizations*, DOE/HWP-100/R2. September 1996 or current revision.

U. S. Environmental Protection Agency, Region 2. *CERCLA Quality Assurance Manual*. March 1988 or current revision.

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U. S. Geological Survey. *National Field Manual for the Collection of Water-Quality Data*, *Chapter A4*. September 1999.

_____. A guide to the Proper Selection and Use of Federally Approved Sediment and Water Quality Samplers. Open-File Report 2005-1087. 2005.

Project-Specific Standard Operating Procedure
Libby Asbestos Project

SOP No.: CDM-LIBBY-09, Revision 2
SOP Title: Global Positioning Satellite (GPS) Coordinate Collection and File Transfer Process
Project: Libby Asbestos Project
Project No.: 2616
Client: U.S. Department of Transportation (DOT)/Volpe Center

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1.0 Objective

The objective of this standard operating procedure (SOP) is to provide a standardized approach for the collection and handling of GPS data at the Libby Asbestos Site (site).

2.0 Background

2.1 Definitions

LibbySampling_090615.ddf Data Dictionary – All Trimble handheld units used at the site are pre-programmed with the LibbySampling data dictionary, specific to the spatial data collection needs for the Libby Asbestos Project. All personnel required to collect GPS data will be familiar with the contents of the LibbySampling data dictionary, which contains the following features: Sample, Building Location, Interest Point, and Interest Area. The Trimble units also are loaded with a generic data dictionary that handles collection of generic lines, points, and areas.

2.2 Discussion

The following attributes are required to be collected, as indicated in Table 1, for each feature type when a GPS coordinate is collected:

Table 1 – Attributes Collected in the LibbySampling_090615 Data Dictionary

Feature	Attributes Collected
Sample	IndexID, LocationID, Comment
Building Location	LocationID, Address, Comment
Interest Point	Location, Land_Use, Comment
Interest Area	Location, Land_Use, Comment

These attributes are discussed in detail in Section 4 of this document.

3.0 Responsibilities

GPS data is collected by field staff as specified in the guidance document (e.g., sampling and analysis plan) governing the field work. Transfer of GPS data from the field equipment to the onsite server and transmittal of data off-site will be performed by designated administrative support staff. Documentation regarding off-site processing is posted on the Libby eRoom at https://team.cdm.com/eRoom/R8-RAC/Libby/0_290a.

4.0 Procedures

The following sections describe how GPS points are collected and handled for features commonly used at the site.

4.1 GPS Point Collection

The Sample Feature from the LibbySampling data dictionary is used to collect GPS points for sample locations.

Soil Samples
For **Grab** samples, a GPS point is collected at the exact sampling location. Location IDs beginning with the prefix "SP" (indicating a sample point), are used for such locations.

For **Composite** samples, a GPS point is collected at the approximate center of each sample area. In the case of an irregular-shaped sample area or sample area that is non-continuous (e.g., a flowerbed that wraps around a house), a GPS point is collected at the center of the largest continuous sample area. Location IDs beginning with the prefix "SP" are used for such locations.

Outdoor Stationary Air and Dustfall (Settled Dust) Samples
For permanent (i.e., samples representing a consistent monitoring zone or area collected on a routine schedule) outdoor stationary air and dustfall sample locations, a GPS point is collected at each unique sample location. All subsequent samples taken at that location will be assigned the same Location ID and X,Y coordinates. The GPS point is only collected once. Location IDs beginning with the prefix "SP" (indicating a sample point), are used for such locations.

GPS points are **not** collected for the following features, unless otherwise specified in the governing document:

- Stationary air, dust, and soil samples collected inside or beneath 4-sided structures (locations are associated with the X,Y coordinate of the building where the sample was collected)
- Stationary air samples, with the exception of permanent monitoring locations as designated in site-specific removal work plans or Response Action Work Plan Addenda
- Duplicate or Replicate air or dust samples (which are assigned the same Location ID and X,Y coordinates as the parent sample)
- Soil samples taken at depth from the same sample area as a previously-collected sample. The at-depth soil sample will be assigned the same Location ID as the shallower sample in order to relate both samples to the same X,Y coordinate.
- Duplicate or split soil samples (which are assigned the same Location ID and X,Y coordinates as the parent sample)
- Personal air samples (locations are associated with the X,Y coordinate of the building (i.e., BD Location ID) or property (i.e., AD Location ID) where the sample was collected)

Building Locations
The Building Location Feature from the LibbySampling data dictionary is used to collect GPS points for building locations. For building locations, a GPS point is collected near the front door or main entrance of the building. Location IDs beginning with the prefix "BD" (indicating a building point), are used for such locations.

Interest Point, Interest Area
GPS points for these features are not routinely collected on the Libby Asbestos Project. However, they are included in the LibbySampling data dictionary in the event that a GPS point is collected for an area where no sampling is conducted, or a series of points is collected to document the perimeter of an interest area or sample area.

Pre-determined Sample Areas
For pre-determined sample areas (e.g., gridded) where waypoints are available, the Trimble units may be pre-loaded with waypoint files to guide samplers to sampling locations. Pre-loading of coordinates is typically performed by a member of the Libby information management system team or by the field team leader. It should be noted that, in order to ensure GPS coordinate data are included in the project database, *GPS points will also be collected at the time of sampling for sample locations located using waypoint files*.

4.2 Operation of Trimble Handheld Units:

Operators must be standing at the sample location *before* the unit starts to collect positions. Once the unit has started collecting positions, the operator must remain standing at the sample location until the minimum required positions have been collected. A minimum of **30** positions will be collected for each GPS location. More positions will be required in circumstances where the position dilution of precision (PDOP) is greater than the default setting of 4.5.

Record-keeping Requirements:

Serial numbers of the Trimble datalogger, receiver, and antenna will be recorded in a field logbook. GPS filenames will be recorded in the logbook. Recording GPS filenames on field sample data sheets (FSDSs) is not required.

Upgrades to Trimble Equipment and Software

Trimble equipment and software is subject to change according to availability. The field team leader or designated administrative support staff is responsible for contacting the technical support of the vendor if there are any questions regarding setup, operation, or data transfer of models not covered below.

Data Collection Instructions for Trimble Pro XRS:

- Turn on the Trimble unit
- Select **Data Collection** from the main menu
- Select **Create New File** and press **Enter**. A generic default file name that begins with "*RO…*" followed by the date will appear.
- **Name the file** using the following naming convention: **T1A10209**, where **T1** refers to the specific Trimble unit being used, **A** refers to the first file of the day (**B** would be the second file of the day, and so on), and **10219** refers to the date (October 21, 2009). The file name is limited to 8 characters on some units; therefore, the date notation must be MMDDY.
- Make sure the data dictionary is set to **LibbySampling**.
- Press **Enter** to bring up the **Start feature** menu.
- Arrow to the feature to be collected (i.e., Sample or Building Location). Press **Enter**

- Press the **F1** key to pause the unit until data collection can begin. (Note that if the unit is not paused, data collection will begin immediately).
- Enter the **Index ID** and **Location ID** exactly as they appear on the printed labels assigned to the sample.

  Index IDs, and Location IDs must match field documentation.

  - Capitalize the ID prefixes where they are capitalized
  - Include dashes where they are present
  - Remove extra spaces

  Data entry errors will prevent the coordinate data from exporting and validating correctly. Enter the property address and/or other information in the **Comment**. If required by the governing document, enter any additional information such as Owner, Sample Grid, Sample Location, etc. in the **Comment** field.
- Press the F1 key to **resume** collecting positions. The unit will beep for every position it collects, and display the total number of positions in the lower right corner.
- After the counter has reached the desired number of positions (30 positions), press **Enter** and then **Enter** to confirm and save your data point.
- Repeat this process for every new sample location.

Data may be viewed and edited by pressing **F2** (**Review**) from the **Start feature** menu, using the directional pad to scroll through the locations and pressing **Enter** to view the sample information. If edits are made to the data, be sure to press **Enter.** To exit without changing the data press **Esc**. Press **F2 (New)** to return to the **Start feature** menu.

Additional handheld features:

- **Review feature –** allows for quick review/editing of keyed data
- **Repeat feature –** use of this feature is not advised because of the likelihood to miss an edit of the index or location id fields. Points that have not been edited correctly will be rejected as duplicates when they are uploaded.
- **Offset –** reduces the extra time associated with trying to capture GPS data under bridges, large trees, porches, facades and awnings, or while standing close to a building or other object that can deflect satellites signals from the GPS receiver.
- **Delete Feature –** allows for deleting a feature from a file if, for example, no positions were collected or the sample is voided. This will prevent having to rectify data later on.
- **Rename File –** allows for file name browsing/editing. This will prevent having to rectify data if done *before* the files are downloaded.
- **Delete File –** allows for deleting a file from the handheld when necessary. This will prevent having to rectify data if it is done *before* the files are downloaded.

Data Collection Instructions for Trimble GeoXT:

- Turn on the unit and using the stylus, select **GPS** from the lower right menu. This will open the Terra Sync software.
- Wait for the GPS status screen to recognize at least 4 satellites. Depending on location, this can take several minutes and must be complete or data will not successfully be collected. The connected satellite names will appear on the left side of the screen – highlighted to indicate a connection.

- Select **Data** from the upper left drop down menu. Use the file naming convention described above to create a file. Make sure the data dictionary is **LibbySampling**. Select **Create**.
- Confirm the antennae height by selecting **Ok**.
- Highlight the appropriate feature name and select **Create**. The unit will begin logging the point automatically. Enter the attribute data using the stylus and the keyboard icon located at the bottom of the touch screen. When recording is complete, select **Ok**, which saves the file and location information.
- To collect other points within the same feature file, select the **Options** menu then select **Repeat**.

4.3 GPS Data Transfer from Handheld Units to Libbysvr02

GPS File Transfer to Libbysvr02 from Trimble Pro XRS

- Turn on the Trimble Unit
- *The unit will try to connect to the GPS receiver* - press the **Esc** button
- Select **File Manager**
- Select **File Transfer** - *currently the data consists of .ssf files and is transferred to Libbysvr02\libbycommon\Data Management\Pfdata\Libby - the file is named with an 8 character identifier: T + TrimbleUnitNo + file number (A for first file collected that day) + MMDDY*
- Open Pathfinder Office
- Select **Utilities**
- Select **Data Transfer**
- Select **Add**
- Select **Datafile –** *Pathfinder will search for a connection to the Trimble Unit*
- Connect the cable from the computer to the Trimble Unit
- A list of files will appear when the connection is complete
- Select **Open**
- Select **Transfer All**
- When the download is complete, close the data transfer window **–** *if downloading files from several units, close and reopen this window between downloads*
- Delete files from the Trimble Unit **–** *all of the files will be listed – double check that all the files were transferred to libbysvr02 before deleting*

GPS File Transfer to Libbysvr02 from Trimble Pro GeoXT

The Trimble GeoXT connects to a PC through the charger unit using a USB cable *(type A to type B)*, and Microsoft Active Sync software. *(There are Active Sync connection settings to enable or disable once the device is connected to the PC. From the Active Sync menu, select Tools, select Options. These connect the Trimble to other Windows applications on the PC [e.g.; email, task managers, etc.]. The main reason to disable these settings at the Libby office is that the Trimble Units are shared and it does not make sense to activate them.)*

- Turn on the Trimble Unit
- Select **GPS** - from lower right corner *(This opens up the TerraSync GPS software.)*
- Select **Setup**
- Select **Options**
- Select **Disconnect from GPS**

- Select **Data**
- At the bottom of list, select **File Manager**
- Open Pathfinder
- Select **Utilities**
- Select **Data Transfer**
- From the Device list, select **GIS Datalogger on Windows CE**
- Click on the connect icon (the button with the checkmark circled in green). *A picture on the right will indicate the connection status.*

4.4 Transfer of GPS Data Off-site for Validation and Post-Processing

Following the download of files from the Trimble units, a copy of each file is made and filed in *Libbysvr02\ libbycommon\Data Management\Pfdata\Libby\RawFiles*. The raw files are not modified but kept as the only copy of the original downloaded data files. The files are zipped and sent off-site for validation and post-processing. The .zip files are moved to *Libbysvr02\libbycommon\Data Management\Pfdata\Libby\QC and sent zip files.*

For reference on using Pathfinder export and ARCMap attribute tables see e-Rroom: Libby GIS folder: GPS to GIS procedure posted by Mike Schultz on August 29, 2006.

4.5 Equipment, Software & Configuration

For Trimble Pro XRS or Trimble GeoXT:

Software used for data transfer: GPS Pathfinder Office 2.90 and 3.10
TerraSync

Software used for on-site QC: GPS Pathfinder Office 2.90 and 3.10
ArcGIS ArcMap
Microsoft Excel
eLASTIC

Configuration Settings (TSC1 5.27 software)
Software can vary with rental equipment. Some settings can be changed to accommodate data collection needs.

Table - 2 Configuration Settings for Trimble Pro XRS

GPS Rover Options - Logging Options		
Logging Intervals	Point feature	1 s
	Line / area	3 s
	Not in feature	none
	Velocity	none
Confirm end feature	no	
Minimum Positions	30	
Carrier phase	Carrier mode	off
	Minimum time	10mins
GPS Rover Options – Position Filters		
Position mode	Manual 3D	

Elevation mask	15 degrees	
SNR mask	6.0	
DOP type	PDOP	
PDOP mask	6.0	
PDOP switch	4.0	
GPS Rover Options – Real-time input		
Preferred correction source	use uncorrected GPS	
GPS Rover Options – General real-time settings		
Correction age limit	10s	
GPS Rover Options – Antenna options		
Height	6.000USft	
Measure	Vertical	
Confirm	Never	
Type	auto-filled when part number is entered	
Part number	get part number off of antenna	
GPS Rover Options – Initial Position		
North	USft	
East	USft	
GPS Rover Options – 2D altitude		
Altitude(MSL)	USft	
Computed at	time	
Computed at	date	
GPS Base Station Options – Logging Options		
Logging Intervals	Measurements	5s
	Positions	30s
Audible Click	Yes	
Log DOP data	Yes	
GPS Base Station Options – Position Filters		
Position mode	Manual 3D	
Elevation mask	15 degrees	
SNR mask	4.0	
PDOP mask	6.0	
PDOP switch	4.0	
GPS Base Station Options – Real-time output options		
Real-time output mode	off	
Radio type	Custom	
Baud rate	9600	
Data bits	8	
Stop bits	1	
Parity	Odd	
RTCM options	Station	1
	Message type	Type 1
	Message interval	5s
	Message suffix	None
	CTS flow control	Off
	CTS xmit delay	0ms
	RTS mode	High
	RTS edge delay	0ms
GPS Base Station Options – Reference position		
Datum	NAD 1983 (Conus)	
Zone	11 North	
NMEA/TSIP Output options		
Output	TSIP	
Baud rate	38400	
Coordinate System	UTM	

Map display options	All show with no background	
Units and Display		
Units	Distance(2D)	US Survey Ft
	Area	Square feet
	Velocity	Miles/Hour
	Angle format	DDMMSSss
	Order	North/East
	North reference	True
	Magnetic declination	Auto
	Null string	
	Language	English
Time and Date	24 hour clock	Yes
	Time	##:##:##
	Date format	MM/DD/YYYY
	Date	MM/DD/YY weekday
Quickmarks	Attributes	Repeat
	Confirm	No
Hardware(TSC1) software version 5.27		

Table 3 LibbySampling_090615 Data Dictionary
"LibbySampling_090615", Dictionary
"Sample", point, "", 1, seconds, 1, Code
"IndexID", text, 30, required, required, Label2
"LocationID", text, 30, required, required, SP-, Label1
"Comment", text, 30, normal, normal
"Building Location", point, "", 1, seconds, 1, Code
"LocationID", text, 30, required, required, BD-, Label1
"Address", text, 50, required, normal, Label2
"Comment", text, 30, normal, normal
"Interest Point", point, "", 1, seconds, 1, Code
"Location", text, 30, required, required, Label1
"Land_Use", text, 30, required, required, Label2
"Comment", text, 30, normal, normal
"Interest Area", area, "", 3, seconds, Code
"Location", text, 30, required, required, Label1
"Land_Use", text, 30, required, required, Label2
"Comment", text, 30, normal, normal

Field Equipment Decontamination at Nonradioactive Sites

SOP 4-5
Revision: 7
Date: March 2007

Prepared: Steven Fundingsland

Technical Review: Mike Higman

E-Signed by Michael C. Malloy
VERIFY authenticity with ApproveIt

QA Review: Jo Nell Mullins

Approved:

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E-Signed by P. Michael Schwan
VERIFY authenticity with ApproveIt

Issued:

Signature/Date

1.0 Objective

The objective of this standard operating procedure (SOP) is to describe the general procedures required for decontamination of field equipment at nonradioactive sites. This SOP serves as a general guide and is applicable at most sites; however, it shall be noted that site-specific conditions (i.e., type of contamination, type of media sampled), the governing agency (e.g., EPA, DOE, USACE), and site-specific work plans, sampling and analysis plans and/or quality assurance (QA) project plans may require modifications to the decontamination procedures provided in this SOP. Decontamination of field equipment is necessary to ensure acceptable quality of samples by preventing cross contamination. Further, decontamination reduces health hazards and prevents the spread of contaminants offsite.

2.0 Background

2.1 Definitions

Acid Rinse - A solution of 10 percent nitric or hydrochloric acid made from reagent grade acid and analyte-free water.

Analyte-Free Water - Tap water that has been treated so that the water contains no detectable heavy metals or other inorganic compounds. Analyte-free water shall be stored only in clean glass, stainless steel, or plastic containers that can be closed when not in use.

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

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

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

Material Safety Data Sheets (MSDS) - These documents discuss the proper storage and physical and toxicological characteristics of a particular substance used during decontamination. These documents, generally included in site health and safety plans, shall be kept on site at all times during field operations.

Organic-Free/Analyte-Free Water - Tap water that has been treated so that the water meets the analyte-free water criteria and contains no detectable organic compounds. Organic-free/analyte-free water shall be stored only in clean glass, Teflon™, or stainless steel containers that can be closed when not in use.

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

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

Soap - Low-sudsing, nonphosphate detergent such as Liquinox™.

Solvent Rinse - Pesticide grade, or better, isopropanol, acetone, or methanol.

2.2 Associated Procedures

- CDM Federal SOP 1-1 - *Surface Water Sampling*
- CDM Federal SOP 1-3 - *Surface Soil Sampling*
- CDM Federal SOP 1-4 - *Subsurface Soil Sampling*
- CDM Federal SOP 1-5 - *Groundwater Sampling Using Bailers*
- CDM Federal SOP 1-7 - *Wipe Sampling*
- CDM Federal SOP 1-9 - *Tap Water Sampling*
- CDM Federal SOP 1-11 - *Sediment/Sludge Sampling*
- CDM Federal SOP 2-2 - *Guide to Handling Investigation-Derived Waste*
- CDM Federal SOP 3-1 - *Geoprobe® Sampling*

3.0 Responsibilities

The project manager or designee, generally the field team leader (FTL), ensures that field personnel are trained in the performance of this procedure and that decontamination is conducted in accordance with this SOP and site-specific work plans. The FTL may also be required to collect and document rinsate samples (also known as equipment blanks) to provide quantitative verification that these procedures have been correctly implemented.

Note: Responsibilities may vary from site to site. Therefore, all field team member responsibilities shall be defined in the field plan or site-/project-specific QA plan.

4.0 Required Equipment

- Stiff-bristle scrub brushes
- Plastic buckets and troughs
- Soap
- Nalgene or Teflon sprayers or wash bottles or 2- to 5-gallon, manual-pump sprayer (pump sprayer material must be compatible with the solution used)
- Plastic sheeting, plastic bags, and/or aluminum foil to keep decontaminated equipment clean between uses
- Disposable wipes, rags, or paper towels
- Potable water*
- Analyte-free water
- Organic-free/analyte-free water
- Gloves, safety glasses, and other protective clothing as specified in the site-specific health and safety plan
- High-pressure pump with soap dispenser or steam-spray unit (for large equipment only)
- Appropriate decontamination solutions pesticide grade or better and traceable to a source (e.g., 10 percent and/or 1 percent nitric acid [HNO_3], acetone, methanol, isopropanol, hexane)
- Tools for equipment assembly and disassembly (as required)
- 55-gallon drums or tanks for temporary storage of decontamination water (as required)
- Pallets for drums or tanks holding decontamination water (as required)

* Potable water may be required to be tested for contaminants before use. Check field plan for requirements.

5.0 Procedures

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

The decontamination area shall be constructed so that contaminated water is either collected directly into appropriate containers (5-gallon buckets or steel wash tubs) or within the berms of the decontamination area that then drains into a collection system. Water from the collection system shall be transferred into 55-gallon drums or portable tanks for temporary storage. Typically, decontamination water shall be staged until sampling results or waste characterization results are obtained and evaluated and the proper disposition of the waste is determined (SOP 2-2, *Guide to Handling Investigation-Derived Waste*). The exact procedure for decontamination waste disposal shall be discussed in the work plan. Also, solvent and acid rinse fluids may need to be segregated from other investigation-derived wastes.

All items that shall come into contact with potentially contaminated media shall be decontaminated before use and between sampling and/or drilling locations. If decontaminated items are not immediately used, they shall be covered either with clean plastic or aluminum foil depending on the size of the item. All decontamination procedures for the equipment being used are as follows:

General Guidelines

- Potable, analyte-free, and organic-free/analyte-free water shall be free of all contaminants of concern. Following the field QA sampling procedure described in the work plan, analytical data from the water source may be required.
- Sampling equipment that has come into contact with oil and grease shall be cleaned with methanol or other approved alternative to remove the oily material. This may be followed by a hexane rinse and then another methanol rinse. Regulatory or client requirements regarding solvent use shall be stated in the work plan.
- All solvents and acids shall be pesticide grade or better and traceable to a source. The corresponding lot numbers shall be recorded in the appropriate logbook.

  Note: Solvents and acids are potentially hazardous materials and must be handled, stored, and transported accordingly. Solvents shall never be used in a closed building. See the site-specific health and safety plan and/or the chemical's MSDS for specific information regarding the safe use of the chemical.
- Decontaminated equipment shall be allowed to air dry before being used.
- Documentation of all cleaning and field QA sampling shall be recorded in the appropriate logbook.
- Gloves, boots, safety glasses, and any other personnel protective clothing and equipment shall be used as specified in the site-specific health and safety plan.

5.1 Heavy Equipment Decontamination

Heavy equipment includes drilling rigs, well development rigs, and backhoes. Follow these steps when decontaminating this equipment:

- Establish a bermed decontamination area that is large enough to fully contain the equipment to be cleaned. If available, an existing wash pad or appropriate paved and bermed area may be used; otherwise, use one or more layers of heavy plastic sheeting to cover the ground surface and berms. All decontamination pads shall be upwind of the area under investigation.
- With the rig in place, spray areas (rear of rig or backhoe) exposed to contaminated media using a hot water high-pressure sprayer. Be sure to spray down all surfaces, including the undercarriage.
- Use brushes, soap, and potable water to remove dirt whenever necessary.
- Remove equipment from the decontamination pad and allow it to air dry before returning it to the work site.
- Record the equipment type, date, time, and method of decontamination in the appropriate logbook.

- After decontamination activities are completed, collect all contaminated wastewater, plastic sheeting, and disposable gloves, boots, and clothing in separate containers or receptacles. All receptacles containing contaminated items must be properly labeled for disposal as detailed in the field plan. Liquids and solids must be drummed separately.

5.2 Downhole Equipment Decontamination

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

- Set up a centralized decontamination area, if possible. This area shall be set up to collect contaminated rinse waters and to minimize the spread of airborne spray.
- Set up a “clean” area upwind of the decontamination area to receive cleaned equipment for air-drying. At a minimum, clean plastic sheeting must be used to cover the ground, tables, or other surfaces on which decontaminated equipment is to be placed. All decontamination pads shall be upwind of any areas under investigation.
- Place the object to be cleaned on aluminum foil or plastic-covered wooden sawhorses or other supports. The objects to be cleaned shall be at least 2 feet above the ground to avoid splashback when decontaminating.
- Using soap and potable water in the hot water high-pressure sprayer (or steam unit), spray the contaminated equipment. Aim downward to avoid spraying outside the decontamination area. Be sure to spray inside corners and gaps especially well. Use a brush, if necessary, to dislodge dirt.
- If using soapy water, rinse the equipment using clean, potable water. If using hot water, the rinse step is not necessary if the hot water does not contain a detergent. If the hot water contains a detergent, this final clean water rinse is required.
- Using a suitable sprayer, rinse the equipment thoroughly with analyte-free water.
- Remove the equipment from the decontamination area and place in a clean area upwind to air dry.
- Record equipment type, date, time, and method of decontamination in the appropriate logbook.
- After decontamination activities are completed, collect all contaminated wastewaters, plastic sheeting, and disposable gloves, boots, and clothing in separate containers or receptacles. All receptacles containing contaminated items must be properly labeled for disposal. Liquids and solids must be drummed separately.

5.3 Sampling Equipment Decontamination

Follow these steps when decontaminating sampling equipment:

- Set up a decontamination line on plastic sheeting. The decontamination line shall progress from "dirty" to "clean." A clean area shall be established upwind of the decontamination wash/rinse activities to dry the equipment. At a minimum, clean plastic sheeting must be used to cover the ground, table, or other surfaces that the decontaminated equipment is placed for drying.
- Disassemble any items that may trap contaminants internally. Do not reassemble the items until decontamination and air drying are complete.
- Wash the items with potable water and soap using a stiff brush as necessary to remove particulate matter and surface films. The items may be steam cleaned using soap and hot water as an alternative to brushing. ***Note*: Polyvinyl chloride or plastic items shall not be steam cleaned.** Items that have come into contact with concentrated and/or oily contaminants may need to be rinsed with a solvent such as hexane and allowed to air dry prior to this washing step.
- Thoroughly rinse the items with potable water.

- If sampling for metals, thoroughly rinse the items with an acid solution (e.g., 10 percent nitric acid) followed by a rinse using analyte-free water. If sampling for organic compounds, thoroughly rinse the items with solvent (e.g., isopropanol) followed by a rinse using analyte-free water. The specific chemicals used for the acid rinse and solvent rinse phases shall be specified in the work plan. The acid rinsate and solvent rinsate must each be containerized separately. Acids and solvents are potentially hazardous materials and care must be exercised when using these chemicals to prevent adverse health affects (e.g., skin burns, irritation to the eyes and respiratory system). Appropriate personal protective equipment must be worn when using these chemicals. These chemicals (including spent rinsate) must be managed and stored appropriately. Special measures such as proper labels, paperwork, notification, etc. may be required when transporting or shipping these chemicals.
- Rinse the items thoroughly using organic-free/analyte-free water.
- Allow the items to air dry completely.
- After drying, reassemble the parts as necessary and wrap the items in clean plastic wrap or in aluminum foil.
- Record equipment type, date, time, and method of decontamination in the appropriate logbook.
- After decontamination activities are completed, collect all contaminated waters, used solvents and acids, plastic sheeting, and disposable personal protective equipment. Place the contaminated items in properly labeled drums for disposal. Liquids and solids must be drummed separately. Refer to site-specific plans for labeling and waste management requirements.

5.4 Pump Decontamination

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

- Set up the decontamination area and separate "clean" storage area using plastic sheeting to cover the ground, tables, and other surfaces. Set up four containers: the first container shall contain dilute (nonfoaming) soapy water, the second container shall contain potable water, the third container shall be empty to receive wastewater, and the fourth container shall contain analyte-free water.
- The pump shall be set up in the same configuration as for sampling. Submerge the pump intake (or the pump, if submersible) and all downhole-wetted parts (tubing, piping, foot valve) in the soapy water of the first container. Place the discharge outlet in the wastewater container above the level of the wastewater. Pump soapy water through the pump assembly until it discharges to the waste container. Scrub the outside of the pump and other wetted parts with a metal brush.
- Move the pump assembly to the potable water container while leaving discharge outlet in the waste container. All downhole-wetted parts must be immersed in the potable water rinse. Pump potable water through the pump assembly until it runs clear.
- Move the pump intake to the analyte-free water container. Pump the water through the pump assembly. Pump the volume of water through the pump specified in the field plan. Usually, three pump-and-line-assembly volumes shall be required.
- Decontaminate the discharge outlet by hand, following the steps outlined in Section 5.3.
- Remove the decontaminated pump assembly to the clean area and allow it to air dry upwind of the decontamination area. Intake and outlet orifices shall be covered with aluminum foil to prevent the entry of airborne contaminants and particles.
- Record the equipment type, serial number, date, time, and method of decontamination in the appropriate logbook.

5.5 Instrument Probe Decontamination

Instrument probes used for field measurements such as pH meters, conductivity meters, etc. shall be decontaminated between samples and after use with analyte-free, or better, water.

5.6 Waste Disposal

Refer to site-specific plans and SOP 2-2 for waste disposal requirements. The following are guidelines for disposing of wastes:

- All wash water, rinse water, and decontamination solutions that have come in contact with contaminated equipment are to be handled, packaged, labeled, marked, stored, and disposed of as investigation-derived waste.
- Small quantities of decontamination solutions may be allowed to evaporate to dryness.
- If large quantities of used decontamination solutions shall be generated, each type of waste shall be contained in separate containers.
- Unless otherwise required, plastic sheeting and disposable protective clothing may be treated as solid, nonhazardous waste.
- Waste liquids shall be sampled, analyzed for contaminants of concern in accordance with disposal regulations, and disposed of accordingly.

6.0 Restrictions/Limitations

Nitric acid and polar solvent rinses are necessary only when sampling for metals or organics, respectively. These steps shall not be used, unless required, because of the potential for acid burns and ignitability hazards.

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

7.0 References

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Guide to Handling Investigation-Derived Waste

SOP 2-2
Revision: 5
Date: March 2007

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1.0 Objective

This standard operating procedure (SOP) presents guidance for the management of investigation-derived waste (IDW). The primary objectives for managing IDW during field activities include:

- Leaving the site in no worse condition than existed before field activities
- Removing wastes that pose an immediate threat to human health or the environment
- Proper handling of onsite wastes that do not require offsite disposal or extended aboveground containerization
- Complying with federal, state, local, and facility applicable or relevant and appropriate requirements (ARARs)
- Careful planning and coordination of IDW management options
- Minimizing the quantity of IDW

2.0 Background

2.1 Definitions

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

Investigation-Derived Wastes - Discarded materials resulting from field activities such as sampling, surveying, drilling, excavations, and decontamination processes that, in present form, possess no inherent value or additional usefulness without treatment. Wastes may be solid, sludge, liquid, gaseous, or multiphase materials that may be classified as hazardous or nonhazardous.

Mixed Waste - Any material that has been classified as hazardous and radioactive.

Radioactive Wastes - Discarded materials that are contaminated with radioactive constituents with specific activities in concentrations greater than the latest regulatory criteria (i.e., 10 CFR 20).

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

2.2 Discussion

Field investigation activities result in the generation of waste materials that may be characterized as hazardous or radioactive waste. IDWs may include drilling muds, cuttings, and purge water from test pit and well installation; purge water, soil, and other materials from collection of samples; residues from testing of treatment technologies and pump and treat systems; personal protective equipment (PPE); solutions (aqueous or otherwise) used to decontaminate nondisposable protective clothing and equipment; and other wastes or supplies used in sampling and testing potentially hazardous or radiologically contaminated material.

Note: The client's representatives may not be aware of all potential contaminants. The management of IDW must comply with applicable regulatory requirements.

3.0 General Responsibilities

Site Manager - The site manager is responsible for ensuring that all IDW procedures are conducted in accordance with this SOP. The site manager is also responsible for ensuring that handling of IDW is in accordance with site-specific requirements.

Project Manager - The project manager is responsible for identifying site-specific requirements for the disposal of IDW in accordance with federal, state, and/or facility requirements.

Field Crew Members - Field crew members are responsible for implementing this SOP and communicating any unusual or unplanned condition to the project manager's attention.

Note: Responsibilities may vary from site to site. Therefore, all field team member responsibilities shall be defined in the field plan or site/project specific quality assurance plan.

4.0 Required Equipment

Equipment required for IDW containment will vary according to site-specific/client requirements. Management decisions concerning the necessary equipment required shall consider: containment method, sampling, labeling, maneuvering, and storage (if applicable). Equipment must be onsite and inspected before commencing work.

4.1 IDW Containment Devices

The appropriate containment device (drums, tanks, etc.) will depend on site- or client-specific requirements and the ultimate disposition of the IDW. Typical IDW containment devices can include:

- Plastic sheeting (polyethylene) with a minimum thickness of 20 millimeters
- Department of Transportation (DOT)-approved steel containers
- Polyethylene or steel bulk storage tanks

Containment of IDW shall be segregated by waste type (i.e., solid or liquid, corrosive or flammable, etc.) and source location. Volume of the appropriate containment device shall be site-specific.

4.2 IDW Container Labeling

A "Waste Container" or "IDW Container" label or indelible marking shall be applied to each container. Labeling or marking requirements for onsite IDW not expected to be transported offsite are:

- Labels and markings that contain the following information: project name, generation date, location of waste origin, container identification number, sample number (if applicable), and contents (drill cuttings, purge water, PPE, etc.).
- Each label or marking will be applied to the upper one-third of the container at least twice, on opposite sides.
- Containers that are 5 gallons or less may only require one label or set of markings.
- Labels or markings will be positioned on a smooth part of the container. The label must not be affixed across container bungs, seams, ridges, or dents.
- Labels must be constructed of a weather-resistive material with markings made with a permanent marker or paint pen and capable of enduring the expected weather conditions. If markings are used, the color must be easily distinguishable from the drum color.
- Labels will be secured in a manner to ensure the label remains affixed to the container.

Labeling or marking requirements for IDW expected to be transported offsite must be in accordance with the requirements of 49 CFR 172.

4.3 IDW Container Movement

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

4.4 IDW Container Storage

Containerized IDW shall be staged pending chemical analysis or further onsite treatment. Staging areas and bulk storage procedures are to be determined according to site-specific requirements. Containers are to be stored in such a fashion that the labels can be easily read. A secondary/spill container must be provided for liquid IDW storage and as appropriate for solid IDW storage.

5.0 Procedures

The three general options for managing IDW are (1) collection and onsite disposal, (2) collection for offsite disposal, and (3) collection and interim management. Attachment 1 summarizes media-specific information on generation processes and management options. The option selected shall take into account the following factors:

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

In all cases the client shall approve the plans for IDW. Formal plans for the management of IDW must be prepared as part of a work plan or separate document.

5.1 Collection and Onsite Disposal

5.1.1 Soil/Sludge/Sediment

The options for handling soil/sludge/sediment IDW are as follows:

1. Return to boring, pit, or source immediately after generation as long as returning the media to these areas will not increase site risks (e.g., the contaminated soil will not be replaced at a greater depth than where it was originally so that it will not contaminate “clean” areas).

2. Spread around boring, pit, or source within the area of contamination (AOC) as long as returning the media to these areas will not increase site risks (e.g., direct contact with surficial contamination).

3. Consolidate in a pit within the AOC as long as returning the media to these areas will not increase site risks (e.g., the contaminated soil will not be replaced at a greater depth than where it was originally so that it will not contaminate “clean” areas).

4. Send to onsite TSDF - may require analytical analysis before treatment/disposal.

Note: These options may require client and/or regulatory approval.

5.1.2 Aqueous Liquids

The options for handling aqueous liquid IDW are as follows:

1. Discharge to surface water, only when IDW is not contaminated.

2. Discharge to ground surface close to the well, only if soil contaminants will not be mobilized in the process and the action will not contaminate clean areas. If IDW from the sampling of background upgradient wells is not a community concern or associated with soil contamination, this presumably uncontaminated IDW may be released on the ground around the well.

3. Discharge to sanitary sewer, only when IDW is not contaminated.

4. Send to onsite TSDF - may require analysis before treatment/disposal.

Note: These options may require analytical results to obtain client and/or regulatory approval.

5.1.3 Disposable PPE

The options for handling disposable PPE are as follows:

1. Double-bag contents in nontransparent trash bags and place in onsite industrial dumpster, only if PPE is not contaminated.

2. Containerize, label, and send to onsite TSDF - may require analysis before treatment/disposal.

5.2 Collection for Offsite Disposal

Before sending to an offsite TSDF, analysis may be required. Manifests are required. In some instances, a bill of lading can be used for nonhazardous solid IDW (i.e., wooden pallets, large quantities of plastic sheeting). Arrangements must be made with the client responsible for the site to sign as generator on any waste profile and all manifests or bill of ladings; it is CDM's policy not to sign manifests. The TSDF and transporter must be permitted for the respective wastes. Nonbulk containers (e.g., drums) must have a DOT-approved label adhered to the container and all required associated placard stickers before leaving for a TSDF off site. These labels must include information as required in 49 CFR 172. Bulk containers (i.e., rolloffs, tanks) do not require container specific labels for transporting off site, but must include appropriate placards as required in 49 CFR 172.

5.2.1 Soil/Sludge/Sediment

When the final site remedy requires offsite treatment and disposal, the IDW may be stored (e.g., drummed, covered in a waste pile) or returned to its source until final disposal. The management option selected shall take into account the potential for increased risks, applicable regulations, and other relevant site-specific factors (e.g., weather, storage space, and public concern/perceptions).

5.2.2 Aqueous Liquids

When the final site remedy requires offsite treatment and disposal, the IDW may be stored (e.g., mobile tanks or drums with appropriate secondary containment) until final disposal. The management option selected shall take into account the potential for increased risks, applicable regulations, and other relevant site-specific factors (e.g., weather, storage space, and public concern/perceptions).

5.2.3 Disposable PPE

When the final site remedy requires offsite treatment disposal, the IDW may be containerized and stored. The management option selected shall take into account potential for increased risks, applicable regulations, and other relevant site-specific factors (e.g., weather, storage space, and public concern/perceptions).

5.3 Collection and Interim Management

All interim measures must be approved by the client and regulatory agencies.

1. Storing IDW onsite until the final action may be practical in the following situations:
   - Returning wastes (especially sludges and soils) to their onsite source area would require reexcavation for disposal in the final remediation alternative.
   - Interim storage in containers may be necessary to provide adequate protection to human health and the environment.
   - Offsite disposal options may trigger land disposal regulations under the Resource Conservation and Recovery Act (RCRA). Storing IDW until the final disposal of all wastes from the site will eliminate the need to address this issue more than once.
   - Interim storage may be necessary to provide time for sampling and analysis.

2. Segregate and containerize all waste for future treatment and/or disposal.
   - Containment options for soil/sludge/sediment may include drums or covered waste piles in AOC.
   - Containment options for aqueous liquids may include mobile tanks or drums.
   - Containment options for PPE may include drums or roll-off boxes.

6.0 Restrictions/Limitations

Site Managers Shall Determine the Most Appropriate Disposal Option for Aqueous Liquids on a Site-Specific Basis. Parameters to consider, especially when determining the level of protection, include the volume of IDW, the contaminants present in the groundwater, the presence of contaminants in the soil at the site, whether the groundwater or surface water is a drinking water supply, and whether the groundwater plume is contained or moving. Special disposal/handling may be needed for drilling fluids because they may contain significant solid components.

Disposable sampling materials, disposable PPE, decontamination fluids, etc. will always be managed on a site-specific basis. **Under No Circumstances Shall These Types of Materials Be Brought Back to the Office or Warehouse**.

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Attachment 1
IDW Management Options

Type of IDW	*Generation Processes*	*Management Options*
Soil	■ Well/Test pit installations ■ Borehole drilling ■ Soil sampling	**Onsite Disposal** ■ Return to boring, pit, or source immediately after generation ■ Spread around boring, pit, or source within the AOC ■ Consolidate in a pit (within the AOC) ■ Send to onsite TSDF **Offsite Disposal** ■ Client to send to offsite TSDF **Interim Management** ■ Store for future treatment and/or disposal
Sludge/Sediment	■ Sludge pit/sediment sampling	**Onsite Disposal** ■ Return to boring, pit, or source immediately after generation ■ Send to onsite TSDF **Offsite Disposal** ■ Client to send to offsite TSDF **Interim Management** ■ Store for future treatment and/or disposal
Aqueous Liquids (groundwater, surface water, drilling fluids, wastewaters)	■ Well installation/development ■ Well purging during sampling ■ Groundwater discharge during pump tests ■ Surface water sampling ■ Wastewater sampling	**Onsite Disposal** ■ Pour onto ground close to well (nonhazardous waste) ■ Discharge to sewer ■ Send to onsite TSDF **Offsite Disposal** ■ Client to send to offsite commercial treatment unit ■ Client to send to publicly owned treatment works (POTW) **Interim Management** ■ Store for future treatment and/or disposal
Decontamination Fluids	■ Decontamination of PPE and equipment	**Onsite Disposal** ■ Send to onsite TSDF ■ Evaporate (for small amounts of low contamination organic fluids) ■ Discharge to ground surface **Offsite Disposal** ■ Client to send to offsite TSDF ■ Discharge to sewer **Interim Management** ■ Store for future treatment and/or disposal
Disposable PPE and Sampling Equipment	■ Sampling procedures or other onsite activities	**Onsite Disposal** ■ Place in onsite industrial dumpster ■ Send to onsite TSDF **Offsite Disposal** ■ Client to send to offsite TSDF **Interim Management** ■ Store for future treatment and/or disposal

Adapted from U. S. Environmental Protection Agency, *Guide to Management of Investigation-Derived Wastes*, 9345-03FS, January 1992.

Field Logbook Content and Control

SOP 4-1
Revision: 6
Date: March 2007

Prepared: Del Baird

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VERIFY authenticity with ApproveIt

QA Review: Jo Nell Mullins

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Issued:

Signature/Date

1.0 Objective

The objective of this standard operating procedure (SOP) is to set CDM Federal (CDM) criteria for content entry and form of field logbooks. Field logbooks are an essential tool to document field activities for historical and legal purposes.

2.0 Background

2.1 Definitions

Biota - The flora and fauna of a region.

Magnetic Declination Corrections - Compass adjustments to correct for the angle between magnetic north and geographical meridians.

2.2 Discussion

Information recorded in field logbooks includes field team names; observations; data; calculations; date/time; weather; and description of the data collection activity, methods, instruments, and results. Additionally, the logbook may contain deviations from plans and descriptions of wastes, biota, geologic material, and site features including sketches, maps, or drawings as appropriate.

3.0 General Responsibilities

Field Team Leader (FTL) - The FTL is responsible for ensuring that the format and content of data entries are in accordance with this procedure.

Site Personnel - All CDM employees who make entries in field logbooks during onsite activities are required to read this procedure before engaging in this activity. The FTL will assign field logbooks to site personnel who will be responsible for their care and maintenance. Site personnel will return field logbooks to the records file at the end of the assignment.

Note: Responsibilities may vary from site to site. Therefore, all field team member responsibilities should be defined in the field plan or site-/project-specific quality assurance plan.

4.0 Required Equipment

- Site-specific plans
- Field logbook
- Indelible black or blue ink pen
- Ruler or similar scale

5.0 Procedures

5.1 Preparation

In addition to this SOP, site personnel responsible for maintaining logbooks must be familiar with all procedures applicable to the field activity being performed. These procedures should be consulted as necessary to obtain specific information about equipment and supplies, health and safety, sample collection, packaging, decontamination, and documentation. These procedures should be located at the field office or vehicle for easy reference.

Field logbooks shall be bound with lined, consecutively numbered pages. All pages must be numbered before initial use of the logbook. Before use in the field, each logbook will be marked with a specific document control number issued by

the document control administrator, if required by the contract quality implementation plan (QIP). Not all contracts require document control numbers. The following information shall be recorded on the cover of the logbook:

- Field logbook document control number (if applicable).
- Activity (if the logbook is to be activity-specific), site name, and location.
- Name of CDM contact and phone number(s) (typically the project manager).
- Start date of entries.
- End date of entries.
- In specific cases, special logbooks may be required (e.g., waterproof paper for stormwater monitoring).

The first few (approximately five) pages of the logbook will be reserved for a table of contents (TOC). Mark the first page with the heading and enter the following:

Table of Contents

Date/Description	Pages
(Start Date)/Reserved for TOC	1-5

The remaining pages of the table of contents will be designated as such with "TOC" written on the top center of each page. The table of contents should be completed as activities are completed and before placing the logbook in the records file.

5.2 Operation

Requirements that must be followed when using a logbook:

- Record work, observations, quantities of materials, calculations, drawings, and related information directly in the logbook. If data collection forms are specified by an activity-specific plan, this information does not need to be duplicated in the logbook. However, any forms used to record site information must be referenced in the logbook.
- Do not start a new page until the previous one is full or has been marked with a single diagonal line so that additional entries cannot be made. Use both sides of each page.
- Do not erase or blot out any entry at any time. Indicate any deletion by a single line through the material to be deleted. Initial and date each deletion. Take care to not obliterate what was written previously.
- Do not remove any pages from the book.

Specific requirements for field logbook entries include:

- Initial and date each page.
- Sign and date the final page of entries for each day.
- Initial and date all changes.
- Multiple authors must sign out the logbook by inserting the following:
  Above notes authored by:
  - (Sign name)
  - (Print name)
  - (Date)
- A new author must sign and print his/her name before additional entries are made.
- Draw a diagonal line through the remainder of the final page at the end of the day.
- Record the following information on a daily basis:
  - Date and time
  - Name of individual making entry
  - Names of field team and other persons onsite
  - Description of activity being conducted including station or location (i.e., well, boring, sampling location number) if appropriate
  - Weather conditions (i.e., temperature, cloud cover, precipitation, wind direction, and speed) and other pertinent data
  - Level of personal protection used
  - Serial numbers of instruments
  - Equipment calibration information
  - Serial/tracking numbers on documentation (e.g., carrier air bills)

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

At each station where a sample is collected or an observation or measurement made, a detailed description of the location of the station is required. Use a compass (include a reference to magnetic declination corrections), scale, or nearby survey markers, as appropriate. A sketch of station location may be warranted. All maps or sketches made in the logbook should have descriptions of the features shown and a direction indicator. It is preferred that maps and sketches be oriented so that north is toward the top of the page. Maps, sketches, figures, or data that will not fit on a logbook page should be referenced and attached to the logbook to prevent separation.

Other events and observations that should be recorded include:

- Changes in weather that impact field activities.
- Deviations from procedures outlined in any governing documents. Also record the reason for any noted deviation.
- Problems, downtime, or delays.
- Upgrade or downgrade of personal protection equipment.
- Visitors to the site.

5.3 Post-Operation

To guard against loss of data as a result of damage or disappearance of logbooks, completed pages shall be periodically photocopied (weekly, at a minimum) and forwarded to the field or project office. Other field records shall be photocopied and submitted regularly and as promptly as possible to the office. When possible, electronic media such as disks and tapes should be copied and forwarded to the project office.

At the conclusion of each activity or phase of site work, the individual responsible for the logbook will ensure that all entries have been appropriately signed and dated and that corrections were made properly (single lines drawn through incorrect information, then initialed and dated). The completed logbook shall be submitted to the records file.

6.0 Restrictions/Limitations

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

7.0 References

Sandia National Laboratories. 1991. *Procedure for Preparing Sampling and Analysis Plan, Site-Specific Sampling Plan, and Field Operating Procedures,* QA-02-03. Albuquerque Environmental Program, Department 3220, Albuquerque, New Mexico.

Sandia National Laboratories. 1992. *Field Operation Procedure for Field Logbook Content and Control*. Environmental Restoration Department, Division 7723, Albuquerque, New Mexico.

Sample Custody

SOP 1-2
Revision: 5
Date: March 2007

Prepared: David O. Johnson

Technical Review: S. Budney

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1.0 Objective

Because of the evidentiary nature of samples collected during environmental investigations, possession must be traceable from the time the samples are collected until their derived data are introduced as evidence in legal proceedings. To maintain and document sample possession, sample custody procedures are followed. All paperwork associated with the sample custody procedures will be retained in CDM Federal Programs Corporation (CDM) files unless the client requests that it be transferred to them for use in legal proceedings or at the completion of the contract.

Note: Sample custody documentation requirements vary with the specific EPA region or client. This SOP is intended to present basic sample custody requirements, along with common options. Specific sample custody requirements shall be presented in the project-specific quality assurance (QA) project plan or project-specific modification or clarification form (see Section U-1).

2.0 Background

2.1 Definitions

Sample - A sample is material to be analyzed that is contained in single or multiple containers representing a unique sample identification number.

Sample Custody - A sample is under custody if:

1. It is in your possession
2. It is in your view, after being in your possession
3. It was in your possession and you locked it up
4. It is in a designated secure area

Chain-of-Custody Record - A chain-of-custody record is a form used to document the transfer of custody of samples from one individual to another.

Custody Seal - A custody seal is a tape-like seal that is part of the chain-of-custody process and is used to detect tampering with samples after they have been packed for shipping.

Sample Label - A sample label is an adhesive label placed on sample containers to designate a sample identification number and other sampling information.

Sample Tag - A sample tag is attached with string to a sample container to designate a sample identification number and other sampling information. Tags may be used when it is difficult to physically place adhesive labels on the container (e.g., in the case of small air sampling tubes).

3.0 General Responsibilities

Sampler - The sampler is personally responsible for the care and custody of the samples collected until they are properly transferred or dispatched.

Field Team Leader - The field team leader (FTL) is responsible for ensuring that strict chain-of-custody procedures are maintained during all sampling events. The FTL is also responsible for coordinating with the subcontractor laboratory to

ensure that adequate information is recorded on custody records. The FTL determines whether proper custody procedures were followed during the fieldwork.

Field Sample Custodian - The field sample custodian, when designated by the FTL, is responsible for accepting custody of samples from the sampler(s) and properly packing and shipping the samples to the laboratory assigned to do the analyses. A field sample custodian is typically designated only for large and complex field efforts.

Note: Responsibilities may vary from site to site. Therefore, all field team member responsibilities shall be defined in the field plan or site/quality assurance project plan (QAPP).

4.0 Required Supplies

- Chain-of-custody records (applicable client or CDM forms)
- Sample labels and/or tags
- EPA Field Operations Records Management System II Lite™ (FORMS II Lite™) software (if required)
- Printer paper
- Custody seals
- Clear tape
- Computer
- Printer

5.0 Procedures

5.1 Chain-of-Custody Record

This procedure establishes a method for maintaining custody of samples through use of a chain-of-custody record. This procedure will be followed for all samples collected or split samples accepted.

Field Custody

1. Collect only the number of samples needed to represent the media being sampled. To the extent possible, determine the quantity and types of samples and sample locations before the actual fieldwork. As few people as possible shall handle samples.

2. Complete sample labels or tags for each sample using waterproof ink.

3. Maintain personal custody of the samples (in your possession) at all times until custody is transferred for sample shipment or directly to the analytical laboratory.

Transfer of Custody and Shipment

1. Complete a chain-of-custody record for all samples (see Figure 1 for an example of a chain-of-custody record. Similar forms may be used when requested by the client). When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents sample custody transfer from the sampler, often through another person, to the sample custodian in the appropriate laboratory.

    - The date/time will be the same for both signatures when custody is transferred directly to another person. When samples are shipped via common carrier (e.g., Federal Express), the date/time will not be the same for both signatures. Common carriers are not required to sign the chain-of-custody record.

    - In all cases, it must be readily apparent that the person who received custody is the same person who relinquished custody to the next custodian.

    - If samples are left unattended or a person refuses to sign, this must be documented and explained on the chain-of-custody record.

Note: If a field sample custodian has been designated, he/she may initiate the chain-of-custody record, sign, and date as the relinquisher. The individual sampler(s) must sign in the appropriate block, but does (do) not need to sign and date as a relinquisher (refer to Figure 1).

2. Package samples properly for shipment and dispatch to the appropriate laboratory for analysis. Each shipment must be accompanied by a separate chain-of-custody record. If a shipment consists of multiple coolers, a chain-of-custody record shall be filled out for each cooler documenting only samples contained in that particular cooler.

3. The original record will accompany the shipment, and the copies will be retained by the FTL and, if applicable, distributed to the appropriate sample coordinators. Freight bills will also be retained by the FTL as part of the permanent documentation. The shipping number from the freight bill shall be recorded on the applicable chain-of-custody record and field logbook in accordance with TSOP 4-1, *Field Logbook Content and Control*.

Procedure for Completing CDM Example Chain-of-Custody Record
The following procedure is to be used to fill out the CDM chain-of-custody record. The record provided herein (Figure 1) is an example chain-of-custody record. If another type of custody record (i.e., provided by the EPA Contract Laboratory Program (CLP) or a subcontract laboratory or generated by FORMS II Lite™) is used to track the custody of samples, the custody record shall be filled out in its entirety.

1. Record project number.
2. Record FTL for the project (if a field sample custodian has been designated, also record this name in the “Remarks” box).
3. Record the name and address of the laboratory to which samples are being shipped.
4. Enter the project name/location or code number.
5. Record overnight courier’s airbill number.
6. Record sample location number.
7. Record sample number.
8. Note preservatives added to the sample.
9. Note media type (matrix) of the sample.
10. Note sample type (grab or composite).
11. Enter date of sample collection.
12. Enter time of sample collection in military time.
13. When required by the client, enter the names or initials of the samplers next to the sample location number of the sample they collected.
14. List parameters for analysis and the number of containers submitted for each analysis.
15. Enter appropriate designation for laboratory quality control (e.g., matrix spike/matrix spike duplicate [MS/MSD], matrix spike/duplicate [MS/D]), or other remarks (e.g., sample depth).
16. Sign the chain-of-custody record(s) in the space provided. All samplers must sign each record.
17. If sample tags are used, record the sample tag number in the “Remarks” column.
18. The originator checks information entered in Items 1 through 16 and then signs the top left “Relinquished by” box, prints his/her name, and enters the current date and time (military).
19. Send the top two copies (usually white and yellow) with the samples to the laboratory; retain the third copy (usually pink) for the project files. Retain additional copies for the project file or distribute as required to the appropriate sample coordinators.
20. The laboratory sample custodian receiving the sample shipment checks the sample label information against the chain-of-custody record. Sample condition is checked and anything unusual is noted under “Remarks” on the chain-of-custody record. The laboratory custodian receiving custody signs in the adjacent “Received by” box and keeps the copy. The white copy is returned to CDM.

5.2 Sample Labels and Tags

Unless the client directs otherwise, sample labels or tags will be used for all samples collected or accepted for CDM projects.

1. Complete one label or tag with the information required by the client for each sample container collected. A typical label or tag would be completed as follows (see Figure 2 for example of sample tag; labels are completed with the equivalent information):

    - Record the project code (i.e., project or task number).
    - Enter the station number (sample number or EPA CLP identification number) if applicable.
    - Record the date to indicate the month, day, and year of sample collection.
    - Enter the time (military) of sample collection.

- Place a check to indicate composite or grab sample.
- Record the station (sample) location.
- Sign in the space provided.
- Place a check next to "yes" or "no" to indicate if a preservative was added.
- Place a check under "Analyses" next to the parameters for which the sample is to be analyzed. If the desired analysis is not listed, write it in the empty slot. Note: Do not write in the box for "laboratory sample number."
- Place or write additional relevant information under "Remarks."

2. Place adhesive labels directly on the sample containers. Place clear tape over the label to protect from moisture.

3. Securely attach sample tags to the sample bottle. On 2.27 liter (80 oz.) amber bottles, the tag string may be looped through the ring-style handle and tied. On all other containers, it is recommended that the string be looped around the neck of the bottle, then twisted, and relooped around the neck until the slack in the string is removed.

4. Double-check that the information recorded on the sample tag is consistent with the information recorded on the chain-of-custody record.

5.3 Custody Seals

Two custody seals must be placed on opposite corners of all shipping containers (e.g., cooler) before shipment. The seals shall be signed and dated by the shipper.

Custody seals may also be required to be placed on individual sample bottles. Check with the client or refer to EPA regional guidelines for direction.

5.4 Sample Shipping

CDM Federal SOP 2-1, *Packaging and Shipping Environmental Samples* defines the requirements for packaging and shipping environmental samples.

6.0 Restrictions/Limitations

Check with the EPA region or client for specific guidelines. If no specific guidelines are identified, this procedure shall be followed.

For EPA CLP sampling events, combined chain-of-custody/traffic report forms generated with EPA FORMS II Lite™ or other EPA-specific records may be used. Refer to regional guidelines for completing these forms.

The EPA FORMS II Lite™ software may be used to customize sample labels and custody records when directed by the client or the CDM project manager.

7.0 References

U. S. Army Corps of Engineers. 2001. *Requirements for the Preparation of Sampling and Analysis Plan*, EM 200-1-3. Appendix F. February.

U. S. Environmental Protection Agency. Revised March 1992. *National Enforcement Investigations Center, Multi-Media Investigation Manual*, EPA-330/9-89-003-R. p.85.

_____. Region IV. 1996. *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*. Section 3.3. May.

_____. 2002. *FORMS II Lite™ User's Guide, Version 5.1*.

_____. 2002. *EPA Guidance for Quality Assurance Project Plans*, EPA QA/G-5, EPA/240/R-02/009. Section 2.2.3. December.

_____. 2004. *Contract Laboratory Program (CLP), Guidance for Field Samplers,* EPA-540-R-00-003. Final. Section 3.2. August.

Figure 1
Example CDM Chain-of-Custody Record

CDM

125 Maiden Lane, 5th Floor
New York, NY 10038
(212) 785-9123
Fax: (212) 785-6114

CHAIN OF CUSTODY RECORD

PROJECT ID.	FIELD TEAM LEADER	LABORATORY AND ADDRESS	DATE SHIPPED
PROJECT NAME/LOCATION		LAB CONTRACT:	AIRBILL NO.

MEDIA TYPE	PRESERVATIVES	SAMPLE TYPE
1. Surface Water	1. HCl, pH <2	G = Grab
2. Groundwater	2. HNO3, pH <2	C = Composite
3. Leachate	3. NaOH, pH >12	
4. Field QC	4. H2SO4, pH <2	
5. Soil/Sediment	5. Zinc Acetate, pH >9	
6. Oil	6. Ice Only	
7. Waste	7. Not Preserved	
8. Other _____	8. Other _____	

SAMPLE LOCATION NO.	LABORATORY SAMPLE NUMBER	PRESER-VATIVES ADDED	MEDIA TYPE	SAMPLE TYPE	20_ _ DATE	TIME SAMPLED	ANALYSES (List no. of containers submitted)								REMARKS (Note if MS/MSD)
1.															
2.															
3.															
4.															
5.															
6.															
7.															
8.															
9.															
10.															

SAMPLER SIGNATURES:

RELINQUISHED BY: (PRINT)	DATE/TIME	RECEIVED BY: (PRINT)	DATE/TIME	RELINQUISHED BY: (PRINT)	DATE/TIME	RECEIVED BY: (PRINT)	DATE/TIME
(SIGN)		(SIGN)		(SIGN)		(SIGN)	
RELINQUISHED BY: (PRINT)	DATE/TIME	RECEIVED BY: (PRINT)	DATE/TIME	RELINQUISHED BY: (PRINT)	DATE/TIME	RECEIVED BY: (PRINT)	DATE/TIME
(SIGN)		(SIGN)		(SIGN)		(SIGN)	

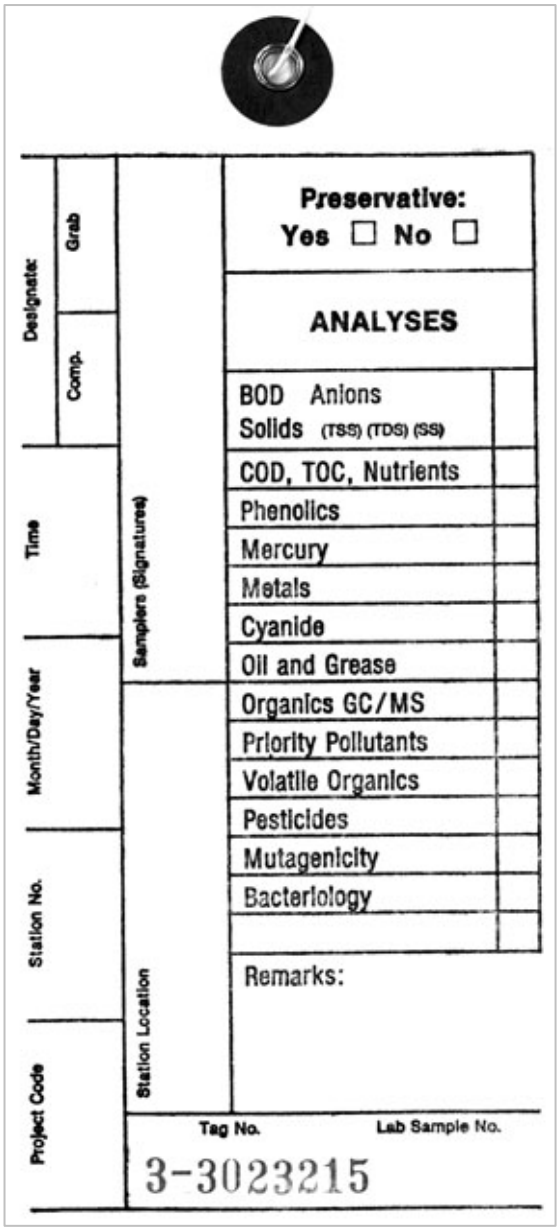
COMMENTS:

DISTRIBUTION: White and yellow copies accompany sample shipment to laboratory; yellow copy retained by laboratory. Pink copy retained by samplers.

1/98

Note: If requested by the client, different chain-of-custody records may be used. Copies of the template for this record may be obtained from the Chantilly Graphics Department.

Figure 2
Example Sample Tag



Note: Equivalent sample labels or tags may be used.

Packaging and Shipping Environmental Samples

SOP 2-1
Revision: 3
Date: March 2007

Prepared: Krista Lippoldt

Technical Review: Chuck Myers

E-Signed by Michael C. Malloy
VERIFY authenticity with ApproveIt

QA Review: Jo Nell Mullins

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Issued:

Signature/Date

1.0 Objective

The objective of this SOP is to outline the requirements for the packaging and shipment of environmental samples. Additionally, Sections 2.0 through 7.0 outline requirements for the packaging and shipping of regulated environmental samples under the Department of Transportation (DOT) Hazardous Materials Regulations, the International Air Transportation Association (IATA), and International Civil Aviation Organization (ICAO) Dangerous Goods Regulations for shipment by air and applies only to domestic shipments. This SOP does not cover the requirements for packaging and shipment of equipment (including data loggers and self-contained breathing apparatus [SCBAs] or bulk chemicals that are regulated under the DOT, IATA, and ICAO.

1.1 Packaging and Shipping of All Samples

This standard operating procedure (SOP) applies to the packaging and shipping of all environmental samples. If the sample is preserved or radioactive, the following sections may also be applicable.

Section 2.0 - Packaging and Shipping Samples Preserved with Methanol
Section 3.0 - Packaging and Shipping Samples Preserved with Sodium Hydroxide
Section 4.0 - Packaging and Shipping Samples Preserved with Hydrochloric Acid
Section 5.0 - Packaging and Shipping Samples Preserved with Nitric Acid
Section 6.0 - Packaging and Shipping Samples Preserved with Sulfuric Acid
Section 7.0 - Packaging and Shipping Limited-Quantity Radioactive Samples

1.2 Background

1.2.1 Definitions

Environmental Sample - An aliquot of air, water, plant material, sediment, or soil that represents the contaminant levels on a site. Samples of potential contaminant sources, like tanks, lagoons, or non-aqueous phase liquids are normally not “environmental” for this purpose. This procedure applies only to environmental samples that contain less than reportable quantities for any foreseeable hazardous constituents according to DOT regulations promulgated in 49 CFR - Part 172.101 Appendix A.

Custody Seal - A custody seal is a narrow adhesive-backed seal that is applied to individual sample containers and/or the container (i.e., cooler) before offsite shipment. Custody seals are used to demonstrate that sample integrity has not been compromised during transportation from the field to the analytical laboratory.

Inside Container - The container, normally made of glass or plastic, that actually contacts the shipped material. Its purpose is to keep the sample from mixing with the ambient environment.

Outside Container - The container, normally made of metal or plastic, that the transporter contacts. Its purpose is to protect the inside container.

Secondary Containment - The outside container provides secondary containment if the inside container breaks (i.e., plastic overpackaging if liquid sample is collected in glass).

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

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

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

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

1.2.2 Associated Procedures

- CDM Federal SOP 1-2, *Sample Custody*

1.2.3 Discussion

Proper packaging and shipping is necessary to ensure the protection of the integrity of environmental samples shipped for analysis. These shipments are potentially subject to regulations published by DOT, IATA, or ICAO. Failure to abide by these rules places both CDM and the individual employee at risk of serious fines. The analytical holding times for the samples must not be exceeded. The samples shall be packed in time to be shipped for overnight delivery. Make arrangements with the laboratory before sending samples for weekend delivery.

1.3 Required Equipment

- Coolers with return address of the appropriate CDM office
- Heavy-duty plastic garbage bags
- Plastic zip-type bags, small and large
- Clear tape
- Nylon reinforced strapping tape
- Duct tape
- Vermiculite (or an equivalent nonflammable material that is inert and absorbent)*
- Bubble wrap (optional)
- Ice
- Custody seals
- Completed chain-of-custody record or contract laboratory program (CLP) custody records, if applicable
- Completed bill of lading
- "This End Up" and directional arrow labels

*Check for any client-specific or laboratory requirements related to the use of absorbent packaging materials.

1.4 Packaging Environmental Samples

The following steps must be followed when packing sample bottles and jars for shipment:

1. Verify the samples undergoing shipment meet the definition of "environmental sample" and are not a hazardous material as defined by DOT. Professional judgment and/or consultation with qualified persons such as the appropriate health and safety coordinator or the health and safety manager shall be observed.

2. Select a sturdy cooler in good repair. Tape any interior opening in the cooler (drain plug) from the inside to ensure control of interior contents. Also, tape the drain plug from the outside of the cooler. Line the cooler with a large heavy-duty plastic garbage bag.

3. Be sure the caps on all bottles are tight (will not leak); check to see that labels and chain-of-custody records are completed properly (SOP 1-2, Sample Custody).

4. Place all bottles in separate and appropriately sized plastic zip-top bags and close the bags. Up to three VOA vials may be packed in one bag. Binding the vials together with a rubber band on the outside of the bag, or separating them so that they do not contact each other, will reduce the risk of breakage. Bottles may be wrapped in bubble wrap. Optionally, place three to six VOA vials in a quart metal can and then fill the can with vermiculite or equivalent. ***Note***: Trip blanks must be included in coolers containing VOA samples.

5. Place 2 to 4 inches of vermiculite (or equivalent) into a cooler that has been lined with a garbage bag, and then place the bottles and cans in the bag with sufficient space to allow for the addition of packing material between the bottles and cans. It is preferable to place glass sample bottles and jars into the cooler vertically. Glass containers are less likely to break when packed vertically rather than horizontally.

6. While placing sample containers into the cooler, conduct an inventory of the contents of the shipping cooler against the chain-of-custody record. The chain-of-custody with the cooler shall reflect only those samples within the cooler.

7. Put ice in large plastic zip-top bags (double bagging the zip-tops is preferred) and properly seal. Place the ice bags on top of and/or between the samples. Several bags of ice are required (dependant on outdoor temperature, staging time, etc.) to maintain the cooler temperature at approximately 4° Celsius (C) if the analytical method requires cooling. Fill all remaining space between the bottles or cans with packing material. Securely fasten the top of the large garbage bag with fiber or duct tape.

8. Place the completed chain-of-custody record or the CLP traffic report form (if applicable) for the laboratory into a plastic zip-top bag, seal the bag, tape the bag to the inner side of the cooler lid and close the cooler.

9. The cooler lid shall be secured with nylon reinforced strapping tape by wrapping each end of the cooler a minimum of two times. Attach a completed chain-of-custody seal across the opening of the cooler on opposite sides. The custody seals shall be affixed to the cooler with half of the seal on the strapping tape so that the cooler cannot be opened without breaking the seal. Complete two more wraps around with fiber tape and place clear tape over the custody seals.

10. The shipping container lid must be marked **"THIS END UP"** and arrow labels that indicate the proper upward position of the container shall be affixed to the cooler. A label containing the name and address of the shipper (CDM) shall be placed on the outside of the container. Labels used in the shipment of hazardous materials (such as Cargo Only Air Craft, Flammable Solids, etc.) are not permitted on the outside of containers used to transport environmental samples and shall not be used. The name and address of the laboratory shall be placed on the container, or when shipping by common courier, the bill of lading shall be completed and attached to the lid of the shipping container.

2.0 Packaging and Shipping Samples Preserved with Methanol

2.1 Containers

- The maximum volume of methanol in a sample container is limited to 30 ml.
- The sample container must not be full of methanol.

2.2 Responsibility

It is the responsibility of the qualified shipper to:

- Ensure that the samples undergoing shipment contain no other contaminant that meets the definition of "hazardous material" as defined by DOT
- Determine the amount of preservative in each sample so that accurate determination of quantities can be made

Note: Responsibilities may vary from site to site. Therefore, all field team member responsibilities shall be defined in the field plan or site-/project-specific quality assurance project plan (QAPP).

2.3 Additional Required Equipment

The following equipment is needed in addition to the required equipment listed in Section 1.3:

- Inner packing may consist of glass or plastic jars
- Outer packaging (for limited quantities) insulated cooler that has passed the ICAO drop test
- Survey documentation (if shipping from Department of Energy [DOE] or radiological sites)
- Class 3 flammable liquid labels
- Orientation labels
- Consignor/consignee labels

2.4 Packaging Samples Preserved with Methanol

The following steps are to be followed when packaging limited-quantity sample shipments:

- Tape any interior opening in the cooler (drain plug) from the inside to ensure control of interior contents. Also, tape the drain plug from the outside of the cooler.
- All sample containers will be properly labeled and the label protected with waterproof tape before sampling.
- At a minimum the label must contain:
  - Project name
  - Project number
  - Date and time of sample collection
  - Sample location
  - Sample identification number
  - Collector's initials
  - Preservative (note amount of preservative used in miscellaneous section of the chain-of-custody form)
- Wrap each container (40-ml VOA vials) in bubble wrap (secure with waterproof tape) to prevent breakage.
- Place the bubble-wrapped container into a 2.7-mil zip-type bag, removing trapped air.
- Place wrapped containers inside a polyethylene bottle filled with vermiculite; seal the bottle. (Maximum of 4 VOA vials will fit inside a 500-ml wide-mouth polyethylene bottle.)
- Total volume of methanol per shipping container must not exceed 500 ml.
- Place sufficient amount of vermiculite in the bottom of the cooler to absorb any leakage that may occur.
- Place a garbage bag in the cooler.
- Pack the samples appropriately inside the garbage bag (bottles placed upright) to prevent movement during shipment.
- Place a sufficient amount of double-bagged ice around the samples to maintain the required temperature during shipment.
- Seal the garbage bag by tieing or taping.
- The maximum weight of the cooler shall not exceed 30 kg (66 lbs) for any limited-quantity shipment of dangerous goods.
- Secure the chain-of-custody form (placed inside a zip-type bag) to the interior of the cooler lid.
- If the shipment is from a DOE or other facility, place the results of the radiation screen and cooler/sample survey with the chain-of-custody.
- Wrap strapping tape or duct tape around both ends of the cooler and around the cooler lid.
- Affix custody seals to opposite sides of the cooler lid. Cover the custody seals with clear waterproof tape.
- Mark the outside of the cooler with the proper shipping name of the contents, corresponding UN number, and LTD. QTY. (as shown below).

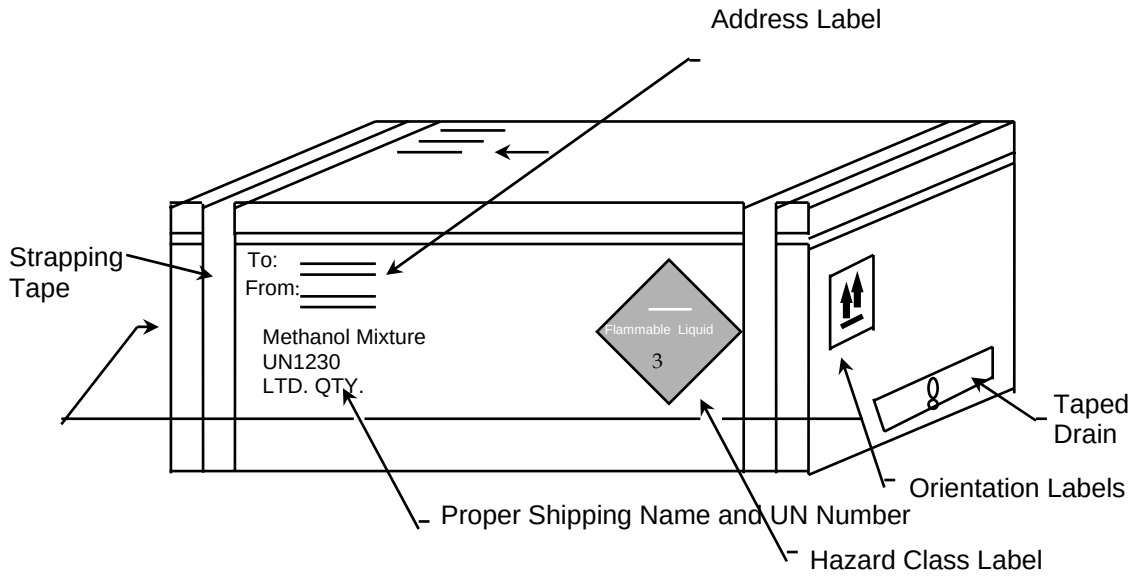
  Methanol Mixture
  UN1230
  LTD. QTY.

- Place a label on the front of the cooler with the company name, contact name, phone number, full street address, and state with zip code for both shipper and recipient.
- Affix a Flammable Liquid label to the outside of the cooler.
- Affix package orientation labels on two opposite sides of the cooler.
- Secure the marking and labels to the surface of the cooler with clear waterproof tape to prevent accidental removal during shipment.
- An example of cooler labeling/marking locations is shown in Figure 1.

Note: No marking or labeling can be obscured by strapping or duct tape.
Note: The inner packaging of dangerous goods must be placed into the designated cooler for shipment. Other nonregulated environmental samples may be added to the cooler for shipment.

- When shipping from a DOE facility, the cooler will be surveyed by a qualified radiation control technician to ensure that radiation flux on exterior surfaces does not exceed 0.5 mrem/h on all sides. This survey will be documented and the results reviewed by the qualified shipper.
- Complete the Dangerous Goods and Hazardous Materials Inspection Checklist for Shipping Limited-Quantity (Appendix A).
- Complete a Dangerous Goods Airbill.

Figure 1
Example of Cooler Label/Marking Locations



3.0 Packaging and Shipping Samples Preserved with Sodium Hydroxide

3.1 Containers

The inner packaging container (and amount of preservative) that may be used for these shipments includes:

Excepted Quantities of Sodium Hydroxide Preservatives

Preservative		***Desired in Final Sample***		***Quantity of Preservative (ml) for Specified Container***				
		pH	**Conc.**	**40 ml**	**125 ml**	**250 ml**	**500 ml**	**1 L**
NaOH	30%	>12	0.08%		.25	0.5	1	2

5 drops = 1 ml

3.2 Responsibility

It is the responsibility of the qualified shipper to determine the amount of preservative in each sample so that accurate determination of quantities can be made.

Note: Responsibilities may vary from site to site. Therefore, all field team member responsibilities shall be defined in the field plan or site-/project-specific quality assurance project plan (QAPP).

3.3 Additional Required Equipment

The following equipment is needed in addition to the required equipment listed in Section 1.3:

- Outer packaging (for limited quantities) insulated cooler that has passed the ICAO drop test
- Inner packings may consist of glass or plastic jars no larger than 1 pint
- Survey documentation (if shipping from DOE or radiological sites)
- Class 8 corrosive labels
- Orientation labels
- Consignor/consignee labels

3.4 Packaging Samples Preserved with Sodium Hydroxide

Samples containing NaOH as a preservative that exceed the excepted concentration of 0.08 percent (2 ml of a 30 percent NaOH solution per liter) may be shipped as a limited quantity per packing instruction Y819 of the IATA/ICAO Dangerous Goods Regulations.

The following steps are to be followed when packaging limited-quantity samples shipments:

- Tape any interior opening in the cooler (drain plug) from the inside to ensure control of interior contents. Also, tape the drain plug from the outside of the cooler.
- All sample containers will be properly labeled and the label protected with waterproof tape before sampling.
- At a minimum the label must contain:
  - Project name
  - Project number
  - Date and time of sample collection
  - Sample location
  - Sample identification number
  - Collector's initials
  - Preservative (note amount of preservative used in miscellaneous section of the chain-of-custody form)
- This step is optional; wrap each container in bubble wrap (secure with waterproof tape) to prevent breakage.
- Place the bubble-wrapped container into a 2.7-mil zip-type bag, removing trapped air.
- Place glass containers inside a polyethylene bottle filled with vermiculite; seal the bottle.
- The total volume of sample in each cooler must not exceed 1 liter.
- Place sufficient amount of vermiculite in the bottom of the cooler to absorb any leakage that may occur.
- Place a garbage bag in the cooler.
- Pack the samples appropriately inside the garbage bag (bottles placed upright) to prevent movement during shipment.
- Place sufficient amount of double-bagged ice around the samples to maintain the required temperature during shipment.
- Seal the garbage bag by tieing or taping.
- The maximum weight of the cooler shall not exceed 30 kg (66 lbs) for any limited-quantity shipment of dangerous goods.
- Secure the chain-of-custody form (placed inside a zip-type bag) to the interior of the cooler lid.
- If the shipment is from a DOE or other facility, place the results of the radiation screen and cooler/sample survey with the chain-of-custody.
- Wrap strapping tape or duct tape around both ends of the cooler and around the cooler lid.
- Affix custody seals to opposite sides of the cooler lid. Cover the custody seals with clear waterproof tape.
- Mark the outside of the cooler with the proper shipping name of the contents, corresponding UN number, and LTD. QTY. (as shown below).

  Sodium Hydroxide Solution
  UN1824
  LTD. QTY.

- Place a label on the front of the cooler with the company name, contact name, phone number, full street address, and state with zip code for both shipper and recipient.
- Affix a Corrosive label to the outside of the cooler.
- Affix package orientation labels on two opposite sides of the cooler.
- Secure the marking and labels to the surface of the cooler with clear waterproof tape to prevent accidental removal during shipment.
- An example of cooler labeling/marking locations is shown in Figure 1.

Note: Samples meeting the exception concentration of 0.08 percent NaOH by weight may be shipped as nonregulated or nonhazardous following the procedure in Section 1.4.

Note: No marking or labeling can be obscured by strapping or duct tape.

Note: The inner packaging of dangerous goods must be placed into the designated cooler for shipment. Other nonregulated environmental samples may be added to the cooler for shipment.

- When shipping from a DOE facility, the cooler will be surveyed by a qualified radiation control technician to ensure that radiation flux on exterior surfaces does not exceed 0.5 mrem/h on all sides. This survey will be documented and the results reviewed by the qualified shipper.
- Complete the Dangerous Goods and Hazardous Materials Inspection Checklist for Shipping Limited-Quantity (Appendix A).
- Complete a Dangerous Goods Airbill.

4.0 Packaging and Shipping Samples Preserved with Hydrochloric Acid

4.1 Containers

The inner packaging container (and amount of preservative) that may be used for these shipments includes:

Excepted Quantities of Hydrochloric Acid Preservatives

Preservative		***Desired in Final Sample***		***Quantity of Preservative (ml) for Specified Container***		
		pH	**Conc.**	**40 ml**	**125 ml**	**250 ml**
HCl	2N	<1.96	0.04%	.2	.5	1

5 drops = 1 ml

4.2 Responsibility

It is the responsibility of the qualified shipper to:

- Determine the samples undergoing shipment contain no other contaminant that meets the definition of hazardous material as defined by DOT
- Determine the amount of preservative in each sample so that accurate determination of quantities can be made

Note: Responsibilities may vary from site to site. Therefore, all field team member responsibilities shall be defined in the field plan or site-/project-specific quality assurance project plan (QAPP).

4.3 Additional Required Equipment

The following equipment is needed in addition to the required equipment listed in Section 1.3.

- Inner packing may consist of glass or plastic jars no larger than 1 pint.
- Outer packaging (for limited quantities) insulated cooler that has passed the ICAO drop test.
- Survey documentation (if shipping from DOE or radiological sites)
- Class 8 corrosive labels
- Orientation labels
- Consignor/consignee labels

4.4 Packaging Samples Preserved with Hydrochloric Acid

The following steps are to be followed when packaging limited-quantity sample shipments:

- Tape any interior opening in the cooler (drain plug) from the inside to ensure control of interior contents. Also, tape the drain plug from the outside of the cooler.
- All sample containers will be properly labeled and the label protected with waterproof tape before sampling.
- At a minimum the label must contain:
  - Project name
  - Project number
  - Date and time of sample collection
  - Sample location
  - Sample identification number
  - Collector's initials
  - Preservative (note amount of preservative used in miscellaneous section of the chain-of-custody form)
- Wrap each container (40-ml VOA vials) in bubble wrap (secure with waterproof tape) to prevent breakage.
- Place the bubble-wrapped container into a 2.7-mil zip-type bag, removing trapped air.
- Place wrapped containers inside a polyethylene bottle filled with vermiculite; seal the bottle. (No more than 4 VOA vials will fit inside a 500-ml wide-mouth polyethylene bottle.)

- Total volume of sample inside each cooler must not exceed 1 liter.
- Place sufficient amount of vermiculite in the bottom of the cooler to absorb any leakage that may occur.
- Place a garbage bag in the cooler.
- Pack the samples appropriately inside the garbage bag (bottles placed upright) to prevent movement during shipment.
- Place sufficient amount of double-bagged ice around the samples to maintain the required temperature during shipment.
- Seal the garbage bag by tieing or taping.
- The maximum weight of the cooler shall not exceed 30 kg (66 lbs) for any limited-quantity shipment of dangerous goods.
- Secure the chain-of-custody form (placed inside a zip-type bag) to the interior of the cooler lid.
- If the shipment is from a DOE or other facility, place the results of the radiation screen and cooler/sample survey with the chain-of-custody.
- Wrap strapping tape or duct tape around both ends of the cooler and around the cooler lid.
- Affix custody seals to opposite sides of the cooler lid. Cover the custody seals with clear waterproof tape.
- Mark the outside of the cooler with the proper shipping name of the contents, corresponding UN number, and LTD. QTY. (as shown below).

  Hydrochloric Acid Solution
  UN1789
  LTD. QTY.

- Place a label on the front of the cooler with the company name, contact name, phone number, full street address, and state with zip code for both shipper and recipient.
- Affix a Corrosive label to the outside of the cooler.
- Affix package orientation labels on two opposite sides of the cooler.
- Secure the marking and labels to the surface of the cooler with clear waterproof tape to prevent accidental removal during shipment.
- An example of cooler labeling/marking locations is shown in Figure 1.

Note: Samples containing less than the exception concentration of 0.04 percent HCl by weight will be shipped as nonregulated or nonhazardous following the procedure in Section 1.4.

Note: No marking or labeling can be obscured by strapping or duct tape.

Note: The inner packaging of dangerous goods must be placed into the designated cooler for shipment. Other nonregulated environmental samples may be added to the cooler for shipment.

- When shipping from a DOE facility, the cooler will be surveyed by a qualified radiation control technician to ensure that radiation flux on exterior surfaces does not exceed 0.5 mrem/h on all sides. This survey will be documented and the results reviewed by the qualified shipper.
- Complete the Dangerous Goods and Hazardous Materials Inspection Checklist for Shipping Limited-Quantity (Appendix A).
- Complete a Dangerous Goods Airbill.

5.0 Packaging and Shipping Samples Preserved with Nitric Acid

5.1 Containers

The inner packaging container (and amount of preservative) that may be used for these shipments includes:

Excepted Quantities of Nitric Acid Preservatives

Preservative		*Desired in Final Sample*		*Quantity of Preservative (ml) for Specified Container*				
		pH	**Conc.**	**40 ml**	**125 ml**	**250 ml**	**500 ml**	**1 L**
HNO_3	6N	<1.62	0.15%		2	4	5	8

5 drops = 1 mg/L

5.2 Responsibility

It is the responsibility of the qualified shipper to:

- Determine the samples undergoing shipment contain no other contaminant that meets the definition of hazardous material as defined by DOT
- Determine the amount of preservative in each sample so that accurate determination of quantities can be made

Note: Responsibilities may vary from site to site. Therefore, all field team member responsibilities shall be defined in the field plan or site-/project-specific quality assurance project plan (QAPP).

5.3 Additional Required Equipment

The following equipment is needed in addition to the required equipment listed in Section 1.3:

- Inner packings may consist of glass or plastic jars no larger than 100 ml.
- Outer packaging (for limited quantities) insulated cooler that has passed the ICAO drop test.
- Survey documentation (if shipping from DOE or radiological sites)
- Class 8 corrosive labels
- Orientation labels
- Consignor/consignee labels

5.4 Packaging Samples Preserved with Nitric Acid

Samples containing HNO_3 as a preservative that exceed the excepted concentration of 0.15 percent HNO_3 will be shipped as a limited quantity per packing instruction Y807 of the IATA/ICAO Dangerous Goods Regulations.

The following steps are to be followed when packaging limited-quantity sample shipments:

- Tape any interior opening in the cooler (drain plug) from the inside to ensure control of interior contents. Also, tape the drain plug from the outside of the cooler.
- All sample containers will be properly labeled and the label protected with waterproof tape before sampling.
- At a minimum the label must contain:
  - Project name
  - Project number
  - Date and time of sample collection
  - Sample location
  - Sample identification number
  - Collector's initials
  - Preservative (note amount of preservative used in miscellaneous section of the chain-of-custody form)
- This step is optional; wrap each container in bubble wrap (secure with waterproof tape) to prevent breakage.
- Place the bubble-wrapped container into a 2.7-mil zip-type bag, removing trapped air.
- Place glass containers inside a polyethylene bottle filled with vermiculite; seal the bottle.
- Place sufficient amount of vermiculite in the bottom of the cooler to absorb any leakage that may occur.
- Place a garbage bag in the cooler.
- Pack the samples appropriately inside the garbage bag (bottles placed upright) to prevent movement during shipment.
- Place sufficient amount of double-bagged ice around the samples to maintain the required temperature during shipment.
- Seal the garbage bag by tieing or taping.
- The maximum volume of preserved solution in the cooler must not exceed 500 ml.
- The maximum weight of the cooler shall not exceed 30 kg (66 lbs) for any limited-quantity shipment of dangerous goods.
- Secure the chain-of-custody form (placed inside a zip-type bag) to the interior of the cooler lid.
- If the shipment is from a DOE or other facility, place the results of the radiation screen and cooler/sample survey with the chain-of-custody.
- Wrap strapping tape or duct tape around both ends of the cooler and around the cooler lid.
- Affix custody seals to opposite sides of the cooler lid. Cover the custody seals with clear waterproof tape.
- Mark the outside of the cooler with the proper shipping name of the contents, corresponding UN number, and LTD. QTY. (as shown below).

Nitric Acid Solution (with less than 20 percent)
UN2031
Ltd. Qty.

- Place a label on the front of the cooler with the company name, contact name, phone number, full street address, and state with zip code for both shipper and recipient.
- Affix a Corrosive label to the outside of the cooler.
- Affix package orientation labels on two opposite sides of the cooler.
- Secure the marking and labels to the surface of the cooler with clear waterproof tape to prevent accidental removal during shipment.
- An example of cooler labeling/marking locations is shown in Figure 1.

Note: Samples meeting the exception concentration of 0.15 percent HNO_3 by weight will be shipped as nonregulated or nonhazardous following the procedure in Section 1.4.

Note: No marking or labeling can be obscured by strapping or duct tape.

Note: The inner packaging of dangerous goods must be placed into the designated cooler for shipment. Other nonregulated environmental samples may be added to the cooler for shipment.

- When shipping from a DOE facility, the cooler will be surveyed by a qualified radiation control technician to ensure that radiation flux on exterior surfaces does not exceed 0.5 mrem/h on all sides. This survey will be documented and the results reviewed by the qualified shipper.
- Complete the Dangerous Goods and Hazardous Materials Inspection Checklist for Shipping Limited-Quantity (Appendix A).
- Complete a Dangerous Goods Airbill.

6.0 Packaging and Shipping Samples Preserved with Sulfuric Acid

6.1 Containers

The inner packaging container (and amount of preservative) that may be used for these shipments includes:

Excepted Quantities of Sulfuric Acid Preservatives

Preservative		***Desired in Final Sample***		***Quantity of Preservative (ml) for Specified Container***				
		pH	**Conc.**	**40 ml**	**125 ml**	**250 ml**	**500 ml**	**1 L**
H_2SO_4	37N	<1.15	0.35%	.1	.25	0.5	1	2

5 drops = 1 ml

6.2 Responsibility

It is the responsibility of the qualified shipper to:

- Determine the samples undergoing shipment contain no other contaminant that meets the definition of hazardous material as defined by DOT
- Determine the amount of preservative in each sample so that accurate determination of quantities can be made

Note: Responsibilities may vary from site to site. Therefore, all field team member responsibilities shall be defined in the field plan or site-/project-specific quality assurance project plan (QAPP).

6.3 Additional Required Equipment

The following equipment is needed in addition to the required equipment listed in Section 1.3:

- Inner packings may consist of glass or plastic jars no larger than 100 ml.
- Outer packaging (for limited quantities) insulated cooler that has passed the ICAO drop test.
- Survey documentation (if shipping from DOE or radiological sites)
- Class 8 corrosive labels
- Orientation labels
- Consignor/consignee labels

6.4 Packaging of Samples Preserved with Sulfuric Acid

Samples containing H_2SO_4 as a preservative that exceed the excepted concentration of 0.35 percent will be shipped as a limited quantity per packing instruction Y809 of the IATA/ICAO Dangerous Goods Regulations.

The following steps are to be followed when packaging limited-quantity samples shipments:

- Tape any interior opening in the cooler (drain plug) from the inside to ensure control of interior contents. Also, tape the drain plug from the outside of the cooler.
- All sample containers will be properly labeled and the label protected with waterproof tape before sampling.
- At a minimum the label must contain:
  - Project name
  - Project number
  - Date and time of sample collection
  - Sample location
  - Sample identification number
  - Collector's initials
  - Preservative (note amount of preservative used in miscellaneous section of the chain-of-custody form)
- Wrap each glass container in bubble wrap (secure with waterproof tape) to prevent breakage.
- Place the bubble-wrapped container into a 2.7-mil zip-type bag, removing trapped air.
- Place glass containers inside a polyethylene bottle filled with vermiculite; seal the bottle.
- Place sufficient amount of vermiculite in the bottom of the cooler to absorb any leakage that may occur.
- Place a garbage bag in the cooler.
- Pack the samples appropriately inside the garbage bag (bottles placed upright) to prevent movement during shipment.
- Place sufficient amount of double-bagged ice around the samples to maintain the required temperature during shipment.
- Seal the garbage bag by tieing or taping.
- The maximum volume of preserved solution in the cooler must not exceed 500 ml.
- The maximum weight of the cooler shall not exceed 30 kg (66 lbs) for any limited-quantity shipment of dangerous goods.
- Secure the chain-of-custody form (placed inside a zip-type bag) to the interior of the cooler lid.
- If the shipment is from a DOE or other facility, place the results of the radiation screen and cooler/sample survey with the chain-of-custody.
- Wrap strapping tape or duct tape around both ends of the cooler and around the cooler lid.
- Affix custody seals to opposite sides of the cooler lid. Cover the custody seals with clear waterproof tape.
- Mark the outside of the cooler with the proper shipping name of the contents, corresponding UN number, and LTD. QTY. (as shown below).

  Sulfuric Acid Solution
  UN2796
  LTD. QTY.

- Place a label on the front of the cooler with the company name, contact name, phone number, full street address, and state with zip code for both shipper and recipient.
- Affix a Corrosive label to the outside of the cooler.
- Affix package orientation labels on two opposite sides of the cooler.
- Secure the marking and labels to the surface of the cooler with clear waterproof tape to prevent accidental removal during shipment.
- An example of cooler labeling/marking locations is shown in Figure 1.

Note: Samples containing less than the exception concentration of 0.35 percent H_2SO_4 by weight will be shipped as nonregulated or nonhazardous in accordance with the procedure described in Section 1.4.

Note: No marking or labeling can be obscured by strapping or duct tape.

Note: The inner packaging of dangerous goods must be placed into the designated cooler for shipment. Other nonregulated environmental samples may be added to the cooler for shipment.

- When shipping from a DOE facility, the cooler will be surveyed by a qualified radiation control technician to ensure that radiation flux on exterior surfaces does not exceed 0.5 mrem/h on all sides. This survey will be documented and the results reviewed by the qualified shipper.
- Complete the Dangerous Goods and Hazardous Materials Inspection Checklist for Shipping Limited-Quantity (Appendix A).
- Complete a Dangerous Goods Airbill.

7.0 Packaging and Shipping Limited-Quantity Radioactive Samples

7.1 Containers

The inner packaging containers that may be used for these shipments include:

- Any size sample container

7.2 Description/Responsibilities

- The qualified shipper will determine that the samples undergoing shipment contain no other contaminant that meets the definition of hazardous material as defined by DOT.
- The qualified shipper will ship all samples that meet the Class 7 definition of radioactive materials and meet the activity requirements specified in Table 7 of 49 CFR 173.425, as Radioactive Materials in Limited Quantity. The qualified shipper will verify that all packages and their contents meet the requirements of 49 CFR 173.421, *Limited Quantities of Radioactive Materials*.
- The packaging used for shipping will meet the general requirements for packaging and packages specified in 49 CFR 173.24 and the general design requirements provided in 173.410. These standards state that a package must be capable of withstanding the effects of any acceleration, vibration, or vibration resonance that may arise under normal condition of transport without any deterioration in the effectiveness of the closing devices on the various receptacles or in the integrity of the package as a whole and without loosening or unintentionally releasing the nuts, bolts, or other securing devices even after repeated use.
- If the shipment is from a DOE facility, radiological screenings will be completed on all samples taken. The qualified shipper will review the results of each screening (alpha, beta, and gamma speciation). Samples will not be shipped offsite until the radiological screening has been performed.
- The total activity for each package will not exceed the relevant limits listed in Table 7 of 49 CFR 173.425. The A_2 value of the material will be calculated based on all radionuclides found during previous investigations (if any) in the area from which the samples are derived. The A_2 values to be used will be the most restrictive of all potential radionuclides as listed in 49 CFR 173.435.
- The radiation level at any point on the external surface of the package bearing the sample(s) will not exceed 0.005 mSv/hour (0.5 mrem/hour). These will be verified by dose and activity monitoring before shipment of the package.
- The removable radioactive surface contamination on the external surface of the package will not exceed the limits specified in 49 CFR 173.443(a). CDM will apply the DOE-established free release criteria for removable surface contamination of less than 20 dpm/100 cm^2 (alpha) and 1,000 dpm/100 cm^2 (beta/gamma). It shall be noted that these values are more conservative than the DOT requirements for removable surface contamination.
- The qualified shipper will verify that the outside of the inner packaging is marked “Radioactive.”
- The qualified shipper will verify that the excepted packages prepared for shipment under the provisions of 49 CFR 173.421 have a notice enclosed, or shown on the outside of the package, that reads, **“This package conforms to the conditions and limitations specified in 49 CFR 173.421 for radioactive material, excepted package-limited quantity of material, UN2910.”**

Note: Responsibilities may vary from site to site. Therefore, all field team member responsibilities shall be defined in the field plan or site-/project-specific quality assurance project plan (QAPP).

7.3 Additional Required Equipment

The following equipment is needed in addition to the required equipment listed in Section 1.3:

- Survey documentation/radiation screening results (if shipping from DOE or radiological sites)
- Orientation labels
- Excepted quantities label
- Consignor/consignee labels

7.4 Packaging of Limited-Quantity Radioactive Samples

The following steps are to be followed when packaging limited-quantity sample shipments:

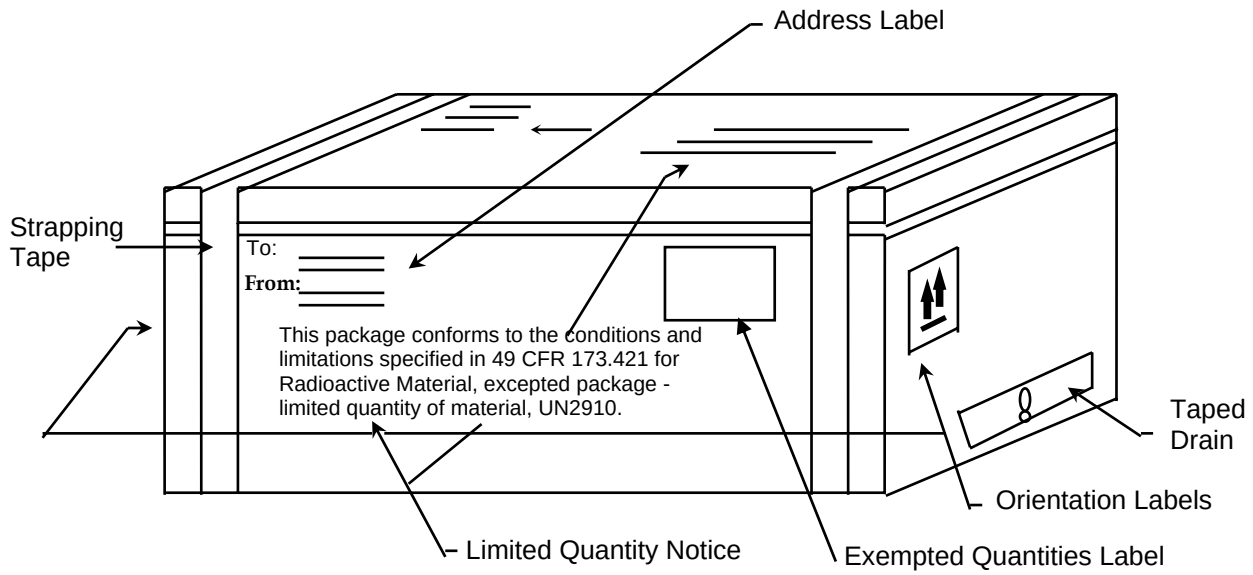
- The cooler is to be surveyed by a qualified radiation control technician to ensure that radiation flux on exterior surfaces does not exceed 0.5 mrem/h on all sides. This survey will be documented and the results reviewed by the qualified shipper.
- Tape any interior opening in the cooler (drain plug) from the inside to ensure control of interior contents. Also, tape the drain plug from the outside of the cooler.
- All sample containers will be properly labeled and the label protected with waterproof tape before sampling.
- At a minimum the label must contain:
  - Project name
  - Project number
  - Date and time of sample collection
  - Sample location
  - Sample identification number
  - Collector's initials
- This step is optional; wrap each container in bubble wrap (secure with waterproof tape) to prevent breakage.
- Place sufficient amount of vermiculite, or approved packaging material, in the bottom of the cooler to absorb any leakage that may occur.
- Place a garbage bag in the cooler.
- Pack the samples appropriately inside the garbage bag (bottles placed upright) to prevent movement during shipment.
- If required, place a sufficient amount of double-bagged ice around the samples to maintain the required temperature during shipment.
- Seal the garbage bag by tieing or taping.
- Place a label marked Radioactive on the outside of the sealed bag.
- Enclose a notice that includes the name of the consignor or consignee and the following statement: ***"This package conforms to the conditions and limitations specified in 49 CFR 173.421 for radioactive material, excepted package-limited quantity of material, UN2910."***
- Note that both DOT and IATA apply different limits to the quantity in the inside packing and in the outside packing.
- The maximum weight of the package shall not exceed 30 kg (66 lbs) for any limited-quantity shipment of dangerous goods.
- Secure the chain-of-custody form (placed inside a zip-type bag) to the interior of the cooler lid.
- If the shipment is from a DOE or other facility, place the results of the radiation screen and cooler/sample survey with the chain-of-custody.
- If a cooler is used, wrap strapping tape or duct tape around both ends of the cooler and around the cooler lid.
- Affix custody seals to opposite sides of the cooler lid. Cover the custody seals with clear waterproof tape.
- Place a label on the front of the cooler with the company name, contact name, phone number, full street address, and state with zip code for both shipper and recipient.
- Affix package orientation labels on two opposite sides of the cooler/package.
- Affix a completed Excepted Quantities label to the side of the cooler/package.
- Secure any marking and labels to the surface of the cooler with clear waterproof tape to prevent accidental removal during shipment.
- An example of the cooler labeling/marking is shown in Figure 2.

Note: No marking or labeling can be obscured by strapping or duct tape.

- Complete the Shipment Quality Assurance Checklist (Appendix B).

Note: Except as provided in 49 CFR 173.426, the package will not contain more than 15 grams of ^{235}U.
Note: A declaration of dangerous goods is not required.

Figure 2
Radioactive Material – Limited-Quantity Cooler Marking Example



8.0 References

U. S. Environmental Protection Agency. Region IV. February 1991 or current. *Standard Operating Procedures and Quality Assurance Manual*.

_____. 1996 or current. *Sampler's Guide to the Contract Laboratory Program*, EPA/540/R-96/032.

Title 49 Code of Federal Regulations, Department of Transportation. 2005 or current revision. *Hazardous Materials Table, Special Provisions, Hazardous, Materials Communications, Emergency Response Information, and Training Requirements*, 49 CFR 172.

Title 49 Code of Federal Regulations, Department of Transportation. 2005 or current revision. *Shippers General Requirements for Shipments and Packagings*, 49 CFR 173.

Appendix A

Dangerous Goods and Hazardous Materials Inspection Checklist for Shipping Limited-Quantity

Sample Packaging

Yes	No	N/A	
❑	❑	❑	The VOA vials are wrapped in bubble wrap and placed inside a zip-type bag.
❑	❑	❑	The VOA vials are placed into a polyethylene bottle, filled with vermiculite, and tightly sealed.
❑	❑	❑	The drain plug is taped inside and outside to ensure control of interior contents.
❑	❑	❑	The samples have been placed inside garbage bags with sufficient bags of ice to preserve samples at 4°C.
❑	❑	❑	The cooler weighs less than the 66-pound limit for limited-quantity shipment.
❑	❑	❑	The garbage bag has been sealed with tape (or tied) to prevent movement during shipment.
❑	❑	❑	The chain-of-custody has been secured to the interior of the cooler lid.
❑	❑	❑	The cooler lid and sides have been taped to ensure a seal.
❑	❑	❑	The custody seals have been placed on both the front and back hinges of the cooler, using waterproof tape.

Air Waybill Completion

Yes	No	N/A	
❑	❑	❑	Section 1 has the shipper's name, company, and address; the account number, date, internal billing reference number; and the telephone number where the shipper can be reached.
❑	❑	❑	Section 2 has the recipient's name and company along with a telephone number where they can be reached.
❑	❑	❑	Section 3 has the **Bill Sender** box checked.
❑	❑	❑	Section 4 has the **Standard Overnight** box checked.
❑	❑	❑	Section 5 has the **Deliver Weekday** box checked.
❑	❑	❑	Section 6 has the number of packages and their weights filled out. Was the total of all packages and their weights figured up and added at the bottom of Section 6?
❑	❑	❑	Under the **Transport Details** box, the **Cargo Aircraft Only** box is obliterated, leaving only the **Passenger and Cargo Aircraft** box.
❑	❑	❑	Under the **Shipment Type**, the **Radioactive** box is obliterated, leaving only the **Non-Radioactive** box.
❑	❑	❑	Under the **Nature and Quantity of Dangerous Goods** box, the **Proper Shipping Name, Class or Division, UN or ID No., Packing Group, Subsidiary Risk, Quantity and Type of Packing, Packing Instructions, and Authorization** have been filled out for the type of chemical being sent.
❑	❑	❑	The **Name, Place and Date, Signature, and Emergency Telephone Number** appears at the bottom of the FedEx Airbill.
❑	❑	❑	The statement "In accordance with IATA/ICAO" appears in the **Additional Handling Information** box.
❑	❑	❑	The E**mergency Contact Information** at the bottom of the FedEx Airbill is truly someone who can respond any time of the day or night.

Proper Shipping Name	*Class or Division*	*UN or ID No.*	*Packing Group*	*Sub Risk*	*Quantity*	*Packing Instruction*	*Authorization*
Hydrochloric Acid Solution	8	UN1789	II		1 plastic box × 0.5 L	Y809	Ltd. Qty.
Nitric Acid Solution (with less than 20%)	8	UN2031	II		1 plastic box × 0.5 L	Y807	Ltd. Qty.
Sodium Hydroxide Solution	8	UN1824	II		1 plastic box × 0.5 L	Y809	Ltd. Qty.
Sulfuric Acid Solution	8	UN2796	II		1 plastic box × 0.5 L	Y809	Ltd. Qty.
Methanol	3	UN1230	II		1 plastic box × 1 L	Y305	Ltd. Qty.

Sample Cooler Labeling

Yes	No	N/A	
❑	❑	❑	The proper shipping name, UN number, and Ltd. Qty. appears on the shipping container.
❑	❑	❑	The corresponding hazard labels are affixed on the shipping container; the labels are not obscured by tape.
❑	❑	❑	The name and address of the shipper and receiver appear on the top and side of the shipping container.
❑	❑	❑	The air waybill is attached to the top of the shipping container.
❑	❑	❑	**Up Arrows** have been attached to opposite sides of the shipping container.
❑	❑	❑	Packaging tape does not obscure markings or labeling.

Appendix B
Shipment Quality Assurance Checklist

Date: _____ Shipper: _____ Destination: _____

Item(s) Description: _____

Radionuclide(s): _____

Radiological Survey Results: surface _____mrem/hr 1 meter _____

Instrument Used: Mfgr: _____ Model: _____

S/N: _____ Cal Date: _____

Limited-Quantity or Instrument and Article

Yes	No		
___	___	1.	Strong tight package (package that will not leak material during conditions normally incidental to transportation).
___	___	2.	Radiation levels at any point on the external surface of package less than or equal to 0.5 mrem/hr.
___	___	3.	Removable surface contamination less than 20 dpm/100 cm^2 (alpha) and 1,000 dpm/100 cm^2 (beta/gamma).
___	___	4.	Outside inner package bears the marking "Radioactive."
___	___	5.	Package contains less than 15 grams of ^{235}U (check yes if ^{235}U not present).
___	___	6.	Notice enclosed in or on the package that includes the consignor or consignee and the statement, **"This package conforms to the conditions and limitations specified in 49 CFR 173.421 for radioactive material, excepted package-limited quantity of material, UN2910."**
___	___	7.	Activity less than that specified in 49 CFR 173.425. Permissible package limit: Package Quantity:
___	___	8.	On all air shipments, the statement **Radioactive Material, excepted package-limited quantity of material** shall be noted on the air waybill.

Qualified Shipper: _____ Signature: _____

Control of Measurement and Test Equipment

SOP 5-1
Revision: 8
Date: March 2007

Prepared: Dave Johnson

Technical Review: Steve Guthrie

E-Signed by Michael C. Malloy
VERIFY authenticity with ApproveIt

QA Review: Jo Nell Mullins

Approved:

Signature/Date

E-Signed by P. Michael Schwan
VERIFY authenticity with ApproveIt

Issued:

Signature/Date

1.0 Objective

The objective of this standard operating procedure (SOP) is to establish the baseline requirements, procedures, and responsibilities inherent to the control and use of all measurement and test equipment (M&TE). Contractual obligations may require more specific or stringent requirements that must also be implemented.

2.0 Background

2.1 Definitions

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

2.2 Associated Procedures

- CDM Federal Technical SOP 4-1, *Field Logbook Content and Control*
- CDM Quality Procedures (QPs) 2.1 and 2.3
- Manufacturer's operating and maintenance and calibration procedures

2.3 Discussion

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

3.0 Responsibilities

All staff with responsibility for the direct control and/or use of M&TE are responsible for being knowledgeable of and understanding and implementing the requirements contained herein as well as any other related project-specific requirements.

The project manager (PM) or designee (equipment coordinator, quality assurance coordinator, field team leader, etc.) is responsible for initiating and tracking the requirements contained herein.

***Note*:** Responsibilities may vary from site to site. Therefore, all field team member responsibilities shall be defined in the field plan or site-/project-specific quality assurance plan.

4.0 Requirements for M&TE

- Determine and implement M&TE related project-specific requirements
- The maintenance and calibration procedures must be followed when using M&TE
- Obtain the maintenance and calibration procedures if they are missing or incomplete
- Attach or include the maintenance and calibration procedures with the M&TE
- Prepare and record maintenance and calibration in an equipment log or a field log as appropriate (Figure 1)
- Maintain M&TE records
- Label M&TE requiring routine or scheduled calibration (when required)
- Perform maintenance and calibration using the appropriate procedure and calibration standards
- Identify and take action on nonconforming M&TE

5.0 Procedures

5.1 Determine if Other Related Project-Specific Requirements Apply

For all M&TE:
The PM or designee shall determine if M&TE related project-specific requirements apply. If M&TE related project-specific requirements apply, obtain a copy of them and review and implement as appropriate.

5.2 Obtain the Operating and Maintenance and Calibration Documents

For GF M&TE that is to be procured:
Requisitioner - Specify that the maintenance and calibration procedures be included.

For GF M&TE that is acquired as a result of a property transfer:
Receiver - Inspect the M&TE to determine whether maintenance and calibration procedures are included with the item. If missing or incomplete, order the appropriate documentation from the manufacturer.

For M&TE that is to be rented or leased from an outside vendor:
Requisitioner - Specify that the maintenance and calibration procedures, the latest calibration record, and the calibration standards certification be included. If this information is not delivered with the M&TE, ask the procurement division to request it from the vendor.

5.3 Prepare and Record Maintenance and Calibration Records

For all M&TE:
PM or Designee - Record all maintenance and calibration events in a field log unless other project-specific requirements apply.

For GF M&TE only (does not apply to rented or leased M&TE):
If an equipment log is a project specific requirement, perform the following:

Receiver - Notify the PM or designee for the overall property control of the equipment upon receipt of an item of M&TE.

PM or Designee and User:
- Prepare a sequentially page numbered equipment log for the item using the maintenance and calibration form (or equivalent) (Figure 1).
- Record all maintenance and calibration events in an equipment log.

5.4 Label M&TE Requiring Calibration

For GF M&TE only (does not apply to rented or leased M&TE):
If calibration labeling is a project specific requirement, perform the following:

PM or Designee:
- Read the maintenance and calibration procedures to determine the frequency of calibration required.
- If an M&TE item requires calibration before use, affix a label to the item stating “Calibrate Before Use.”
- If an M&TE item requires calibration at other scheduled intervals, e.g., monthly, annually, etc., affix a label listing the date of the last calibration, the date the item is next due for a calibration, the initials of the person who performed the calibration, and a space for the initials of the person who shall perform the next calibration.

5.5 Operating, Maintaining or Calibrating an M&TE Item

For all M&TE:
PM or Designee and User - Operate, maintain, and calibrate M&TE in accordance with the maintenance and calibration procedures. Record maintenance and calibration actions in the equipment log or field log.

5.6 Shipment

For GF M&TE:
Shipper - Inspect the item to ensure that the maintenance and calibration procedures are attached to the shipping case, or included, and that a copy of the most recent equipment log entry page (if required) is included with the shipment. If the maintenance and calibration procedures and/or the current equipment log page (if required) is missing or incomplete, do not ship the item. Immediately contact the PM or designee and request a replacement.

For M&TE that is rented or leased from an outside vendor:
Shipper - Inspect the item to ensure that the maintenance and calibration procedures and latest calibration and standards certification records are included prior to shipment. If any documentation is missing or incomplete, do not ship the item. Immediately contact the procurement division and request that they obtain the documentation from the vendor.

5.7 Records Maintenance

For GF M&TE:
PM or Designee - Create a file upon the initial receipt of an item of M&TE or calibration standard. Organize the files by contract origin and by M&TE item and calibration standard. Store all files in a cabinet, file drawer, or other appropriate storage media at the pertinent warehouse or office location.

Receiver - Forward the original packing slip to the procurement division and a photocopy to the PM or designee.

PM or Designee and User:
- Maintain all original documents in the equipment file except for the packing slip and field log.
- File the photocopy of the packing slip in the M&TE file.
- Record all maintenance and calibration in an equipment log or field log (as appropriate). File the completed equipment logs in the M&TE records. Forward completed field logs to the PM for inclusion in the project files.

For M&TE rented or leased from an outside vendor:
Receiver - Forward the packing slip to the procurement division.

User:
- Forward the completed field log to the PM for inclusion in the project files.
- Retain the most current maintenance and calibration record and calibration standards certifications with the M&TE item and forward previous versions to the PM for inclusion in the project files.

5.8 Traceability of Calibration Standards

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

5.9 M&TE That Fails Calibration

For any M&TE item that cannot be calibrated or adjusted to perform accurately:
PM or Designee
- Immediately discontinue use and segregate the item from other equipment. Notify the appropriate PM and take appropriate action in accordance with the CDM QP 2.3 for nonconforming items.
- Review the current and previous maintenance and calibration records to determine if the validity of current or previous measurement and test results could have been affected and notify the appropriate PM(s) of the results of the review.

6.0 Restrictions/Limitations

On an item-by-item basis, exemptions from the requirements of this SOP may be granted by the Headquarters health and safety manager and/or Headquarters quality assurance director. All exemptions shall be documented by the grantor and included in the equipment records as appropriate.

7.0 References

CDM Federal Programs Corporation. 2007. *Quality Assurance Manual.* Rev. 11.

CDM Federal Programs Corporation. 2005. *Government Property Manual*. Rev. 3.

Figure 1

CDM
A subsidiary of Camp Dresser & McKee Inc.

Maintenance and Calibration

Date: Time: (a.m./p.m.)

Employee Name: Equipment Description:

Contract/Project: Equipment ID No.:

Activity: Equipment Serial No.:

Maintenance

Maintenance Performed:

Comments:

Signature: Date:

Calibration/Field Check

Calibration Standard: Concentration of Standard:

Lot No. of Calibration Standard: Expiration Date of Calibration Standard:

Pre-Calibration Reading: Post-Calibration Reading:

Additional Readings: Additional Readings:

Additional Readings: Additional Readings:

Pre-Field Check Reading: Post-Field Check Reading:

Adjustment(s):

Calibration: □ Passed □ Failed

Comments:

Signature: Date:

Appendix B
Analytical Requirements Summary Sheet
[WATER-1111]

SAP REQUIREMENTS SUMMARY #WATER-1111
SUMMARY OF PREPARATION AND ANALYTICAL REQUIREMENTS FOR ASBESTOS

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

SAP Date (Revision): November 1, 2011 (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.

Sample ID Prefix: 1W-

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	Recording Rules (b)	Analytical Sensitivity/ Prioritized Stopping Rules	
			With Ashing	Without Ashing					
A	Water	Yes	No	No	Yes	TEM – EPA Method 100.1	All asbestos (c); L: ≥ 0.5 µm AR: ≥ 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) 100 GOs have been examined	LB-000019, LB-000029B, LB-000030, LB-000066, LB-000084, LB-000085

(a) See Section 6.2 and Section 6.3 of EPA Method 100.1 for sample and filter preparation details.
(b) See Section 6.6 and Section 6.7 of EPA Method 100.1 for analysis and recording procedures.
(c) 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 (d): Lab Blank – 4%
Recount Same – 1%
Recount Different – 2.5%
Verified Analysis – 1%
Repreparation – 1%

(d) See LB-000029B for selection procedure and QC acceptance criteria

Requirements Revision:

Revision #:	Effective Date:	Revision Description
0	11/1/2011	N/A

Analytical Laboratory Review Sign-off:

☐ EMSL – Libby [sign & date: _____]
☐ EMSL – Westmont [sign & date: _____]
☐ EMSL – Beltsville [sign & date: _____]
☐ ESAT [sign & date: _____]
☐ Hygeia [sign & date: _____]
☐ RESI [sign & date: _____]

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

Appendix C
Record of Modification Forms (Field and Laboratory)

Record of Modification to Documents Governing Field Activities Libby Asbestos Project

Form No. LFO-000xxx

Instructions to Requester: Email draft modification form to the contacts at bottom of form for review and approval. File approved copy with the CDM Quality Assurance Coordinator (QAC) at the Libby Field Office (LFO). The QAC will distribute approved copies and maintain the originals at the LFO.

Requester: _____ Title: _____

Company: _____ Date: _____

Governing document (title and approved date) or SOP (title and SOP number):_____

_____

_____

Field logbook and page number where modification is documented (or attach associated correspondence):

_____

Description of modification (attach additional sheets if necessary; include revised text for all document or SOP sections that are affected by the modification):_____

_____

_____

_____

_____

Implication(s) of modification (if applicable, attach a list of affected property addresses or sample IDs): _____

_____

_____

_____

_____

Duration of modification (indicate one):

Temporary Date(s):_____

Permanent Effective Date:_____

Data Quality Indicator (indicate one; reference the definitions below for direction on selecting data quality indicators):

❑ Not Applicable ❑ Low Bias ❑ High Bias

❑ Reject ❑ Estimate ❑ No Bias

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

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

DATA QUALITY INDICATOR DEFINITIONS

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

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

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

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

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

Request for Modification
to
Laboratory Activities
LB-0000XXx

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

All Labs Applicable Forms – copies to: EPA, SRC, CDM, All Project Labs

Individual Labs Applicable Forms – copies to: EPA, SRC, CDM, Initiating Lab

Method (circle one/those applicable): TEM-AHERA TEM-ISO 10312 PCM-NIOSH 7400
EPA/600/R-93/116 ASTM D5755 TEM 100.2 Mod 20 SRC-LIBBY-03
SRC-LIBBY-01 NIOSH 9002 Other:_____

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

Description of Modification:

_____

Reason for Modification:

_____

Potential Implications of this Modification:

_____

Laboratory Applicability (circle one): ALL Individual(s) _____

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

Duration of Modification (circle one):

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

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

Permanent (Complete Proposed Modification Section) Effective Date: _____

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

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

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

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

_____

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

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

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

REFERENCES

[insert here]

DATA QUALITY INDICATOR DEFINITIONS

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

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

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

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

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