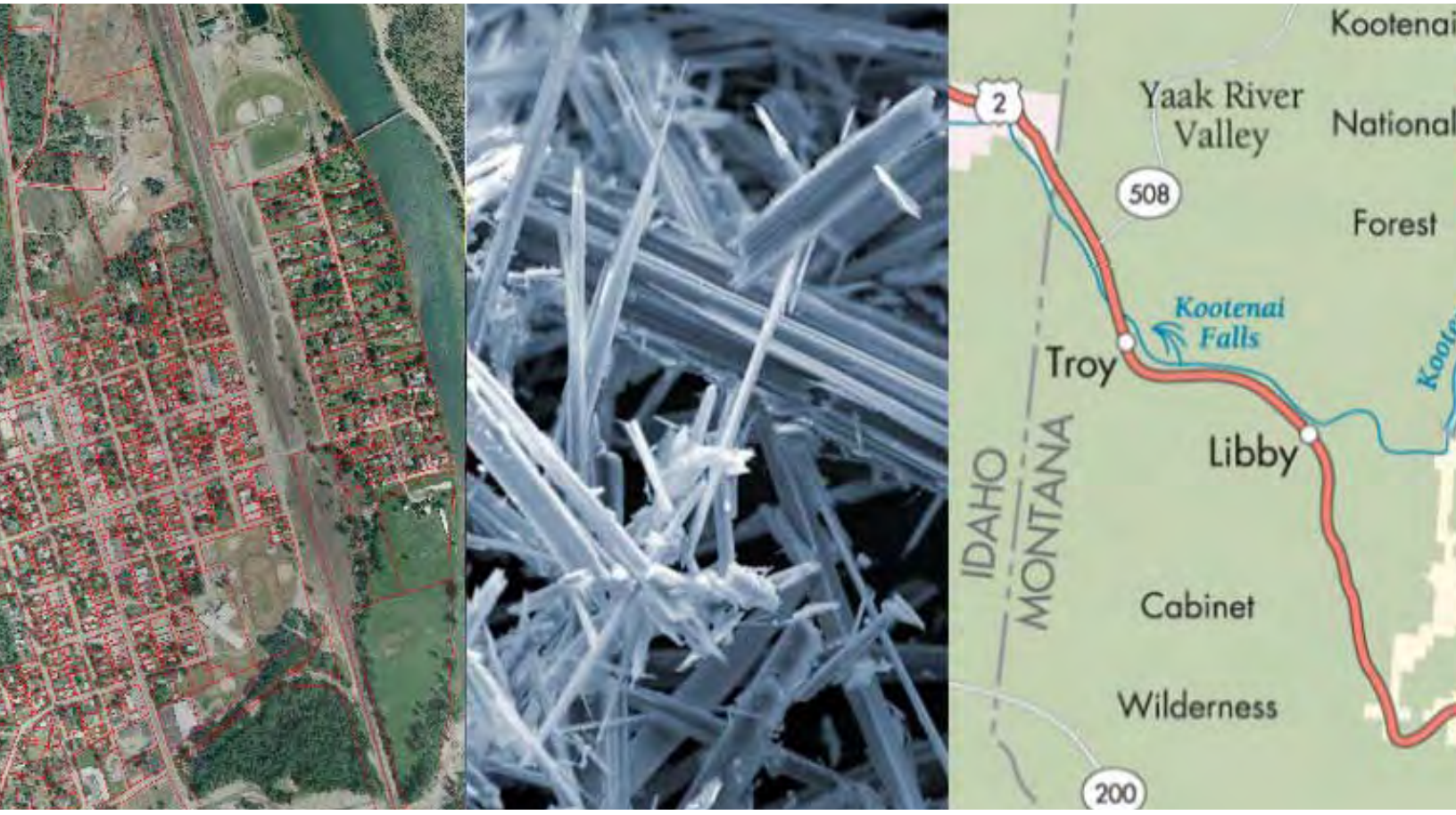
Final
Quarter 7 Memorandum
Outdoor Ambient Air Study

Operable Unit Number 7 of the
Libby Asbestos Superfund Site



Prepared for:

Montana Department of Environmental Quality

Helena Montana

Prepared by:

Tetra Tech

Helena, Montana

September 2011

FINAL
QUARTER 7 MEMORANDUM
OUTDOOR AMBIENT AIR STUDY

Operable Unit Number 7
of the Libby Asbestos Superfund Site

September 22, 2011

Prepared for:

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ACRONYMS AND ABBREVIATIONS

COC	Chain-of-custody
DEQ	Montana Department of Environmental Quality
EDD	Electronic data deliverables
ESAT	Environmental Services Assistance Team
FSDS	Field sampling data sheet
ISO	International Organization for Standardization
LA	Libby amphibole
OU7	Operable Unit Number 7
QC	Quality control
SOP	Standard operating procedure
SRC	Syracuse Research Corporation
TEM	Transmission electron microscopy
Tetra Tech	Tetra Tech EM Inc.

1.0 INTRODUCTION

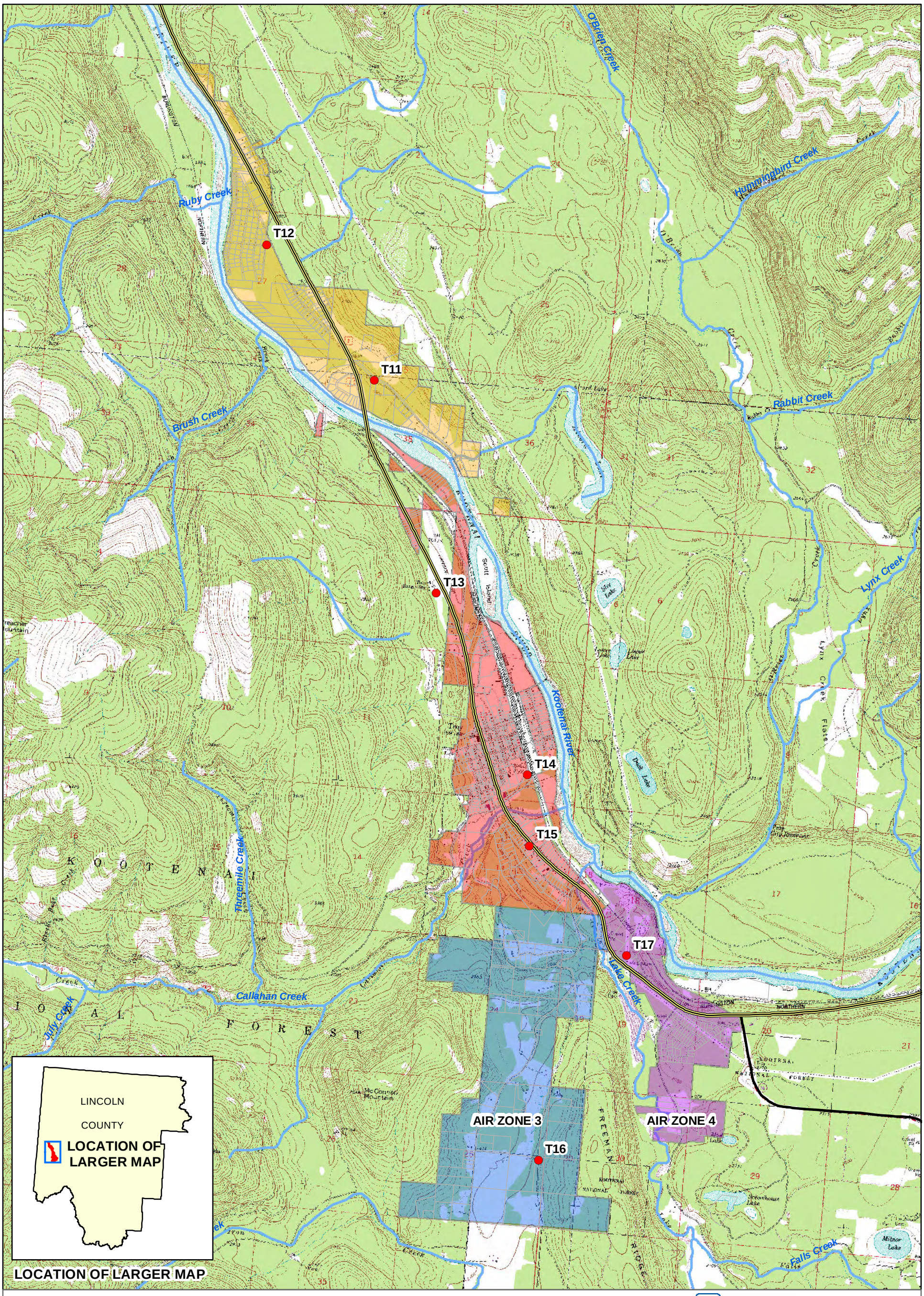
Tetra Tech EM Inc. (Tetra Tech) continued to conduct outdoor ambient air monitoring for the Montana Department of Environmental Quality (DEQ) as part of the remedial investigation in Operable Unit Number 7 (OU7) of the Libby Asbestos Superfund Site to evaluate the presence of Libby Amphibole (LA) asbestos in outdoor ambient air throughout OU7. OU7 consists of residential and commercial areas in and around Troy, Montana.

The outdoor ambient air monitoring program implemented by Tetra Tech is based on the Remedial Investigation Work Plan, Outdoor Ambient Air Study (Tetra Tech 2009a) and the associated health and safety plan (Tetra Tech 2009b) and includes monitoring of ambient air in four distinct "air zones" across OU7. After taking into account variable wind patterns, Tetra Tech established seven initial monitoring station locations in the four air zones during Year 1 to evaluate human health exposure scenarios throughout OU7. Year 1 began on October 30, 2009 and ended on October 27, 2010. Monitoring events were reported by quarter (1 through 4) with 9 sampling periods per quarter. As the ambient air monitoring continued into Year 2, six of the seven station locations from Year 1were moved to different locations to further support data collection efforts for the OU7 human health risk assessment.

This Quarter 7 Memorandum summarizes activities of the outdoor ambient air monitoring program related to placement of monitoring stations, maintenance performed, monitoring activities, issues encountered, and resolutions from May 10, 2011 through August 2, 2011. This report provides a summary of validated ambient air data available at the time this document was prepared (sampling periods 46 through 54 [collected during quarter 6]). Sampling data from Periods 46 through 54 were validated during Quarter 7 using methods described in Section 3.1 and the results are provided in Section 3.2.

2.0 QUARTER 7 AMBIENT AIR MONITORING PLAN IMPLEMENTATION

Quarter 7 monitoring was initiated on May 10, 2011 and was the third quarter of Year 2 monitoring. Initial field activities such as selection of site monitoring stations and assembly and installation of monitoring equipment are described in the Quarter 1 Memorandum (Tetra Tech 2010). At the start of Quarter 5 (beginning of Year 2), six of the seven monitoring stations were moved from their Year 1 locations to new locations to collect further data in support of the OU7 human health risk assessment. Figure 2-1 shows the Year 2 monitoring station locations and Table 2-1 provides the general and detailed locations and rationale for the seven Year 2 station locations.



LEGEND

- OU7 AMBIENT AIR MONITORING STATION - YEAR 2

AMBIENT AIR ZONES

- ZONE 1
- ZONE 2
- ZONE 3
- ZONE 4

0 1 Miles

N

TETRA TECH EM, INC.

LIBBY ASBESTOS SUPERFUND SITE
OPERABLE UNIT 7

FIGURE 2-1
YEAR 2 OU7
AMBIENT AIR MONITORING
STATION LOCATIONS

GIS map by Ed Madej TTEMI-HE
FIG2-1_OU7_AMBIENT_AIR_YEAR2_060111.mxd

TABLE 2-1

YEAR 2 OU7 OUTDOOR AMBIENT AIR SAMPLING LOCATIONS

Station Number	Location*	Purpose
T11	Community exposure site and middle portion of OU7, located at the small community area NE of the Kootenai River	This site is used to evaluate LA concentrations at the small community area and the northern boundary of OU7.
T12	Upwind and downwind site near the NW border of OU7	This site is used to evaluate LA concentrations at the northernmost boundary of OU7 and confirm if any LA is entering or leaving OU7.
T13	City of Troy northern site	This site is used to evaluate LA concentrations north of the Troy community.
T14	City of Troy population exposure site	This site is used to evaluate LA concentrations in the Troy community (specifically in the population center).
T15	City of Troy southern site	This site is used to evaluate LA concentration south of the Troy community.
T16	SW upwind and downwind site	This site is used to evaluate LA concentrations at the southwestern boundary of the OU and confirm if any LA is entering or leaving OU7.
T17	SE upwind and downwind site	This site is used to evaluate LA concentrations at the southeastern boundary of the OU and confirm if any LA is entering or leaving OU7.
TXXQC	Rotating co-located sampling station to each of the seven sampling locations	This co-located sampling station is used to evaluate analytical variability at each of the seven station locations.

Notes:

LA	Libby Amphibole	SE	Southeast
NE	Northeast	SW	Southwest
NW	Northwest	OU	Operable Unit
XX	Station Location Number	QC	Quality Control

* Predominant winds in the area blow from the southeast and northwest. Stations on the southeast and northwest boundaries of OU7 act as upwind and downwind receptors depending on wind direction. A summary of historic meteorological conditions is in Section 4.4.1 of the Ambient Air Remedial Investigation Work Plan (Tetra Tech 2009a).

During Quarter 7 monitoring, one of the seven fixed monitoring stations (T13) was moved approximately 250 feet west of its original location to allow the U.S. Forest Service to corral mules for the summer. Also, some mechanical issues were encountered related to pump faults and failures. Section 2.1 provides the Quarter 7 sampling schedule and Section 2.2 presents a summary of issues encountered and resolutions of those issues.

2.1 QUARTER 7 SAMPLING SCHEDULE

Quarter 7 ambient air sampling consisted of nine 5-day sampling periods generally separated by five off days between each period. Between some sampling periods, the five days were modified by one or two days to adjust for weather or scheduling issues; however, the overall sampling schedule was not impacted. Quarter 7 sampling began with Period 55 on May 10, 2011 and ended with Period 63 on August 2, 2011. Table 2-2 provides a summary of sampling dates for Periods 46 through 54.

TABLE 2-2
OU7 OUTDOOR AMBIENT AIR SAMPLING
QUARTER 7 SAMPLE PERIOD DATES

QUARTER 7 SAMPLE PERIODS	
Sample Period 55	May 10, 2011 through May 14, 2011
Sample Period 56	May 20, 2011 through May 24, 2011
Sample Period 57	May 30, 2011 through June 4, 2011
Sample Period 58	June 9, 2011 through June 13, 2011
Sample Period 59	June 19, 2011 through June 23, 2011
Sample Period 60	June 29, 2011 through July 3, 2011
Sample Period 61	July 9, 2011 through July 13, 2011
Sample Period 62	July 19, 2011 through July 23, 2011
Sample Period 63	July 29, 2011 through August 2, 2011

2.2 MODIFICATIONS, ISSUES, AND RESOLUTIONS

During Quarter 7 sampling, no modifications to field data collection were implemented; however, several mechanical (pump) issues arose. The text below presents a discussion of Quarter 7 issues and resolutions.

The primary issue noted during Quarter 7 sampling was pump failures generally attributed to pump faults or failures related to software and hardware, not battery failures. When failures were identified, Tetra Tech was often able to minimize data loss by reprogramming the pump and re-sampling with a new cassette and sample number. However, on two occasions, pumps automatically reset to the "SLEEP" mode and sample volumes could not be recorded, leading to the loss of samples. On one other occasion, the pump failed to shut off at the programmed time and additional volume was recovered; however, the sample was not lost. The two lost samples were from sample Periods 57 (Station T16) and 60 (Station T11). Field Sampling Data Sheets (FSDS) (Appendix A) were used to record the sampling issues, replacement samples, and revised sample periods.

To address mechanical or electrical pump malfunctions, Tetra Tech arranged for the pump manufacturer to repair the pumps that malfunctioned and could not be reprogrammed during Quarter 7. During this reporting period, 2 of the 11 pumps were shipped for repairs that included reprogramming and replacement of one mother board. Both pumps were repaired and returned to the Troy field office

3.0 OUTDOOR AMBIENT AIR MONITORING DATA

During this reporting period, samples from Periods 55 through 63 were submitted to the Environmental Services Assistance Team (ESAT) laboratory for Transmission Electron Microscopy (TEM) analyses. All sample filter cassettes were shipped under chain-of-custody (COC) protocol to the ESAT Laboratory in Golden, Colorado, where the samples were stored in desiccators to prevent the growth of mold prior to analysis. Complete analytical data from Periods 55 through 63 have not been received and/or validated and are not included in this memorandum.

During Quarter 7, sample results for Periods 46 through 54 were validated. The following sections provide a description of the data validation procedures, data validation findings, and a summary of LA detections noted during sample Periods 46 to 54.

3.1 DATA VALIDATION PROCEDURES AND FINDINGS

During Quarter 7, Tetra Tech conducted data review and data entry verification of the outdoor ambient air TEM data from sampling Periods 46 through 54 in accordance with standard operating procedure (SOP) EPA-LIBBY-09 (revision 1) (Syracuse Research Corporation [SRC] 2008). A copy of this SOP is contained in Appendix F of the Remedial Investigation Work Plan, Outdoor Ambient Air Study (Tetra Tech 2009a). Tetra Tech followed the data review and verification procedures outlined in this SOP, with minor deviations for OU7. An OU7-specific deviation is that the SOP refers to the Libby 2 Database; however, OU7 data are stored in the LibbyTTOU7Field database using the same database protocols. Approximately 10 percent of the Period 46 through 54 data records underwent review and verification. The records were selected in accordance with the SOP process for selecting TEM records for review and verification.

Tetra Tech's verification and validation process has three steps: (1) the selection of data records for review and verification, (2) a review of the original laboratory bench sheets, and (3) verification of the transfer of results from the bench sheets onto the electronic data deliverables and verification that the electronic data were uploaded properly to the LibbyTTOU7Field database. Tetra Tech reviewed field quality control (QC) sample results for adherence to minimum frequency requirements and procedures

and QC limits specified in SOP LB-000029b (SRC 2008). The data verification and validation process is described in detail in the subsections below.

3.1.1 Selection of TEM Records for Review

SOP EPA-Libby-09 specifies review and verification of a minimum of 10 percent of the sample records. Tetra Tech reviewed 10 percent of the records for Periods 46 through 54. Records were queried from the LibbyTTOU7Field database using applicable selection criteria from the SOP EPA-Libby-09 (Revision 1) (SRC 2008). The criteria are used to select a representative subset of the sample records for review and verification on the basis of analysis, detected results, and nondetected results. The record selection process is described in detail in the SOP EPA-Libby-09 (Revision 1) (SRC 2008).

3.1.2 Consistency Review of Laboratory Bench Sheets

Tetra Tech inspected the information recorded on the original hand-written laboratory bench sheets in accordance with the consistency review of laboratory bench sheets procedure outlined in Section 5 of SOP EPA-LIBBY-09 (revision 1) (SRC 2008), modified as needed for OU7. The bench sheets were reviewed to identify any data omissions, apparent inconsistencies, or potential errors in structure. The review determined whether the raw structure data were recorded in accordance with International Organization for Standardization (ISO) 10312 counting rules (as modified by all applicable Libby laboratory modifications).

Corrective Action – Tetra Tech summarized all apparent inconsistencies, omissions, and suspected errors, and provided them to ESAT, which forwarded them to the appropriate laboratories for response. The ESAT laboratory determined which items were authentic errors requiring correction. None of the inconsistencies, omissions, or suspected errors identified during the Quarter 6 data review and verification affected the outcome of interest to the investigation (i.e., the number of LA structures or the concentration of LA). Tetra Tech anticipates the analytical laboratories may submit revised bench sheets to ESAT. If this occurs, Tetra Tech will download the revised documents provided by ESAT, review them, and replace the previous ones as appropriate.

3.1.3 Verification of Data Transfer from Bench Sheet to Database

To ensure that data from laboratory bench sheets are transferred, through the electronic data deliverables (EDDs), into the LibbyTTOU7Field database without error or omission, Tetra Tech compared selected analysis-specific information in the laboratory bench sheets to that in the EDD. Tetra Tech followed the verification of data transfer procedure outlined in Section 6.0 of SOP EPA-LIBBY-09 (revision 1) (SRC

2008), modified as needed for OU7. The bench sheets include the laboratory COC form, sample check-in form, preparation log, and hand-written data record sheets. This process compared analysis-specific information in the EDD to the original laboratory job documentation (e.g., internal laboratory COC, preparation logs, bench sheets, etc.) and included verifying (by recalculation) the reported air sensitivities for amphibole and chrysotile; the area analyzed; and for indirect preparations, the indirect preparation dilution factor. Using the bench sheets, Tetra Tech recounted the countable LA structures across all grid openings evaluated and compared this number (and the calculated concentrations) to the total number of LA structures in the EDD.

The final step in the process was to verify that the data were loaded into the LibbyTTOU7Field database without error or omission. This was done for the records reviewed for Periods 46 through 54.

Corrective Action – Tetra Tech summarized all apparent inconsistencies, omissions, and suspected errors, and provided them to ESAT, which forwarded them to the appropriate laboratories for response. The ESAT laboratory determined which items were authentic errors requiring correction. None of the inconsistencies, omissions, or suspected errors identified during the data review and verification affected the outcome of interest to the investigation (i.e., the number of LA structures or the concentration of LA). Tetra Tech anticipates the analytical laboratories may submit revised bench sheets and/or EDDs to ESAT. If this occurs, Tetra Tech will download the revised documents provided by ESAT, review them, and replace the previous ones as appropriate.

3.1.4 Review of Field and Laboratory Quality Control Sample Results

Review of field and laboratory QC sample results, including implementation of corrective actions, will be completed once all QC sample data are successfully loaded into the LibbyTTOU7Field database. It is expected that the entire field QC data set for Quarters 1 through 6 will be available in the LibbyTTOU7Field database during Quarter 8 and will allow for a complete review and implementation of corrective actions, if necessary.

Tetra Tech will review field QC samples (including co-located samples and field blanks) and the laboratory reviews of the laboratory QC samples for adherence to the minimum frequency requirements set forth in the work plan (Tetra Tech 2009a) and in SOP LB-000029b (SRC 2007), and for conformance with the QC limits specified in SOP LB-000029b (SRC 2007).

For the co-located field samples, Tetra Tech will use the same statistical comparison test used for the Libby ambient air study (SRC 2009). Each co-located sample pair will be compared using the Poisson

rate test (Nelson 1982), included as Attachment 4 to SOP LB-00029b (SRC 2007), to determine whether the results are statistically different at the 95 percent confidence level. The Poisson rate test is suitable for this analysis because fiber counts on TEM grids are considered independent and random.

Corrective Action – For laboratory QC sample exceptions to QC criteria, the appropriate corrective actions are described in detail in LB-00029b (SRC 2007). For co-located field sample pairs, Tetra Tech will review the Poisson rate test results and investigate the basis for any statistical differences and the need for any appropriate corrective actions. Poisson rate test results indicating the co-located samples are similar at the 95 percent confidence interval will be considered good. Test results in the 90 to 95 percent confidence interval range will be considered acceptable, and test results that fall below the 90 percent interval will be considered poor for similarity. If test results are below the 90 percent interval, Tetra Tech will investigate the basis for the discrepancy and take corrective action in sampling and/or analysis of the samples.

Tetra Tech has reviewed and will continue to review the results for all field blanks for adherence to the QC limits specified in SOP LB-000029b (SRC 2007). All of the field blank results to date are within QC limits.

3.2 AMBIENT AIR LA DETECTIONS

LA fibers were detected in a single sample during Period 53. Table B-1 (Appendix B) presents a summary of LA detection results for all sampling periods through Quarter 6. LA detections by station for Periods 46- 54 are summarized below:

Station T12 (located near the fire station in Kootenai Vista): Detection of LA fibers during Period 53 (concentration of 3.97 E-05).

The remaining samples collected during Periods 46 to 54 had no detectable LA fibers. Complete analytical results and a summary of validation findings for sample Periods 46 to 54 are provided in Appendix B.

4.0 REFERENCES

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APPENDICES

(Appendices are provided on the attached CD)

APPENDIX A

QUARTER 7 OUTDOOR AMBIENT AIR SAMPLING
FIELD SAMPLING DATA SHEETS (FSDS)
MAY 10, 2011 THROUGH AUGUST 2, 2011

APPENDIX B

QUARTER 1 THROUGH QUARTER 6 CUMULATIVE AMBIENT AIR MONITORING
VALIDATED ANALYTICAL RESULTS