REMEDIAL ACTION CONTRACT 2 FOR
NON-TIME-CRITICAL REMOVAL ACTIVITIES
IN REGION 5

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN
U.S. SMELTER AND LEAD RESIDENTIAL AREA SUPERFUND SITE
PHASE 1, OPERABLE UNIT 1, ZONE 3
EAST CHICAGO, LAKE COUNTY, INDIANA

Prepared for:
U.S. ENVIRONMENTAL PROTECTION AGENCY
Region 5
77 West Jackson Boulevard
Chicago, IL 60604

Prepared by:
Sustainment and Restoration Services, LLC
79 W. Monroe Street, Suite 1119
Chicago, IL 60603

Date Submitted:	September 27, 2016
EPA Region:	5
TDD No:	S05-0005-16-09-003
Contract No:	EP-S5-16-01
Prepared by:	SRS
Project Manager:	Richard Baldino
Telephone No:	Office: (312) 220-7171 Ext. 2223
EPA Regional Program Manager:	Timothy Drexler
Telephone No:	(312) 353-4367

CONTENTS

Section Page

ACRONYMS AND ABBREVIATIONS

%D	Percent difference
%R	Percent recovery
CAS	Chemical Abstract Services
CCV	Continuing calibration verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
CRQL	Contract-required quantitation limit
DQI	Data quality indicator
EPA	U.S. Environmental Protection Agency
FD	Field Duplicate
FIELDS	Field Environmental Decision Support
FSP	Field sampling plan
HAZWOPER	Hazardous Waste Operations and Emergency Response Standard
ICP	Inductively coupled plasma
ICP/MS	Inductively coupled plasma/mass spectroscopy
ICV	Initial calibration verification
ID	Identification
LIMS	Laboratory information management system
mg/kg	Milligram per kilogram
MPC	Measurement performance criterion
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not applicable
NFG	National Functional Guidelines
NIOSH	National Institute for Occupational Safety and Health
NPL	National Priorities List
OSHA	Occupational Safety and Health Administration
OU	Operable unit
ppm	Part per million
PQO	Project quality objective
QA	Quality assurance
QAPP	Quality assurance project plan
QC	Quality control
QL	Quantitation limit
OSC	One4 scene coordinator
RAC	Remedial Action Contract
ROD	Record of Decision
RPD	Relative percent difference
RRF	Relative response factor
RSCC	Regional Sample Control Coordinator
RSD	Relative standard deviation
SAP	Sampling and analysis plan
SOP	Standard operating procedure

SOW	Statement of work
SRS	Sustainment and Restoration Services, LLC
START	Superfund Technical Assessment and Response Team
SU	Standard unit
TAL	Target Analyte List
TBD	To be determined
TDD	Technical Direction Document
UFP	Uniform Federal Policy for Implementing Environmental Quality Systems

B1.0 INTRODUCTION

Under the U.S. Environmental Protection Agency (EPA) Superfund Technical Ass (START) for Region 5, Contract No. EP-S5-16-01, Technical Direction Document (TDD) No. S05-0005-16-09-003, SRS has prepared this quality assurance project plan (QAPP) as part of the sampling and analysis plan (SAP) for the U.S. Smelter and Lead Refinery, Inc. (USS Lead) Site in East Chicago, Lake County, Indiana. The SAP consists of the field sampling plan (FSP) (Appendix A) and the QAPP (Appendix B). The QAPP provides a framework for environmental data collection conducted to achieve specific project objectives and describes procedures that will be implemented to obtain data of known and adequate quality. This QAPP was prepared in accordance with the EPA's "Uniform Federal Policy for Implementing Environmental Quality Systems" (UFP) (EPA 2005).

This QAPP discusses the procedures that will be used to ensure the quality of data generated for the sampling activities that SRS will perform during remedial activities at the USS Lead Site. SRS will conduct air sampling to monitor potential off-site migration of site-related contaminants during remediation activities at the USS Lead Site. The scope of the FSP was developed based on interaction with the EPA, a July 2009 site visit for the initial OU1 project, and additional meetings with the EPA. The current project has not changed and therefore no new scoping meetings have been conducted, the work remains the same.

The FSP provides a detailed summary of the site description, history, and previous investigations. The QAPP worksheets are presented after this section. References used to prepare this QAPP are listed after the worksheets and figures are attached after the list of references.

QAPP WORKSHEET #1 &2: TITLE AND APPROVAL PAGE

Document Title	Quality Assurance Project Plan (QAPP) for Technical Assistance at the U.S. Smelter and Lead Refinery, Inc. (USS Lead) Site in East Chicago, Lake County, Indiana	
Site/Project Name	USS Lead	
Site location	East Chicago, Lake County, Indiana	
Contract Number	EP-S5-16-01	
TDD Number	S05-0005-16-09-003	
Lead Organization	Sustainment and Restoration Services, LLC	
Project Manager		
	Richard Baldino	Date
QA Manager		
	Raghu Nagam	Date
Federal Agency	United States Environmental Protection Agency	
Regional Program Manager		
	Tim Drexler	Date
QAPP Reviewer		
		Date
State Agency	Indiana Department of Environmental Management (IDEM)	
		Date
Other Stakeholder		
		Date

Plans and reports from previous investigations relevant to this project:

- 1985 Inspection Report of Hammond Lead and USS Lead Refining Soil Survey (OU2)
- 2001 Site-Wide Sampling and Analysis Report (OU2)
- 2001 USS Lead MRFI Addendum Off-Site Sampling and Analysis Report (OU2)
- 2002 Air Dispersion Modeling and Historical Aerial Photography Review (OU1 and OU2)
- 2003 Report on X-Ray Fluorescence Field Study of Selected Properties in Vicinity of Former USS Lead Refinery Facility, East Chicago, Indiana (OU1)
- 2004 Off-Site Soil Excavation, Howard Industries (OU2 HI Triangle Area)
- 2004 Off-Site Soil Excavation, Indiana Harbor Belt Railroad (OU2 IHBRR Triangle Area)
- 2004 Off-Site Soil Excavation Kennedy Avenue (OU2 Eastern Off-Site Area)
- 2004 On-Site Soil Excavation (OU2 Wetlands Area)
- 2004 Draft Final USS Lead, Modified RCRA Facility Investigation (MRFI) Report (OU2)

- 2004 Draft Characterization of Lead and Other Metals in Soil in the Vicinity of the USS Lead Site, East Chicago, Indiana (OU1 and OU2)
- 2006 EPA FIELDS Investigation (OU1)
- 2007 STN Draft Site Assessment Letter Report, USS Lead Site (Background Study)
- 2008 Hazard Ranking Summary Documentation Record (OU1 and OU2)
- 2016 Final Remedial Design for Zone 3 High Priority Properties U.S. Smelter and Lead Residential Area Superfund Site East Chicago, Lake County, Indiana

QAPP WORKSHEET #1 &2: TITLE AND APPROVAL PAGE (CONTINUED)

Facility-Wide UFP-QAPP Worksheets		2106-G-05 QAPP Guidance Section	
1 & 2	Title and Approval Page	2.2.1	Title, Version, and Approval/Sign-Off
3 & 5	Project Organization and QAPP Distribution	2.2.3	Distribution List
		2.2.4	Project Organization and Schedule
4, 7 & 8	Personnel Qualifications and Sign-Off Sheet	2.2.1	Title, Version, and Approval/Sign-Off
		2.2.7	Special Training Requirements and Certification
6	Communication Pathways	2.2.4	Project Organization and Schedule
9	Project Planning Session Summary	2.2.5	Project Background, Overview, and Intended Use of Data
10	Conceptual Site Model	2.2.5	Project Background, Overview, and Intended Use of Data
11	Project/Data Quality Objectives	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
12	Measurement Performance Criteria	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
13	Secondary Data Uses and Limitations	Chapter 3	QAPP Elements for Evaluating Existing Data
14 & 16	Project Tasks & Schedule	2.2.4	Project Organization and Schedule
15	Project Action Limits and Laboratory-Specific Detection / Quantitation Limits	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
17	Sampling Design and Rationale	2.3.1	Sample Collection Procedure, Experimental Design, and Sampling Tasks
18	Sampling Locations and Methods	2.3.1	Sample Collection Procedure, Experimental Design, and Sampling Tasks
		2.3.2	Sampling Procedures and Requirements
19 & 30	Sample Containers, Preservation, and Hold Times	2.3.2	Sampling Procedures and Requirements
20	Field QC	2.3.5	Quality Control Requirements
21	Field Standard Operating Procedures	2.3.2	Sampling Procedures and Requirements
22	Field Equipment Calibration, Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
23	Analytical Standard Operating Procedures	2.3.4	Analytical Methods Requirements and Task Description
24	Analytical Instrument Calibration	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
26 & 27	Sample Handling, Custody, and Disposal	2.3.3	Sample Handling, Custody Procedures, and Documentation
28	Analytical Quality Control and Corrective Action	2.3.5	Quality Control Requirements
29	Project Documents and Records	2.2.8	Documentation and Records Requirements

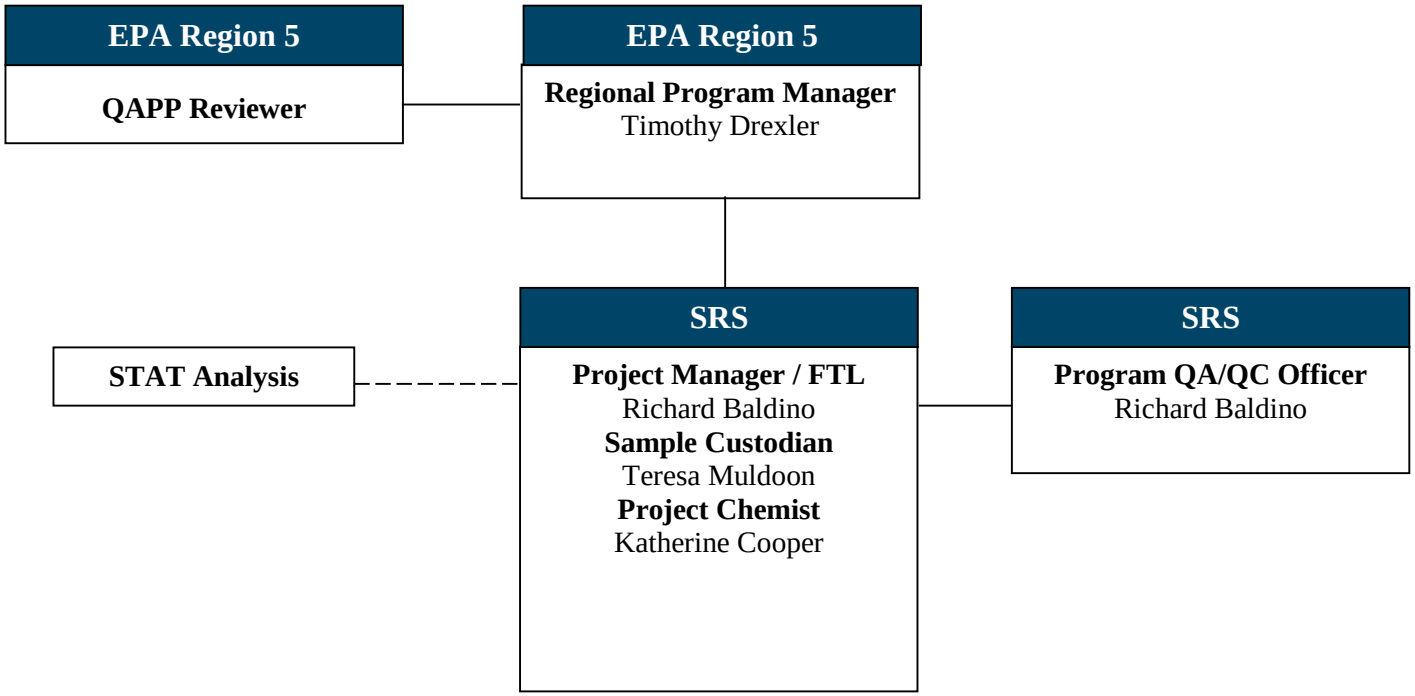
QAPP WORKSHEET #1 &2: TITLE AND APPROVAL PAGE (CONTINUED)

Facility-Wide UFP-QAPP Worksheets		2106-G-05 QAPP Guidance Section	
31, 32 & 33	Assessments and Corrective Action	2.4	Assessments and Data Review (Check)
		2.5.5	Reports to Management
34	Data Verification and Validation Inputs	2.5.1	Data Verification and Validation Targets and Methods
35	Data Verification Procedures	2.5.1	Data Verification and Validation Targets and Methods
36	Data Validation Procedures	2.5.1	Data Verification and Validation Targets and Methods
37	Data Usability Assessment	2.5.2	Quantitative and Qualitative Evaluations of Usability
		2.5.3	Potential Limitations on Data Interpretation
		2.5.4	Reconciliation with Project Requirements

QAPP WORKSHEET #3 & 5: PROJECT ORGANIZATION AND QAPP DISTRIBUTION

QAPP Recipient	Title	Organization	Telephone No.	E-mail Address
Timothy Drexler	Regional Program Manager	EPA Region 5	(312) 353-4367	drexler.timothy@epa.gov
Sam Chummar	Project Officer	EPA Region 5	(312) 886-1434	chummar.sam@epa.gov
Kelly Goetz	Contracting Specialist	EPA Region 5	(312) 886-6794	goetz.kelly@epa.gov
Thomas Harrison	Contracting Officer	EPA Region 5	(312) 353-2030	harrison.thomas@epa.gov
TBD	QAPP Reviewer	EPA Region 5	TBD	TBD
Raghu Nagam	Program Manager	SRS	(312) 220-7171, Ext. 2222	rnagam@srsllc.com
Richard Baldino	Project Manager/Field Team Leader	SRS	(312) 220-7171, Ext. 2223	rbaldino@srsllc.com
Teresa Muldoon	Project Scientist and Sample Custodian	SRS	(312) 220-7171, Ext. 2225	tmuldoon@srsllc.com
Richard Baldino	Program QA/QC Officer	SRS	(312) 220-7171, Ext. 2223	rbaldino@srsllc.com
Katherine Cooper	Project Chemist	SRS	(312) 220-7171, Ext. 2224	kcooper@srsllc.com

Notes:



Notes:
EPA: U. S. Environmental Protection Agency
FTL: Field Team Leader
QAPP: Quality Assurance Protection Plan

QAPP WORKSHEET #4, 7 & 8: PERSONNEL QUALIFICATIONS AND SIGN-OFF SHEET

Project Personnel	Organization	Title	Telephone No.	Signature	Date QAPP Read
Raghu Nagam	SRS	Program Manager	(312) 220-7171, Ext. 2222		
Richard Baldino	SRS	Project Manager/ Field Team Leader	(312) 220-7171, Ext. 2223		
Richard Baldino	SRS	Program QA/QC Officer	(312) 220-7171, Ext. 2223		
Teresa Muldoon	SRS	Project Scientist/Sample Custodian	(312) 220-7171, Ext. 2225		
Katherine Cooper	SRS	Project Chemist	(312) 220-7171, Ext. 2224		

Notes:

QAPP WORKSHEET #6: COMMUNICATION PATHWAYS

Communication Drivers	Responsible Entity	Name	Telephone No.	Procedure (Timing, Pathways, etc.)
Point of contact with EPA Regional Program Manager	Project Manager/SRS	Richard Baldino	(312) 220-7171, Ext. 2223	Forward all materials and information about the project to EPA Regional Program Manager.
Management of all project phases	Project Manager/SRS	Richard Baldino	(312) 220-7171, Ext. 2223	Communicate information to project team (including subcontractors) on a timely basis. Notify EPA Regional Program Manager by telephone or e-mail of any significant issues. Direct field team, and facilitate communication with sample custodian. Delivery of all CLP data packages to project QA manager for final review of validation.
Daily field progress report	Field Team Leader/SRS	Richard Baldino	(312) 220-7171, Ext. 2223	Conduct specific field investigation tasks and provide daily communication with project manager and sample custodian.
Management of field sample organization and delivery to subcontract laboratory	Project Scientist/Sample Custodian/SRS	Teresa Muldoon	(312) 220-7171, Ext. 2225	Ensure field staff is collecting samples in proper containers, observing holding times, and properly packaging and preparing samples for shipment. Coordinate daily with project QA officer concerning sample quantities and delivery locations and dates. Communicate daily with field staff and project manager regarding any issues and developments.
Release of analytical data	Project QA Manager/SRS	Rich Baldino	(312) 220-7171, Ext. 2223	Notify sample custodian and project manager of any laboratory issues or developments. Track all lab deliverables. No analytical data can be released until validation is completed and project QA manager has reviewed and approved the release.
Report of laboratory data quality issues	Laboratory QA Officer/STAT Analysis	Brian Graettinger	(319) 277-2401	The laboratory QA officer will report all QA/QC issues with project field samples to the project QA officer.

Notes:

QAPP WORKSHEET #9: PROJECT PLANNING SESSION SUMMARY

Date of Planning Session	9/15/2016			
Meeting Location	Conference call			
Purpose	Project scoping meeting			
Participants				
Name	**Title/Role**	**Affiliation**	**Telephone No.**	**E-Mail Address**
Timothy Drexler	Remedial Project Manager	EPA Region 5	(312) 353-4367	timothy.drexler@epa.gov
Thomas Alcamo	Task Manager - ERRS	EPA Region 5	(312) 886-7278	alcamo.thomas@epa.gov
Richard Baldino	Project Manager	SRS	(312) 220-7171, Ext. 2223	rbaldino@srsllc.com
Raghu Nagam	Program Manager	SRS	(312) 220-7171, Ext. 2222	rnagam@srsllc.com

Notes/Comments: The overall scope of the project was discussed

Decisions: SRS will prepare plans and prepare subcontractors/equipment for mobilization. Once onsite, SRS will conduct soil sampling for metals sand perform perimeter air monitoring during construction. SRS will also collect tap water samples from the residential properties to collect data on lead exposure from drinking water during construction.

Action Items:

Action	Responsible Party	Due Date

QAPP WORKSHEET #10: CONCEPTUAL SITE MODEL

ENVIRONMENTAL PROBLEM

The environmental problem identified in this QAPP is to determine the extent of lead and arsenic contamination in OU1-Zone 3 of USS Lead Superfund Site (Site). Residential tap water will be collected from residential properties in OU1-Zone 3 to determine if a release of contaminants from pipes has occurred during soil excavation activities.

BACKGROUND INFORMATION AND SITE

The Site is located in East Chicago, Indiana, approximately 18 miles southeast of Chicago, Illinois. As described above, the Site consist of two Operable Units (OU). OU1, located north of the facility, is primarily composed of a commercial, municipal, and low-income residential properties. Schools, churches, playgrounds, parks, and small businesses are present within OU1. OU2 is the U.S. Smelter and Lead Refinery, Inc. facility, which is located at 5300 Kennedy Avenue, East Chicago, Indiana. OU2 includes a 79-acre area of East Chicago and site wide groundwater.

The OU2 property was purchased in 1920 by U.S. Smelting, Refining, and Mining, and later by USS Lead. During this period, USS Lead managed a primary lead smelter at OU2. Between 1972 and 1973, the OU2 facility was then converted to a secondary lead smelter, which recovered lead from scrap metal and automotive batteries. The smelting operations generated two primary waste materials of blast-furnace slag and dust containing lead, which was emitted from the blast furnace stack. (SulTRAC 2012). By 1985, all OU2 operations were discontinued.

Surrounding land use of East Chicago is heavily industrialized, including chemical processing plants, heavy manufacturing, heavy rail, oil refineries, and steel mills. In addition, several historic industrial facilities were associated with lead and other heavy metals. These include the former DuPont site (currently leased and operated by W.R. Grace & Co., Grace Davison) located east of OU2 across Kennedy Avenue and two smelter plant operations on the western edge of OU1, west of Gladiola Street and north of 151 Street. The DuPont Site and smelter plant operations facilities historically manufactured pesticide lead arsenate. According to a 1930 Sanborn Fire Insurance Map, the two smelter plants operations are identified as Anaconda Lead Products and International Lead Refining Company. Anaconda Lead Products manufactured white lead and zinc oxide and International Lead Refining Company is a metal-refining facility.

PREVIOUS SITE INVESTIGATIONS AND REMOVAL ACTIONS

According to SulTRAC (2012), previous site investigations and removal actions conducted at USS Lead Superfund Site (OU1 and OU2) between 1985 to the present are as follows.

- 1985 Inspection Report of Hammond Lead and USS Lead Refining Soil Survey (OU2)
- 2001 Site-Wide Sampling and Analysis Report (OU2)
- 2001 USS Lead MRFI Addendum Off-Site Sampling and Analysis Report (OU2)
- 2002 Air Dispersion Modeling and Historical Aerial Photography Review (OU1 and OU2)
- 2003 Report on X-Ray Fluorescence Field Study of Selected Properties in Vicinity of Former USS Lead Refinery Facility, East Chicago, Indiana (OU1)
- 2004 Off-Site Soil Excavation, Howard Industries (OU2 HI Triangle Area)
- 2004 Off-Site Soil Excavation, Indiana Harbor Belt Railroad (OU2 IHBRR Triangle Area)
- 2004 Off-Site Soil Excavation Kennedy Avenue (OU2 Eastern Off-Site Area)
- 2004 On-Site Soil Excavation (OU2 Wetlands Area)

- 2004 Draft Final USS Lead, Modified RCRA Facility Investigation (MRFI) Report (OU2)
- 2004 Draft Characterization of Lead and Other Metals in Soil in the Vicinity of the USS Lead Site, East Chicago, Indiana (OU1 and OU2)
- 2006 EPA FIELDS Investigation (OU1)
- 2007 STN Draft Site Assessment Letter Report, USS Lead Site (Background Study)
- 2008 Hazard Ranking Summary Documentation Record (OU1 and OU2)
- 2016 Final Remedial Design for Zone 3 High Priority Properties U.S. Smelter and Lead Residential Area Superfund Site East Chicago, Lake County, Indiana

In September 1985, USS Lead was found in violation of State law by the Indiana State Board of Health (ISBH) due to the presence of lead particles downwind of the Site within a residential area (OU1). According to SulTRAC (2012), approximately 7500 people are known to work or attend school within two miles of the Site. In addition, approximately four million people obtain their drinking water from Lake Michigan, which is located 15 miles downstream of where site hazardous substances enter surface water.

In July and early August of 2003, an EPA RCRA investigation collected soil samples collected from 83 residential properties within OU 1. Soil samples were analyzed for lead using a Niton X-ray fluorescence (XRF) instrument. A total of 43 of the 83 soil sampling locations exceeded the lead residential soil screening threshold of 400 mg/kg.

On January 22, 2008, a time-critical removal action (TCRA) for private residential properties within OU1 was approved by the EPA. The removal action was executed due to elevated lead concentrations in surface soils observed during the 2002-2007 investigations. A total of 14 private residential properties contained lead concentrations greater than the removal action level of 1,200 mg/kg within top 0.5 feet of soil.

The EPA received access agreements to 13 of the 15 properties. These 13 properties were remediated between June 9 and September 22, 2008, under a Time Critical Removal Action (TCRA) by Weston Solutions, Inc. and Environmental Quality Management (EQM). Each property was excavated to a depth of 1 to 2.5 feet bgs. An XRF instrument was utilized during the excavation process in order to screen and confirm that soil was excavated to depth that contained lead concentrations below the residential screening criteria of 400 mg/kg. By September 25, 2008, these associated properties were all backfilled with 3,120 cubic yards of clean fill and re-sodded. A total of 1,838 tons of excavated soil was removed from the Site and transported to the Forest Lawn landfill facility (SulTRAC 2012; U.S. EPA 2009).

In September of 2008, OU1 and OU2 of the Site, were evaluated under the Hazard Ranking System (HRS) and identified evidence of a release of lead through air migration and surface water pathways (U.S. EPA 2008). On April 8, 2009, the USS Lead Site was added as a Superfund site on the National Priorities List (NPL).

A Remedial Investigation and Feasibility study (RI/FS) was conducted by the USEPA from 2009 to 2012 (SulTRAC 2012a; SulTRAC 2012b). Additionally, the city of East Chicago remediated two property yards that contained lead soil concentrations above the lead screening level value of 400 mg/kg.

From October to December 2011, a TCRA was completed by EPA on 16 residential properties that contained concentrations of lead in soil greater than 400 mg/kg. The residential properties included 5 East Chicago public housing addresses and 11 residential properties, which includes the two properties that were not remediated in the 2008 TCRA due to access agreement issues. Similar to the 2008 TCRA,

approximately 1,913 tons of excavated soil was removed and transported off-site to a disposal facility. The remediated properties were backfilled and seeded upon completion of the soil excavation.

SOURCES OF KNOWN OR SUSPECTED HAZARDOUS WASTE

In 1999, a Corrective Action Management Unit (CAMU) was built onsite, which consisted of a capped landfill containing demolished building material and lead-contaminated soil (ATSDR, 2011). Based on the previous investigations and site history, there is no other sources of known or suspected hazardous waste at the Site.

KNOWN OR SUSPECTED CONTAMINANTS OR CLASSES OF CONTAMINANTS

As described above in this worksheet, historic industrial operations at USS Lead included a primary lead smelter, which was converted to a secondary lead smelter between 1972 and 1973. Waste generated from the smelting operations consist of blast-furnace slag and dust containing lead emitted from the blast furnace stack. Because East Chicago is heavily industrialized, other contaminants associated with surrounding historical industrial facilitates are suspected to be present near the site. This includes the DuPont Site and smelter plant operations facilities, which historically manufactured pesticide lead arsenate, the Anaconda Lead Product that manufactured white lead and zinc oxide, and the International Lead Refining Company, which operated as a metal-refining facility. Based on this information, lead and other heavy metals are the suspected contaminants surrounding the Site.

PRIMARY RELEASE MECHANISM

The primary release mechanism of contaminants from the USS Lead facility to OU1 is the release of lead and other heavy metals through air migration of dust particulates. Contaminated particulates could migrate offsite via air migration and deposit on surrounding properties.

SECONDARY CONTAMINANT MIGRATION

A secondary release mechanism of contaminants from the USS Lead facility could occur from overland flow to adjacent soil and/or surface water bodies. Lead and other heavy metal contaminants can be directly released to adjacent areas via runoff to adjacent soil and surface water during rainfall events.

No private wells have been installed surrounding the Site. Accordingly, there is no complete exposure pathway from containments derived from the site to residential tap water. However, during the soil excavation activities, water supply lines that are connected to residential properties could be disturbed, resulting in the release of lead and other heavy metals from the pipes to the residential tap water.

FATE AND TRANSPORT CONSIDERATIONS

The fate and transport components of this investigation include the migration of Site soil to OU1-Zone 3 via air migration and overland flow. If soil excavation activities disrupt tap water pipes located within the subsurface, then lead contaminants in the pipes could be released and enter OU1-Zone 3 tap water.

POTENTIAL RECEPTORS AND EXPOSURE PATHWAYS

As described above, OU1 of the Site is composed of a mix of residential, commercial and industrial properties. Based on current conditions, human heath receptors that could potentially be exposed to soil include the commercial/industrial worker, site visitor/trespasser, recreational user, construction worker, and a resident (child and adult). Receptors can be exposed to contaminants in soil via dermal contact, ingestion, and inhalation through fugitive dust. Receptors could also potentially be exposed to heavy metal contaminants released from pipes through via ingestion and dermal contact of tap water.

LAND USE CONSIDERATIONS

No land use alterations are currently planned for the Site. Remedial activities are aimed to remediate soil conditions to acceptable residential conditions in accordance with the EPA residential soil screening thresholds.

KEY PHYSICAL ASPECTS OF THE SITE

A capped landfill created as a Corrective Action Management Unit (CAMU) in 1999 is present onsite, which contains demolished buildings and lead-contaminated soil. Several residential properties have been remediated by the excavation of soil containing unacceptable lead concentrations. ATSDR (2011) indicates that several hundred other residential lawns may still be in need of remedial efforts.

CURRENT INTERPRETATION OF NATURE AND EXTENT OF CONTAMINATION

In order to evaluate if a secondary release has occurred due to the disturbance of drinking water pipes during excavation processes, residential tap water will be analyzed for lead, copper, zinc, aluminum, iron, calcium, cadmium, potassium, magnesium, manganese, sodium, nickel, chromium, and tin for residential properties in OU1- Zone 3.

QAPP WORKSHEET #11: PROJECT/DATA QUALITY OBJECTIVES

State the Problem: Possible releases of hazardous substances on Site, which may pose a threat to public health, or welfare, or the environment.
Identify the Goals of the Study: The objective of the RA sampling is to ensure that metal concentrations in tap water do not pose a threat to residents.
Identify Information Inputs: Tap water sampling for total phosphorous, alkalinity, anions (sulfate, chloride, fluoride) and metals will be conducted on properties in the OU1-Zone 3 residential area site. The List of metals include aluminum, chromium, calcium, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium, tin, and zinc.
Define the Boundaries of the Study: USS Lead Zone 3 is generally bordered on the north by Chicago Avenue, to the east by Parrish Avenue, to the south by the northern edge of the railroad right of way located generally to the south of East 149th and west by the Elgin, Joliet, and Eastern Railway East Chicago, Lake County, Indiana 46312
Develop the Analytic Approach: Tap water samples will be analyzed by STAT Analysis for metals (aluminum, chromium, calcium, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium, tin, and zinc.) using EPA method 200.8, alkalinity using SM2320B, inorganic ions (chloride, fluoride, sulfate) using EPA method 300.0, and total phosphorus by EPA method 365.1. SRS will also perform pH, temperature, and chlorine field tests.
Specify Performance or Acceptance Criteria: The data need to be adequate to evaluate whether tap water metal concentrations pose a threat to residents.
Develop the Detailed Plan for Obtaining Data: Tap water samples will be collected from every residential property in OU1 – Zone 3. SRS will collect two 125 mL samples followed by a series of 1,000 mL samples. The number of sequential 1,000 mL samples will be based on the total volume of water in the pipes from the kitchen tap to the water main (~15 samples). These samples will be analyzed for metals. SRS will collect three distribution system samples after the water has been running for 5 minutes. These samples will be analyzed for total phosphorus, alkalinity, inorganic anions (chloride, fluoride, sulfate), and metals. After the distribution samples are collected, SRS will conduct field tests for pH, residual chlorine, and temperature.

QAPP WORKSHEET #12: MEASUREMENT PERFORMANCE CRITERIA

Matrix	Water
Analytical Group	Total Phosphorus
Concentration Level	Low

Sampling Procedure[1]	Analytical Method SOP	DQIs	MPC	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample to Assess Error for Sampling (S), Analytical (A), or both (S&A)
S-1	EPA 365.1	Accuracy/Bias (Contamination)	No target compounds > RL	Method Blanks and Instrument Blanks	A
S-1	EPA 365.1	Accuracy/ Representativeness	4°C ± 2°C	Cooler Temperature Blank	S
S-1	EPA 365.1	Accuracy/Precision - Laboratory	%R ≥ 80% RPD ≤ 20%[2]	Laboratory Duplicates LCS/LCSD	A
S-1	EPA 365.1	Accuracy/Precision - Laboratory	%R ≥ 75% RPD ≤ 20%[2]	MS/MSD	A
S-1	EPA 365.1	Completeness	>90%	Data Completeness defined as data not rejected after validation	S & A

Notes:
1 Reference number from QAPP Worksheet #21
2 When detections for both duplicates are greater than the reporting limit.

QAPP WORKSHEET #12: MEASUREMENT PERFORMANCE CRITERIA (CONTINUED)

Matrix	Water
Analytical Group	Alkalinity
Concentration Level	Low

Sampling Procedure[1]	Analytical Method SOP	DQIs	MPC	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample to Assess Error for Sampling (S), Analytical (A), or both (S&A)
S-1	SM2320B	Accuracy/Bias (Contamination)	No target compounds > RL	Method Blanks and Instrument Blanks	A
S-1	SM2320B	Accuracy/ Representativeness	4°C ± 2°C	Cooler Temperature Blank	S
S-1	SM2320B	Accuracy/Precision - Laboratory	%R ≥ 80% RPD ≤ 20%[2]	Laboratory Duplicates LCS/LCSD	A
S-1	SM2320B	Accuracy/Precision - Laboratory	%R ≥ 75% RPD ≤ 20%[2]	MS/MSD	A
S-1	SM2320B	Completeness	>90%	Data Completeness defined as data not rejected after validation	S & A

Notes:

1 Reference number from QAPP Worksheet #21

2 When detections for both duplicates are greater than the reporting limit.

QAPP WORKSHEET #12: MEASUREMENT PERFORMANCE CRITERIA (CONTINUED)

Matrix	Water
Analytical Group	Anions (Cl, F, SO_4)
Concentration Level	Low

Sampling Procedure[1]	Analytical Method SOP	DQIs	MPC	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample to Assess Error for Sampling (S), Analytical (A), or both (S&A)
S-1	EPA 300.0	Accuracy/Bias (Contamination)	No target compounds > RL	Method Blanks and Instrument Blanks	A
S-1	EPA 300.0	Accuracy/ Representativeness	4°C ± 2°C	Cooler Temperature Blank	S
S-1	EPA 300.0	Accuracy/Precision - Laboratory	%R ≥ 80% RPD ≤ 20%[2]	Laboratory Duplicates LCS/LCSD	A
S-1	EPA 300.0	Accuracy/Precision - Laboratory	%R ≥ 75% RPD ≤ 20%[2]	MS/MSD	A
S-1	EPA 300.0	Completeness	>90%	Data Completeness defined as data not rejected after validation	S & A

Notes:
1 Reference number from QAPP Worksheet #21
2 When detections for both duplicates are greater than the reporting limit.

QAPP WORKSHEET #12: MEASUREMENT PERFORMANCE CRITERIA (CONTINUED)

Matrix	Water
Analytical Group	Metals[1]
Concentration Level	Low

Sampling Procedure[2]	Analytical Method SOP	DQIs	MPC	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample to Assess Error for Sampling (S), Analytical (A), or both (S&A)
S-1	EPA 200.8	Accuracy/Bias (Contamination)	No target compounds > RL	Method Blanks and Instrument Blanks	A
S-1	EPA 200.8	Accuracy/ Representativeness	4°C ± 2°C	Cooler Temperature Blank	S
S-1	EPA 200.8	Accuracy/Precision - Laboratory	%R ≥ 80% RPD ≤ 20%[2]	Laboratory Duplicates LCS/LCSD	A
S-1	EPA 200.8	Accuracy/Precision - Laboratory	%R ≥ 75% RPD ≤ 20%[2]	MS/MSD	A
S-1	EPA 200.8	Completeness	>90%	Data Completeness defined as data not rejected after validation	S & A

Notes:

1 Metals include aluminum, chromium, calcium, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium, tin, and zinc.

2 Reference number from QAPP Worksheet #21

3 When detections for both duplicates are greater than the reporting limit.

QAPP WORKSHEET #13: SECONDARY DATA USES AND LIMITATIONS TABLE

Data Type	Data Source	Data uses relative to current project	Factors affecting the reliability of data and limitations on data use
Soil metals data	Final Remedial Design for Zone 3 High Priority Properties U.S. Smelter and Lead Residential Area Superfund Site. Lake County, Indiana. September 2016.	Data will be used qualitatively to select sampling locations in addition to background data usage.	None
Soil metals data	Final Remedial Investigation Report. US Smelter and Lead Refinery (USS Lead) Superfund Site. Lake County, Indiana. June 2012	Data will be used qualitatively to select sampling locations in addition to background data usage.	None
Soil metals data	Feasibility Study, US Smelter and Lead Refinery (USS Lead) Superfund Site, Lake County, Indiana. June 2012.	Data will be used qualitatively to select sampling locations in addition to background data usage.	None

Notes:

QAPP WORKSHEET #14 & 16: PROJECT TASKS & SCHEDULE

Activity	Responsible party	Planned start date	Planned completion date	Deliverable(s)	Deliverable due date
Mobilization/demobilization	SRS	28 September 2016	22 October 2016	Field notes	22 November 2016
Sample collection- water	SRS- Field team leader	28 September 2016	22 October 2016	Field notes	30 September through 22 October 2016
Analysis	STAT Analysis	30 September 2016	7 November 2016	Report of Analyses/Data package	7 November 2016
Validation	SRS	3 October 2016	21 November 2016	Validation Summary report	21 November 2016
Summarize data	SRS- PM	21 November 2016	5 December 2016	Draft RI Report	5 December 2016
Usability assessment	Project Team	3 October 2016	5 December 2016	Meeting minutes/Usability assessment summary report	5 December 2016

Notes:

QAPP WORKSHEET #15: PROJECT ACTION LIMITS AND LABORATORY-SPECIFIC DETECTION/QUANTITATION LIMITS

Matrix	Water
Analytical Method	EPA 365.1
Concentration Level	Low

Analyte	CAS Number	PAL (mg/L)	PAL Reference	PQL Goal	Laboratory PQL (mg/L)	Laboratory MDL (mg/L)
Total Phosphorus	14265-44-2	NA	NA	1	0.05	0.016

Notes:
CAS Chemical Abstract Services
mg/L Milligram per liter
NA Not Applicable
PAL Project Action Limit
PQL Project Quantitation Limit

QAPP WORKSHEET #15: PROJECT ACTION LIMITS AND LABORATORY-SPECIFIC DETECTION/QUANTITATION LIMITS (CONTINUED)

Matrix	Water
Analytical Method	SM 2320
Concentration Level	Low

Analyte	CAS Number	PAL (mg/L)	PAL Reference	PQL Goal	Laboratory PQL (mg/L)	Laboratory MDL (mg/L)
Alkalinity	NA	NA	NA	100	100	2.2

Notes:
CAS Chemical Abstract Services
mg/L Milligram per liter
NA Not Applicable
PAL Project Action Limit
PQL Project Quantitation Limit

QAPP WORKSHEET #15: PROJECT ACTION LIMITS AND LABORATORY-SPECIFIC DETECTION/QUANTITATION LIMITS (CONTINUED)

Matrix	Water
Analytical Method	EPA 300.0
Concentration Level	Low

Analyte	CAS Number	PAL (mg/L)	PAL Reference	PQL Goal	Laboratory PQL (mg/L)	Laboratory MDL (mg/L)
Chloride	16887-00-6	250	NSDWR	100	1	0.77
Fluoride	16984-48-8	2	NSDWR	0.5	0.5	0.016
Sulfate	18785-72-3	250	NSDWR	100	5	0.7

Notes:
CAS Chemical Abstract Services
mg/L Milligram per liter
NA Not Applicable
NSDWR National Secondary Drinking Water Regulations
PAL Project Action Limit
PQL Project Quantitation Limit

QAPP WORKSHEET #15: PROJECT ACTION LIMITS AND LABORATORY-SPECIFIC DETECTION/QUANTITATION LIMITS (CONTINUED)

Matrix	Water
Analytical Method	EPA 200.8
Concentration Level	Low

Analyte	CAS Number	PAL (mg/L)	PAL Reference	PQL Goal	Laboratory PQL (mg/L)	Laboratory MDL (mg/L)
Aluminum	7429-90-5	20	RSL	2	0.02	0.015
Cadmium	7440-43-9	0.0092	RSL	0.005	0.003	0.001
Calcium	7440-70-2	500	NSDWR	100	0.1	0.023
Chromium	7440-47-3	0.035	RSL	0.01	0.002	0.0005
Copper	7440-50-8	0.8	RSL	0.01	0.005	0.0007
Iron	7439-89-6	14	RSL	1.0	0.05	0.008
Lead	7439-92-1	0.015	RSL	0.002	0.002	0.0004
Magnesium	7439-95-4	500	NSDWR	100	0.002	0.0003
Manganese	7439-96-5	0.43	RSL	0.04	0.002	0.00006
Nickel	7440-02-0	0.39	RSL	0.04	0.002	0.0002
Potassium	7440-09-7	500	NSDWR	100	0.05	0.018
Sodium	7440-23-5	500	NSDWR	100	0.15	0.028
Tin	7440-31-5	12	RSL	5	0.01	0.00081
Zinc	7440-66-6	6	RSL	1	0.01	0.002

Notes:
CAS Chemical Abstract Services
mg/L Milligram per liter
NA Not Applicable
NSDWR National Secondary Drinking Water Regulations
PAL Project Action Limit
PQL Project Quantitation Limit
RSL Regional Screening Levels

QAPP WORKSHEET #17: SAMPLING DESIGN AND RATIONALE

The physical boundaries for the area under study (include maps or diagrams).
OU1-Zone 3 is generally bordered on the north by Chicago avenue, on the east by Parrish Avenue, on the south by the northern edge of the railroad right of way located generally to the south of East 149th and west by the Elgin, Joliet, and Eastern Railway.

The time period being represented by the collected data.
Sample collection will begin during the last week of September and are anticipated to be completed before the end of October, 2016.

The descriptions and basis for dividing the site into sampling areas (e.g., decision units, exposure units, etc.) that support the decision statements documented on Worksheet #11.
Tap water sampling will be conducted at each residence in OU1 – Zone 3.

The basis for the number and placement of samples within sampling areas.
A series of tap water samples will be collected at each residence to assess metal levels pre-excavation and post-excavation. A series of 8-15 tap water samples will be collected for metals analysis followed by three distribution system samples for total phosphorus, alkalinity, inorganic anions and metals. Field tests will be conducted for pH, chlorine and temperature.

If sample locations are specified in the QAPP, descriptions of how actual sample positions will be located once in the field. (Include maps or diagrams).
Samples will be collected at the kitchen faucet at each property unless the aerator cannot be removed. If the aerator cannot be removed, samples will be collected from the bathroom faucet.

If a sample cannot be collected where planned, the decision process for changing the location.
If the kitchen aerator cannot be removed, samples will be collected from the bathroom faucet at the property.

If sample locations will be determined in the field, the decision process for doing so.
If the kitchen aerator cannot be removed, samples will be collected from the bathroom faucet at the property.

Contingencies in the event field conditions are different than expected and could have an effect on the sample design.
If the kitchen aerator cannot be removed, samples will be collected from the bathroom faucet at the property.

QAPP WORKSHEET #18: SAMPLING LOCATIONS AND METHODS

Sampling Location[1]/ID Number	Matrix	Depth	Type	Analytical Group	Sampling SOP[2]	Comments
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, F, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, F, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, F, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, F, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, F, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, F, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, Fl, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None

QAPP WORKSHEET #18: SAMPLING LOCATIONS AND METODS (CONTINUED)

Sampling Location[1]/ID Number	Matrix	Depth	Type	Analytical Group	Sampling SOP[2]	Comments
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, F, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, F, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, F, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, F, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, F, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, F, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, F, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None

QAPP WORKSHEET #18: SAMPLING LOCATIONS AND METODS (CONTINUED)

Sampling Location[1]/ID Number	Matrix	Depth	Type	Analytical Group	Sampling SOP[2]	Comments
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, F, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, F, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, F, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, F, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]						
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None
[redacted]	Water	NA	Grab	Total phosphorus	S-1	None
[redacted]	Water	NA	Grab	Alkalinity, anions (Cl, F, SO_4)	S-1	None
[redacted]	Water	NA	Grab	Metals[3], pH, temperature, chlorine	S-1	None

Notes:

1 See attached Figures for sampling areas.

2 See Worksheet #21 for a list of sampling methods S-1 through S-3.

3 Metals include aluminum, chromium, calcium, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium, tin, and zinc.

QAPP WORKSHEET #19 & 30: SAMPLE CONTAINERS, PRESERVATION, AND HOLD TIMES

Analytical Group	Matrix	Analytical Method	Accreditation Expiration Date	Containers	Preservation	Preparation Holding Time	Analytical Holding Time	Data Package TAT
Metals[2]	Water	EPA Method 200.8		1x1 L HPDE	HNO_3 pH < 2, Cool to 4 ± 2 C	NA	6 months	10 days
Total Phosphorus	Water	EPA Method 365.1		1x125 mL HPDE	H_2SO_4, Cool to 4 ± 2 C	NA	28 days	10 days
Alkalinity	Water	SM2320B		1x125 mL HPDE	None	NA	14 days	10 days
Anions (Cl, F, SO_4)	Water	EPA Method 300.0		1x125 mL HPDE	None	NA	Chloride – 28 days Fluoride – 28 days Sulfate – 28 days	10 days

Notes:
TAT Turnaround time
1 Holding time is applicable from validated time of sample receipt and is measured to time of sample extraction and analysis.
2 Metals include aluminum, chromium, calcium, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium, tin, and zinc.

QAPP WORKSHEET #20: FIELD QUALITY CONTROL SUMMARY

Matrix	Analytical Group[1]	Field Samples	FD[2]	MS	MSD	Field Blanks	Equipment Blanks	Trip Blanks	Other	Total Samples
Water	Total Phosphorus, Alkalinity, Anions, Metals[3]	360								360

Notes:
FD Field Duplicate
MS Matrix Spike
MSD Matrix Spike Duplicate
NA Not Applicable

Sample numbers in this table reflect field QC samples collected during each sampling event.
1 Analytical and preparation SOPs are listed in Worksheet #23.
2 Field duplicates are collected at a rate of 1 per 10 investigative samples of the same matrix.
3 Metals include aluminum, chromium, calcium, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium, tin, and zinc.

QAPP WORKSHEET #21: FIELD SOPS

Reference Number	Title, Revision, Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
S-1	Sequential Potable Water Supply Sampling SOP No. SRS0017, Revision No. 0, April 2015.	SRS	Sample containers	N	None
S-2	Field Records and Documentation SOP No. SRS002A, Revision 0, April 2015	SRS	Logbook, ball point pen	N	None
S-3	Sample Labeling, Control and Shipping SOP No. SRS010C, Revision 0, April 2015	SRS	Computer, printer, labels, custody seals, zip locks, trash bags, ice.	N	None

Notes:

QAPP WORKSHEET #22: FIELD EQUIPMENT CALIBRATION, MAINTENANCE, TESTING, AND INSPECTION

Field Equipment	Calibration Activity[1]	SOP Reference	Responsible Person	Frequency	Acceptance Criteria	Corrective Action	Comments
pH Meter	Daily Calibration Check	S-1	FTL	Daily	±0.2 pH units	Turn off and recheck	

Notes:
1 The field equipment will be calibrated per manufacturer's instructions.
2 Instrument accuracy will be verified using manufacturer supplied calibration blanks.

QAPP WORKSHEET #23: ANALYTICAL SOPs

Reference Number	Title, Revision, Date, and/or Number	Definitive or Screening Data	Matrix	Analytical Group	Equipment Type	Modified for Project Work?
EPA 365.1	Lab SOP to be provided	Definitive	Water	Total Phosphorus	Automated Spectrophotometer	No
SM2320	Lab SOP to be provided	Definitive	Water	Alkalinity	pH Meter	No
EPA 300.0	Lab SOP to be provided	Definitive	Water	Inorganic Anions (Cl, F, SO_4)	Ion Chromatography	No
EPA 200.8	Lab SOP to be provided	Definitive	Water	Metals	ICP/MS	No

Notes:
ICP/MS Inductively coupled plasma /mass spectroscopy
ICP/AES Inductively coupled plasma/atomic emission spectrometry

QAPP WORKSHEET #24: ANALYTICAL INSTRUMENT CALIBRATION

Instrument	Calibration Procedure	Calibration Range	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for CA	SOP Reference[1]
ICP/MS	Run five calibration mixed standard solutions and a blank	Low	Each CCV analyzed shall reflect the conditions of analysis of all associated analytical samples (the preceding 10 analytical samples or the preceding analytical samples up to the previous CCV)	Deviation from the ICV: metals 90-110%	Inspect the system for problems, clean the system, verify operating conditions, and take CAs to achieve the technical acceptance criteria.	STAT Analysis	A-5
Automated Spectrophotometer	Run five calibration mixed standard solutions and a blank	Low	Each CCV analyzed shall reflect the conditions of analysis of all associated analytical samples (the preceding 10 analytical samples or the preceding analytical samples up to the previous CCV)	Deviation from the ICV: metals 90-110%	Inspect the system for problems, clean the system, verify operating conditions, and take CAs to achieve the technical acceptance criteria.	STAT Analysis	A-2
Ion Chromatography	Run five calibration mixed standard solutions and a blank	Low	Each CCV analyzed shall reflect the conditions of analysis of all associated analytical samples (the preceding 10 analytical samples or the preceding analytical samples up to the previous CCV)	Deviation from the ICV: metals 90-110%	Inspect the system for problems, clean the system, verify operating conditions, and take CAs to achieve the technical acceptance criteria.	STAT Analysis	A-4

Notes:
ICP/MS Inductively coupled plasma /mass spectroscopy
CCV Continuing calibration verification
ICV Initial Calibration Verification
1 See Worksheet #23 for analytical methods.

QAPP WORKSHEET #25: ANALYTICAL INSTRUMENT AND EQUIPMENT MAINTENANCE TESTING, AND INSPECTION

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Person Responsible for CA	SOP Reference[1]
ICP/MS	Daily check, ICV	Nebulizer, injection tube, flame optimization, gas supply, and detector	Nebulizer, injection tube, flame optimization, gas supply, and detector	Daily	See A-5	Inspect the system for problems, clean the system, verify operating conditions, and take CAs to achieve the technical acceptance criteria.	Laboratory personnel/STAT Analysis	A-5
Automated Spectrophotometer	Daily check, ICV			Daily	A-2		Laboratory personnel/STAT Analysis	A-2
Ion Chromatography	Daily check, ICV			A-4	A-4		Laboratory personnel/STAT Analysis	A-4

Notes:
ICP/MS Inductively coupled plasma /mass spectroscopy
ICV Initial Calibration Verification
1 See Worksheet #23 for identification of analytical methods.

QAPP WORKSHEET #26 & 27: SAMPLE HANDLING, CUSTODY, AND DISPOSAL

Sampling Organization: SRS
Laboratory: STAT Analysis
Method of sample delivery (shipper/carrier): Courier
Number of days from reporting until sample disposal: In accordance with individual laboratory SOP

Activity	Organization and title or position of person responsible for the activity	SOP reference
Sample labeling	Field sampling personnel/SRS	S-8
Chain-of-custody form completion	Field sampling personnel/SRS	S-8
Packaging	Field sampling personnel/SRS	S-8
Shipping coordination	Field sampling personnel/SRS	S-8
Sample receipt, inspection, & log-in	Laboratory personnel/STAT Analysis	
Sample custody and storage	Laboratory personnel/STAT Analysis	
Sample disposal	Laboratory personnel/STAT Analysis	

Notes:

QAPP WORKSHEET #28: ANALYTICAL QUALITY CONTROL AND CORRECTIVE ACTION

Matrix	Water
Analytical Group	Total Phosphorus
Analytical Method	EPA 365.1

QC Sample	Frequency/Number	Acceptance Criteria	Corrective Action	Person(s) Responsible for CA	Project-Specific MPC
Method Blank	1 per prep. batch of up to 20 samples.	No analytes detected >reporting limit (RL)	Reprep and reanalyze the method blank and all samples processed with the contaminated blank. If problem persists, call PM.	Analyst/ Laboratory Quality Assurance Officer	All analytes in the method blank must be less than the RL
MS/MSD	1 per extraction batch of 20 samples maximum		If sufficient volume is available, extract and reanalyze samples in affected batch. Otherwise, analyze laboratory control sample to see if problem is analysis or sample.	Laboratory Analyst	75-125 %R
Laboratory Duplicate	1 per extraction batch of 20 samples maximum		If sufficient volume is available, extract and reanalyze samples in affected batch. Otherwise, analyze laboratory control sample to see if problem is analysis or sample.	Laboratory Analyst	<20% RPD
LCS	One per preparatory batch of up to 20 samples.	QC acceptance criteria specified in DoD QSM v4.2, if available. Otherwise use in-house limits.	Correct problem, reprep and reanalyze LCS and all samples in associated batch for failed analytes. If problem persists, call PM.	Analyst/ Laboratory Quality Assurance Officer	All analytes in samples found to be within +/- 20% of the PAL's on WS#15 MUST pass method/SOP criteria.

QAPP WORKSHEET #28 (CONTINUED)
QC SAMPLES TABLE

Matrix	Water
Analytical Group	Alkalinity
Analytical Method	EPA 310.1

QC Sample	Frequency/Number	Acceptance Criteria	Corrective Action	Person(s) Responsible for CA	Project-Specific MPC
Method Blank	1 per prep. batch of up to 20 samples.	No analytes detected >reporting limit (RL)	Reprep and reanalyze the method blank and all samples processed with the contaminated blank. If problem persists, call PM.	Analyst/ Laboratory Quality Assurance Officer	All analytes in the method blank must be less than the RL
MS/MSD	1 per extraction batch of 20 samples maximum		If sufficient volume is available, extract and reanalyze samples in affected batch. Otherwise, analyze laboratory control sample to see if problem is analysis or sample.	Laboratory Analyst	75-125 %R
Laboratory Duplicate	1 per extraction batch of 20 samples maximum		If sufficient volume is available, extract and reanalyze samples in affected batch. Otherwise, analyze laboratory control sample to see if problem is analysis or sample.	Laboratory Analyst	<20% RPD
LCS	One per preparatory batch of up to 20 samples.	QC acceptance criteria specified in DoD QSM v4.2, if available. Otherwise use in-house limits.	Correct problem, reprep and reanalyze LCS and all samples in associated batch for failed analytes. If problem persists, call PM.	Analyst/ Laboratory Quality Assurance Officer	All analytes in samples found to be within +/- 20% of the PAL's on WS#15 MUST pass method/SOP criteria.

QAPP WORKSHEET #28 (CONTINUED)
QC SAMPLES TABLE

Matrix	Water
Analytical Group	Anions
Analytical Method	EPA 300.0

QC Sample	Frequency/Number	Acceptance Criteria	Corrective Action	Person(s) Responsible for CA	Project-Specific MPC
Method Blank	1 per prep. batch of up to 20 samples.	No analytes detected >reporting limit (RL)	Reprep and reanalyze the method blank and all samples processed with the contaminated blank. If problem persists, call PM.	Analyst/ Laboratory Quality Assurance Officer	All analytes in the method blank must be less than the RL
MS/MSD	1 per extraction batch of 20 samples maximum		If sufficient volume is available, extract and reanalyze samples in affected batch. Otherwise, analyze laboratory control sample to see if problem is analysis or sample.	Laboratory Analyst	75-125 %R
Laboratory Duplicate	1 per extraction batch of 20 samples maximum		If sufficient volume is available, extract and reanalyze samples in affected batch. Otherwise, analyze laboratory control sample to see if problem is analysis or sample.	Laboratory Analyst	<20% RPD
LCS	One per preparatory batch of up to 20 samples.	QC acceptance criteria specified in DoD QSM v4.2, if available. Otherwise use in-house limits.	Correct problem, reprep and reanalyze LCS and all samples in associated batch for failed analytes. If problem persists, call PM.	Analyst/ Laboratory Quality Assurance Officer	All analytes in samples found to be within +/- 20% of the PAL's on WS#15 MUST pass method/SOP criteria.

QAPP WORKSHEET #28 (CONTINUED)
QC SAMPLES TABLE

Matrix	Water
Analytical Group	Metals
Analytical Method	EPA 200.8

QC Sample	Frequency/Number	Acceptance Criteria	Corrective Action	Person(s) Responsible for CA	Project-Specific MPC
Method Blank	1 per prep. batch of up to 20 samples.	No analytes detected >reporting limit (RL)	Reprep and reanalyze the method blank and all samples processed with the contaminated blank. If problem persists, call PM.	Analyst/ Laboratory Quality Assurance Officer	All analytes in the method blank must be less than the RL
MS/MSD	1 per extraction batch of 20 samples maximum		If sufficient volume is available, extract and reanalyze samples in affected batch. Otherwise, analyze laboratory control sample to see if problem is analysis or sample.	Laboratory Analyst	75-125 %R
Laboratory Duplicate	1 per extraction batch of 20 samples maximum		If sufficient volume is available, extract and reanalyze samples in affected batch. Otherwise, analyze laboratory control sample to see if problem is analysis or sample.	Laboratory Analyst	<20% RPD
LCS	One per preparatory batch of up to 20 samples.	QC acceptance criteria specified in DoD QSM v4.2, if available. Otherwise use in-house limits.	Correct problem, reprep and reanalyze LCS and all samples in associated batch for failed analytes. If problem persists, call PM.	Analyst/ Laboratory Quality Assurance Officer	All analytes in samples found to be within +/- 20% of the PAL's on WS#15 MUST pass method/SOP criteria.

QAPP WORKSHEET #29: PROJECT DOCUMENTS AND RECORDS

Sample Collection and Field Records			
Record	**Generation**	**Verification**	**Storage location/archival**
Field logbook or data collection sheets	Field Team Leader	Project Manager	Project File
Chain-of-Custody Forms	Field Team Leader	Project Manager	Project file (laboratory data), SRS offices
Air Bills	Field Team Leader	Project Manager	Project File, SRS offices
Contractor Daily QC Reports	Field Team Leader	Project Manager	Project File, SRS offices
Deviations	Field Team Leader	Project Manager	Project File, SRS offices
Corrective Action Reports	Field Team Leader	Project Manager	Project File, SRS offices
Correspondence	Field Team Leader	Project Manager	Project File, SRS offices

Project Assessments			
Record	**Generation**	**Verification**	**Storage location/archival**
Field logbook or data collection sheets	Field Team Leader	Project Manager	Project File, SRS offices
Field audit checklists	Field Team Leader	Project Manager	Project File, SRS offices
Data verification checklists	Program QA/QC Officer	Project QA Manager	Project file (laboratory data), SRS offices
Data validation report	Program QA/QC Officer	Project QA Manager	Project file (laboratory data), SRS offices
Data usability assessment report	Program QA/QC Officer	Project QA Manager	Project file (laboratory data), SRS offices

Laboratory Records			
Record	**Generation**	**Verification**	**Storage location/archival**
Sample Receipt Forms	Laboratory	Project Manager	Project file (laboratory data), SRS offices
Data Packages	Laboratory	Project Manager	Project file (laboratory data), SRS offices
Corrective Action Reports	Laboratory	Project Manager	Project file (laboratory data), SRS offices
Correspondence	Laboratory	Project Manager	Project file (laboratory data), SRS offices

Notes:

QAPP WORKSHEET #31, 32 & 33: ASSESSMENTS AND CORRECTIVE ACTION

Assessment Type	Responsible Party & Organization	Number/ Frequency	Estimated Dates	Assessment Deliverable	Deliverable due date
Field Sampling Technical Systems Audit (TSA)	QA/QC Officer and/or Project Chemist SRS	Once		STAT Analysis QA Officer	24 hours

QAPP WORKSHEET #34: DATA VERIFICATION AND VALIDATION INPUTS

Item	Description	Verification	Validation
Planning Documents/Records			
1	Approved QAPP	X	
2	Contract	X	
4	Field SOPs	X	
5	Laboratory SOPs	X	
Field Records			
6	Field logbooks	X	X
7	Equipment calibration records	X	X
8	Chain-of-Custody Forms	X	X
9	Sampling diagrams/surveys	X	X
10	Drilling logs	X	X
11	Geophysics reports	X	X
12	Relevant Correspondence	X	X
13	Change orders/deviations	X	X
14	Field audit reports	X	X
15	Field corrective action reports	X	X
Analytical Data Package			
16	Cover sheet (laboratory identifying information)	X	X
17	Case narrative	X	X
18	Internal laboratory chain-of-custody	X	X
19	Sample receipt records	X	X
20	Sample chronology (i.e. dates and times of receipt, preparation, & analysis)	X	X
21	Communication records	X	X
22	Project-specific PT sample results	X	X
23	LOD/LOQ establishment and verification	X	X
24	Standards Traceability	X	X
25	Instrument calibration records	X	X
26	Definition of laboratory qualifiers	X	X
27	Results reporting forms	X	X
28	QC sample results	X	X
29	Corrective action reports	X	X
30	Raw data	X	X
31	Electronic data deliverable	X	X

QAPP WORKSHEET #35: DATA VERIFICATION PROCEDURES

Records Reviewed	Requirement Documents	Process Description	Responsible Person/Organization
Field logbook	QAPP, S-2	Verify that records are present and complete for each day of field activities. Verify that all planned samples including field QC samples were collected and that sample collection locations are documented. Verify that meteorological data were provided for each day of field activities. Verify that changes/exceptions are documented and were reported in accordance with requirements. Verify that any required field monitoring was performed and results are documented.	Daily - Project Manager. At conclusion of field activities - Project QA Manager
Chain-of-custody forms	QAPP, S-3	Verify the completeness of chain-of-custody records. Examine entries for consistency with the field logbook. Check that appropriate methods and sample preservation have been recorded. Verify that the required volume of sample has been collected and that sufficient sample volume is available for QC samples (e.g., MS/MSD). Verify that all required signatures and dates are present. Check for transcription errors.	Daily – Field Team Leader. At conclusion of field activities - Project Chemist
Laboratory Deliverable	QAPP	Verify that the laboratory deliverable contains all records specified in the QAPP. Check sample receipt records to ensure sample condition upon receipt was noted, and any missing/broken sample containers were noted and reported according to plan. Compare the data package with the COCs to verify that results were provided for all collected samples. Review the narrative to ensure all QC exceptions are described. Check for evidence that any required notifications were provided to project personnel as specified in the QAPP. Verify that necessary signatures and dates are present.	Before release – Laboratory QAM. Upon receipt - Project Chemist
Audit Reports, Corrective Action Reports	QAPP	Verify that all planned audits were conducted. Examine audit reports. For any deficiencies noted, verify that corrective action was implemented according to plan.	Project QAM

Notes:

1 EPA is responsible for conducting CADRE of analytical data generated by the CLP laboratory. EPA review will be conducted in accordance with CLP National Functional Guidelines (NFG) for data validation. EPA will provide SRS with a summary data review report.

QAPP WORKSHEET #36: DATA VALIDATION PROCEDURES

Data Validator: Sustainment and Restoration Services, LLC

Analytical Group/Method:	Air – NIOSH 7300 and SW-846 6020	Water –SM 2320, EPA 356.1, EPA 300.0, EPA 200.8	Soil – SW-846 6010
Data deliverable requirements:	SEDD Stage 3	SEDD Stage 3	SEDD Stage 3
Analytical specifications:	WS 28-2, SOP Met-03	WS 28-2, SOP Met-03	WS 28-2, SOP Met-03
Measurement performance criteria:	WS 12	WS 12	WS 12
Percent of data packages to be validated:	100%	100%	100%
Percent of raw data reviewed:	0	0	0
Percent of results to be recalculated:	0	0	0
Validation procedure:	Inorganic NFG	Inorganic NFG	Inorganic NFG
Electronic validation program/version:	None	None	None

The following data qualifiers will be applied during data validation by a third party. Potential impacts on project-specific data quality objectives will be discussed in the data validation report.

Qualifier	Description
[=]	Confirmed Identification
I	Interferences present which may cause the results to be biased high
J	Analyte present. Reported value may or may not be accurate or precise
N	Tentative Identification. Consider Present. Special methods may be needed to confirm its presence or absence in future sampling efforts
NJ	Qualitative identification questionable due to poor resolution. Presumptively present at approximate quantity
Q	Estimated dioxin/furan concentration
R	Unreliable result
U	Not Detected
UJ	Not detected, quantitation limit may be inaccurate or imprecise

QAPP WORKSHEET #37: DATA USABILITY ASSESSMENT

Identify personnel (organization and position/title) responsible for participating in the data usability assessment:
Program Manager Raghu Nagam
Program QA/QC Officer Richard Baldino
Project Manager/Field Team Leader Richard Baldino
Project Scientist and Sample Custodian Teresa Muldoon
Project Chemist Katherine Cooper

Describe how the usability assessment will be documented:

Summarize the data usability assessment process including statistics, equations, and computer algorithms that will be used to analyze the data:

Step 1	**Review the project's objectives and sampling design:** Review the key outputs defined during systematic planning (i.e.,PQOs or DQOs and MPCs) to make sure they are still applicable. Review the sampling design for consistency with stated objectives. This provides the context for interpreting the data in subsequent steps.
Step 2	**Review the data verification and data validation outputs:** Review available QA reports, including the data verification and data validation reports. Perform basic calculations and summarize the data (using graphs, maps, tables, etc.). Look for patterns, trends, and anomalies (i.e., unexpected results). Review deviations from planned activities (e.g., number and locations of samples, holding time exceedances, damaged samples, non-compliant PT sample results, and SOP deviations) and determine their impacts on the data usability. Evaluate implications of unacceptable QC sample results.
Step 3	**Verify the assumptions of the selected statistical method:** Verify whether underlying assumptions for selected statistical methods (if documented in the QAPP) are valid. Common assumptions include the distributional form of the data, independence of the data, dispersion characteristics, homogeneity, etc. Depending on the robustness of the statistical method, minor deviations from assumptions usually are not critical to statistical analysis and data interpretation. If serious deviations from assumptions are discovered, then another statistical method may need to be selected.
Step 4	**Implement the statistical method:** Implement the specified statistical procedures for analyzing the data and review underlying assumptions. For decision projects that involve hypothesis testing (e.g., "concentrations of lead in groundwater are below the action level") consider the consequences for selecting the incorrect alternative; for estimation projects (e.g., establishing a boundary for surface soil contamination), consider the tolerance for uncertainty in measurements.
Step 5	**Document data usability and draw conclusions:** Determine if the data can be used as intended, considering implications of deviations and corrective actions. Discuss data quality indicators. Assess the performance of the sampling design and Identify limitations on data use. Update the conceptual site model and document conclusions. Prepare the data usability summary report which can be in the form of text and/or a table.

REFERENCES

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EPA 2005. "Uniform Federal Policy for Implementing Environmental Quality Systems." March.

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SulTRAC 2012a. "Remedial Investigation Report, US Smelter and Lead Refinery Superfund Site, Lake County, Indiana." June 20.

SulTRAC 2012b. "Feasibility Study, US Smelter and Lead Refinery Superfund Site, Lake County, Indiana." June 20.

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U.S. EPA 2003. "Superfund Lead-Contaminated Residential Sites Handbook." August.

U.S. EPA 2008. Hazardous Ranking System Documentation Record. US Smelter and Lead Refinery. April.

U.S. EPA 2009. "Federal On-Scene Coordinator's Report, Rev. 1, Comprehensive Environmental Response, Compensation, and Liability Act Removal Action at the USS Lead Site, East Chicago, Lake County, Indiana, Site ID: 053J." August.

FIGURES

- Title Sheet – US Smelter & Lead Refinery. Remedial Design – Zone 3