Five-Year Review Report

Fourth Five-Year Review Report for East Helena Superfund Site

EPA ID MTD006230346

East Helena
Lewis and Clark County, Montana

September 2016

Prepared by:
United States Environmental Protection Agency
Region 8
Denver, Colorado

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Date: 9/26/16

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List of Acronyms

AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
ASARCO	American Smelting and Refining Company
CAMU	Corrective Action Management Unit
CDCP	Center for Disease Control and Prevention
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
CMS	Corrective Measures Study
COC	Contaminant of Concern
EP	Extraction Procedure
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
ET	Evapotranspiration
EVGCA	East Valley Groundwater Control Area
FS	Feasibility Study
FYR	Five-Year Review
GIS	Geographical Information System
HDS	High Density Sludge
IC	Institutional Control
ICIAP	Institutional Control Implementation and Assurance Plan
ICP	Institutional Controls Plan
ICS	Interim Cover System
IM WP	Interim Measures Work Plan
LEAP	Lead Education and Abatement Program
LTMRS	Long-Term Monitoring of Remediated Sites
MCA	Montana Code Annotated
MCL	Maximum Contaminant Level
MDHES	Montana Department of Health and Environmental Sciences
MDEQ	Montana Department of Environmental Quality
MDNRC	Montana Department of Natural Resources and Conservation
METG	Montana Environmental Trust Group
µg/dL	Micrograms per Deciliter
µg/L	Micrograms per Liter
mg/kg	Milligrams per Kilogram
MPDES	Montana Pollutant Discharge Elimination System
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PPC	Prickly Pear Creek
PWT	Pacific Western Technologies, Ltd.
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision

RPM	Remedial Project Manager
RSL	Regional Screening Level
UCL95	Upper 95th confidence limit on the mean
WP	Work Plan
WTP	Water Treatment Plant

Executive Summary

The East Helena Superfund site (the Site) is located in the community of East Helena, in Lewis and Clark County, Montana. The Site consists of the 140-acre former lead smelter facility and about 2,000 acres around the smelter property. These 2,000 acres include the City of East Helena, residential subdivisions, rural residences and farms, and undeveloped lands. The American Smelting and Refining Company (ASARCO) conducted lead and zinc smelter operations for over 100 years. Operations released lead, arsenic, copper, zinc, cadmium and other heavy metals into the air, soil, surface water and groundwater of the Helena Valley; contamination affected over a 100-square-mile area. ASARCO shut the plant down on April 4, 2001.

In 1984, the United States Environmental Protection Agency (EPA) placed the Site on the Superfund program's National Priorities List (NPL). To manage site investigations and cleanup, EPA initially divided the Site into five operable units (OUs) in 1987. EPA prioritized the Site's process ponds and fluids circuitry (designated as OU1) and off-site soils (designated as OU2) OUs for cleanup; these two OUs were well characterized while the remaining OUs areas were still undergoing investigation. In 1998, the United States Department of Justice issued a Consent Decree requiring ASARCO to resolve major environmental compliance issues under the Resource Conservation and Recovery Act (RCRA). The remaining work under the OU1 Record of Decision (ROD) – the process ponds, groundwater, surface water and soils, the slag pile, and the ore storage area – were deferred to RCRA for cleanup under the1998 RCRA Consent Decree. EPA designated the residential soils and undeveloped lands as OU2 and this property is addressed under the 2009 OU2 ROD.

On June 5, 2009, the 2009 Bankruptcy Court approved the Consent Decree and Settlement Agreement regarding the Montana Sites. The Settlement Agreement was between ASARCO subsidiaries, the United States and the State of Montana. The Settlement Agreement provides for the transfer and administration of the formerly owned ASARCO properties to the Custodial Trustee for the Montana Properties, Montana Environmental Trust Group (METG). The Custodial Trustee has assumed the responsibility for the corrective action cleanup as dictated in the 1998 RCRA Consent Decree to include all environmental compliance obligations, including outstanding work in the OU1 ROD.

The triggering action for this statutory five-year review (FYR) was the signing of the previous FYR on September 27, 2011.

The remedies at OU1 (remedial work done under the 1989 OU1 ROD and remaining work done under RCRA Corrective Action to address remaining source areas contributing to groundwater contamination) and OU2 are expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risk at OU1 or OU2.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: East Helena Superfund Site		
EPA ID: MTD006230346		
Region: 8	**State:** MT	**City/County:** East Helena/Lewis and Clark County
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** No	
REVIEW STATUS		
Lead agency: EPA		
Author name: Betsy Burns and Claire Marcussen		
Author affiliation: EPA Region 8 and Skeo		
Review period: September 27, 2015 – September 27, 2016		
Date of site inspection: November 5, 2015		
Type of review: Statutory		
Review number: 4		
Triggering action date: September 27, 2011		
Due date *(five years after triggering action date)*: September 27, 2016		

Five-Year Review Summary Form (continued)

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU1

Issues and Recommendations Identified in the Five-Year Review:

OU(s): OU2	Issue Category: Institutional Controls			
	Issue: Jefferson County has decided not to participate in developing an institutional control program for OU2.			
	Recommendation: EPA will conduct sampling and statistically reevaluate the Administrative Boundary as detailed in the OU2 ROD Figure 5-6 to determine appropriate institutional controls for Jefferson County.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	09/27/2017

OU(s): OU2	Issue Category: Institutional Controls			
	Issue: The 2013 Institutional Controls Plan (ICP) for OU2 does not provide sufficient detail on best management practices for agricultural land.			
	Recommendation: Update the ICP to include specific instructions for implementing best management practices on agricultural land. Update the ICP to an Institutional Control Implementation and Assurance Plan (ICIAP), following EPA guidance.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Other	EPA	09/27/2017

Protectiveness Statements

Operable Unit:	*Protectiveness Determination:*
OU1	Will be Protective
Protectiveness Statement: The remedy at OU1 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risk at OU1.	

Five-Year Review Summary Form (continued)

Operable Unit:	*Protectiveness Determination:*
OU2	Will be Protective

Protectiveness Statement:
The remedy at OU2 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risk at OU2.

Fourth Five-Year Review Report
for
East Helena Superfund Site

1.0 Introduction

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is protective of human health and the environment. FYR reports document FYR methods, findings and conclusions. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121 states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

EPA interpreted this requirement further in the NCP, 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.

Skeo, an EPA Region 8 contractor, conducted the FYR and prepared this report regarding the remedy implemented at the East Helena Superfund site (the Site) in East Helena, Lewis and Clark County, Montana. EPA's contractor conducted this FYR from September 2015 to September 2016. EPA is the lead agency for developing and implementing the OU2 remedy financed with money from the ASARCO potentially responsible party bankruptcy. The Montana Department of Environmental Quality (MDEQ), as the support agency representing the State of Montana, has reviewed all supporting documentation and provided input to EPA during the FYR process.

This is the fourth FYR for the Site. The triggering action for this statutory review is the signature of the previous FYR. The FYR is required because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted

exposure. To implement Superfund cleanup activities, EPA originally identified five operable units at the Site, and after the 1998 RCRA Consent Decree there are two operable units (OUs) – the process ponds and fluids (OU1) and soils on residential and undeveloped lands (OU2). Areas on the smelter property that were not remediated under the OU1 Record of Decision (ROD) prior to 1998 are being addressed under the Resource Conservation and Recovery Act (RCRA) Corrective Action authority as per a Consent Decree issued by the U.S. Department of Justice in 1998, and revised under the First Modification to Consent Decree on January 17, 2012. In 2009, as successor to American Smelting and Refining Company (ASARCO), the Montana Environmental Trust Group (METG), the Custodial Trustee for the Site, assumed responsibility for the corrective action cleanup as dictated in the 1998 RCRA Consent Decree. This responsibility includes all environmental compliance obligations of the OU1 1990 Consent Decree: groundwater contamination, site soils, surface water and the slag pile. This FYR Report addresses OU1 and OU2. It also briefly summarizes RCRA corrective action activities that affect the development of protectiveness statements for this FYR.

2.0 Site Chronology

Table 1 lists the dates of important events for the Site.

Table 1: Chronology of Site Events

Event	Date
Smelter operations began	1888
EPA proposed Site for listing on Superfund program's National Priorities List (NPL)	September 8, 1983
EPA issued Administrative Order on Consent (AOC) for ASARCO to conduct a remedial investigation (RI) at OU1; ASARCO initiated RI for OU1	August 31, 1984
EPA finalized Site on NPL	September 21, 1984
ASARCO initiated feasibility study (FS) for OU1	June 23, 1987
EPA issued AOC for ASARCO to conduct comprehensive RI/FS for OU2; ASARCO initiated OU2 RI/FS	December 30, 1988
ASARCO completed RI/FS for OU1 Process Ponds; EPA issued OU1 ROD	November 22, 1989
ASARCO began remedial design for OU1	September 11, 1990
EPA issued Consent Decree for ASARCO to complete OU1 remedial design and remedial action	December 27, 1990
EPA issued AOC for ASARCO to complete non-time critical removal action for lead- and arsenic-contaminated soil in OU2; ASARCO initiated removal action	July 19, 1991
ASARCO completed OU1 remedial design at OU1; ASARCO began remedial action	March 31, 1992
EPA modified OU2 AOC for removal action of soils in OU2	October 13, 1992
EPA modified OU2 AOC for removal action of soils in OU2	May 11, 1993
EPA issued Explanation of Significant Differences (ESD) for OU1	June 17, 1993
EPA established Lead Education and Abatement Program for OU2	1995
EPA modified OU2 AOC for removal action of soils in OU2	August 23, 1996
ASARCO completed OU1 remedial action	January 23, 1998
Department of Justice issued RCRA Consent Decree requiring ASARCO to resolve major environmental compliance issues under RCRA authority at smelter property and its ancillary features	May 5, 1998
EPA signed Site's first FYR	September 27, 1999
ASARCO completed Phase I RCRA Facility Investigation Work Plan	December 2000
Smelter owner closed down smelting operations	April 4, 2001
EPA initiated human and environmental risk assessment for OU2	September 24, 2003
EPA completed OU2 human and environmental risk assessment	January 14, 2005

Event	Date
MDEQ issued Consent Decree for ASARCO to address violations of on-site hazardous waste accumulation	February 17, 2005
EPA modified OU2 AOC for removal action of soils in OU2	April 19, 2005
ASARCO filed for bankruptcy; formerly owned ASARCO properties transferred to METG Trust	August 9, 2005
ASARCO began RI/FS for OU2	December 31, 2005
EPA signed Site's second FYR	March 31, 2006
ASARCO completed OU2 RI/FS; EPA issued OU2 ROD	September 17, 2009
Formerly owned ASARCO properties transferred to METG	December 9, 2009
METG completed Phase II RCRA Facility Investigation Work Plan for RCRA areas of OU2	May 2010
EPA signed Site's third FYR	September 27, 2011
ASARCO completed non-time critical removal actions for OU2	October 29, 2011
First Modification to RCRA Consent Decree	January 17, 2012
EPA approved first Corrective Action Interim Measures Work Plan (IM WP)	August 28, 2012
EPA approved second Corrective Action IM WP	January 21, 2013
EPA began remedial design for OU2	August 2, 2013
Lewis and Clark City-County Health Department prepared institutional controls program implementation plan (ICP)	December 23, 2013
EPA approved third Corrective Action IM WP	April 28, 2014
EPA approved fourth Corrective Action IM WP	May 29, 2015
EPA completed final remedial design for OU2 for remaining residential yards, roads and road aprons, and flood channels	September 4, 2015
EPA began OU2 remedial actions	October 26, 2015
MDEQ issued AOC for METG to comply with Montana Water Quality Act and Administrative Rules of Montana	September 29, 2015
EPA approved addendum to fourth Corrective Action IM WP	March 2016
EPA completed qualified property OU2 remedial actions	May 13, 2016

3.0 Background

3.1 Physical Characteristics

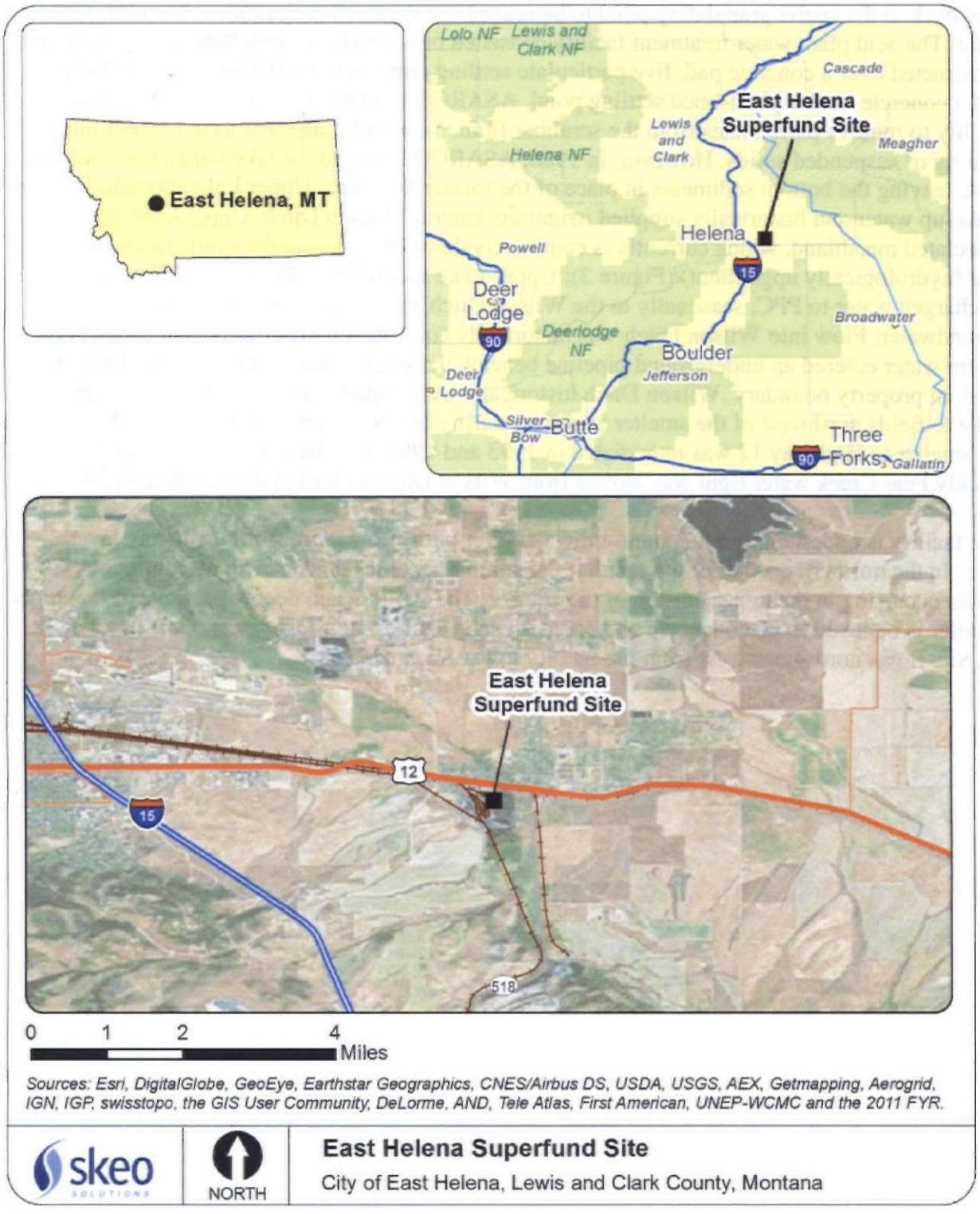
The Site is located in East Helena, in Lewis and Clark County, Montana, about 3 miles east of Helena, Montana (Figure 1). The 140-acre former smelter facility is located primarily on the Prickly Pear Creek (PPC) alluvial plain. Upper Lake and Lower Lake borders the facility to the south. PPC borders it to the east and northeast. Uplands or foothills border the facility to the west and southwest. State Highway 12 and American Chemet (a metals-based chemical manufacturer) border it to the north. The City of East Helena is located a short distance north of the facility (Figure 2).

The facility has changed significantly over the past 20 years, following the 2001 plant shutdown, site remediation and demolition of most plant structures. A large slag pile remains in the northeastern portion of the Site. Prior to demolition, the facility included water treatment facilities and process ponds that handled process wastes and effluent, including Lower Lake, a speiss granulating pond and pit, an acid plant water treatment facility, the high-density sludge water treatment plant (HDS WTP) constructed in 1994 to treat water from Lower Lake and Thornock Lake. ASARCO used the 7-acre Lower Lake to discharge treated water used in the main plant process circuits and runoff from the plant site; Lower Lake is no longer used and has been dewatered.

ASARCO used the speiss granulating pond, which contained water from Lower Lake, to cool the hot speiss (molten material) in the concrete speiss pit. The water then drained through a steel pipe back to the speiss granulating pond to be reused in the granulating process from the dross plant. The acid plant water treatment facility consisted of a wooden trough fluid transport system constructed over a concrete pad, five particulate settling dumpsters underlain by a concrete pad, and a concrete- and asphalt-lined settling pond. ASARCO used the acid plant water treatment facility to remove particulates from the scrubber fluid. Thornock Lake was used for preliminary settling of suspended solids. However, in 1986, ASARCO replaced the lake with a steel holding tank, leaving the bottom sediments in place of the former lake area. Upper Lake provided smelter make-up water and historically supplied irrigation water to Wilson Ditch. Upper Lake and associated marshland, which currently is completely dewatered, was at the southern end of the Site (hydrologically upgradient) (Figure 2); Upper Lake was fed by PPC. Upper Lake then discharged water to PPC, seasonally to the Wilson Ditch and through seepage to the groundwater. Flow into Wilson Ditch was historically controlled with a headgate at Upper Lake, where water entered an underground pipeline beneath the smelter and surfaced in the ditch at the western property boundary. Wilson Ditch historically transported irrigation water from Upper Lake to fields northwest of the smelter area only during the irrigation season. Wilson Ditch from the smelter to Highway 12 was remediated in 1993 and 1994, and the point of diversion for the Prickly Pear Creek water right was moved from Wilson Ditch to further downstream in 2012.

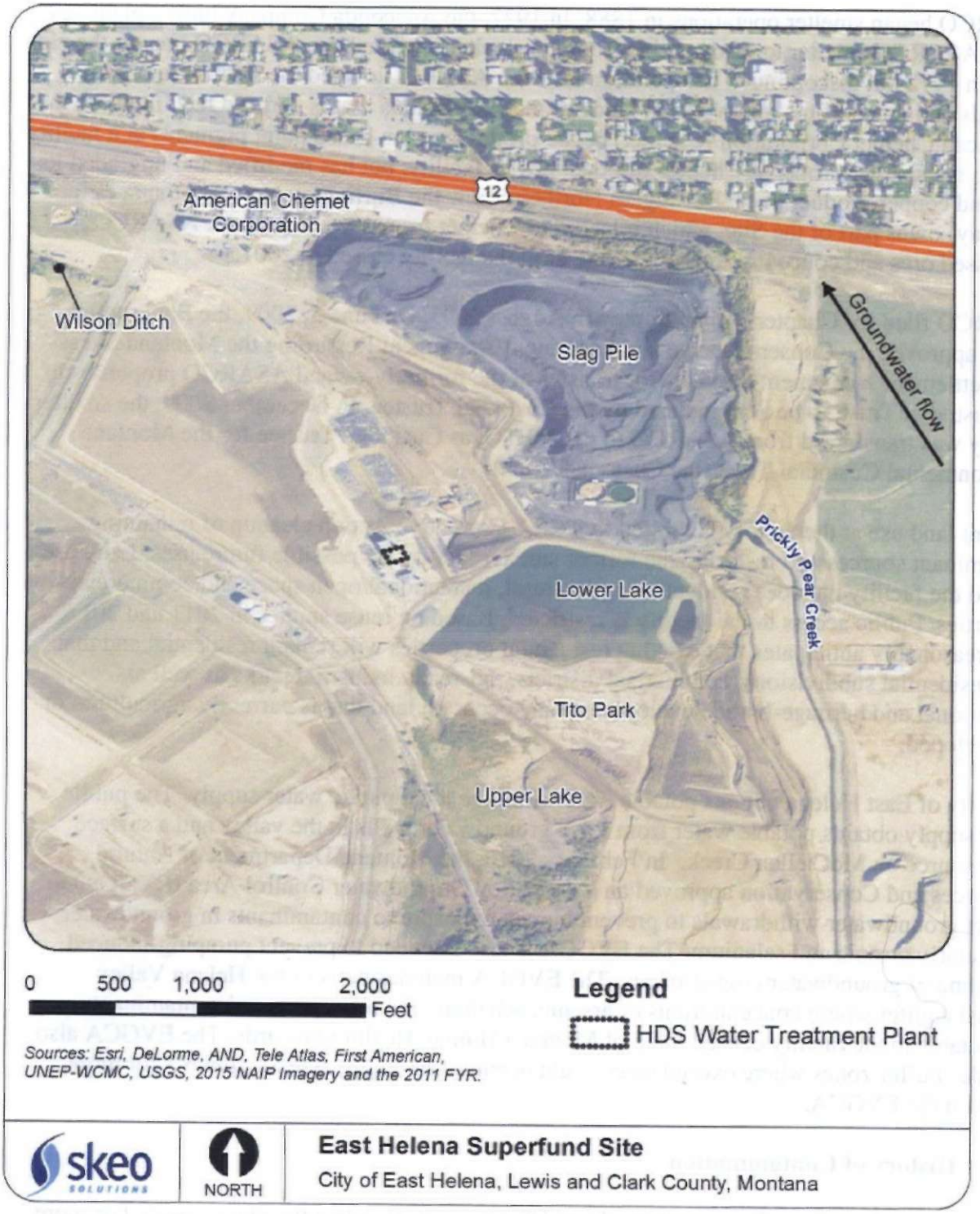
The facility is underlain by a sand-and-gravel aquifer with a low permeability silt/clay layer base. In the northern portion of the facility, the aquifer becomes thicker with discontinuous silt lenses occurring in the upper portion of the aquifer. The shallow and deeper portions of the upper Aquifer is believed to be connected and act as a single shallow aquifer system. Groundwater at the Site flows north-northwest from the facility toward East Helena.

Figure 1: Site Vicinity Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Figure 2: Detailed Facility Site Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

3.2 Land and Resource Use

ASARCO began smelter operations in 1888. In 1927, the Anaconda Company built a plant next to the ASARCO smelter to recover zinc from the smelter's waste slag. ASARCO bought the zinc plant in 1972 but discontinued its operation in 1982. ASARCO owned the smelter facility grounds and much of the undeveloped land around East Helena that is part of OU2. In 1955, the American Chemet Corporation (Chemet) began producing zinc-based paint pigments at a facility next to the smelter property. Chemet still operates its facility, but has modified and upgraded its zinc and copper product lines. Burlington Northern (now the Burlington Northern Santa Fe Railway) owns part of the Site, which it leased to Chemet from 1969 to present. ASARCO processed ores and concentrations at the Site until the facility closed in 2001.

ASARCO filed for Chapter 11 bankruptcy in August 2005. On June 5, 2009, the Bankruptcy Court approved the Consent Decree and Settlement Agreement Regarding the Montana Sites. The Settlement Agreement provides for transfer of the formerly-owned ASARCO properties to the Custodial Trust, to be administered by the Custodial Trustee. In December 2009, the smelter facility was transferred from ASARCO to the METG, as Custodial Trustee for the Montana Environmental Custodial Trust (the Custodial Trust).

Current land use at the facility is limited to RCRA Corrective Action cleanup of remaining contaminant sources and restoring the former smelter facility for possible future uses. Land use around the facility includes residential, agricultural, recreational/open space and commercial properties. Public access to the facility is restricted. Based on reuse studies in 2011 and 2012, EPA reasonably anticipates that existing residential properties will remain residential and that new residential subdivisions, commercial districts, rail-ready industrial parks as well as recreational and heritage-based development may occur on land that is currently agricultural or undeveloped.

The City of East Helena obtains potable water from the local public water supply. The public water supply obtains potable water from three groundwater wells in the valley and a surface water source on McClellan Creek. In February 2016, the Montana Department of Natural Resources and Conservation approved an East Valley Groundwater Control Area (EVGCA) to restrict groundwater withdrawals to prevent human exposure to contaminants in groundwater, particularly arsenic and selenium. The EVGCA is also intended to prevent pumping-induced spreading of groundwater contaminants. The EVGCA includes parts of the Helena Valley alluvial aquifer where concentrations of arsenic, selenium and other potential contaminants attributable to the facility exceed State of Montana Human Health Standards. The EVGCA also includes buffer zones where exceedances could occur in the future. See Section 6.3 for more detail on the EVGCA.

3.3 History of Contamination

ASARCO conducted smelter operations from 1888 until 2001, when the plant closed. For more than 100 years, ASARCO's smelting operations deposited heavy metals, arsenic and other hazardous chemicals into the soil, surface water and groundwater of the Helena Valley. EPA

identified five primary sources of contamination: smelter air emissions, the slag pile, ore storage areas, process ponds and process fluids.

In 1989, EPA determined that the process ponds and fluids should be the first contaminant source to be remediated. They were determined to be the most significant and well-characterized sources of contamination impacting groundwater.

3.4 Initial Response

Investigations by EPA and the State of Montana (the State) between 1969 and 1983 found high metal levels in air, soil, surface water and dust in and around East Helena. In 1975, the Montana Department of Health and Environmental Sciences (MDHES) and the national Centers for Disease Control and Prevention conducted the first blood-lead studies of residents in the area; some area children had blood-lead levels above action levels. ASARCO installed air pollution control equipment to reduce lead emissions. Blood-lead studies completed by the Lewis and Clark County (County) health department in 1983, 1987 and 1988 demonstrated a decline in the number of children above the blood-lead action levels. EPA proposed the Site for listing on the Superfund program's National Priorities List (NPL) in 1983 and finalized the Site on the NPL in 1984. Pursuant to a 1991 Administrative Order on Consent (AOC), contractors working directly for ASARCO implemented non-time critical removal actions at residential properties between 1991 and October 2011.

3.5 Basis for Taking Action

In 1984, EPA issued an AOC for ASARCO to complete a remedial investigation (RI) to assess contamination in the process ponds. The RI was completed in 1987. It showed that inorganic contaminants from the process ponds and fluids had contaminated soils, plants, livestock, surface water, sediment and groundwater. In 1987, EPA initially divided the Site into five OUs:

- OU1 – Process Ponds and Fluids
- OU2 – Sitewide Groundwater
- OU3 – Surface Soils, Surface Water, Vegetation, Livestock, Fish and Wildlife, and Air
- OU4 – Slag Pile
- OU5 – Ore Storage Area

In 1988, EPA issued an AOC for ASARCO to conduct a comprehensive remedial investigation and feasibility study (RI/FS) and endangerment assessment for OU2, OU3, OU4 and OU5. They were completed in 1991. Both RIs indicated that contamination was greatest near the smelter. Heavy metals were detected in blood from cattle near the smelter. Arsenic and lead were elevated in PPC surface water. In 1991, EPA and ASARCO signed an AOC to begin a non-time critical removal action for lead- and arsenic-contaminated soil; the 1991 AOC is the guiding document for these soil removal actions.

In 1998, the U.S. Department of Justice issued the RCRA Consent Decree requiring ASARCO to resolve major environmental compliance issues under the RCRA authority at the smelter

property and its ancillary features. The RCRA Consent Decree deferred remaining cleanup in OU1, OU3, OU4, OU5 and Sitewide Groundwater from CERCLA to RCRA. After the 1998 RCRA Consent Decree EPA identified two operable units (OUs) – the process ponds and fluids (OU1) and soils on residential and undeveloped lands (OU2).

Between 2005 and 2009, EPA completed the RI and human health evaluations for the area now known as OU2. EPA concluded that the procedures, methods and criteria applied during the removal action are appropriate for completing the cleanup under a final remedial action.

4.0 Remedial Actions

In accordance with CERCLA and the NCP, remedial actions are required to protect human health and the environment and to comply with applicable or relevant and appropriate requirements (ARARs). A number of remedial alternatives were considered for the Site, and final selection was made based on an evaluation of each alternative against nine evaluation criteria that are specified in Section 300.430(e)(9)(iii) of the NCP. The nine criteria are:

1. Overall Protection of Human Health and the Environment
2. Compliance with ARARs
3. Long-Term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility or Volume through Treatment
5. Short-Term Effectiveness
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance

4.1 Remedy Selection

OU1 – Process Ponds and Fluids

EPA signed the OU1 ROD on November 22, 1989, to address the process ponds and fluids, including Lower Lake, the speiss granulating pond and pit (speiss area), the acid plant water Treatment facility, and Thornock Lake (Figure 3). EPA issued an Explanation of Significant Differences (ESD) in 1993 that revised some of the remedy components. The ROD and ESD did not include formal remedial action objectives (RAOs), but the ROD stated that a response action was warranted at the process ponds to:

- Alleviate the primary threats to public health and the environment.
- Prevent current or future exposure to contaminated sediment/soil.
- Reduce contaminant migration into the groundwater.

The selected remedy components were specific to the four process pond areas:

Lower Lake

- Replace Lower Lake with two 1-million-gallon storage tanks.

- Construct a stormwater collection tank to include a permitted discharge to PPC through the Montana Pollutant Discharge Elimination System (MPDES) program.
- Treat lake water in the HDS WTP and discharge to PPC.
- Remove and dry sediments and store in on-site corrective action management unit (CAMU).
- Excavate the saturated sediments between Upper and Lower Lake and smelt after all Lower Lake sludges and sediments are excavated, dried and removed.
- Install monitoring wells no later than July 1, 1993, to monitor for compliance with performance standards.

Speiss Area

- Excavate and smelt soils in the smelter process.
- Replace existing pond with a tank and secondary containment facility.
- Replace existing pit with a newly-lined facility.

Acid Plant Water Treatment Facility

- Replace settling dumpsters and pond with a closed-circuit filtration treatment system.
- Excavate and smelt soils in the smelter process.

Thornock Lake

- Excavate and smelt sediment in the smelter process.

The OU1 ROD established remediation goals to measure remedy effectiveness because ARARs were considered unattainable due to technical impracticability. The prescribed standards for Lower Lake are presented in Table 2.

Table 2: OU1 Process Water Prescribed Standards

Lower Lake Process Water COC	ROD Prescribed Standard[a] (mg/L)	Basis
Arsenic	0.02	Upper range of water quality data measured from PPC, and below the federal primary maximum contaminant level (MCL) of 0.05 mg/L (as of the 1989 ROD).
Cadmium	0.01	Federal primary MCL
Lead	0.05	Federal primary MCL (as of the 1989 ROD) because the state water quality standard to protect aquatic life (0.0032 mg/L) is exceeded from mining impacts above PPC.
Copper	0.004 to 0.008	Range of concentrations in PPC above and below the smelter.
Zinc	0.11	State water quality standard to protect aquatic life.
Notes: a. Obtained from Section 9.5 of the OU1 ROD mg/L = micrograms per liter		

EPA established standard soil leachate levels based on the extraction procedure for toxicity (EP toxicity) as the cleanup objective for the OU1 remedy. EP toxicity levels are achieved when site-

specific leachate concentrations do not exceed maximum contaminant levels (MCLs) for groundwater.

As successor to ASARCO, METG has assumed responsibility for the corrective action cleanup as dictated in the RCRA Consent Decree. This includes all environmental compliance obligations for the process ponds, which is further described in the following section.

RCRA Corrective Action

The previous FYR concluded that the OU1 remedy was not protective. Implementation of the ROD was incomplete because RCRA investigations and corrective actions were needed to address remaining sources of groundwater contamination, including portions of OU1. Therefore, this FYR summarizes the RCRA remedies that address remaining source areas contributing to groundwater contamination, to support the OU1 protectiveness determination.

The RCRA cleanup remedies are referred to as interim measures (IM) or corrective actions, which are presented in four Interim Measure Work Plans (IM WPs). EPA approved three general IMs for the RCRA cleanup. They are described in detail in the four RCRA IM WPs from 2012, 2013, 2014, 2015 and a 2016 addendum. The three IMs include south plant hydraulic control (SPHC), source removal and an evapotranspiration (ET) cover system.

The primary remedial objectives for the three IMs are to:

- Reduce migration of groundwater contaminants from the operating area of the former smelter site to protect public health and the environment.
- Eliminate human and ecological receptor exposure to on-site contaminated soil.

The cleanup goals established in the 2015 Corrective Measures Study Work Plan (CMS WP) are summarized in Table 3.

Table 3: RCRA Soil Cleanup Standards

COC	Land Use	Cleanup Goal[a] (mg/kg)	Basis	Application of Standard
Surface Soil				
Arsenic	residential	35	Hegeler Zinc Smelter Site ROD[b]	Determined based on land use planned for undeveloped properties.
	industrial/commercial	572	OU2 ROD	
	recreational	794	OU2 ROD	
Lead	residential	400	EPA RSL	
	industrial/commercial	800	EPA RSL	
	recreational	3,245	OU2 ROD	
	ecological	650	based on protection of ecological receptors	Will be applied as a design criterion for IM and final remedy construction (e.g., final surface site work associated with PPC and Tito Park excavation, surface layer of ET cover system)

COC	Land Use	Cleanup Goal[a] (mg/kg)	Basis	Application of Standard
Subsurface Soil				
Arsenic	NA	40	leachability-based values	Establishes extent of remedial action required to prevent groundwater contact with contaminated soil and to control infiltration.
Cadmium	NA	0.38		
Lead	NA	0.26		

Notes:
a. Obtained from Section 2.3.3 of the Final CMS Work Plan, prepared by METG, October 2015.
b. EPA approved this level for the Hegeler Zinc Smelter site in 2014 ROD.
NA = not applicable
mg/kg = milligrams per kilogram
RSL = regional screening level

An extensive monitoring well network monitors the effectiveness of the on-site IMs in reducing impacts to groundwater. EPA finalized the groundwater protection standards in the 2015 CMS work plan; they are summarized in Table 4.

Table 4: RCRA Groundwater Protection Standards

COC	RCRA Groundwater Protection Standard[a] (mg/L)
Arsenic	0.010
Cadmium	0.005
Selenium	0.05

Notes:
a. Obtained from Section 2.3.3 of the Final CMS Work Plan, prepared by METG in October 2015. They represent the federal MCLs that have been adopted as Montana's Numeric Water Quality Standards for groundwater: http://www.deq.mt.gov/wqinfo/circulars.mcpx.
mg/L = micrograms per liter

OU2 – Residential Soils and Undeveloped Lands

EPA signed the OU2 ROD on September 17, 2009, selecting a remedy to address soil contamination on residential and undeveloped land. The OU2 ROD identified the following RAOs:

- Continue to have no child in the East Helena area exhibit a blood lead concentration greater than 10 micrograms per deciliter (µg/dl).
- Continue the Lead Education and Abatement Program (LEAP) and continue to seek ways to improve its effectiveness and outreach.
- Maintain 95 percent or more of the children at or below 4 µg/dl blood-lead and the average blood-lead concentration for area children at a level less than the national average for children less than 7 years old.
- Prevent direct contact/ingestion with soil having contaminant concentrations above cleanup levels in existing residential areas.
- Prevent recontamination of areas already cleaned up.
- Minimize wind-borne migration of lead into residential areas.
- Minimize lead and arsenic exposures to livestock and wildlife.

- Prevent direct contact/ingestion with soil having concentrations above cleanup levels on undeveloped lands that may be used by workers or recreational visitors.
- Ensure that lead and arsenic concentrations in soil do not exceed established cleanup levels in undeveloped areas proposed for future residential development.

The major components of the OU2 selected remedy include:

- Excavation of contaminated soils remaining in qualified residential yards, vacant lots, unpaved streets, aprons, alleys, historic irrigation ditches and drainage channels, and portions of the railroad right-of-way.
- Disposal of excavated soils in an EPA-approved soil repository.
- Institutional controls.
- Continue the County-administered, community-wide education program.
- Immediate remedial action of a residential yard whenever blood tests of children and a follow-up environmental assessment by a health professional demonstrate that exposure to lead in yard soils is responsible for a blood lead level in a child above 10 µg/dl, regardless of the yard's soil-lead concentration.

Table 5 presents the soil cleanup levels for OU2. Table 6 lists the target blood-lead levels for residential children.

Table 5: OU2 Surface Soil COC Cleanup Goals

Land Use	Surface Soil Cleanup Goals (mg/kg)	
	Lead	Arsenic
Existing residential and vacant lots (including non-yard features either in or next to residential areas, such as historic ditches, unpaved streets and alleys, railroad right-of-way)	1,000/500[a]	100[b]
Undeveloped commercial use (farm, ranch, irrigation)	1,482	572
Recreational (for undeveloped lands proposed for future commercial or recreational use)	3,245	794
Future residential	500	100

Notes:

a. When any section of a yard has a soil-lead concentration greater than an upper 95th confidence limit on the mean (UCL95) of 1,000 mg/kg, all portions of the yard with soil-lead greater than a UCL95 of 500 mg/kg will be cleaned up.

b. Yards will be cleaned up regardless of the lead concentrations when the yard-wide average soil arsenic concentration exceeds 100 mg/kg which falls within the range of residential cleanup levels for arsenic in soil in Region 8 (70 mg/kg – 250 mg/kg) and within the risk range of 1×10^{-6} to 1×10^{-4}.

mg/kg = milligrams per kilogram

Table 6: Target Blood-lead Levels

Child Population	OU2 ROD Blood Lead Standard (µg/dl)
Not to exceed value for any child	10
95 percent of the children	at or below 4
Average for all children[a]	less than 1.7
Notes: a. The national average for children less than 7 years old (national average at the time of the 2009 ROD). µg/dL = micrograms per deciliter	

4.2 Remedy Implementation

In December 1990, EPA issued a Consent Decree for ASARCO to complete the OU1 remedial design and remedial action. ASARCO started the OU1 remedial design in September 1990 and completed it in March 1992. ASARCO began the remedial action in March 1992; remedial actions for areas identified in the OU1 ROD finished in January 1998. The ASARCO smelter facility was still operating in 1998 and all of the OU1 remedies were not fully implemented, therefore the outstanding remedies were deferred to RCRA corrective action. The Custodial Trustee is currently conducting RCRA investigations and IMs to address remaining areas of OU1, as outlined in the 1998 RCRA Consent Decree.

OU1 – Process Ponds and Fluids

The CERCLA remedial actions completed for each process pond and the RCRA subunits in OU1 are summarized below.

Lower Lake
In 1989, ASARCO installed two steel tanks as the primary holding facility for process waters rather than diverting the process waters to Lower Lake. In 1994, ASARCO built the HDS WTP to treat Lower Lake water to meet MPDES effluent requirements. The most contaminated sediments from Lower Lake were dredged and dried in filter presses. Between 1994 and 1997, ASARCO smelted about 4,280 cubic yards of the 27,000 cubic yards of dredged sediment. Remaining sediments were stockpiled and covered with a geomembrane layer; in 2002, ASARCO put them in a RCRA CAMU. In 1997, ASARCO built a stormwater collection tank that included a permitted discharge through the MPDES program. Between July and October 2014, METG remediated saturated sediments next to and within the Upper and Lower Lake complex. The 1993 ESD required downgradient monitoring wells to monitor compliance with performance standards. METG expands and refines the monitoring well network as required by the 1993 ESD. METG annually evaluates where wells need to be abandoned or installed as corrective action progresses. Changes to the monitoring well network are documented in annual revisions to the Compliance Monitoring Plan. Lower Lake continues to be dewatered as part of RCRA corrective actions at the Site.

Speiss Area
In 1995, ASARCO replaced the pond with a steel tank; the tank has a liner, leak detection system, and secondary containment and recovery capability. In 1995, ASARCO demolished the speiss granulating pit and excavated contaminated soils to the maximum depth practicable without compromising the integrity of adjacent structures. ASARCO smelted contaminated soils on site. ASARCO changed the granulating operation from water to air granulation, precluding the need for the concrete pit required in the ROD as fluids were no longer being generated. The air granulating method stopped when the plant closed in 2001.

Acid Plant Water Treatment Facility
In 1992, ASARCO replaced the settling dumpsters and pond with a closed-circuit filtration treatment system. In 1993, ASARCO demolished the acid plant water treatment facility and excavated and smelted contaminated soils on site. In 2001, the acid storage tanks were drained – except for a small reservoir of 1,250 gallons in each tank – to provide acid vapor pressure. ASARCO planned to ensure the integrity of the storage tanks by routinely analyzing the sulfuric acid strength (sulfuric acid is more corrosive at lower concentrations) and conducting ultrasonic metal thickness testing on the storage tank exterior walls. The remedial actions required by the ROD were completed; ongoing maintenance is being addressed under RCRA. Additional soil removal was conducted in May 2016 at the former Acid Plant.

Former Thornock Lake
In 1991, ASARCO had excavated and treated contaminated sediments by on-site smelting and the excavated area backfilled with clean earthen fill.

RCRA Remedy Implementation

Cleanup activities completed for the three RCRA IMs are summarized below.

South Plant Hydraulic Control
METG reduced site groundwater levels from November 2011 through 2016, to keep source material from contacting groundwater. The Custodial Trustee eliminated flow in Wilson Ditch (2011), began dewatering Upper Lake in 2011 and built a temporary bypass channel to route PPC flow around Smelter Dam in 2013. METG has completed dewatering Upper and Lower Lakes, which began in 2011 and 2014, respectively. METG began construction of the new PPC channel (also referred to as PPC Realignment) in 2015; completion is anticipated in 2016. The PPC Realignment will further reduce site groundwater levels and stop undercutting of the eastern edge of the slag pile.

Source Removal
METG began source removal activities in May 2014, including dewatering the remaining water in Lower Lake as part of the Tito Park Area removal action. In October 2014, the Custodial Trustee completed removal of contaminated soil and sediment from the Tito Park Area, Upper Ore Storage Area, Acid Plant Sediment Drying Area and Lower Lake. METG put soil excavated from within the Acid Plant Sediment Drying Area slurry wall in an on-site CAMU to eliminate potential inundation and erosion from PPC flooding, to support the PPC Realignment, and to reduce the overall footprint of the ET cover system. An additional removal action was completed

in June 2016; this action removed about 14,000 cubic yards of arsenic- and selenium-contaminated soil under the former Acid Plant Area process water settling facility. These arsenic and selenium concentrations exceed EPA's industrial soil regional screening level (RSL) and present an ongoing source of contamination to groundwater. METG is completing investigations at three source areas, including the West Selenium source area, the North Plant Arsenic source area and the Former Speiss-Dross source area to determine if additional remedies are warranted.

ET Cover System

METG is constructing the ET cover system in phases following demolition of buildings and infrastructure. METG completed demolition activities between July 2013 and October 2013 and constructed Interim Cover System 1 (ICS 1) in 2014. In 2015, METG built the final ET Cover System over ICS 1 (ET Cover West). The ICS 2 was completed over the eastern portion of the facility in late 2015. ICS 2 managed contaminated soils excavated during PPC Realignment. ICS 3 (central corridor) and the final ET Cover System will be completed in 2016. Demolition of the HDS WTP was completed in August 2016.

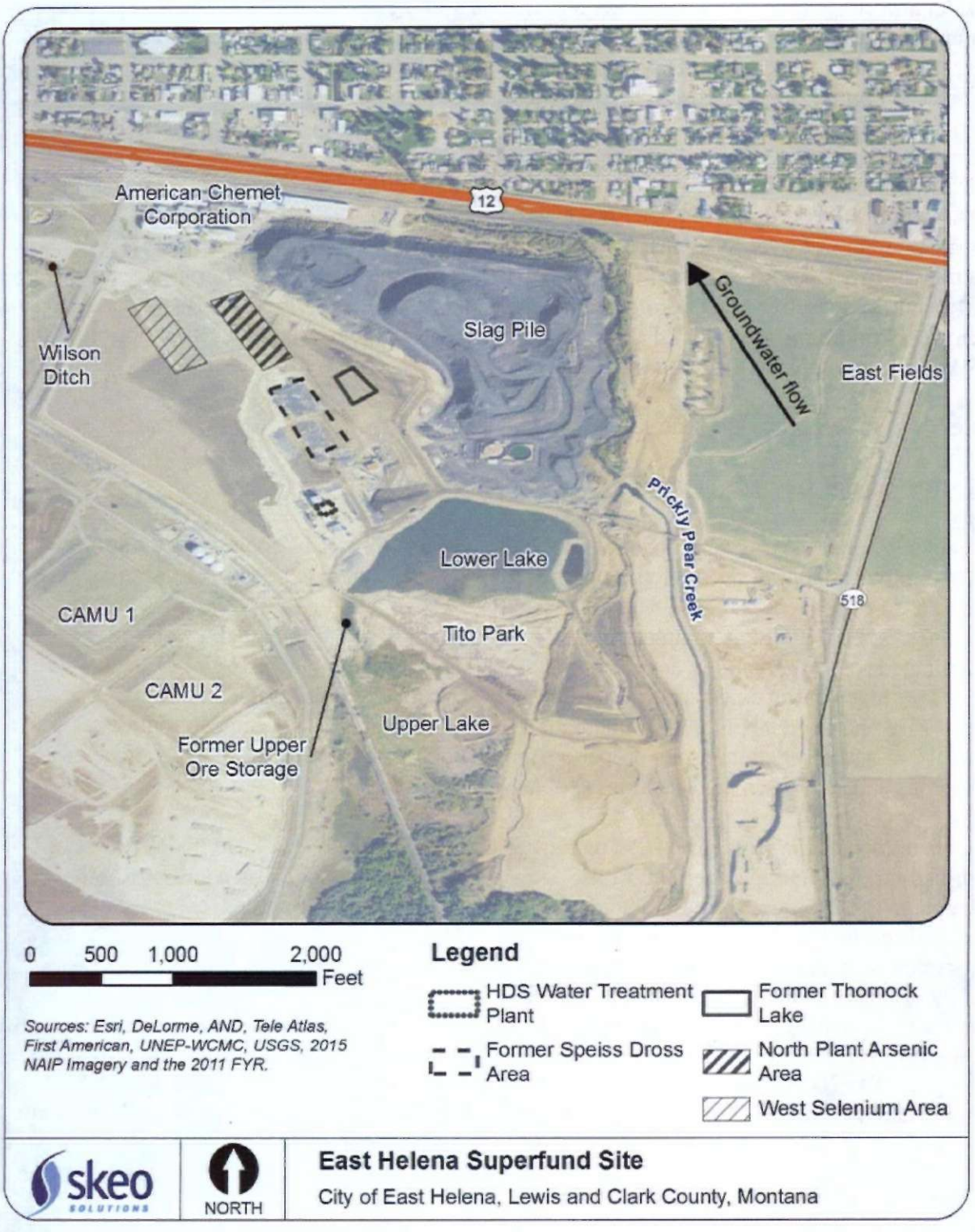
Figure 3 shows additional site features associated with the site cleanup as of February 2016.

OU2 – Residential Soils and Undeveloped Lands

Pursuant to the 1991 AOC, contractors working directly for ASARCO implemented non-time critical removal actions at residential properties between 1991 and October 2011; these actions addressed 1,576 properties (Table 8). In August 2013, EPA funded Pacific Western Technologies, Ltd (PWT) to complete the OU2 remedial design and remedial action for contaminated soils at remaining developed lands (qualified residential yards, flood channels, and road aprons that were in existence prior to 2009). PWT completed the remedial design between August 2013 and September 2015. Remediation began in October 2015 and was completed in May 2016 to address the remaining properties that included one residential yard, 23 unpaved road aprons and 7 flood channel sections (Table 8).

The remediation of the remaining OU2 properties that occurred between 2015 and 2016 was performed through funding from the EPA Special Account, established as a result of ASARCO's bankruptcy. The 225-acre East Field holds contaminated soil removed from OU2 properties where soils of differing lead concentrations are blended together to achieve a soil layer about 12 inches thick with an average lead concentration below 1,000 milligrams per kilogram (mg/kg). The 1993 modification to the 1991 AOC governs management of the East Fields. Currently, there is a fence and signage limiting access to the property. The 2009 ROD notes that remedial action-generated contaminated soil will be excavated and hauled to an "EPA-approved repository." The 2009 ROD details how the East Field has been used as a repository for contaminated soil from the beginning of non-time critical removal actions in 1991 to the present.

Figure 3: Detailed Site Map, February 2016



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Although the ROD does not identify the East Fields as an EPA-approved repository, it states that the land application demonstration project between 1991 and 1993 showed that the East Fields could be a temporary repository for excavated OU2 soils. In addition, a draft O&M Plan prepared by EPA's contractor in April 2015 outlines the dust and traffic control measures, security, revegetation and soil management of the East Fields. EPA is installing additional wells and collecting soil to determine if the East Field repository is the final repository for OU2 soils.

In addition to the construction remedies, which includes residential soil removal throughout the town, the LEAP was established 21 years ago. This public health program provides blood-lead screening free of charge to all East Helena residents. Children with elevated blood-lead levels are provided with in-home residential environmental assessments (e.g., yard soil, indoor dust, lead-based paint, etc.) to identify potential sources of the elevated blood lead levels, and education aimed at reducing lead exposure.

Since 2001 only two out of 910 children tested in East Helena have been identified with blood lead levels over 10 µg/dL (Table 7), the EPA and Center for Disease Control and Prevention (CDCP) blood-lead level of concern until 2012. In 2012, the CDCP began to use a reference level of 5 µg/dL (http://www.cdc.gov/nceh/lead/). This represents the 97th percentile blood lead level in U.S. children today. It does not represent an adverse effect level. From 2005 to 2012, 12 children out of 403 tested by the LEAP were found to have blood lead levels from 5-9 µg/dL. The children in East Helena with blood lead levels between 5-9 µg/dL were provided free residential environmental assessments. Lead-based paint and pica behavior (eating large amounts of non-food items) were identified as probable sources of the elevated blood-lead levels, not lead in soil, which Region 8 has found to commonly be the case at Superfund sites contaminated with lead in the soil. The LEAP worked with the families to mitigate and reduce those lead exposures.

The scientific evidence to date suggests that the LEAP in East Helena, working closely with the Department of Public Health and Human Services, Medicaid and Headstart, has been highly successful in identifying children with elevated blood lead levels, identifying the sources of those exposures and mitigating those exposures. The evidence also supports the current cleanup remedies in place as being protective of human health.

Table 7: 1995-2012 Blood-lead Data for Children 0-72 Months

Year	Total Screened	Mean µg/dL	Non-Detect	1-4 µg/dL	5-9 µg/dL	10-15 µg/dL	16-25 µg/dL
1995	82	5.6	0	37	38	7	0
1996	95	4.3	0	60	31	5	0
1997	89	5.6	0	48	28	11	2
1998	137	3.9	0	100	30	5	2
1999	66	6.6	1	25	37	5	0
2000	190	3.7	30	110	45	6	0
2001	135	2.4	34	88	13	0	0
2002	44	2	18	26	0	0	0
2003	205	1.7	86	116	6	0	0
2004	123	2.4	12	104	7	0	0
2005	10	0.75	7	3	0	0	0

Year	Total Screened	Mean µg/dL	Non-Detect	1-4 µg/dL	5-9 µg/dL	10-15 µg/dL	16-25 µg/dL
2006	115	1.3	55	58	2	0	0
2007	9	1.6	2	7	0	0	0
2008	175	1.8	27	136	7	2	0
2011	76	1.9	0	73	3	0	0
2012	18	1.5	9	9	0	0	0
µg/dL = micrograms per deciliter							

Removal action contractors for ASARCO developed the East Helena remediation database. It includes pre- and post-removal action information for OU2 from 1991 to 2011. Since 2011, EPA's remediation contractor maintains the database as OU2 remediation is completed. The East Helena database is housed in LEAP offices to manage soil remediation progress. The remedial contractor is working with EPA and Lewis and Clark County to incorporate geographic information system (GIS) overlays and standardize all OU2 data for regulatory access to the database, and has completed a map for public viewing. The website for the interactive GIS map is: https://helenamontanamaps.org/html5viewer/?viewer=EHIC.

Table 8: Summary of Removal and Remedial Actions Completed, by Land Use Category

Year	Total Properties Remediated by Year	Residential	Commercial	Church/School	Park/Public Area	Vacant Lots	Parking Lots	Road Aprons	Alley	Roadway	Flood Channels	Flood Ditches
Removal Actions												
1991	33	29	1	2		1						
1992	84	60	2	1	3	1	4	12	1			
1993	139	80	18			4		32	4			1
1994	215	103	2		4	13		55	30	7		1
1995	361	123	7	1		4		181	39	6		
1996	101	55	1			2		41	1		1	
1997	56	26	1		4			25				
1998	60	12				1					47	
1999	9	6				1				1	1	
2000	25	12				2					11	
2001	26	12						1			13	
2002	89	9									2	78
2003	14	7				2		5				
2004	12	6				5					1	
2005	33	31						2				
2006	26	26										
2007	46	44	1			1						
2008	66	56	3								7	
2009	94	39	10					19			26	
2010	65	37	4								24	
2011	22	13				1					8	
Total	**1,576**	**786**	**50**	**4**	**11**	**38**	**4**	**373**	**75**	**14**	**141**	**80**
Remedial Actions												

Year	Total Properties Remediated by Year	Residential	Commercial	Church/School	Park/Public Area	Vacant Lots	Parking Lots	Road Aprons	Alley	Roadway	Flood Channels	Flood Ditches
Removal Actions												
2015	5	1						4				
2016	26							19			7	
Total	**31**	**1**						**23**			**7**	
Grand Total	**1,607**	**787**	**50**	**4**	**11**	**38**	**4**	**396**	**75**	**14**	**148**	**80**

Notes:
Summary from the East Helena Residential Soils Removal Action Report 2011Year End Report. Prepared by Zanetti Brothers, Inc. February 2012 and direct correspondence with PWT for remediation completed in 2015 and 2016.
Bold = cumulative sum of all years

4.3 Operation and Maintenance (O&M)

OU1 source areas regulated under Superfund have been remediated; long-term monitoring is occurring under RCRA authority. Two CAMUs are in use for contaminant disposal, under RCRA jurisdiction. The 2009 OU2 ROD does not directly address O&M requirements. It states that all future management will occur through institutional controls, including long-term management of the East Field repository. As part of OU2 remedial design and remedial action, EPA prepared a draft O&M Plan for the East Fields Area in 2015. However, it will not be finalized until the results of the ongoing FS are completed to demonstrate that this area remains suitable as a repository for OU2 remediated soils. O&M costs were not available for this review.

5.0 Progress Since the Last Five-Year Review

The protectiveness statement from the 2011 FYR for the Site stated:

The 1989 OU1 ROD remedy elements still apply and were transferred to RCRA authority in the 1998 RCRA CD. The remedy at OU1 is not protective because implementation of the ROD is incomplete. Completion of the RCRA investigations and identification and implementation of appropriate corrective actions are needed to ensure protectiveness for this OU.

The remedy at OU2 is under construction and is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

The 2011 FYR included 14 issues and recommendations. This report summarizes each recommendation and its current status below (Table 9).

Table 9: Progress on Recommendations from the 2011 FYR

Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Treat Lower Lake in the HDS WTP until it reaches prescribed surface water standards.	METG	September 2013	Completed. Lower Lake was dewatered and dredged in 2014. Stormwater no longer discharges to this lake.	10/14/2014
Remediate the drying area between Upper and Lower Lakes.	METG	September 2013	Completed. Soils in Tito Park and the Acid Plan Drying Area were removed and placed in CAMU2.	10/13/2014
Install groundwater monitoring wells and establish performance standards for OU1 groundwater.	EPA	September 2012	Completed. Extensive monitoring well network was installed. Performance standards are included in the October 2015 final CMS Work Plan.	10/22/2015
No action under CERCLA necessary for OU1 because EPA and MDEQ's RCRA program will manage the remedial needs.	EPA	Ongoing	Documentation will be issued to close out the OU1 ROD once RCRA IMs and corrective actions are implemented.	NA
Complete soil removal activities at 73 properties (30 residential/commercial, 33 road aprons, 10 flood channels) that qualify for remedial action on which no action has been taken.	EPA	October 2012	Completed.	5/13/2016
Prepare comprehensive and updated Work Plan for Excavation and Removal of residential soils for OU2 consistent with modifications to the AOC.	EPA	June 2012	Completed. The Remedial Design Report was finalized. It includes a Remedial Action Construction Quality Assurance Plan.	09/04/2015
Prepare O&M Plan for the East Field repository.	EPA	March 2012	A draft was completed in April 2015. It cannot be finalized until a FS is completed that demonstrates whether the East Fields Area can be the final repository for OU2 soils.	NA
Continue to conduct child blood-lead level screening incentive event. Continue to offer screening as requested.	LEAP	December 2011 and ongoing	Completed. Blood-lead level screening is continuously available through LEAP. The next study is anticipated in 2017.	09/30/2012
Develop and implement a comprehensive institutional controls (IC) program.	IC stakeholders*	June 2012	Lewis & Clark City-County Health Department issued a soils ordinance for the East Helena Superfund Area in June 2013. The Montana Department of Natural Resources (DNR) established a groundwater control area for the East Valley in January 2016.	01/25/2016

Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Include Jefferson County government and appropriate property owners in sampling, remediation and IC programs.	EPA	November 2011	Incomplete. Jefferson County does not intend to participate in the IC program. EPA will conduct sampling and statistically reevaluate the Administrative Boundary as detailed in the OU2 ROD Figure 5-6 to determine appropriate ICs for Jefferson County.	NA
Formalize the long-term monitoring program for OU2 in a single document with the implementation, progress, historical results and future plans for the program.	EPA	June 2012	Completed. The Remedial Design Report was finalized; it includes a Remedial Action Construction Quality Assurance Plan, Remedial Action Confirmation Sampling Quality Assurance Project Plan, and Remedial Action Operations and Maintenance Plan.	09/04/2015
Develop best agricultural management practices and include their use in the comprehensive IC program.	IC stakeholders*	June 2012	The ICP will be updated to include specific instructions for implementing best management practices on agricultural land.	NA
Host public meetings and availability sessions, attend local government meetings, and publish fact sheets/newsletters to educate public on site activities and METG involvement.	EPA	October 2011 and ongoing	Annual meetings, biannual newsletters, monthly updates to city, county and state, and press releases in the Prickly Pear Creek Junction newspaper since 2012.	01/18/2012
Prepare a Data Management Plan for the remediation database and transition the management of the database to the LEAP.	LEAP	June 2012	Completed. The Remedial Design Report was finalized. It includes a Remedial Action Confirmation Sampling Quality Assurance Project Plan.	09/04/2015
Notes: * IC stakeholders include Lewis and Clark County, Jefferson County, the City of East Helena and LEAP.				

6.0 Five-Year Review Process

6.1 Administrative Components

EPA Region 8 initiated the FYR in September 2015 and scheduled its completion for September 2016. EPA remedial project manager (RPM) Betsy Burns led the EPA site review team, which also included EPA site attorney, Steven Moores, EPA community involvement coordinator (CIC) Robert Moler and contractor support provided to EPA by Skeo Solutions. In August 2015, EPA held a scoping call with the review team to discuss the Site and items of interest as they related to the protectiveness of the remedy currently in place. The review schedule established consisted of the following activities:

- Community notification.
- Document review.
- Data collection and review.
- Site inspection.
- Local interviews.
- FYR Report development and review.

6.2 Community Involvement

In March 2016, EPA published a public notice in the *Helena Independent Record* newspaper announcing the commencement of the FYR process for the Site, providing contact information for EPA RPM Betsy Burns and inviting community participation. The press notice is available in Appendix B. No one contacted EPA as a result of the advertisement.

EPA will make the final FYR Report available to the public. EPA will place copies of the document in the designated site repository, EPA's Superfund Records Center Montana Office, located at 10 West 15th Street, Suite 3200, Helena, MT 59626. Upon completion of the FYR, EPA will place a public notice in the *Helena Independent Record* newspaper to announce the availability of the final FYR Report in the Site's document repository.

6.3 Document Review

This FYR included a review of relevant, site-related documents including the RODs, ESD and recent monitoring data. Appendix A includes a complete list of the documents reviewed.

ARARs Review

Surface Water
According to the 1989 OU1 ROD, cleanup goals for the five COCs in Lower Lake process waters were based on a combination of ARARs and site-specific considerations. The chemical-specific ARARs considered as performance standards in the 1989 OU1 ROD included the water quality criterion based on human ingestion of water and aquatic organisms for arsenic; the remaining water quality criteria were based on the long-term protection of aquatic life (Table 9). Table 10 shows that the water quality criterion for cadmium has become more stringent; this does not impact remedy protectiveness because the final prescribed cadmium standard for Lower Lake process waters was selected as the MCL of 10 micrograms per liter (µg/L). The state water quality criterion was waived based on technical impracticability.

Table 10: Evaluation of 1989 OU1 ROD Surface Water ARARs (mg/L)

COC	1989 ROD State Water Quality Standard (mg/L)[a]	State Water Quality Standards[f]	ARAR Change
Arsenic	0.000002[b]	0.010	less stringent
Cadmium	0.0011[b]	0.00045	more stringent
Copper	0.012[c]	0.017	less stringent
Lead	0.0032[d]	0.008	less stringent
Zinc	0.110[e]	0.215	less stringent

Notes:

a. 1989 ROD, Section 10.2.1. For arsenic, these are based on state-identified water quality standards for water and fish ingestion (acute). For all other elements, these are based on state-identified water quality standards for long-term protection of aquatic life (chronic).
b. Waived in 1989 OU1 ROD due to technical impracticability; value of 0.02 mg/L (upper range for PPC) for arsenic, 0.01 mg/L, the MCL for cadmium, was selected as final performance standard.
c. Most stringent state aquatic life standard; prescribed standard of 0.004 to 0.008 mg/L was selected since it represents the range in PPC.
d. Most stringent state aquatic life standard; waived in 1989 OU1 ROD due to technical impracticability; value of 0.05 (MCL) was selected as final performance standard.
e. Most stringent state aquatic life standard and is the selected performance standard.
f. Montana Numeric Water Quality Standards adjusted for a hardness of 200 mg/L observed in Lower Lake during the 2005 Ecological Risk Assessment. https://deq.mt.gov/Portals/112/Water/WQPB/Standards/PDF/DEQ7/FinalApprovedDEQ7.pdf (accessed 11/23/15).

mg/L = micrograms per liter

MDEQ issued METG a renewal of MPDES permit MT0030147 authorizing the discharge of wastewater from the HDS WTP to Outfall 001 in PPC. The permit listed interim effluent limits that expired July 31, 2015. However, an AOC issued in September 2015 retained the interim effluent limits for antimony, cadmium, mercury, thallium and selenium as final effluent limits effective until January 2018 (Table 11). The permit authorizes METG to discharge treated effluent from the HDS WTP to meet permit limits at outfall 1 at PPC.

Table 11: OU1 Surface Water Effluent Limits

Process Water COC	Enforcement Effluent Limits[a] (pounds per day)		Current Limits[b] (mg/L)		ARAR Change
	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	
Antimony	1.2	1.8	1.2	1.8	None
Cadmium	0.14	0.21	0.14	0.21	None
Mercury	0.0008	0.0012	0.0008	0.0012	None
Selenium	1.5	2.3	1.5	2.3	None
Thallium	0.07	0.11	0.07	0.11	None

Notes:

a. Obtained from September 2015 AOC.
b. Current limits obtained from http://deq.mt.gov/Portals/112/Water/WPB/MPDES/Minors/MT0030147PER.pdf (accessed 03/21/16).

mg/L = micrograms per liter

Groundwater

EPA finalized groundwater cleanup goals in the October 2015 CMS Work Plan. The selected standards are the federal MCLs, which were adopted by the Montana Numeric Water Quality Standards, issued in October 2012 (Table 12). None of the values have changed since 2012.

Table 12: RCRA Groundwater Protection Standards

Process Water COC	RCRA Groundwater Protection Standard[a] (mg/L)	Federal[b] and State[c] ARAR (mg/L)	ARAR Change
Arsenic	0.010	0.010	None
Cadmium	0.005	0.005	None
Selenium	0.05	0.05	None

Notes:
a. Obtained from Section 2.3.3 of the October 2015 Final CMS Work Plan.
b. Federal MCLs obtained from http://www.epa.gov/your-drinking-water/table-regulated-drinking-water-contaminants (accessed 03/09/16).
c. DEQ-7 Montana Numeric Water Quality Standards for groundwater obtained from https://deq.mt.gov/Portals/112/Water/WQPB/Standards/PDF/DEQ7/FinalApprovedDEQ7.pdf (accessed 03/09/16).
mg/L = micrograms per liter

Soil
Chemical-specific ARARs were not established for soil COCs. The cleanup goals are reviewed further in Section 7.2.

Institutional Control (IC) Review

The 2009 OU2 ROD describes the intent of the IC program. The ROD also provides requirements for specific ICs that are applicable to the Site. Requirements include local regulations to prevent or reduce recontamination of cleaned up areas, coordination of planning and zoning efforts, local use and permitting requirements, management of the soils repository, deed notices, easements, public education, best agricultural management practices (e.g., minimal tilling and burning), and continuation of LEAP.

EPA consulted with LEAP coordinators and the East Helena Institutional Controls Work Group (IC Work Group) regarding the current status and future objectives for the East Helena Site ICs Program. The IC Work Group includes federal, state and local governments, local developers, and the Division Administrator for the Lewis and Clark City/County Health Department. EPA routinely attends IC Work Group meetings; information from those meetings was considered during review of the ICs for this FYR Report.

LEAP is the cornerstone for the current IC program and for the future IC and O&M programs. Since 1995, LEAP has provided environmental assessments for residential properties, education to realtors and prospective purchasers, outreach to new residents through pre-natal and new mother packets at St. Peter's Hospital, blood-lead testing, and soil and water testing. It also acts as a liaison between property owners, the remedial contractor, EPA and the State in addressing comments or concerns. Since OU2 remediation recently was completed, LEAP is changing focus from remediation oversight to implementation and enforcement of ICs and O&M.

The East Helena IC Work Group recognized the need to establish additional ICs, including those with enforcement authority, to create a comprehensive IC program. A memorandum of understanding was anticipated in late 2011 between Jefferson County and Lewis and Clark County to work cooperatively on the IC program. However, since the previous FYR, Jefferson County decided not to develop an IC program. In June of 2013, Lewis & Clark County adopted *Regulations Governing Soil Displacement and Disposal in the East Helena Superfund Area in Lewis and Clark County, Montana*, as an IC. In December 2013, the IC Work Group prepared an Institutional Controls Program Implementation Plan for the East Helena Superfund Site (OU2) (ICP). It includes the cities of East Helena and Helena, Lewis and Clark County, and Jefferson County. EPA provided the City of East Helena and Lewis and Clark County with funding for IC program development. The 2013 ICP describes the scope of the East Helena Superfund Site OU2 ICP and outlines the strategy for implementation. As recommended by EPA, the ICP documents the activities necessary to implement the program and specifies the organizations responsible for these activities. The ICP is intended to be a "living" document that may require modification in the future. The ICP is maintained by the Lewis and Clark City-County Health Department. Any modifications to the ICP will require revisions to the document and review by the same government agencies. The ICP specifies:

- Development of a GIS layer identifying the "area of interest" for soils management, to include the City of East Helena and surrounding portions of Lewis and Clark County and Jefferson County.
- Web-based public access to property contamination and status information.
- Modification of city building permits, zoning policies and East Helena's growth policy.
- UDig (a One Call underground utilities location tool).
- Deed notices.
- Best management options for cleanup during property development.
- Repository management.
- Memoranda of Understanding between Lewis and Clark County, the City of East Helena, and Jefferson County for administrative and enforcement authorities.
- Subdivision regulations for the City of East Helena.
- City excavation permits.

The 2013 ICP also includes a copy of the June 2013 Regulations Governing Soil Displacement and Disposal in the East Helena Superfund Area (Soil Regulations). They apply to an administrative area that includes a portion of Jefferson County. However, Jefferson County has not adopted the Soil Regulations. EPA may conduct additional soil sampling in Jefferson County to see if the county can be excluded from the administrative area. A map showing the boundaries of the administrative area is presented in Figure F-1.

Lewis and Clark County will update the ICP in 2016 to include more detail on best management practices for agricultural land. Updates will also include the groundwater control area, which was approved by the Montana Department of Natural Resources and Conservation (MDNRC) in January 2016. The groundwater control area places restrictions on well installations and groundwater use for potable purposes (Figure F-2). A summary of the institutional controls implemented or planned for the Site is presented in Table 13.

Table 13: Institutional Controls Summary Table

Media	ICs Needed	ICs Called for in the Decision Documents or RCRA Documents	Impacted Parcel(s)	IC Objective	Instrument in Place
Sitewide Groundwater	Yes	Yes[a]	on site and off site[b]	Restrictions on installation of new wells and changes in uses of existing wells.	MDNRC adopted the EVGCA on January 25, 2016[c] under Montana Code Annotated (MCA) § 85-2-506. It established controls for groundwater in Zones 1 and 2 of the alluvial aquifer, including monitoring requirements, restrictions on new groundwater uses and changes to existing uses to protect human health and safety.
					East Helena Montana City Code (Title 8, Chapter 8, Section 8.3.7) prohibits the installation of new private water wells in city limits.
OU1 Sediment and Soil	No	No[d]	NA	None	NA
OU1 Surface Water	No	No	NA	No ICs necessary. Contaminated process ponds replaced with tanks.	NA
Former Smelter Soils	Yes	Yes[a]	multiple parcels[e]	If numeric standards cannot be achieved, engineering and or institutional controls will be implemented to interrupt pathways for exposure and to maintain protective conditions.	Lewis & Clark City-County Health Department Regulations Governing Soil Displacement in the East Helena Superfund Area issued in 2013[f].
OU2 Soil	Yes	Yes	multiple parcels[e]	Prevent direct contact/ingestion with contaminated soil and recontamination of remediated areas. Minimize wind-borne migration of lead into residential areas.	Lewis & Clark City-County Health Department Regulations Governing Soil Displacement in the East Helena Superfund Area issued in 2013[f].
Notes:					

Media	ICs Needed	ICs Called for in the Decision Documents or RCRA Documents	Impacted Parcel(s)	IC Objective	Instrument in Place

a. Groundwater contamination is being addressed under the 1998 RCRA Consent Decree. Therefore, ICs are not a component of CERCLA decision documents but are part of RCRA implementation work plans and the Final RCRA CMS Work Plan.
b. Area requiring controls is about 3 square miles in and around East Helena, Montana.
c. The EVGCA adopted the groundwater restrictions in groundwater in Zone 1 and Zone 2 impacted with arsenic and selenium contamination, primarily from the former smelter, in the groundwater of the Helena Valley alluvial aquifer. Concentrations in Zone 1 exceed human health standards. Contaminant concentrations on Zone 2 do not currently exceed human health standards but exceedances may occur due to future groundwater withdrawals or changes in the hydrogeologic system. http://dnrc.mt.gov/public-interest/public-notices/notices/36-22-180adp-arm.pdf.
d. OU1 Process Pond soil and sediment were recycled in the smelting process so no ICs were warranted for these media.
e. The removal contractor is in the process of working with EPA and Lewis and Clark County to incorporate GIS overlays and a process for allowing regulatory access to the database consistent with the 2013 ICP.
f. The Soils Displacement Plan was intended to include Jefferson County, but Jefferson County decided not to participate in developing an IC program with Lewis and Clark County.

NA = not applicable; ICs not warranted

6.4 Data Review

Data evaluated to determine the effectiveness of the OU1 remedy include groundwater level measurements and groundwater contaminant monitoring that continues under the 1998 RCRA Consent Decree. Thus, the evaluation included long-term groundwater monitoring conducted according to the RCRA IM WPs. Most contaminated soils in OU2 have been addressed under the removal action completed in 2011. Remedial action for the remaining OU2 parcels, which includes one residential property, 23 road aprons and 7 flood channels, started in October 2015; construction were completed in May 2016. Therefore, OU2 soil data are not available for this FYR.

Long-term monitoring of the OU1 remedy is conducted under RCRA authority and includes monitoring to ensure the HDS WTP is treating Lower Lake water to MPDES effluent requirements. Process water was removed from the former Thornock tank, the speiss granulating pond and pit, and the acid plant water treatment facility. Therefore, remedy performance is focused on ensuring that residual waste does not remain in contact with groundwater and is currently being monitored through an extensive RCRA groundwater monitoring program.

Water Levels

Groundwater levels are an important component of IM implementation at the former smelter area; they are critical for designing and implementing the construction and proper long-term functioning of the PPC realignment. Groundwater levels also determine, in part, the interaction of groundwater with contaminated soil, and subsequent contaminant leaching to groundwater. The METG has monitored groundwater and surface water levels on and around the former smelter since 2011 to evaluate water level changes associated with the IMs. Water levels are recorded monthly throughout the project area and biweekly for some locations in the former

smelter and adjacent former Upper Lake area, where IM construction activities are ongoing. According to the latest IM work plan, groundwater levels in the former Upper Lake Area have continued to decline throughout 2015 in response to the IM activities; groundwater levels have declined almost 10 feet in the eastern portion and over 2.5 feet in the western area.

In the former smelter area, the METG reports that water levels have declined most in the North Plant Arsenic Area; most of this decline occurred between November 2014 and March 2015, largely due to the 2014 Tito Park Area Source Removal/Lower Lake Dewatering IM. In the South Plant area, the METG reports an overall groundwater water level decline of up to about 9 feet. Groundwater levels in the former Acid Plant Area, where the 2016 contaminant source removal action is planned, declined by more than 5 feet between October 2011 and December 2015. The reduction in groundwater levels has desaturated some of the most highly contaminated soils in the former Acid Plant Area. However, 2015 sampling results show elevated concentrations of arsenic and other contaminants (i.e., cadmium and selenium) near the former Acid Plant settling pond up to 30 feet in depth. As a result of ongoing contaminant loading to groundwater, soils within the former Acid Plant settling pond area will be removed in 2016 under the RCRA program.

Contaminant Monitoring

METG groundwater quality evaluations have focused primarily on arsenic and selenium because monitoring indicates that other site-related contaminants of concern (COCs) are co-located with these chemicals. Selenium was not identified as a CERCLA COC. However, it became a COC during RCRA corrective action activities. Data presented in the IM WPs have consistently shown two relatively distinct, narrow groundwater contaminant plumes. One plume has elevated arsenic concentrations and the other has elevated selenium concentrations; both plumes originate at the former smelter and extend north-northwest along the general direction of groundwater flow (Figures G-1 and G-2, respectively). There is another lower concentration arsenic plume north of the slag pile.

The March 2016 addendum to the IM WP presents the arsenic and selenium groundwater plumes based on October 2015 data. Compared to plume outlines from 1990, 2000, 2010 and 2015, the arsenic plume has contracted in some areas; the plume now consists of more isolated areas in the former smelter site and an area extending into East Helena (Figure G-1). Decreasing arsenic concentrations have been observed at some wells in the former acid plant area, immediately downgradient of the Tito Park Area removal area and where hydraulic control has been most beneficial. The arsenic plumes have not migrated further north and have remained relatively stable. Arsenic concentrations have declined in most areas, except downgradient of the former acid plant settling pond, where arsenic concentrations have been stable but above the MCL for more than 10 years. As a result, additional IM activities are planned for this area in 2016, as outlined in the January 2016 Addendum to Former ASARCO East Helena Facility Interim Measures Work Plan – 2015 and 2016.

The configuration of the selenium groundwater plume from 1990, 2000, 2010 and 2015 is presented in Figure G-2. The 2015 data show that, similar to arsenic, selenium concentrations are decreasing at many wells in the former smelter area, including the former acid plant area and the west selenium area. The METG reports that selenium concentrations in the slag pile area are

relatively stable. The METG reports that decreases in arsenic and selenium concentrations are attributable in part to lowering of groundwater levels from IM implementation, and resulting isolation of waste mass in formerly-saturated aquifer materials. The 2015 selenium plume map indicates the plume is smaller to the west and at the slag pile. However, the plume has migrated further north since the previous FYR. As the groundwater flow and geochemical systems change in response to the IMs, long-term monitoring is needed to fully evaluate the effectiveness of the RCRA cleanup activities.

6.5 Site Inspection

The site inspection took place on November 5, 2015. Participants included Betsy Burns and Allie Archer, EPA; Johnny Zimmerman-Ward and Claire Marcussen, Skeo; Greg Hayes, Project Manager for OU2, PWT; and Mark Rhodes, Project Manager and Construction Manager for METG, Hydrometrics, Inc. EPA and Skeo staff and Greg Hayes met at East Helena City Hall to discuss previous FYR issues and recommendations with Lewis and Clark Public Health personnel, including Deb Tillo, Jan Williams and Kathy Moore. EPA and Skeo staff and Greg Hayes conducted an inspection of residential yards and road aprons in OU2. EPA and Skeo staff met with Mark Rhodes to inspect OU1 remedial components. Site participants observed the hydroseeded west ET cover, CAMU1, Lower Lake, the central area with the former speiss area slurry wall and the east ICS cover and the slag pile. All covers appeared to be intact. Participants viewed the East Fields repository, the PPC floodplain and dam, the stormwater treatment plant, CAMU2 and the two 1-million gallon stormwater tanks on the slag pile. The PPC is undercutting the northeastern edge of the slag pile; METG is actively addressing this as part of the RCRA IMs by realigning the PPC to bring it further from the slag pile. Skeo staff observed locked and secured monitoring wells. The active remediation area is protected by a secured fence; a key card is required for entry.

A copy of the completed Site Inspection Checklist is included in Appendix D. Site photographs are provided in Appendix E.

6.6 Interviews

The FYR process included interviews with parties affected by the Site, including the Mayor of East Helena, the East Helena Schools Superintendent, regulatory agencies involved in site activities and O&M contractors. The purpose was to document the perceived status of the Site and any perceived problems or successes with the phases of the remedy implemented to date. Several interviews took place during the site inspection on November 5, 2015. Others took place via email. The interviews are summarized below. Appendix C provides the complete interviews.

Greg Hayes: Mr. Hayes is the PWT project manager. He observed that the project has been very successful in terms of the number of residential yards, unpaved road aprons, flood channels, unpaved alleys, unpaved roads and undeveloped lands that have been remediated. In 30 years, an enormous amount of work has been completed, both in OU2 and at the former ASARCO smelter site. He finds that almost everyone knows quite a bit about the Site's Superfund status. There seems to be a general sentiment in the community that the best path forward is to cooperate with the cleanup, maintenance and reuse activities as they relate to the Superfund site. PWT proposed

to EPA that it collect and analyze soil samples from additional depths to inform the remedial design to qualify a property for remediation. This would allow PWT to know, prior to the excavation of the top 6 inches, if they need to excavate to a greater depth. This will improve efficiency of the remedial action, eliminating the need for some post-excavation sampling to determine the final excavated depth.

Jan Williams: Ms. Williams represents the LEAP. LEAP is informed of RCRA activities and receives monthly updates about activities at the former plant site. Ms. Williams has found that in the last four or five years, EPA has provided more information with regard to RCRA activities and has offered to take any and all interested parties on tours of the plant site and show the progress of the project. She feels that communication between EPA and Lewis and Clark County programs has improved and if there are questions or concerns on either side they can be asked or stated without reservation.

Ron Whitmoyer: Mr. Whitmoyer is the East Helena Schools Superintendent. He feels very well informed about the Site and he attends many of the stakeholder meetings. School board members also recently toured the Site, which helps to keep them informed. Mr. Whitmoyer has found everyone involved with the Site to be very honest and open about the issues that are being dealt with. EPA has been very involved with the community by providing weekly, if not more often, contact and has worked hard at building relationships. He has found responses to community members' concerns to be addressed quickly and communications are very transparent.

Jamie Schell: Mr. Schell is the Mayor of East Helena. He is aware of the Site and feels well informed about recent activities at the since within the last 10 years, when he started attending meetings. Mr. Schell would like to consider additional ways to share information with the community, possibly through social media, but for now, publishing notices and posting them on the public bulletin board at City Hall is sufficient. The City is well informed and receives EPA updates frequently. Mr. Schell has found that EPA, METG and the subcontractors are always willing to talk to citizens and are very open about the work there and often give tours. Mr. Schell would like to see EPA and METG continue to have public meetings to provide opportunities for the public to ask questions, listen and provide comments.

7.0 Technical Assessment

7.1 Question A: Is the remedy functioning as intended by the decision documents?

Yes. The remedy for OU1 is functioning as intended. ASARCO completed most remedial components of the OU1 remedy before the 1998 RCRA Consent Decree. However, additional corrective actions and long-term monitoring occurs under RCRA authority by METG as dictated in the 1998 RCRA Consent Decree. To fulfill the requirements of the RCRA Consent Decree, METG is performing additional investigations, IMs and long-term corrective actions at remaining source areas on the former smelter property. In addition, METG is addressing groundwater emanating from the property to complete RCRA investigation, reporting and remediation requirements. However, the OU1 remedy cannot achieve construction completion until all RCRA interim measures and corrective actions have been completed.

The remedy for OU2 is functioning as intended. Removal actions address contaminated soils posing imminent health threats in developed lands, and cleanup of remaining undeveloped lands will be evaluated whenever a change in land use is proposed and, if necessary, cleaned up to appropriate levels for the proposed use. As stated in the OU2 ROD, under current undeveloped land uses, livestock, wildlife, and vegetation on undeveloped lands are found by EPA to be minimally affected by the levels of contamination present in the soils. As part of the remedial design and remedial action, data gaps are being evaluated to ensure complete implementation of the OU2 remedy.

Institutional controls have been implemented to prevent exposure to soil and groundwater. In 2013, Lewis and Clark County promulgated county regulations that include layered ICs to govern soil displacement and disposal in the East Helena Superfund Area (Soil Regulations). Although Jefferson County is included in the East Helena Superfund Area, they elected not to adopt the regulations. The Soil Regulations, for OU2, enhance procedures to ensure continued protection of human health; however, additional specifics are needed for the best management practices for agricultural lands. Exposure to groundwater is controlled through adoption of the East Valley Controlled Groundwater Area in January 2016; the need for ICs is documented in the Final CMS Work plan.

7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of remedy selection still valid?

Yes. The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. The OU1 cleanup goals for the process ponds remain valid because they were based on background concentrations or MCLs which have not changed. The cleanup goals for lead and arsenic in OU2 soils are human health-based values. The toxicity values for arsenic have not changed since the 2009 OU2 ROD and there are not any changes to the risk characterization methodology since 2009 that would materially affect the cleanup goals for arsenic. The cleanup levels for lead were based on site-specific data for concentrations in blood, soil and air (line dust particulates). The site-specific data are a primary basis for the soil-lead cleanup levels identified in the OU2 2009 ROD, and were selected in lieu of results from EPA's lead model as a basis for selection of cleanup levels. EPA has blood-lead results from 1995 to 2012. Since 2001, the blood lead results of 95 percent of children tested were at levels of 4 µg/dl or below, which is a level below the OU2 ROD value of 10 µg/dl, demonstrating that the non-time critical removal actions have reduced the soil-lead concentration at the Site. In 2012, the CDCP began to use a reference level of 5 µg/dL (http://www.cdc.gov/nceh/lead/). This represents the 97th percentile blood lead level in U.S. children today. It does not represent an adverse effect level. EPA plans to adopt this reference level. From 2005 to 2012, 12 children out of 403 tested by the LEAP were found to have blood lead levels from 5-9 µg/dL. The children in East Helena with blood lead levels between 5-9 µg/dL were provided free residential environmental assessments. Lead-based paint and pica behavior (eating large amounts of non-food items) were identified as probable sources of the elevated blood lead levels, not lead in soil. The LEAP worked with the families to mitigate and reduce those lead exposures. No additional blood lead data are available beyond 2012, but LEAP plans to host a blood-lead screening event in 2017 to verify that the decrease trend continues since the OU2 remedy was recently completed in May 2016.

Risks to ecological receptors were first evaluated in a Comprehensive Endangerment Assessment in 1989. The aquatic habitats of Upper Lake and marshy areas, Lower Lake, and PPC, including riparian areas, are now the responsibility of RCRA and are being addressed under the 1998 RCRA Consent Decree. Whether ecological toxicity values have changed does not impact the protectiveness of OU2 cleanup levels. Livestock and wildlife receptors in upland areas remain a concern in OU2. The Anaconda Smelter Biomonitoring Study took place from the spring of 1999 through the fall of 2000 for the Anaconda Smelter Superfund site near Anaconda, Montana. The study showed a risk to insectivorous passerine species (e.g., perching and song birds) at lead concentrations of about 650 mg/kg. The current soil remediation approach is expected to result in a community-wide average of less than 500 mg/kg. It would, therefore, lower the risk to these species. There do not appear to be any changes to the ecological risk assessment for lead that would result in reevaluation of the lead cleanup level for the protection of livestock and wildlife receptors in OU2. EPA conducted a review of the ARARs in Section 6.3. No changes were identified in the contaminant-specific ARARs.

7.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No. Additional information has not come to light that could call into question the protectiveness of the remedy for OU1 or OU2. RCRA regulations will continue to manage the remaining site sources as appropriate, as outlined in the RCRA IM WPs.

7.4 Technical Assessment Summary

The remedy for OU1 is functioning as intended. The OU1 source areas regulated under Superfund have been remediated and long-term monitoring is occurring under RCRA authority. METG is currently addressing remaining source areas and site-wide groundwater cleanup under RCRA corrective action cleanup, as dictated in the 1998 RCRA Consent Decree. Contamination remains at the smelter property. A 2013 local soils ordinance controls exposures to residual soil contamination within the site boundary. Exposure to contaminated groundwater in OU1 is controlled through the 2016 groundwater control area. Remedy completion will be achieved once RCRA corrective actions are completed.

The remedy for OU2 is functioning as intended; cleanup levels are being met through removal of contaminated soil and the recent remediation of remaining OU2 properties in May 2016. Measures have been taken to make the database documenting remedial activities accessible to regulatory agencies. In addition, institutional controls have been implemented to prevent exposure to soil.

The exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection were reviewed and determined to remain valid.

8.0 Issues

Table 14 summarizes current site issues.

Table 14: Current Site Issues

Issue	Affects Current Protectiveness?	Affects Future Protectiveness?
Jefferson County has decided not to participate in developing an institutional control program for OU2.	No	Yes
The 2013 ICP for OU2 does not provide sufficient detail on best management practices for agricultural land.	No	Yes

9.0 Recommendations and Follow-up Actions

Table 15 provides recommendations to address the current site issues.

Table 15: Recommendations to Address Current Site Issues

Issue	Recommendation / Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness?	
					Current	Future
Jefferson County has decided not to participate in developing an institutional control program for OU2.	EPA will conduct sampling and statistically reevaluate the Administrative Boundary as detailed in the OU2 ROD Figure 5-6 to determine appropriate institutional controls for Jefferson County.	EPA and Lewis and Clark County	EPA	09/27/2017	No	Yes
The 2013 ICP for OU2 does not provide sufficient detail on best management practices for agricultural land.	Update the ICP to include specific instructions for implementing best management practices on agricultural land. Update the ICP to an Institutional Control Implementation and Assurance Plan (ICIAP), following EPA guidance.	Lewis and Clark County	EPA	09/27/2017	No	Yes

The following items, though not expected to affect protectiveness, warrant additional follow up:

- Finalize the O&M Plan for the OU2 East Fields Repository.

10.0 Protectiveness Statements

The remedy at OU1 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risk at OU1.

The remedy at OU2 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risk at OU2.

11.0 Next Review

The next FYR will be due within five years of the signature/approval date of this FYR.

Appendix A: List of Documents Reviewed

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Information System Site Information accessed online: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0800377.

Combination Initial and Final Pollution Report. East Helena Superfund Site, Residential Soils and Undeveloped Lands (OU02) Completion of Non-Time-Critical Removal Action. Completed by EPA. February 22, 2016.

Corrective Measures Study Work Plan 2013. Former ASARCO East Helena Facility. Prepared for The Montana Environmental Trust Group, LLC, and the Montana Environmental Custodial Trust. January 2014.

Corrective Measures Study Work Plan. Final. Former ASARCO East Helena Facility. Prepared by CH2MHill. October 2015.

Corrective Measures Study Activities Update at the Former ASARCO East Helena Facility. Prepared by CH2MHill. March 2016.

Explanation of Significant Differences, East Helena NPL Site, East Helena, Montana, Process Ponds Operable Unit (OU-1). U.S. Environmental Protection Agency, June 1993.

East Helena RCRA Consent Decree. U.S. Environmental Protection Agency and ASARCO, entered by the U.S. District Court of Montana. May 1998.

Interim Measures Work Plan Addendum– 2015 and 2016. Former ASARCO East Helena Facility. Prepared by CH2MHill. Final. January 2016.

Interim Measures Work Plan – 2015 and 2016. Former ASARCO East Helena Facility. Prepared by CH2MHill. Final. May 2015.

Interim Measures Work Plan – 2014. Former ASARCO East Helena Facility. Final. Prepared for The Montana Environmental Trust Group, LLC, and the Montana Environmental Custodial Trust. May 2014.

Interim Measures Work Plan – Conceptual Overview of Proposed Interim Measures and Details of 2012 Activities. Former ASARCO East Helena Facility. Final Draft. Prepared by CH2MHill. June 2012.

Record of Decision East Helena Smelter Site Process Ponds Operable Unit. U.S. Environmental Protection Agency, November 1989.

Record of Decision, East Helena Superfund Site, Operable Unit No. 2, Residential Soils and Undeveloped Lands. U.S. Environmental Protection Agency, September 2009.

Remedial Design for Residential Yards, Unpaved Road Aprons and Alleys, and Flood Channels. East Helena Superfund Site, Residential Soils and Undeveloped Lands (OU2) Lewis & Clark County and Jefferson County, Montana. Prepared by PWT. September 4, 2015.

Residential Soils Removal Action Report - East Helena, 2011 Year-End Report. Prepared by Zanetti Brothers, Inc. February 2012.

Second Five-Year Review Report for the East Helena Superfund Site. Prepared by HDR. March 31, 2006.

Third Five-Year Review Report for the East Helena Superfund Site. Prepared by EPA Region 8. September 27, 2011.

Appendix B: Press Notice

Public Input Opportunity
EPA Five-Year Review Planned for the East Helena Superfund Site

The U.S. Environmental Protection Agency (EPA) is conducting the fourth Five-Year Review of remedial actions performed under the Superfund program at the East Helena Superfund site in East Helena, Montana. The purpose of the Five-Year Review is to make sure the selected cleanup actions remain protective of human health and the environment. The Five-Year Review is scheduled for completion by September 2016.

Smelting operations at the site began in 1888. Concerns of contamination led the State of Montana to initiate environmental and human health investigations in the early 1970s. They revealed high levels of lead, arsenic, cadmium, copper and zinc in the air, soil, surface water and dust in and around East Helena. The sources of this contamination included the smelter stack, fugitive emissions from plant operations, process ponds and direct surface water discharges. Historically, the mode of transport for the contaminants was air and surface water. The smelter closed in 2001.

In consultation with the Montana Department of Environmental Quality and site stakeholders, EPA is conducting site cleanup. Remedial actions thus far have included capping and removal of smelting waste, residential yard cleanups, and groundwater controls. Many of the large source areas that have posed the greatest threats to human health and environment have been mitigated.

More information is available at the site's information repository and on EPA's website:

EPA Superfund Records Center
Montana Office
10 West 15th Street, Suite 3200
Helena, MT 59626
(406) 457-5046
(866) 457-2690 (toll free)
https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0800377

EPA invites community participation in the Five-Year Review process: Community members are encouraged to contact EPA staff with any information that may help the Agency make its determination regarding the protectiveness and effectiveness of the remedies at the site.

EPA Region 8

Betsy Burns
Remedial Project Manager
Phone: (406) 457-5013
Email: burns.betsy@epa.gov

Robert Moler
Community Involvement Coordinator
Phone: (406) 457-5032
Email: moler.robert@epa.gov

Appendix C: Interview Forms

East Helena Superfund Site	Five-Year Review Interview Form
Site Name: East Helena	**EPA ID No.:** MTD006230346
Interviewer Name: Johnny Zimmerman-Ward	**Affiliation:** Skeo Solutions
Subject Name: Ron Whitmoyer	**Affiliation:** East Helena Public Schools
Subject Contact Information: 406-227-7700	
Time: 4:00 P.M.	**Date:** 11/04/2015
Interview Location: Superintendent office	
Interview Format: In Person	

Interview Category: School Superintendent

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date? *Yes, I am very well informed and have attended most of the stakeholder meetings about the Site. I participate because as a community member. I am curious about contaminant issues and how they could potentially affect my health, my students' health and my employees' health.*
2. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future? *Absolutely. School board members recently toured the site. We are all well informed. Everyone is very open and honest about the issues and how they are being dealt with.*
3. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing? *No.*
4. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide site-related information in the future? *EPA has been very involved with the community. There is weekly, it not more often, contact with EPA and the Mayor. EPA is in contact with me frequently and the notice of upcoming meetings are wildly available. I have been to many meetings where there is standing room only. Responses to community concerns are quick. For example, community members expressed concerns about ice jams causing flooding and private property damage with the upcoming Prickly Pear Creek realignment. EPA and METG had a response at the next public meeting. EPA provides opportunities for citizens to express any concerns.*
5. Do you have any comments, suggestions or recommendations regarding the project?

   No. I think everyone should continue to do what they have been doing as it has been an excellent job. The relationships that EPA has built with the community are crucial to the good work that is getting done. EPA has worked hard at building good relationships in my world. In my world as an educator, kids do not care how much you know until they know how much you care. This applies to EPA's relationship with the community. Betsy Burns has earned out trust and respect. I am very confident and proud of the work that has been done and the relationships that have been built with contractors, METG and EPA. Communications are very transparent.

East Helena Superfund Site **Five-Year Review Interview Form**

Site Name: East Helena **EPA ID No.:** MTD006230346
Interviewer Name: Johnny Zimmerman-Ward **Affiliation:** Skeo Solutions
Subject Name: Jamie Schell **Affiliation:** East Helena Mayor
Subject Contact Information: 406-465-2921
Time: 8:00 A.M. **Date:** 11/05/2015
Interview Location: City Hall
Interview Format: In Person

Interview Category: Local Government

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date? *Yes.*
2. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future? *I have thought a lot about this. I'm well informed about recent activity at the Site since about 10 years ago. I started going to EHECTIC meetings then. I have tried to think of a way to share information more that would be logical and acceptable to the population here. For now, publishing notices in the paper and adding them to the public bulletin board in the city hall is working. I would think including this information on Facebook would invite comments, which would then need to be monitored and I do not think that is a good use of public money. Maybe in due time, social media might have its advantages for sharing information.*
3. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing? *Nothing beyond the usual. There was an incident about a year ago where a pipe bomb was found outside the property fence.*
4. Are you aware of any changes to state laws or local regulations that might affect the protectiveness of the Site's remedy? *No.*
5. Are you aware of any unplanned changes in projected land use(s) at the Site? *No, not any unplanned changes. They are moving the creek over and hopefully lands will be sold.*
6. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide site-related information in the future? *Yes, the newspapers notices about upcoming meetings are good. The City of East Helena and city council are updated about the Site in monthly reports. Information is then shared on the City Hall board.* EPA, *METG and subcontractors are always willing to talk to us and citizens and share their time. They are very open to showing folks what they doing there and often give tours.*
7. Do you have any comments, suggestions or recommendations regarding the project?

   I would like to see EPA and METG continue to have public meetings that are advertised to give the public continued opportunities to ask questions, listen and provide comments.

East Helena Superfund Site	Five-Year Review Interview Form
Site Name: East Helena	**EPA ID No.:** MTD006230346
Subject Name: Greg Hayes, PWT project manager	**Affiliation:** Pacific Western Technologies, Ltd.
Subject Contact Information: greg.hayes@pwt.com; 406-457-5495	
Time: 4:30 P.M.	**Date:** 11/23/2015
Interview Format: email	

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)? *My overall impression of the project is that it has been very successful in terms of the number of residential yards, unpaved road aprons, flood channels, unpaved alleys, unpaved roads and undeveloped lands that have been remediated. This has been a Superfund site for over 30 years, and in that time an enormous amount of work has been completed, both in OU2 and at the former ASARCO smelter site. The public perception around East Helena is interesting: almost everyone knows quite a bit about the Superfund status, which is certainly not the case for most communities in or adjacent to a Superfund site. There also seems to be a general feeling among the community that the best path forward is to cooperate with cleanup, maintenance and reuse activities as they relate to the Site as much as possible and to look to the future and a possible delisting of the Site.*

2. What is your assessment of the current performance of the remedy in place at the Site? *The current performance of the remedy in place at the Site is taking care of cleaning up the most contaminated properties in East Helena, though there are over a hundred properties that remain unremediated, and will not qualify for remediation, with lead concentrations over 500 mg/kg but not above 1000 mg/kg.*

   The remedy laid out in the 2009 ROD is being met successfully, with four more road aprons and one residential yard remediated in 2015. A total of 19 road aprons and 17 flood channels will be remediated in 2016.

   The portions of the railroad right-of-way adjacent to residential areas, which are to be cleaned up under the remedy where lead concentrations exceed 1,000 mg/kg or arsenic concentrations exceed 100 mg/kg, will be more fully characterized in 2016 by a separate PWT sampling event. A separate remedial action may follow, pending the results from this characterization.

3. What are the findings from the monitoring data? What are the key trends in contaminant levels that are being documented over time at the Site? *The monitoring data that has been collected thus far by PWT includes surface soil data from 28 properties that have been remediated in the past. These 28 properties (and two other properties for which we are awaiting access to sample) are on the Long-Term Monitoring of Remediated Sites (LTMRS) list. This list, which has changed slightly over the years, consists of residential yards, road aprons, alleys, school properties and commercial properties.*

The preliminary, unvalidated and unverified data that has come back from the analytical laboratory up to this point have revealed all surface soil concentrations (0-to-1-inch below ground surface) below 500 mg/kg lead and 100 mg/kg arsenic.

The LTMRS sampling program has been set up to ensure that the remedy remains protective and that no previously remediated properties have become, or are becoming, recontaminated. The trend of finding no elevated levels of lead or arsenic at any of these properties continued into 2015.

4. Is there a continuous on-site O&M presence? If so, please describe staff responsibilities and activities. Alternatively, please describe staff responsibilities and the frequency of site inspections and activities if there is not a continuous on-site O&M presence. *PWT's O&M responsibilities at OU2 include verification of installed sod and grass seed to ensure watering and weeding needs are met. Other O&M tasks at the site, such as the East Fields Repository O&M, are METG's responsibility.*

5. Have there been any significant changes in site O&M requirements, maintenance schedules or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts. *There has been a change in the sampling routine in the last five years. Since PWT was hired as the EPA contractor for the remedial design and remedial action at OU2, they developed several Quality Assurance Project Plans and associated Field Sampling Plans. The major change to sampling properties not sampled in the past is the depths from which samples are collected. In the past, only 0-to-1-inch samples have been collected. PWT proposed to EPA that we collect and analyze soil samples from additional depths (0 to 1 inch, 1 to 6 inches, and 6 to 7 inches) to inform the remedial design of that particular property should it qualify for remediation. This would allow us to know, prior to the excavation of the top 6 inches, if we need to excavate to a greater depth.*

6. Have there been unexpected O&M difficulties or costs at the Site since start-up or in the last five years? If so, please provide details. *No, not in the view of PWT.*

7. Have there been opportunities to optimize O&M activities or sampling efforts? Please describe changes and any resulting or desired cost savings or improved efficiencies. *As noted in number 5 above, the addition of sampling depths will improve the efficiency of the remedial action, eliminating the need for some post excavation sampling to determine the final excavated depth.*

8. Do you have any comments, suggestions or recommendations regarding O&M activities and schedules at the Site? *No additional comments.*

East Helena Superfund Site **Five-Year Review Interview Form**

Site Name: East Helena
EPA ID No.: MTD006230346
Subject Name: Jan Williams
Affiliation: Lewis and Clark Public Health Lead Education and Assistance program
Subject Contact Information: jwilliams@lccountymt.gov
Time: 10:15 A.M. **Date:** 11/23/2015
Interview Location: East Helena Lead Program Office
Interview Format: email

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date? *Yes, the Lead Education and Abatement Program (LEAP) has been informed of the RCRA activities. During the last four or five years, EPA has provided more information with regard to RCRA activities and offered to take any and all interested parties on tours of the plant site and show the progress of the project.*

2. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future? *Yes, our program is informed of RCRA activities and receives monthly updates regarding the activities at the former plant site. At this point we do not need any additional information, the monthly updates are sufficient.*

3. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing? *Our program has not heard of any such activities. The only activity our program has information on, is that some entity dumped concrete, rebar and asphalt in the soils repository. The entity that dumped the construction debris was identified, asked to remove the debris, and notified that only soil was to be taken to the repository.*

4. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide site-related information in the future? *The continued monthly updates are sufficient for RCRA updates, unless an unexpected event happens (flood, earthquake or fire) and then we would want a timelier update. Our program appreciates the tours that METG and EPA have provided during the construction season. It helps us understand the extent of the project and also the progress of the project. We really enjoy taking the tours.*

5. Do you have any comments, suggestions or recommendations regarding the project? *It seems that communication between EPA and Lewis and Clark County programs has improved and if there are questions or concerns on either side they can be asked or stated without reservation. Personnel changes on the part of the METG have helped the communication and idea sharing improve greatly.*

Appendix D: Site Inspection Checklist

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: East Helena Superfund Site	**Date of Inspection:** 11/05/2015
Location and Region: 8	**EPA ID:** MTD006230346
Agency, Office or Company Leading the Five-Year Review: EPA	**Weather/Temperature:** 30 Fahrenheit and overcast

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☐ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other: _____
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☒ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** Mark Rhodes (Name) O&M Mgr. OU1 (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   Problems, suggestions ☐ Report attached: _____

2. **O&M Staff** Greg Hayes (Name) O&M Mgr. OU2 (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   Problems/suggestions ☐ Report attached: _____

3. **Local Regulatory Authorities and Response Agencies** (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.

   Agency EPA
   Contact Betsy Burns (Name) RPM (Title) _____ (Date) _____ (Phone No.)
   Problems/suggestions ☐ Report attached: _____

   Agency MDEQ
   Contact Daryl Reed (Name) Project Manager (Title) _____ (Date) _____ (Phone No.)
   Problems/suggestions ☐ Report attached: _____

   Agency Lead Education and Abatement Program
   Contact Deb Tillo and Jan Williams (Name) Coordinators (Title) _____ (Date) _____ (Phone No.)
   Problems/suggestions ☐ Report attached: _____

   Agency _____
   Contact _____ _____ _____ _____

Name	Title	Date	Phone No.	
Problems/suggestions ☐ Report attached: _____				
Agency _____				
Contact _____	_____	_____	_____	
Name	Title	Date	Phone No.	
Problems/suggestions ☐ Report attached: _____				

4. **Other Interviews** (optional) ☐ Report attached: _____

James Schell, Mayor of East Helena

III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☒ Up to date	☐ N/A
☒ As-built drawings	☒ Readily available	☒ Up to date	☐ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

2. **Site-Specific Health and Safety Plan**	☒ Readily available	☒ Up to date	☐ N/A
☐ Contingency plan/emergency response plan	☒ Readily available	☒ Up to date	☐ N/A

Remarks: _____

3. **O&M and OSHA Training Records**	☒ Readily available	☒ Up to date	☐ N/A

Remarks: _____

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☒ Effluent discharge	☒ Readily available	☒ Up to date	☐ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☒ Other permits: permits for relocating creek	☒ Readily available	☒ Up to date	☐ N/A

Remarks: _____

5. **Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

6. **Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

7. **Groundwater Monitoring Records**	☒ Readily available	☒ Up to date	☐ N/A

Remarks: _____

8. **Leachate Extraction Records**	☒ Readily available	☒ Up to date	☐ N/A

Remarks: _____

9. **Discharge Compliance Records**

	☐ Air	☐ Readily available	☐ Up to date	☒ N/A
	☒ Water (effluent)	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: _____			
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: Card key entry			

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for state

☐ PRP in-house ☐ Contractor for PRP

☐ Federal facility in-house ☐ Contractor for Federal facility

☒ Custodial Trustee

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☐ Funding mechanism/agreement in place ☒ Unavailable

Original O&M cost estimate: _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs during Review Period**

Describe costs and reasons: _____

A. Fencing

1. **Fencing Damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: _____

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☐ N/A

Remarks: All gates and fencing have signage for OU1; institutional controls are in place for OU2.

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (e.g., self-reporting, drive by): Lewis and Clark County instituted 811 system (call before you dig).

Frequency: _____

Responsible party/agency: Lewis and Clark County Public Health Department

Contact	Jan Williams	Environmental Health Specialist	_____	406-457-8583
	Name	Title	Date	Phone no.

Reporting is up to date ☒ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☒ N/A

Violations have been reported ☐ Yes ☒ No ☐ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks: Groundwater Control Area in place as of January 25, 2016.

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: _____

2. **Land Use Changes On Site** ☒ N/A

Remarks: _____

3. **Land Use Changes Off Site** ☒ N/A

Remarks: _____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads Damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: _____

B. Other Site Conditions

Remarks: _____

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (low spots) ☐ Location shown on site map ☒ Settlement not evident

Arial extent: _____ Depth: _____

Remarks: _____

2.	**Cracks**	☐ Location shown on site map	☒ Cracking not evident
	Lengths: _____	Widths: _____	Depths: _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☒ Erosion not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
4.	**Holes**	☐ Location shown on site map	☒ Holes not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
5.	**Vegetative Cover**	☒ Grass	☐ Cover properly established
	☐ No signs of stress	☐ Trees/shrubs (indicate size and locations on a diagram)	
	Remarks: Recently hydroseeded the west evapotranspiration (ET) cover.		
6.	**Alternative Cover** (e.g., armored rock, concrete)		☐ N/A
	Remarks: East interim cover system (ICS 2) is covered with a gravel bio barrier. It will eventually be covered by an ET cover.		
7.	**Bulges**	☐ Location shown on site map	☒ Bulges not evident
	Arial extent: _____		Height: _____
	Remarks: _____		
8.	**Wet Areas/Water Damage**	☒ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Arial extent: _____
	☐ Ponding	☐ Location shown on site map	Arial extent: _____
	☐ Seeps	☐ Location shown on site map	Arial extent: _____
	☐ Soft subgrade	☐ Location shown on site map	Arial extent: _____
	Remarks: _____		
9.	**Slope Instability**	☐ Slides	☐ Location shown on site map
	☒ No evidence of slope instability		
	Arial extent: _____		
	Remarks: _____		
B. Benches		☐ Applicable ☒ N/A	
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
2.	**Bench Breached**	☐ Location shown on site map	☐ N/A or okay

Remarks: _____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay

Remarks: _____

C. Letdown Channels ☐ Applicable ☒ N/A

(Channel lined with erosion control mats, riprap, grout bags or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ No evidence of settlement

Arial extent: _____ Depth: _____

Remarks: _____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation

Material type:_____ Arial extent: _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion

Arial extent: _____ Depth: _____

Remarks: _____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting

Arial extent: _____ Depth: _____

Remarks: _____

5. **Obstructions** Type: _____ ☐ No obstructions

☐ Location shown on site map Arial extent: _____

Size: _____

Remarks: _____

6. **Excessive Vegetative Growth** Type: _____

☐ No evidence of excessive growth

☐ Vegetation in channels does not obstruct flow

☐ Location shown on site map Arial extent: _____

Remarks: _____

D. Cover Penetrations ☒ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A

Remarks: _____

2. **Gas Monitoring Probes**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A

Remarks: _____

3. **Monitoring Wells** (within surface area of landfill)

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

4. **Extraction Wells Leachate**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A

Remarks: _____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☒ N/A

Remarks: _____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**

☐ Flaring ☐ Thermal destruction ☐ Collection for reuse

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Gas Collection Wells, Manifolds and Piping**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)

☐ Good condition ☐ Needs maintenance ☐ N/A

Remarks: _____

F. Cover Drainage Layer ☒ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☒ N/A

Remarks: Drainage controlled by concrete fabric-lined perimeter ditches leading to infiltration basin on the northwest end of the property.

2. **Outlet Rock Inspected** ☐ Functioning ☒ N/A

Remarks: _____

G. Detention/Sedimentation Ponds ☒ Applicable ☐ N/A

1. **Siltation** Area extent: _____ Depth: _____ ☒ N/A

☐ Siltation not evident

Remarks: Bypass channel discharges to plunge pool and then to two discharge infiltration basins.

2. **Erosion** Area extent: _____ Depth: _____

☒ Erosion not evident

Remarks: _____

3. **Outlet Works** ☐ Functioning ☒ N/A

Remarks: _____

4. **Dam** ☐ Functioning ☒ N/A

Remarks: Dam is not used as PPC bypass is being used and diverts creek flow around dam; dam is planned for demolition.

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident

Horizontal displacement: _____ Vertical displacement: _____

Rotational displacement: _____

Remarks: _____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident

Remarks: _____

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☒ Siltation not evident

Area extent: _____ Depth: _____

Remarks: Ditches drain through infiltration.

2. **Vegetative Growth** ☐ Location shown on site map ☒ N/A

☐ Vegetation does not impede flow

Area extent: _____ Type: _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident

Area extent: _____ Depth: _____

Remarks: PPC was undercutting the northwest portion of the slab pile but is currently being redirected away through realighment and construction of a bypass channel.

4. **Discharge Structure** ☒ Functioning ☐ N/A

Remarks: Discharge feature is an infiltration basin.

VIII. VERTICAL BARRIER WALLS ☒ Applicable ☐ N/A

1. **Settlement** ☐ Location shown on site map ☒ Settlement not evident

Area extent: _____ Depth: _____

Remarks: Under RCRA, ASARCO constructed slurry walls to contain arsenic groundwater contamination in the vicinity of the speiss dross and acid plant areas in 2006 and 2007, respectively.

2. **Performance Monitoring** Type of monitoring: Groundwater monitoring

☐ Performance not monitored

Frequency: Monitoring completed under RCRA IM WPs. ☐ Evidence of breaching

Head differential: _____

Remarks: _____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing and Electrical**

☐ Good condition ☐ All required wells properly operating ☐ Needs maintenance ☐ N/A

Remarks: _____

2. **Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

B. Surface Water Collection Structures, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps and Electrical**

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☐ Air stripping ☐ Carbon adsorbers

☐ Filters: _____

☐ Additive (e.g., chelation agent, flocculent): _____

☐ Others: _____

☐ Good condition ☐ Needs maintenance

☐ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☐ Equipment properly identified

☐ Quantity of groundwater treated annually: _____

☐ Quantity of surface water treated annually: _____

Remarks: _____

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs maintenance

Remarks: _____

4. **Discharge Structure and Appurtenances**

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

5. **Treatment Building(s)**

☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair

☐ Chemicals and equipment properly stored

Remarks: _____

6. **Monitoring Wells** (pump and treatment remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

D. Monitoring Data

1. **Monitoring Data**

☒ Is routinely submitted on time ☐ Is of acceptable quality

2. **Monitoring Data Suggests:**

☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

X. OTHER REMEDIES

If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical

nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.	
XI. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions). The OU1 remedy is in place, following remediation of process pond water and sludge. Remaining sources and site-wide contaminated groundwater is currently being addressed under the RCRA corrective action program using three interim measures: South Plant hydraulic control, source removal and installation of an ET cover system to reduce leaching to groundwater. Site-wide groundwater monitoring is also conducted under RCRA to evaluate effectiveness of the ongoing cleanup under RCRA and completed cleanup under Superfund. The OU2 remedy for contaminated residential off-site soils recently was completed in May 2016. Institutional controls are in place to prevent exposure to contaminated soil while remediation is taking place.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. A draft O&M for the East Field OU2 soil respository has been submitted for regulatory review on April 23, 2015. It will not be finalized until a feasibility study is completed to ensure the East Field can be used as the final repository for contaminated OU2 soils. Ongoing sitewide groundwater monitoring is occurring under RCRA to monitor the groundwater remedy's effectiveness.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. No issues have been observed.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Sitewide groundwater monitoring under RCRA corrective action has identified additional source material remaining in the former acid plant area and the former speiss dross area; these areas will be undergoing source removal this year.

Appendix E: Photographs from Site Inspection Visit (November 2015) and Aerial Photographs (March 2016)

OU2 yard cleanup

OU2 yard remediated in 2011

OU2 road apron cleanup

View from slag pile with ICS-2 in foreground and ETC west (recently hydroseeded) in background

View of creek at base of slag pile where undercutting occurring at time of site inspection.

Area of creek bed restructuring on left with slag pile on right

Lower Lake and Little Lower Lake

Slag pile (on right) and million-gallon stormwater tanks

Monitoring wells near ICS-2

Signage and locked fence at east bench

Signage and slag pile

Aerial photograph of the Site (March 2016)

Aerial photograph of creek rerouting (March 2016)

Appendix F: Institutional Control Maps

Figure F-1: ICP Administrative Boundary for Contaminated Soils

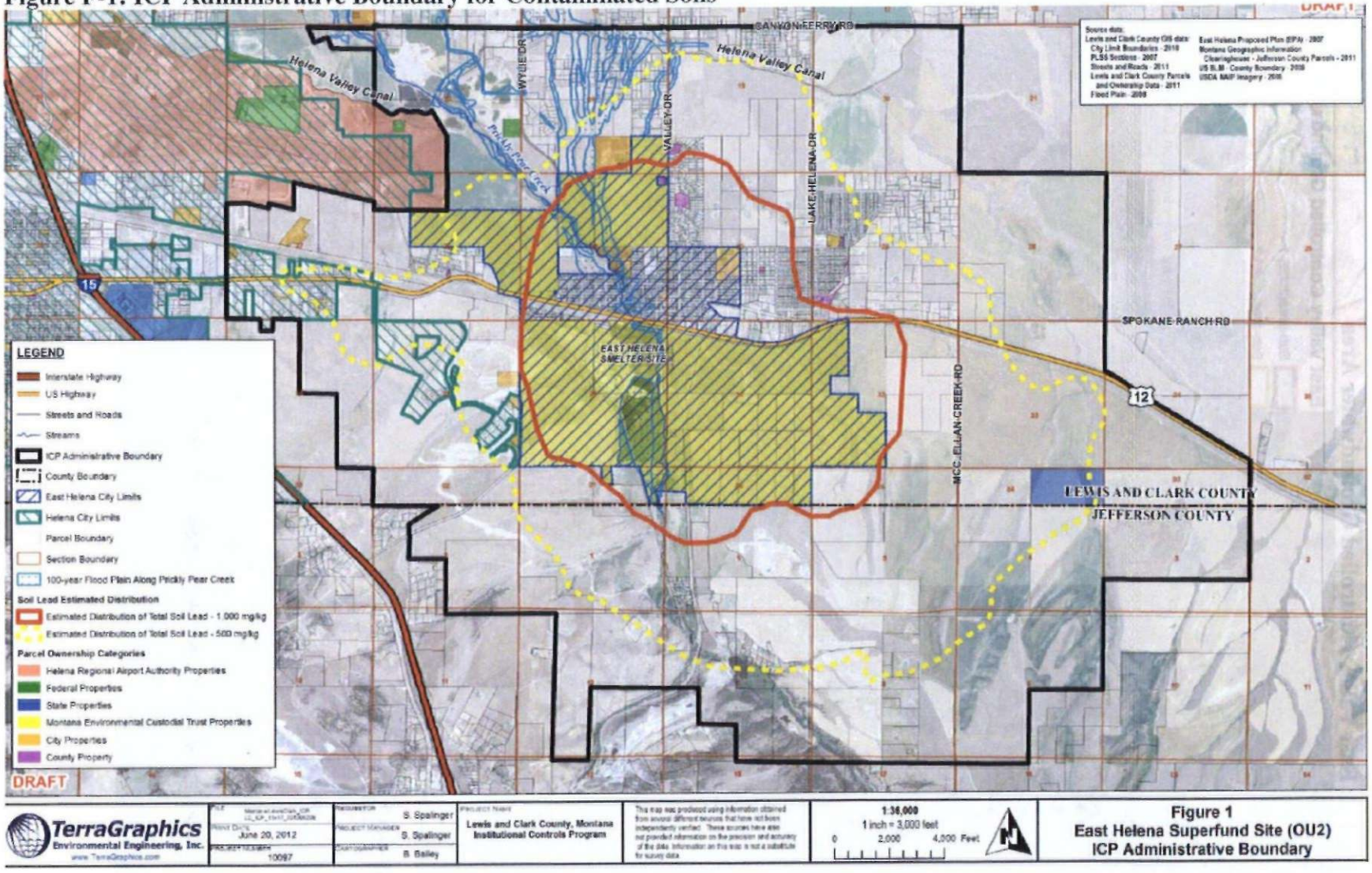
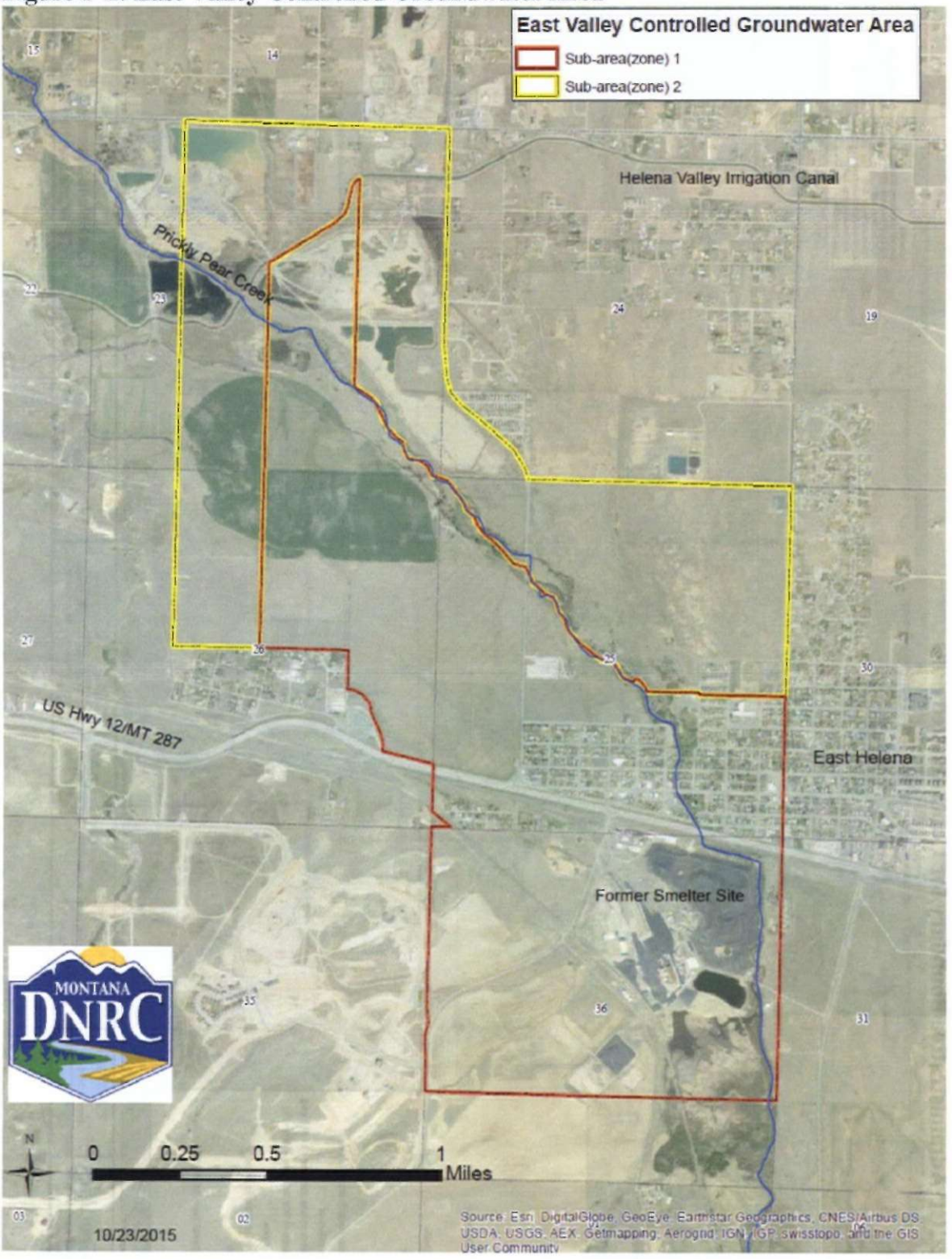
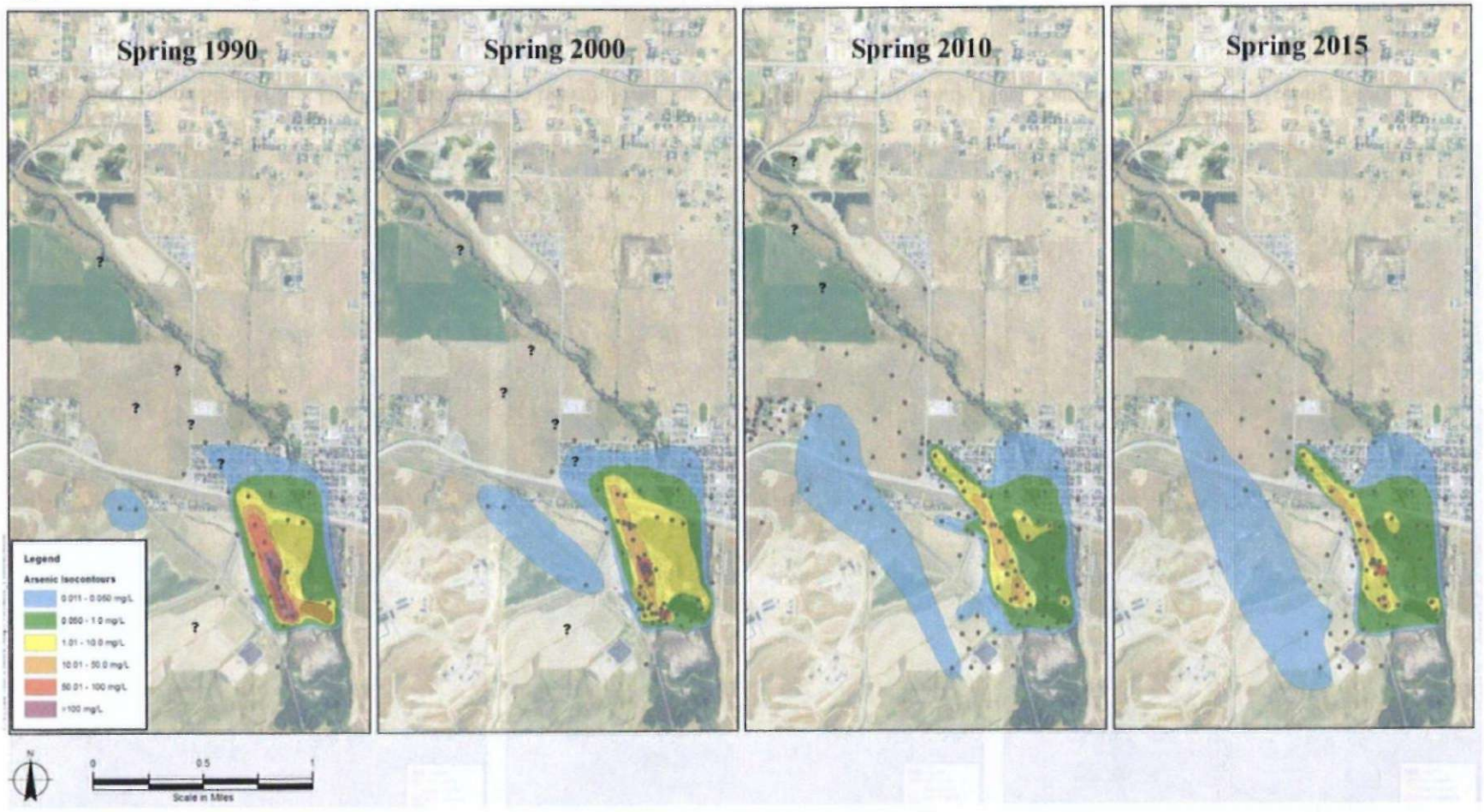


Figure F-2: East Valley Controlled Groundwater Area



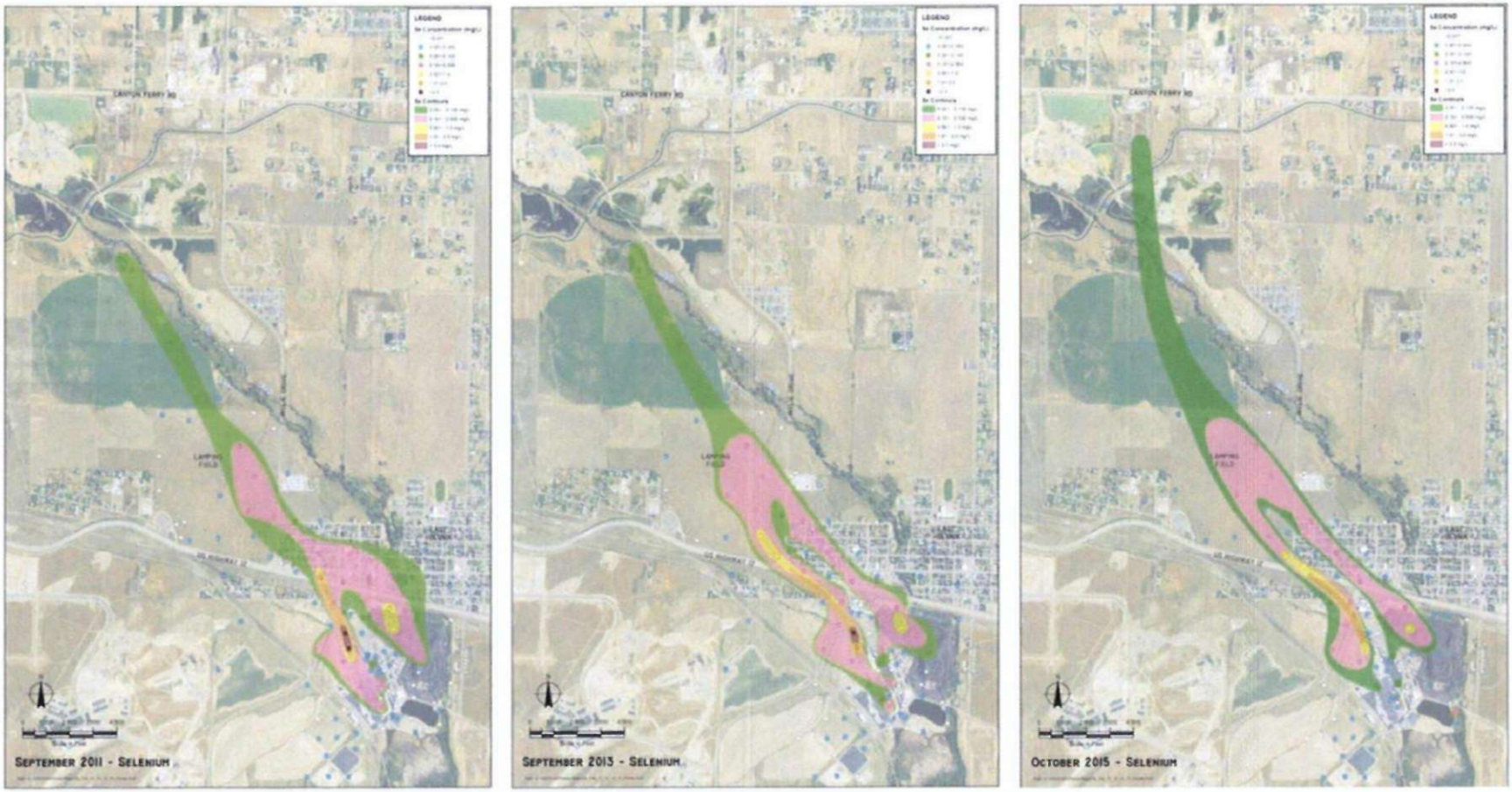
Appendix G: Groundwater Contaminant Plume Maps

Figure G-1: Summary of Arsenic Plumes, 1990 to 2015



Source: East Helena Smelter Site Draft Addendum to the Interim Measures Work Plan, 2015-2016 – Acid Plant Source Removal Public Meeting: February 4, 2016 METG Presentation.

Figure G-2: Summary of Selenium Plumes, 2011 to 2015



Source: East Helena Smelter Site Draft Addendum to the Interim Measures Work Plan 2015-2016 – Acid Plant Source Removal Public Meeting: February 4, 2016 METG Presentation.