THIRD FIVE-YEAR REVIEW REPORT

ORONOGO-DUENWEG MINING BELT SITE

JASPER COUNTY, MISSOURI

August 2012

Prepared by:
United States Environmental Protection Agency
Region 7
901 North Fifth Street
Kansas City, Kansas 66101

Approved by:

Cecilia Tapia
Director, Superfund Division
U. S. Environmental Protection Agency

Date 8/29/12

[This page intentionally left blank.]

Table of Contents

Attachments

1. Site Location Map
2. List of Documents Reviewed
3. Site Inspection Checklist
4. Joplin Tornado Site Location Map

List of Abbreviations

AOC	Administrative Order on Consent
ATSDR	Agency for Toxic Substances and Disease Registry
CAG	Community Advisory Group
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	Contaminant of Concern
DA	Designated Area
DGLS	Department of Geology and Land Survey
EE/CA	Engineering Evaluation/Cost Analysis
ERA	Ecological Risk Assessment
ICs	Institutional Controls
JCHD	Jasper County Health Department
MDNR	Missouri Department of Natural Resources
MDHSS	Missouri Department of Health and Senior Services
MHTD	Missouri Highway and Transportation Department
NCP	National Contingency Plan
O&M	Operation and Maintenance
OU	Operable Unit
ppm	parts per million
PWSD	Public Water Supply District
PRP	Potentially Responsible Party
RI/FS	Remedial Investigation/Feasibility Study
RAO	Remedial Action Objectives
ROD	Record of Decision
TI	Technical Impracticability
UAO	Unilateral Administrative Order
μg/dl	micrograms per deciliter

[This page intentionally left blank.]

Executive Summary

The remedial actions conducted to date at the Site have included removal and replacement of metals-contaminated residential yard soil, construction of a repository for the excavated residential soil, construction of public water supply systems, remediation of a portion of the Site's mining and milling wastes and institutional controls. The actions at Operable Units 2 and 3, Residential Yard Soils, were completed in 2002 with the cleanup of contaminated soil from approximately 2,600 properties. Operable Unit 4, Groundwater, was completed in 2007 with the installation of the public water supply systems throughout the Site. In addition, the institutional controls specified in the Record of Decision for Operable Units 2 and 3 were completed in 2005. Actions at Operable Unit 1, Mine Waste, were initiated in 2007. To date, approximately 1,500 acres of the site mining and milling wastes have been remediated. Cleanup of the Operable Unit 1 wastes is expected to be completed in 2018. Investigative activities at Operable Unit 5, Spring River Basin, were initiated in 2005. The perennial streams in Operable Unit 5 are expected to be remediated after the completion of the cleanup actions for Operable Unit 1.

The assessment conducted during this five-year review found the remedies were constructed in accordance with the Records of Decision. The remedies are functioning as designed. The immediate threats to people have been addressed, and the remedies conducted to date are considered to be protective. Ecological risks have not yet been completely addressed, but will be with the cleanup of mine waste in Operable Units 1 and 5.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Oronogo-Duenweg Mining Belt Site		
EPA ID: MOD 980686281		
Region: 7	**State:** MO	**City/County:** Jasper County

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** No

REVIEW STATUS
Lead agency: EPA **If "Other Federal Agency" was selected above, enter Agency name:** Click here to enter text.
Author name (Federal or State Project Manager): D. Mark Doolan
Author affiliation: US EPA Region 7
Review period: November 2006 - November 2011
Date of site inspection: Multiple through the report period
Type of review: Statutory
Review number: 3
Triggering action date: 08/27/2007
Due date *(five years after triggering action date)*: 08/27/2012

Five-Year Review Summary Form (continued)

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OUs 1, 2, 3, and 4

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 1, 2, 3, and 4	**Issue Category: No Issue**			
	Issue: No issues identified			
	Recommendation: No recommendations are made			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Choose an item.	Choose an item.	Choose an item.	Choose an item.	Enter date.

Protectiveness Statement(s)

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU1	Will be Protective	Click here to enter date.

Protectiveness Statement:
The remedy at OU1 is expected to be protective upon completion. In the interim, soil excavation activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU2 and OU3	Protective	Click here to enter date.

Protectiveness Statement:
The remedy at OU2 is protective of human health and the environment. All exposure pathways have been addressed through excavation of soils and the implementation of institutional controls in the form of residential development ordinances.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU4	Protective	Click here to enter date.

Protectiveness Statement:
The remedy at OU4 is protective of human health and the environment. All exposure pathways have been addressed through the installation of the public water supply systems and the implementation of institutional controls preventing shallow groundwater use.

Five-Year Review Summary Form Continued

Issues:

(1) The Record of Decision (ROD) for Operable Units (OUs) 2 and 3 contained a contingency for in-place phosphate stabilization of lead in residential soils dependent on the outcome of treatability studies. These studies have been completed and show a significant reduction in the toxicity of soil lead from the addition of phosphate. However, the EPA does not plan to conduct the additional phosphate treatment at the Site.

(2) Approximately 30 percent of the mine waste piles on the Site have been remediated. Significant ecological risk and some human health risk still exist at the Site due to erosion of the remaining waste piles to surrounding soils and streams.

(3) Remediation of the stream sediments in OU 5 is not scheduled to commence until all the wastes have been removed from OU 1. Therefore, the streams still present a significant risk to the aquatic environment.

Recommendations and Follow-up Actions:

(1) A follow-up exposure study conducted by the Missouri Department of Health and Senior Services at the conclusion of the residential yard soil removal action indicates the EPA exceeded its goal for reducing blood lead concentrations at the Site. Therefore, the EPA has determined additional phosphate treatment of yards below 800 ppm lead is not warranted.

(2) Remediation of the mining and milling wastes in OU 1 will continue through at least 2018.

(3) Remediation of the stream sediments in OU 5 should commence at the completion of the entire waste cleanup in OU 1.

Protectiveness Statement(s):

The remedy at OU 2 and 3 currently is considered protective of human health because all properties with current residents where soil exceeded the action levels have been cleaned up. The follow-up exposure study conducted at the Site shows the goal for blood lead reduction in small children at the Site has been exceeded. The institutional controls, in the form of residential development ordinances, have been adopted and implemented by the local governments to ensure proper development of new residences in contaminated areas.

The remedy at OU 4 is protective of human health due to the installation of public water supplies to homes with contaminated wells. All known private drinking water wells contaminated with metals within the Site have been addressed through connection of the homes to public water or the installation of new deep-aquifer wells. A well drilling regulation for the Site to control the installation of drinking water wells in the shallow aquifer has been promulgated and implemented by the MDNR.

A site-wide remedy for OU 1 was selected in the 2004 ROD. Cleanup actions began in 2007. Approximately 30 percent of the wastes have been remediated to date. Therefore, the mining wastes still present a significant risk to the environment at the Site.

Remediation of the stream sediments in OU5 is not scheduled to commence until all the wastes have been removed from OU 1. Therefore, the streams still present a significant risk to the aquatic environment.

Oronogo-Duenweg Mining Belt Site
Jasper County, Missouri
Five-Year Review Report

I. Introduction

The purpose of five-year reviews is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings and conclusions of reviews are documented in five-year review reports. In addition, five-year review reports identify any issues found during the review and recommendations to address them.

The U.S. Environmental Protection Agency has prepared this five-year review pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) § 121 and the National Contingency Plan (NCP). CERCLA §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 five 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.

The EPA interpreted this requirement further in the NCP; 40 CFR § 300.430(f)(4)(ii) 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 the initiation of the selected remedial action.

The EPA Region 7 has conducted a five-year review of the remedial actions implemented at the Oronogo-Duenweg Mining Belt Site (Site) in Jasper County, Missouri. This review was conducted by the Remedial Project Manager for the Site for the period from November 2007 through November 2011. This report documents the results of the review.

This is the third five-year review for the Site. The triggering action for this review is the date of the start of remedial action for residential yard soils cleanup of Operable Units (OUs) 2 and 3. The five-year review is required due to the fact hazardous substances, pollutants or contaminants above levels that allow for unlimited use and unrestricted exposure are or will be left on-site. The five-year review assesses each OU at the Site.

The Site is broken up into five OUs. OU 1 addresses the mine and mill waste. The remedial actions for this OU are ongoing. OUs 2 and 3 address lead contamination in residential yards. The remedial actions for these OUs are completed. Any additional response due to Site conditions that changed after the May 22, 2011, EF5 tornado will be implemented under OU 1. OU 4 addressed contaminated shallow groundwater. The remedial actions have been completed. OU 5 addresses contaminated surface water and sediments in the Site's perennial streams. This OU is in the Remedial Investigation/Feasibility Study (RI/FS) stage, and, as a result, is not subject to this five-year review.

II. Site Chronology

Table 1: Chronology of Site Events

Event	Date
Initial discovery of problem or contamination	1986
Removal Assessment conducted	1989 - 1994
National Priorities List final listing	1990
AOC signed with Responsible Parties to conduct Remedial Investigation/Feasibility Study	1991
Remedial Investigation conducted (OUs 1 & 4)	1991 - 1995
Exposure Study of child blood lead	1991 - 1994
Human Health Risk Assessment	1991 - 1995
Ecological Risk Assessment	1991 - 1997
Unilateral Administrative Order to PRP to provide bottled water (OU 4)	1993
Time-critical Removal Action to provide bottled water (OU 4)	1993 - 2004
Time-critical Removal Action of Residential Yard Soil (OU 2& 3)	1995 - 1996
Record Of Decision for Residential Yard Soil (OU 2 & 3)	1996
Remedial Design for Residential Yard Soil (OU 2 & 3)	1996
Remedial Action of Residential Yard Soil (OU 2 & 3)	1996 - 2002
Follow-up Exposure Study by Missouri Department of Health and Senior Services	1999 - 2002
Record Of Decision for Groundwater (OU 4)	1998
Remedial Design for Groundwater (OU 4)	2000 - 2001
Remedial Action for Groundwater (OU 4)	2001 - 2007
Engineering Evaluation/Cost Analysis for use of mine waste in highway construction	2000
Nontime-Critical Removal Action, highway construction using mine waste	2001 - 2008
Record Of Decision for Mine Waste (OU 1)	2004
Remedial Design for Mine Waste (OU 1)	2006 - present
Remedial Action for Mine Waste (OU1)	2007 - present
Remedial Investigation/Feasibility Study for Perennial Streams (OU 5)	2006 - present

III. Background

Historical Background

The Site in Jasper County represents a large part of the Missouri portion of the Tri-State Mining District. The Tri-State District encompasses approximately 2,500 square miles in Oklahoma, Kansas and Missouri and was formerly one of the richest lead and zinc ore deposits in the world. Mining and smelting activities began as early as 1830, peaked in the years from 1900 through 1950 and continued through the 1970s. The Missouri portion of the district lies within the southwest corner of Jasper County, Missouri. The Site encompasses approximately 250 square miles of the district. Figure 1 shows the location and extent of the Site.

Ore production in Jasper County consisted of mining, milling and smelting. Milling included crushing and grinding the rock to standard sizes and separating the ores. At one time, approximately 200 mines were found in and around the Oronogo and Duenweg areas. Extraction and milling of the ore created large piles of mining wastes distributed throughout the county. Approximately 100 million tons of mining and milling wastes contaminated with cadmium, lead and zinc were created during the mining activities. Approximately 10 million tons of wastes remain on-site scattered over 7,000 acres. These source piles have led to the contamination of surface water, groundwater and surface soils. In addition, smelting operations dispersed airborne contaminants over a large area. Historic smelters have contaminated approximately 2,600 residential yards with unacceptable levels of lead.

Land and Resource Use

Approximately 60,000 people live within the Site boundaries. Most of the population is located within the city of Joplin and the surrounding communities of Webb City, Carterville and Duenweg. Several other small communities are scattered throughout the Site. Land use within the Site is mixed from rural, to agricultural and urban. Growth in the communities is high. Development in many areas is spreading into mine-scared lands. Prior to the EPA's groundwater actions, many homes outside corporate city limits relied on the shallow aquifer for drinking water through private water wells.

Site Enforcement History

The Site was proposed for listing on the National Priorities List on June 24, 1988, and was listed as Final on August 30, 1990. The EPA began negotiation with a group of potentially responsible parties (PRPs) to perform am RI/FS on September 4, 1990, and entered into an Administrative Order on Consent (AOC) with the PRPs on August 6, 1991. Negotiations resulted in the Site being divided into 10 designated areas (DAs) for investigations. The PRPs agreed to perform the RI/FS at seven of the DAs while the EPA performed the RI at the other three DAs. The EPA subsequently added a fourth DA for investigation in the southern portion of the Site, bringing the total number of DAs to 11. The DA locations are shown on Figure 1. The PRPs agreed to incorporate the information from the EPA's four DAs into one FS for the Site.

The EPA notified the following companies of potential responsibility for the Site: (1) ASARCO, Inc.; (2) E.I. DuPont Company; (3) Gold Fields Mining Company; (4) Blue Tee Corporation (Beazer East, Inc.); (5) St. Joe Minerals Company (Doe Run Company); (6) Sun Company; (7) NL Industries; (8) Brown & Root; (9) USX, Inc.; (10) AMAX, Inc.; (11) Paramount Communications; (12) Eljer Manufacturing; (13) Connor Investment; (14) FSN, Inc.; (15) Eagle-Picher Industries, Inc.; (16) Childress Royalty Company and (17) ACME Land Company. The first nine companies listed participated in the RI/FS. The EPA settled with Connor Investment and FSN, Inc. based on ability to pay, and settled with DuPont Company, Brown & Root, and USX, Inc. through a peripheral party settlement. The EPA settled claims in bankruptcy court with Eagle-Picher Industries, Inc., and ASARCO, Inc. The remaining viable PRPs are Gold Fields, Blue Tee, Childress, ACME and Doe Run.

As part of the Site-wide RI, the PRPs sampled private water wells throughout the Site. Approximately 100 wells were identified that exceeded health-based action levels for cadmium, lead, manganese and/or zinc. The EPA issued a Unilateral Administrative Order (UAO) to the PRPs to provide bottled water to these residents on December 16, 1993. On June 24, 1994, the EPA issued a second UAO to the PRPs that expanded the number of homes to receive bottled water based on additional sampling conducted as part of the December 24, 1993, UAO. The EPA and responsible parties signed a Consent Decree in January 2001 to settle the responsible parties' liability for groundwater. Under the settlement, the parties made a cash payment to the EPA for their share of the installation costs for the public water supply system.

On June 30, 1994, the EPA issued an AOC to the PRPs to sample all play areas of day care centers and to randomly sample residential yards throughout the Site to prioritize removal and remedial actions. Sampling was conducted during the summer 1994.

The EPA entered into Consent Decrees with Doe Run and Blue Tee on March 26, 2009, and with Childress Royalty on December 31, 2009, for remedial design and remedial action at OU 1. These responsible parties initiated remedial design activities in early 2010, and the remedial actions on their respective parcels in mid-2010.

Basis for Taking Action

In 1991, the Missouri Department of Health (MDOH), now the Missouri Department of Health and Senior Services (MDHSS), funded by the EPA through the Agency for Toxic Substances and Disease Registry (ATSDR), began a large-scale health study to learn how local residents had been and were being affected by mine-related contamination. The results of that study released in May 1994, "found increased blood-lead levels due to exposure to contaminated soils in the Jasper County Superfund Site" and recommended "that exposure to the lead-contaminated soil in the study area be reduced." The study showed that approximately 14 percent of children less than seven years of age at the Site had blood lead levels exceeding 10 micrograms per deciliter (µg/dl).

In response to the health study, the EPA developed in cooperation with other state, local, and federal agencies a lead strategy for the Site, which was presented to the public in May 1994, along with the findings of the health study. The strategy generally describes the

cleanup action contemplated for the soils and mine wastes including a prioritization method to take care of those most at risk first. The strategy also describes the actions the EPA took to provide bottled water to area residents whose wells were contaminated.

The priority of the lead strategy was to address the areas with the highest health risks first. These areas included day care centers with play area soil exceeding 500 parts per million (ppm) lead, yard soil exceeding 500 ppm lead at homes where children with elevated blood lead reside and residential yards soils exceeding 2,500 ppm lead. The second priority was to remediate all soil in residential yards exceeding 500 ppm lead at homes where soils exceeded the action level of 800 ppm. The final Site priority was to replace the temporary bottled water program at homes with metals-contaminated, private drinking water wells with a public water supply.

Beyond the human health issues in the area, a significant evaluation of the ecological impacts from mining was undertaken as a part of the RIs. A detailed ecological risk assessment was performed by the EPA and PRPs. The U.S. Fish and Wildlife Service, under an interagency agreement with the EPA, identified a federally listed endangered species and critical species habitat in the Site's streams. The Ecological Risk Assessment (completion in May 1998) identified significant risk to both aquatic and terrestrial life.

The Ecological Risk Assessment (ERA) evaluated risk to terrestrial receptors by modeling exposures to specific feeding guilds within the terrestrial environment. Risks to terrestrial vertebrate populations and communities were evaluated by comparing the average daily dose to selected toxicity reference values. An addendum to the final ERA reevaluated risks to terrestrial vermivores and concluded that terrestrial vertebrates that consume earthworms in soils with elevated contaminant of concern (COC) concentrations may experience adverse chronic effects.

Site Strategy

The overall strategy for the Site is to follow a comprehensive response action approach to address both human health and ecological risk issues. The strategy incorporates the Superfund Accelerated Cleanup Model approach where significant health-risk problems are identified and remediated as quickly as possible. To manage the interrelated problems identified at the Site, the EPA divided the potential contamination problems into OUs. An OU is a clearly defined, smaller portion of the overall work to be completed at a Superfund site. Each OU is generally investigated and remediated on an individual basis. The criteria used to designate OUs are:

- Areas with similar contaminated media (soils, dust, groundwater, etc.)
- Areas with similar geographic area
- Areas that will be remediated using similar techniques
- Areas that will be remediated within a similar time frame
- Areas that can be managed and addressed as an individual RI/FS.

OUs are subject to change as more information becomes available. For example, it may be possible to further consolidate OUs if additional similarities between individual units are identified, or further investigation may show some consolidated OUs must be broken down into smaller, more manageable units to carry out appropriate remedies.

The Site activities were initially conducted with a site-wide focus. Subsequent to these initial investigations, three OUs were identified based on the mining- and smelting-related activities. Each of the three OUs was evaluated against the above criteria and placed into a high or medium priority category. Based on the criteria, the Site OUs have been prioritized in the following three groups: (1) Residential Yards, (2) Groundwater, and (3) Mine and Mill Waste. Subsequently, the Residential Yards OU was divided into the smelter zone area and mine waste area. This division was done solely to track response costs associated with each area for the purposes for recovering costs from the PRPs. As the ROD for OU 1 was being developed, the EPA recognized the need for a fifth OU to separate the perennial streams from the rest of the Site for investigation and cleanup after the completion of the mine waste area remediation in OU 1. The following describes the OUs established for the Site:

OU 1: This OU was set up to address the overall problem of mine and mill waste. The investigations for this OU focused on the characterization of metal concentrations and areal distribution of mining and milling wastes, smelter-related materials, transition zone soils near mined areas and soils unaffected by mining. In addition, characterizations of water quality and loading sources were made for the Spring River and its major tributaries within the Site. Sampling was also performed to characterize groundwater chemistry in the shallow and deep aquifers. Included in this OU were investigations of the terrestrial ecology and aquatic biota. Ambient air quality in mine waste areas was assessed by operating air particulate samplers at two separate on-site locations. Personal air monitors were worn by individuals operating motorcycles and all-terrain vehicles to quantify human exposure to metals in dust while recreating on waste piles. The human health-related problems were split into the OUs listed below to expedite actions in those areas. Consequently, OU 1 deals with the ecological risk issues and the residual human health risk caused from construction of residential housing near mined areas. The ROD for OU 1 was signed on September 30, 2004. The EPA completed the initial Remedial Design and started the first phase of cleanup in November 2007. The design and cleanup activities are ongoing for this OU and are expected to be completed in 2018.

OU 2: This OU was established to deal with the lead contamination found in residential yards in the smelter areas. Studies were designed to assess lead concentrations in yards soils focusing on characterization of lead in yards in and near mill waste areas and near historic sites of lead smelting. The studies indicated the area around the Eagle-Picher smelter in northwest Joplin as having the highest concentrations of soil lead and thus presented the greatest health risk. As a result of the MDHSS exposure study, the EPA began a time-critical removal of residential soils and day care center soils in January 1995. The

removal was completed in January 1996, and involved excavation and replacement of soil at six day care centers and 304 residential homes. The ROD was completed in August 1996 that addressed the remaining contaminated residences with soil lead concentration above health-based levels not remediated under the time-critical removal action.

Remediation activities conducted by the EPA for OU 2 were completed in 2002. A few remaining properties that had denied access to the EPA for cleanup were remediated by MDNR and completed in 2010.

OU 3: This OU was established to track remedial actions conducted in the mining areas. The remedial action performed for the residential yard OU was conducted by the EPA and covered under the OU 2 ROD, but tracked separately for cost recovery from the PRPs.

OU 4: This OU was established to deal with the contaminated shallow groundwater and numerous contaminated private water supply wells. During the RI field program for this OU, a number of households with shallow drinking water wells in the Oronogo-Duenweg DA, the Iron Gate Extension DA and the Neck/Alba DA were found to contain concentrations of lead, cadmium, zinc and manganese in well water in excess of EPA action levels. Supplemental water well sampling programs conducted in December 1993 and January 1994 confirmed these exceedances and identified additional households where shallow groundwater containing metals concentrations in excess of the action levels was being consumed. The remedial action included construction of a newly formed rural water district and expansion of existing municipal water supplies. The remedial action for this OU was completed in 2007.

OU 5: This OU was established to deal with the contaminated surface water and sediments in the perennial streams at the Site. The initial investigation of water and sediment quality to identify loading sources for the Spring River and its major tributaries (the North Fork of the Spring River, Center Creek, Turkey Creek and Short Creek and Shoal Creek in Newton County) was conducted in 2006. Additional studies to assess the toxicity of stream sediments were completed in 2007. Monitoring of surface water and sediment quality is planned throughout the mine-waste-cleanup project to assess improvements made as a result of source control of the mine waste. Final cleanup decisions on the perennial streams will be made taking into consideration the effectiveness and completeness of the mine waste cleanup in OU 1.

Community Involvement

The EPA awarded a Technical Assistance Grant (TAG) to the Jasper County Superfund Site Coalition (Coalition). The Coalition retained a group of professors at Kansas State University to serve as technical advisors. Members of the Coalition, besides the federal, state and county agencies, include local citizens, business owners and county commissioners. In general,

the EPA provides documents generated from Site activities such as the RI report, risk assessments and FS for review and comment. The EPA, MDNR, MDHSS, ATSDR and Jasper County Health Department (JCHD) representatives met with the Coalition periodically in a public forum to update the members on Site activities and discuss Site issues. The Coalition focused on problems associated with mining, milling and smelting wastes found throughout the Site. The TAG expired in 2006; the Coalition has not been actively involved in the Site for some time.

Additionally, at the encouragement of the EPA, a community advisory group (CAG) was formed by the Joplin City Council in 1995. The CAG membership consists of local citizens, bankers, realtors, business owners, county commissioners, county and city health department employees, local health care providers, state legislator representatives, city council members from several cities, the Joplin city manager and city attorney, school district representative and a Joplin planning and zoning board member. The EPA, MDNR, MDHSS and ATSDR meet with the CAG regularly to provide status updates, discuss site-related issues, and solicit input and feedback on ongoing and proposed EPA actions. The focus of the CAG was primarily on the actions the EPA conducted on residential yards surrounding a large primary lead smelter in northwest Joplin. In April 1998, the CAG reformed to the Environmental Task Force of Jasper and Newton Counties (Task Force) and expanded its membership to include representatives from Newton County, Missouri. The Task Force developed a two-county-wide environmental master plan which established recommended institutional controls (ICs) for development of future residential areas in and around the mining and smelting areas as well as addressed other non-Superfund-related environmental problems in the counties.

Involvement of the Task Force has been extensive. The EPA has shared and discussed with the group results of investigations, risk assessments and cleanup actions. The EPA's work with the group has resulted in wide-spread community acceptance of the cleanup actions performed to date and proposed for the future to mitigate site risks. The Task Force successfully developed and achieved implementation of the ICs for residential development at the Site.

IV. Remedial Actions

The following is a discussion of the response actions performed at the Site to date. The actions include time-critical, non-time-critical and remedial actions.

OU 1, Mine and Mill Waste

In August 2002, the EPA signed an Engineering Evaluation/Cost Analysis (EE/CA) for a non-time-critical removal action of mining waste in the Oronogo-Duenweg DA, located on the east side of the Site, to clean up mining waste in and adjacent to the construction corridor of the Route 249 Highway project. The highway was constructed by the Missouri Highway and Transportation Department (MHTD) through approximately four miles of the Site. The EE/CA specified using the mine and mill waste as subsurface fill during construction of the roadway as follows:

- Excavation of the mining waste piles with transport into the highway corridor.
- Removal of the top 12 inches of soil beneath the excavated waste piles.
- Incorporation of the mining wastes and underlying soil into the highway construction fill.
- Implementation of storm water runoff controls during excavation and disposal activities.
- Dust suppression during excavation and disposal activities.
- Placement of 12 inches of clean soil cover on all mining waste exceeding 1,500 ppm lead in the highway side slopes.
- Revegetation of disturbed areas.

The design specified the burial of approximately 600,000 cubic yards of mining waste under the roadway. The EPA funded the MHTD to move the mining waste located outside of the corridor into the footprint of the roadway for disposal. However, the MHTD actually moved only approximately 60,000 cubic yards of waste into the corridor and incorporated the wastes into the construction fill.

In September 2004, the EPA signed a ROD for the cleanup of the remaining mine wastes at the Site under OU 1. The ROD discusses the remedial action objectives (RAOs) as follows:

- Mitigate risks to terrestrial vermivores from exposure to COCs from mine, mill and smelter wastes within the Site, such that the calculated toxicity quotients or hazard indexes are less than or equal to 1.0.
- Mitigate risks to aquatic biota in Class P streams and their tributaries exceeding federal ALCs for the COCs by controlling the transport of mine, mill and smelter wastes from source areas to waters of the state.

Based on these ROAs, the OU 1 ROD established action levels for contaminated terrestrial source materials (mine wastes and soils) at 400 ppm lead, 40 ppm cadmium and 6,400 ppm zinc. Additionally, sediment action levels for tributary sediments and delta deposits at 2 ppm cadmium, 70 ppm lead and 250 ppm zinc based on the average concentration of background soil values. Subsequent to the ROD, the EPA conducted toxicity studies in the Tri-Stated Mining District to establish district-wide, site-specific sediment action levels. Based on these studies, the sediment action levels for the Site were modified to 219 ppm lead, 17 ppm cadmium, and 2,949 ppm zinc. The cleanup actions specified in the ROD include the following:

- Removal of mine/mill wastes and contaminated soil exceeding 400 ppm lead, 40 ppm cadmium, and 6,400 ppm zinc.
- Removal of intermittent tributary stream sediment samples exceeding 219 ppm lead, 17 ppm cadmium, and 2,949 ppm zinc.
- Subaqueous disposal of excavated source material in mine subsidence pits.
- Recontouring and revegetating excavated areas.
- Plugging of selected mine shafts and surface water diversion from mine openings.
- A monitoring program for assessing the effect of cleanup on Site streams.

- Continuation of the Health Education Program established under OU 2/3.
- ICs to regulate future residential development in contaminated areas and use of the disposal areas.

The EPA completed the initial remedial design for a 75-acre portion of OU 1 to address mine and mill waste piles located in the Site. The initial remedial action commenced in November 2007. Subsequent remedial designs and remedial actions have been continuous and ongoing since 2007. To date, cleanup has been completed on approximately 1,500 acres of mine wastes.

OU 2, Smelter Zone Residential Yards Soil, and OU 3, Mine Waste Residential Yard Soil

These OUs both address cleanup of residential yard soil. Response actions were identical and were conducted simultaneously for both OUs. Initial actions conducted for residential yards consisted of a time-critical removal initiated by the EPA in late 1995 on 294 residential yards and six day care centers in the smelter area. Soil removal and replacement was completed at day care centers where soils were greater than 500 ppm lead; at residential yards where soils exceeded 2,500 ppm lead; or where a child in the home had a blood lead level greater than 15 μg/dl. This time-critical removal was completed in May 1996. The EPA signed a ROD for residential yard remediation in August 1996 and began cleanup of yard soil under the remedial program in November 1996. Only one RAO was stated in the ROD which was "Reduce public exposure, particularly children's exposure, to residential soils with elevated lead and cadmium concentrations resulting from historic mining and smelting activities." The ROD specified excavation and replacement of all residential yard soils exceeding 500 ppm lead at properties where at least one soil sample result exceeded 800 ppm. The major components of the remedy were:

- Excavation and replacement of residential yard soils exceeding 500 ppm lead and 75 ppm cadmium.
- Construction of an on-site repository for excavated soil.
- Establishing ICs for new residential and day care center development.
- Continuation of the ongoing health education programs.
- Conducting a phosphate stabilization treatability study.
- Phosphate stabilization of yard soils if treatability study results are positive.

The EPA completed soil removal and replacement actions at 2,192 yards by September 2001. Except for approximately 30 owner-occupied homes where access for cleanup was denied by the owners, the EPA replaced all smelter- and mining-related contaminated soil exceeding 500 ppm lead in the residential yards where the trigger level of 800 ppm lead was met. MDNR conducted the cleanup actions on the yards where owners denied access to the EPA. These actions were completed by MDNR in August 2010, and reduced the state match requirement owed to the EPA for the remedial action. All contaminated soils were placed in the repository near the Route 249 corridor at 17th and Eagle Road, southeast of Webb City.

The EPA and MDNR conducted a phosphate treatability study at the Site over a period of approximately six years. Results of the study indicate addition of phosphate amendments to lead-

contaminated soil can reduce the bioavailability of the lead by as much as 30 percent. The EPA and MDNR, along with the Environmental Task Force of Jasper and Newton Counties, have agreed that phosphate amendment would reduce soil lead toxicity below action levels. However, the goal for the Site of blood lead reduction has been exceeded due to the completion of remedial actions. Thus, additional soil treatment is unnecessary to achieve OU 2/OU 3 RAOs.

In addition to the soil replacement actions conducted by the EPA, extensive health education activities have been carried out at the Site. Education activities continue to be conducted by many groups including the Joplin Health Department, JCHD, MDHSS, ATSDR, Joplin and Jasper County school districts and the local Girl Scouts' chapter. The EPA has provided funding to MDHSS, ATSDR, and the JCHD to support many of the health education activities. These activities include the following:

- Extensive blood lead screening and in-home assessments of children in the contaminated areas including door-to-door screening and distribution of educational material.
- Development and publication of a site-specific lead awareness and health education coloring book for distribution to preschool children.
- Development of lead poisoning awareness curriculum in the local school district.
- Development of a Lead Poisoning Prevention merit badge for the local Girl Scouts' chapter.
- Maintaining information booths at local heath fairs held in shopping malls, schools and hospitals.
- Contacting local pediatricians to provide lead awareness and health educational information packets and encourage blood lead screening.
- Conducting lead awareness and education seminars in conjunction with prenatal classes at local hospitals.
- Mass mailing of a community newsletter (22,000 copies) devoted to lead awareness, health education and lead poisoning prevention.
- Providing lead educational materials to schools, day care centers, and the Parents As Teachers Association.
- Off-site blood lead screening activities at local community events.

The EPA worked with the Task Force and local governments to establish the IC program for the residential portion of the Site. The ICs will prevent improper development of lead-contaminated land in the future. The ordinance was adopted by Jasper County in early 2006.

OU 4, Groundwater

OU 4 was established to address groundwater contamination in private residential water wells. During the investigations for OU 1, data were collected from private residential water wells indicating numerous wells exceeded health-based standards for lead, cadmium and zinc. The EPA issued two UAOs to the PRPs in late 1993 and early 1994 to provide bottled water to homes with contaminated wells and to sample additional residential wells. The EPA and PRPs

provided bottled water to those homes from 1994 to 2002. An FS was completed in 1998 to assess permanent water supply options for the area of the Site not covered by a public water supply system.

The EPA issued a ROD for remedial action for the private water supply wells in July 1998 which calls for installation of public water supply lines and point-of-use treatment units. The RAO developed for the OU 4 ROD was "Prevent unacceptable human health risk due to ingestion of or exposure to site-related contaminants in groundwater." The major components of selected remedy are:

- Support to Public Water Supply District 3 (PWSD) in the Oronogo-Duenweg DA.
- Extension of existing public water lines in the Oronogo-Duenweg DA.
- Extension of existing public water lines in the Irons Gates Extension DA.
- Installation of point-of-use treatment units to homes not accessible to public water.
- A maintenance program for the point-of-use treatment units.
- A monitoring program for threatened homes and the point-of-use treatment units.
- ICs to regulate future uses of the contaminated shallow aquifer.

In addition, the OU 4 ROD presented a Technical Impracticability (TI) Waiver for groundwater. This TI Waiver determined that it was not technically feasible to remediate groundwater for heavy metals contamination due to the size of the aquifer. Instead, the RAOs of the ROD are to prevent human consumption of the contaminated groundwater.

Installation of the public water supply systems began in June 2001. The EPA funded PWSD 3, PWSD 1, the cities of Webb City and Duenweg and Missouri American Water Company to install the new water supply systems to the areas of groundwater contamination, which will cover approximately 25 square miles. During the design phase, the EPA was able to expand the extent of public water supply to include all but two of the homes which are specified in the ROD to receive a whole-house treatment unit. For these two homes, MDNR installed new drinking water wells into the deep aquifer to eliminate the maintenance requirements of treatment units. All water systems planned for the Site were completed in 2007.

Operation and Maintenance

Operation and Maintenance (O&M) has been ongoing for OUs 2, 3 and 4 since completion of the remedies at those OUs. The O&M activities for each OU are discussed below and include descriptions of the ICs established for the OUs.

OUs 2 and 3

O&M associated with this action consists of inspection and maintenance of the soil disposal repository and the implementation of the IC program by the JCHD. The soil repository remains open for use for disposal of metals-contaminated residential soils by local residents, builders and developers constructing new residential dwellings on contaminated soil, and has been occasionally used for soil disposal from new construction since the completion of the OU 2 and 3 remedy. To date, several thousand cubic yards of contaminated soil have been disposed of

at the repository since the completion of the OU 2 and 3 remedy. Other than inspections of the repository and periodic burning for weed control by the EPA, no costs have been incurred for O&M. On June 12 and 13, 2012, MDNR hired a contractor to knock down and smooth the contaminated soil piles disposed of at the repository by builders and developers of new residential construction. Cost for this work, which included removal of trees, shrubs and weeds that had invaded the repository, was $3,000.

During the remedial action for OUs 2 and 3, the EPA and JCHD, in conjunction with MDHSS, developed and implemented a health education program. This program, considered by the EPA as an IC, is conducted by the JCHD with funding from the EPA. Health education activities include blood lead monitoring and in-home follow-up of at-risk children, physician education, and general public education activities. The EPA provides approximately $120,000 per year to JCHD through a cooperative agreement with MDHSS. The program is functioning well with 2,000 to 3,000 children tested annually.

Additionally, in 2006 at the request of the EPA, the Jasper County Commission promulgated a building ordinance for construction of new residential dwellings in known contaminated area. The ordinance, also considered an IC, was implemented and is administered by JCHD and requires heavy-metals testing of yard soil at new residential construction. Yard soils that exceed 400 ppm lead or 75 ppm cadmium require remediation under the ordinance prior to occupancy of the dwelling. Contaminated soils excavated from these residences are disposed of at the soil repository discussed above. The EPA provides approximately $150,000 annually to JCHD to administer this program. The program is functioning well with more than 500 properties sampled since implementation of this program.

OU 4

The public water supplies installed under the remedy for OU 4 were completed in September 2007. The EPA funded PWSD 3, PWSD 1, the cities of Webb City and Duenweg and Missouri American Water Company to install the new water supply systems and connect residences to the systems in the areas of groundwater contamination. These systems are being operated and maintained by the individual entities that installed the systems. Neither the EPA nor MDNR have incurred any costs associated with the O&M of these systems. Additionally, MDNR promulgated a wellhead protection program, considered an IC, for Jasper County and Newton County in 2001. This rule requires newly installed wells drilled in the contamination zone to be completed into the deep aquifer and cased and sealed through the shallow aquifer. The program is administered by the Department of Geology and Land Survey (DGLS), and is functioning properly. All costs associated with administering the rule are incurred by MDNR/DGLS.

V. Progress Since the Last Review

The EPA completed the second Five-Year Review for the Site in 2007. During the second review, the remedial actions completed for the Site were the cleanup of the residential yards soils in OU 2 and 3, and the remedial actions for OU 4. In addition, the ICs specified in the OU 2, 3 and 4 RODs were implemented. The OU 2 and 3 RODs specified an IC for the development of new residential dwellings in metals-contaminated areas of the Site. In 2005, the Japer County

Commission promulgated a health ordinance requiring soil testing at properties where new residential development occurs in mining or smelting affected areas of the county. This ordinance prevents the construction of new residences on contaminated soil by requiring both testing and cleanup of soil if the test results exceed 400 ppm lead. The OU 4 ROD specified ICs for the installation of drinking water wells in the contaminated shallow aquifer at the site. In 2001, MDNR/DGLS promulgated a well-drilling code regulating the installation of drinking water wells in both Jasper and Newton Counties. The code prohibits the completion of drinking water wells in the contaminated portion of the shallow aquifer. This code supplements the EPA's action of installing public water lines and provides protection to future residents at the Site from exposure to metals in the shallow aquifer. Finally, the RI for OU 5 was initiated prior to completion of the second Five-Year Review.

Since the completion of the second Five-Year Review, the remedial actions began at OU 1. To date, 1,500 acres of the 7,000 acres of mine wastes have been cleaned up, and approximately four million cubic yards of mine wastes and contaminated soil have been excavated, disposed of and capped at the Site.

On May 22, 2011, an EF5 tornado devastated the southern portion of the city of Joplin and a large portion of the city of Duquesne. Approximately 7,000 homes and 3,000 businesses were destroyed along a seven-mile path up to one-mile wide. During the debris cleanup in the devastation zone, lead-contaminated soils were exposed at the surface in numerous residential properties. The JCHD has been sampling properties in the zone as residential construction occurs on the debris-cleared properties under the county ordinance/IC program. To date, over 160 properties have been identified with soil lead concentration over 400 ppm, which is the level set by JCHD above which soil remediation is required by the county ordinance. The EPA plans to address this soil contamination problem by providing funding to the city of Joplin under OU 1. These funds will be used by the city to obtain contractor support for excavation and replacement of contaminated yard soil as the properties are redeveloped. The EPA provided $500,000 to the city in late 2011. The EPA proposes to continue providing annual funding to the city for soil remediation during the redevelopment of properties in the devastation zone. This activity represents a significant change in Scope to the OU 1 ROD. Thus, the EPA will be issuing an Amended Proposed Plan and ROD in 2012 to address this added activity.

VI. Five-Year Review Process

Community Involvement

This is the third five-year review conducted for the Site. The EPA discussed the five-year review process with the public through quarterly meetings with the Task Force during the five-year review process. The public was informed of the completion of the five-year review through the media on June 22, 2012. Additionally, a fact sheet describing the five-year review process was posted on the EPA Region 7's website advising the public where the document could be reviewed. No comments were received from the public on the five-year review or the effectiveness of the remedies conducted to date.

Data Review

The remedial actions completed to date are the cleanup of residential yard soil for OUs 2 and 3, and the installation of public water supply systems for OU 4. The IC, which regulates construction of new homes in contaminated areas of the Site, became effective in spring 2006. The JCHD now tests the yard soil of all newly constructed residential dwellings prior to occupancy in contaminated zones to ensure the yard soils contain less than 400 ppm lead.

To assess the effectiveness of the remedy, the EPA requested ATSDR to conduct a follow-up exposure study of children under the age of seven years during the first five-year review process. The initial exposure study completed in 1994 indicated 14 percent of children under the age of seven had blood lead concentrations greater than 10 μg/dl. Further, the study found the most significant contributor to elevated blood lead in children was lead-contaminated yard soil. These results triggered the cleanup of residential yard soil (OUs 2 and 3) at the Site. The follow-up exposure study was released by MDHSS in September 2002. The report indicates when the blood lead sampling was conducted in 1999, only two percent of children under the age of seven had blood lead concentrations exceeding 10 μg/dl; down from 14 percent in 1991. Additionally, the mean blood lead in 1999 was 3.81 μg/dl, down from 6.24 μg/dl in 1991. This equates to a decrease in average blood lead concentrations of approximately four percent per year and an overall decrease in children exceeding 10 μg/dl of 86 percent.

The nature of the remedies does not require data collection until after OU 1 remedial action is completed.

Site Inspection

Throughout 2011, the EPA periodically inspected the soil repository where contaminated yard soils were placed as part of the OU 2 and 3 remedial actions. Approximately 20 percent of the repository is currently used for soil disposal by builders and developers constructing new residential homes on contaminated soil. The unused portion of the repository is well vegetated and no significant erosion was noted. Quarterly reports from the MDHHS JCHD indicate the health education and building ordinance ICs are fully functioning and protective of human health.

Discussions with representatives of PWSD 3, Duenweg, Webb City and Missouri American Water Company indicate all water systems installed as part of the OU 4 remedial action are functioning properly and supplying water to homes previously at risk from shallow private drinking wells.

Discussions with MDNR/DGLS indicate that the well-drilling IC rule is functioning appropriately and local well-drilling companies are following the requirements in the rule. Therefore, this IC continues to add to the protectiveness for human health by restricting exposure to contaminated groundwater.

VII. Technical Assessment

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

OU 1

Remedial actions of the mining wastes began in November 2007. These actions were initiated in Carterville, Missouri, on mining wastes located in close proximity to residential areas. To date, approximately four million cubic yards of wastes have been removed and disposed of from 1,500 acres of land in the Carterville and Webb City area. In addition, cleanup on another 400 acres in the vicinity of Prosperity, Missouri, is nearing completion. The remedy is expected to take another six to eight years to complete. ICs are in place that prevents unacceptable residential use of OU1.

OUs 2 and 3

Currently, the remedial action completed for OUs 2 and 3 continues to be operational and functional and is performing as expected in the ROD. Cleanup levels were achieved in all known contaminated properties. The soil repository is functioning properly, and only minimal O&M in the form of burning weeds has been required.

The ROD specified development of ICs for future residential development within the Site. The Task Force assumed the task of developing local ordinances and development plans that could be adopted by the various governmental entities to ensure safe residential development. As a result, the Task Force developed a health ordinance that requires soil sampling at all new residential properties and the replacement of any soil with lead greater than 400 ppm. The Jasper County Commission and several municipalities have adopted and implemented the ordinance.

The ROD specified ongoing health education as part of the remedy. Both the Jasper County and Joplin health departments have done an excellent job in conducting the health education. Among a variety of educational activities conducted, the agencies screen blood lead of several thousand children per year and conduct consultations with parents of those children whose levels are elevated. The EPA has funded the health education throughout the remedial actions conducted to date and will continue to fund the health education until the completion of the mine waste cleanup in OU 1. At the conclusion of the OU 1 remedial action, health education will no longer be required at the Site.

OU4

The remedial action is complete, and the remedy is operational and functional. MDNR established the ICs for OU 4 as specified in the ROD. Regulations were promulgated to prevent the installation of private drinking water supply wells in the contaminated zone of the shallow aquifer throughout both the Jasper and Newton County sites.

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

There are no changes in the conditions of the Site that would affect the protectiveness of the remedies defined in either the OUs 2, 3 or 4 RODs. All toxicity information and risk assumptions used in the risk assessments and to set cleanup levels are still current and appropriate. The RAOs for OUs 2, 3 and 4 have been met. All applicable or relevant and appropriate requirements (ARARs) identified in the RODs for OUs 2 and 3 are still valid and have been met. Under OU 4, all ARARs identified in the RODs have been met. However, as of 2006, the arsenic Maximum Contaminant Level (MCL) has dropped from 0.05 mg/L to 0.01 mg/L. Because the maximum detected concentration of arsenic at the Site exceeds the current MCL, arsenic would be considered a COC today. However, the remedy is considered to still be protective because the maximum detected concentrations of arsenic only slightly exceed the current MCL. Additionally, the remedy involved establishing a public drinking water system to mitigate the exposure to shallow groundwater.

The ERA performed for OU 1 evaluated risk to terrestrial receptors by modeling exposures to specific feeding guilds within the terrestrial environment. Risks to terrestrial vertebrate populations and communities were evaluated by comparing the average daily dose to selected toxicity reference values. An addendum to the final ERA (Risk Management Considerations for Terrestrial Vermivores) reevaluated risks to terrestrial vermivores and concluded that terrestrial vertebrates that consume earthworms in soils with elevated COC concentrations may experience adverse chronic effects. The addendum developed threshold criteria for protection of the terrestrial environment. The criteria are as follows: lead at 804 ppm, cadmium at 41 ppm and zinc at 6,424 ppm. These criteria remain protective of the terrestrial environment.

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

According to the reviews and inspections for the Site, the remedy for OUs 2 and 3 is functioning as intended by the ROD. The remedy for OU 4 is fully operational and functional. There have been no changes in the condition of the Site that would affect the protectiveness of the remedies selected to date. There have been no changes to toxicity assumptions or risk assessment methodology that would alter cleanup levels that have been established for the Site. No other information has been found that would call into question the protectiveness of the remedies.

As discussed above, on May 22, 2011, an EF5 tornado devastated the southern portion of the city of Joplin and a large portion of the city of Duquesne. Approximately 7,000 homes and 3,000 businesses were destroyed along a seven-mile path up to one-mile wide. Cleanup in the devastation zone caused contaminated soils to become exposed at the surface in numerous residential properties. The EPA is addressing this soil contamination by providing funding to the city of Joplin under OU 1 to excavate and replace contaminated yard soil as the properties are redeveloped. These actions, along with the Jasper County building ordinance, are providing protection of people living in the Site.

VIII. Issues

No issues were identified during this review that affects the protectiveness of the remedies.

IX. Recommendations and Follow-up Actions

There are no recommendations identified for the remedies.

X. Protectiveness Statements

OU 1 – will be protective

The remedy at OU 1 is expected to be protective upon completion. In the interim, soil excavation activities completed to date and the ICs program currently in place adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

OUs 2 and 3 – protective

The remedy at OU 2 is protective of human health and the environment. All exposure pathways have been addressed through excavation of soils and the implementation of ICs in the form of residential development ordinances.

OU 4 – protective

The remedy at OU 4 is protective of human health and the environment. All exposure pathways have been addressed through the installation of the public water supply systems and the implementation of ICs preventing shallow groundwater use.

XI. Next Review

Due to the fact hazardous substances remain on-site, additional five-year reviews will be required. The next review is scheduled to be conducted in 2016.

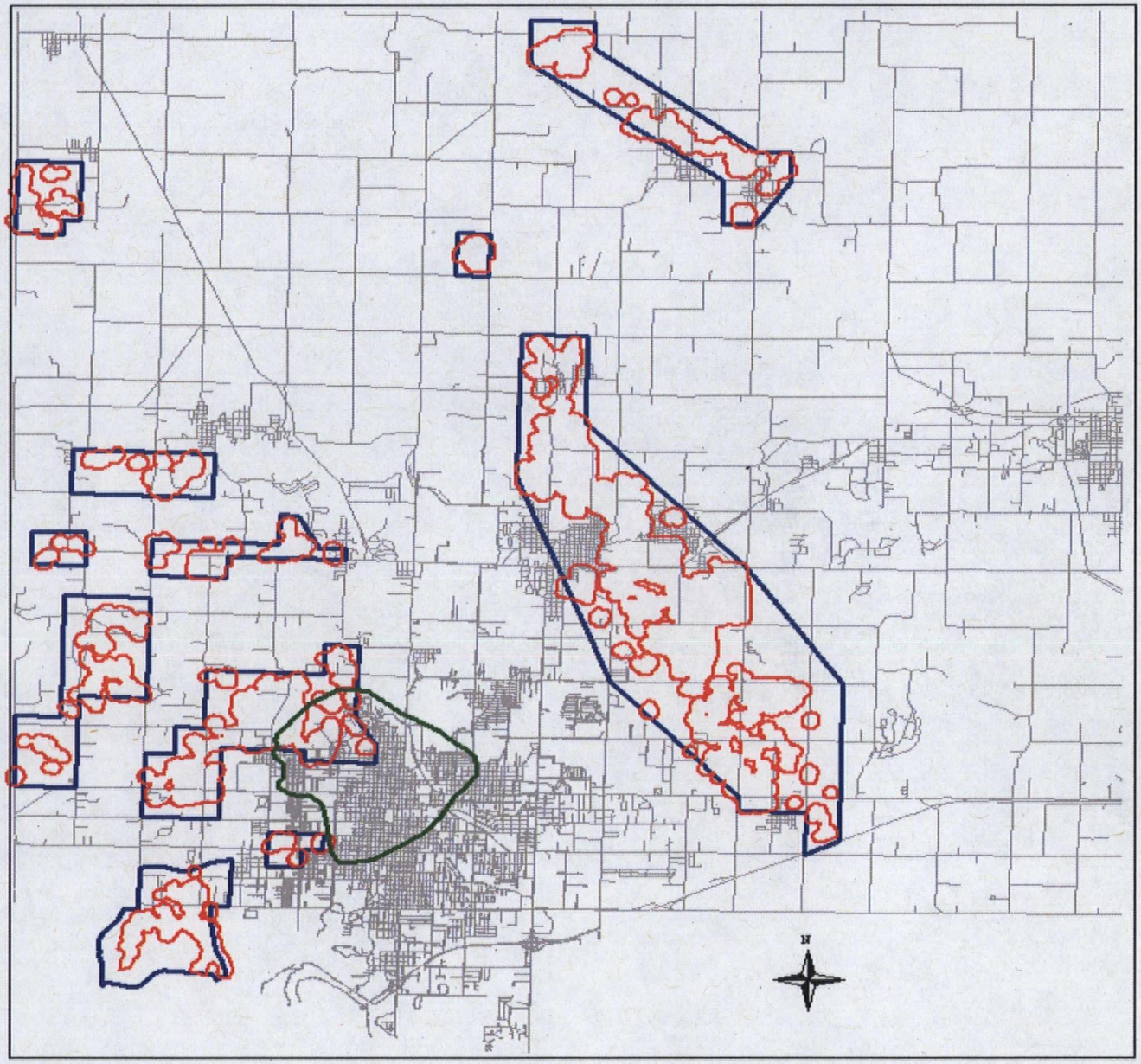
[This page intentionally left blank]

ATTACHMENT 1

Site Location Map

Jasper County

Mine Waste Areas and Smelter Zone



ATTACHMENT 2

List of Documents Reviewed

Record of Decision, Groundwater, Operable Unit 4, Jasper County Superfund Site, Jasper County, Missouri, July 1998

Record of Decision, Residential Yard and Mine Waste Yard Soils, Operable Units 2 and 3, Oronogo-Duenweg Mining Belt Site, Jasper County, Missouri, June 1996

Record of Decision, Mine Waste, Operable Unit 1, Oronogo-Duenweg Mining Belt Site, Jasper County, Missouri, September 2004

Quarterly Progress Reports, Missouri Department of Health and Senior Services

Quarterly Progress Reports, Jasper County Health Department

ATTACHMENT 3

Site Inspection Checklist

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Oronogo-Duenweg Mining Belt Site	**Date of inspection:** November 1, 2011
Location and Region: Jasper County, Missouri Region 7	**EPA ID:** MOD 980686281
Agency, office, or company leading the five-year review: EPA	**Weather/temperature:** Sunny, 45 degrees

Remedy Includes: (Check all that apply)

- X Landfill cover/containment
- ☐ Access controls
- X 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** _____ _____ _____
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   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, etc.) Fill in all that apply.

Agency Missouri Department of Natural Resourses
Contact Don Van Dyke SPM Nov. 1, 2011 573-522-3351
Name 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 _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ☐ O&M manual — ☐ Readily available — ☐ Up to date — X 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 — X 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 — X N/A

   Remarks_____

4. **Permits and Service Agreements**
   - ☐ Air discharge permit — ☐ Readily available — ☐ Up to date — X N/A
   - ☐ Effluent discharge — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Waste disposal, POTW — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Other permits_____ — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks_____

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

   Remarks_____

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

   Remarks_____

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

   Remarks_____

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

   Remarks_____

9. **Discharge Compliance Records**
   - ☐ Air — ☐ Readily available — ☐ Up to date — X N/A
   - ☐ Water (effluent) — ☐ Readily available — ☐ Up to date — X N/A

   Remarks_____

10. **Daily Access/Security Logs** — ☐ Readily available — ☐ Up to date — X N/A

    Remarks_____

IV. O&M COSTS

1. **O&M Organization**

X State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other_____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date X N/A
☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

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

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS X Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map X Gates secured ☐ N/A
Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
Remarks In tact

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes X No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes X No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Periodic Inspections
Frequency Once per quarter
Responsible party/agency MDNR
Contact Don Van Dyke SPM 573-522-3351
Name Title Date Phone no.

Reporting is up-to-date X Yes ☐ No ☐ N/A
Reports are verified by the lead agency X Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met X Yes ☐ No ☐ N/A
Violations have been reported X Yes ☐ No ☐ N/A
Other problems or suggestions: ☐ Report attached

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

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map X No vandalism evident
Remarks

2. **Land use changes on site** ☐ N/A
Remarks None

3. **Land use changes off site** ☐ N/A
Remarks None

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable X N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads adequate X 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 X Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Cracks** ☐ Location shown on site map X Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____
   _____

3. **Erosion** ☐ Location shown on site map X Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Holes** ☐ Location shown on site map X Holes not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established X No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____
   _____

6. **Alternative Cover (armored rock, concrete, etc.)** **X** N/A
   Remarks_____
   _____

7. **Bulges** ☐ Location shown on site map X Bulges not evident
   Areal extent_____ Height_____
   Remarks_____
   _____

8. **Wet Areas/Water Damage** **X** Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Areal extent_____
   ☐ Ponding ☐ Location shown on site map Areal extent_____
   ☐ Seeps ☐ Location shown on site map Areal extent_____
   ☐ Soft subgrade ☐ Location shown on site map Areal extent_____
   Remarks_____
   _____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map X No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable X 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 X N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map X N/A or okay
Remarks_____

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

C. Letdown Channels ☐ Applicable X 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** ☐ Location shown on site map X No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map X No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map X No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map X No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ X No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
X No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☐ Applicable X 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. **Leachate Extraction Wells**
☐ 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 X 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 X N/A

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

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

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

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
   X Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   X Erosion not evident
   Remarks_____

3. **Outlet Works** X Functioning ☐ N/A
   Remarks_____

4. **Dam** ☐ Functioning X N/A
   Remarks_____

H. Retaining Walls ☐ Applicable X 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 X Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map X Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   X Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map X Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** ☐ Functioning X N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable X N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored
   Frequency_____ ☐ Evidence of breaching
   Head differential_____
   Remarks_____

C. Treatment System ☐ Applicable X 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 X N/A

V. 1. Monitoring Data
☐ Is routinely submitted on time ☐ Is of acceptable quality

VI. 2. Monitoring data suggests:
☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation X N/A

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 which are 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 to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Soil repository in good condition. ICs in place and functioning as designed.

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.

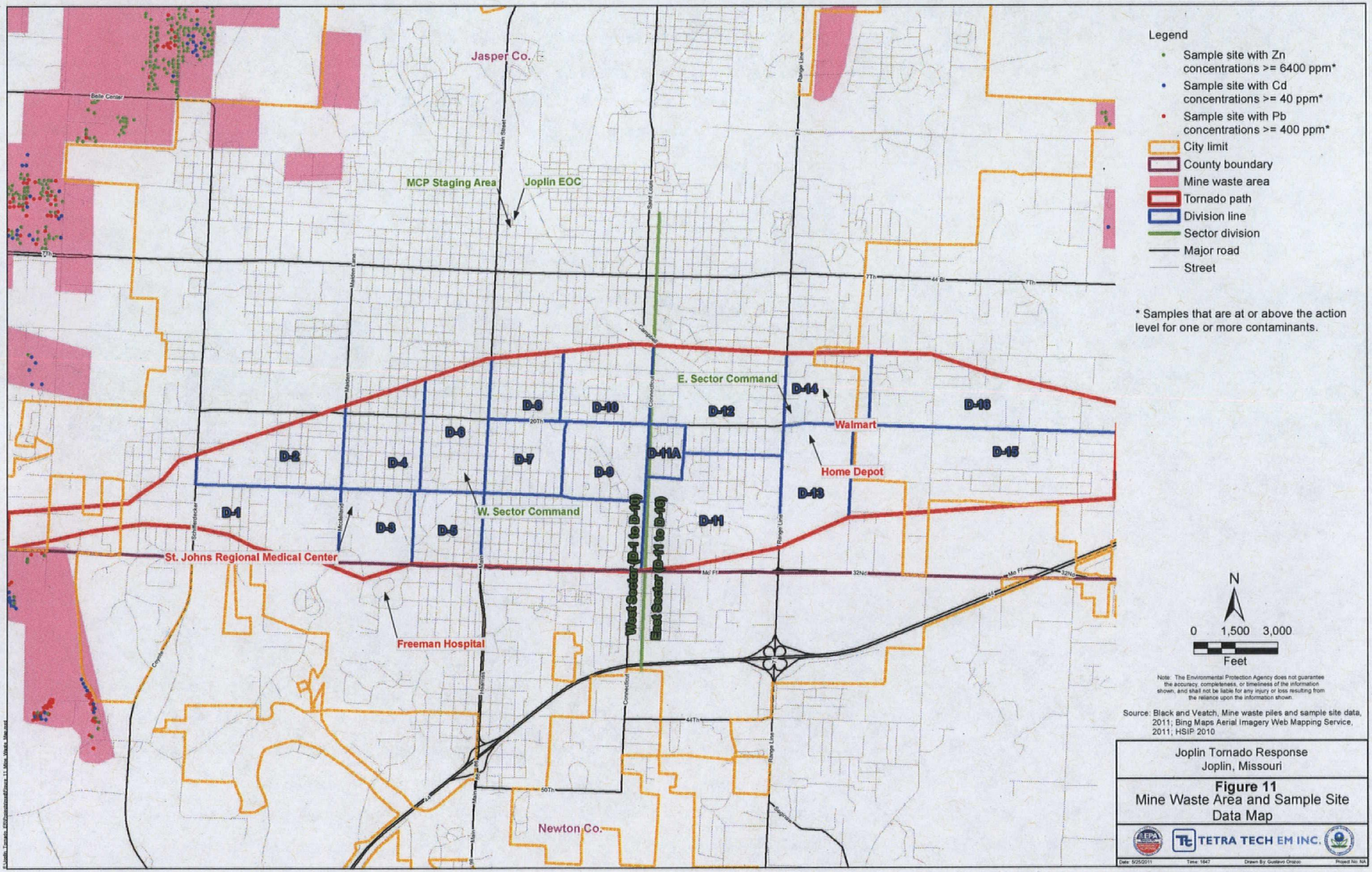
O&M is adequate for the soil repository.

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. None

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None

ATTACHMENT 4

Joplin Tornado Site Location Map


Jasper Co.
Newton Co.
MCP Staging Area
Joplin EOC
E. Sector Command
W. Sector Command
Walmart
Home Depot
St. Johns Regional Medical Center
Freeman Hospital
West Sector (D-1 to D-10)
East Sector (D-11 to D-16)
D-1
D-2
D-3
D-4
D-5
D-6
D-7
D-8
D-9
D-10
D-11
D-11A
D-12
D-13
D-14
D-15
D-16
Legend
Sample site with Zn concentrations >= 6400 ppm*
Sample site with Cd concentrations >= 40 ppm*
Sample site with Pb concentrations >= 400 ppm*
City limit
County boundary
Mine waste area
Tornado path
Division line
Sector division
Major road
Street
* Samples that are at or above the action level for one or more contaminants.
N
0 1,500 3,000
Feet
Note: The Environmental Protection Agency does not guarantee the accuracy, completeness, or timeliness of the information shown, and shall not be liable for any injury or loss resulting from the reliance upon the information shown.
Source: Black and Veatch, Mine waste piles and sample site data, 2011; Bing Maps Aerial Imagery Web Mapping Service, 2011; HSIP 2010
Joplin Tornado Response
Joplin, Missouri
Figure 11
Mine Waste Area and Sample Site Data Map
TETRA TECH EM INC.
Date: 9/25/2011
Time: 1647
Drawn By: Gustavo Orozco
Project No: NA